Major Project Report

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Submitted

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By

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SCHOOL OF JOURNALISM AND MASS COMMUNICATION (SJMC)

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Study of social feasibility of electric vehicles in India

Presented to the faculty of

K.R. MANGALAM UNIVERSITY

In partial fulfillment of the requirement for the degree

MASTERS IN JOURNALISM AND MASS COMMUNICATION

Student Declaration:

I declare that I, **Shashank Vashisth**, the undersigned, have completed this work and that I have not used any other than permitted reference sources or materials nor engaged in any plagiarism. All references and other sources used by me have been appropriately acknowledged in the work. I further declare that the work has not been submitted for the purpose of academic examination, either in its original or similar form, anywhere else.

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I, the undersigned, verify that this document meets K.R. Mangalam University academic standards.

_____

Mrs. Sarina place/date

PREFACE

This thesis could not be completed without the support of many individuals. I want to express my sincere gratitude towards all of them.

Firstly, I would like to thanks to all the researchers who really helped me out to make my thesis as there research helped me out to know how will electric vehicles going to impact people in near future and also to understand more about electric vehicles.

Secondly, I would express my gratitude and thanks to my mentor Mrs. Sarina for imparting her knowledge and experience in my study.

I am thankful to K.R. Mangalam University for giving me this opportunity to pursue my research.

I thanks and appreciate faculty members, family and colleagues for supporting and encouraged me throughout my research.

In last I would like to appreciate the government for launching electric vehicles in India for the betterment of environment in future.

FOREWARD

As many of us know that air pollution is increasing day by day and major cause of pollution is emission created by conventional vehicles as we have an option to replace it with electric vehicles but how will it going to impact a common person in India. This is what author is trying to elaborate the challenges, difficulties, advantages and many more things through his study. Study on Social feasibility of electric vehicles in India will going to let us know the different point of view people on electric vehicles.

On the basis of many researches author has discovered many theories about how electric vehicles will create lots of complications and as well as benefits for both government and people in future.

Author major motive is to let people know that the air pollution can be reduced by choosing an alternative of conventional vehicles which is electric vehicles but for that we all have to take steps from our side and it's true that in beginning it will going to create some problem but we all have to adjust with it and should take steps forward towards making our cities and town clean and green.

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TOPIC:

STUDY OF SOCIAL FEASIBILITY OF ELECTRIC VEHICLE IN INDIA

EXECUTIVE SUMMARY

In India today there are many problems that need to be resolved but the major problem is air pollution. As we all suffering from it last many years and air pollution causing many diseases which are harming nature and human beings. The one of the major reason of air pollution is pollution caused by conventional vehicle. Carbon emission vehicles cause lots of air pollution in India which harms our environment. In March 2013 India's first electric vehicle launched in Delhi after 26% government subsidy granted and it is known as e20which will help to keep our town and cities clean and green. In general, electric vehicles produce fewer emissions that contribute to climate change and smog than conventional vehicles.

Electric vehicles also have a good impact globally and people there are taking steps forward to make environment good by shifting towards electric vehicles. As they help to improve both noise and air pollution. Indians are also trying to shift to electric vehicles as they are getting more aware about vehicles which help to improve environment and keep their cities and towns clean and green.

CHAPTER 1

1. INTRODUCTION

1.1. Background of the problem

All vehicles produce emissions which cause air pollution and harm the environment. However, electric vehicle typically produce less emission than conventional vehicle because most emissions are low for electricity generation than burning gasoline or diesel. By 2023, in Delhi there will be one-fourth electric vehicle on road to making a step towards reducing the air pollution. In many cities electric vehicle are running estimated is done around 5,000 vehicles are electric which are running in India. Battery charging and swapping stations will setup all across these cities with private sector participation at existing public parking zones, bus depots and terminals, metro stations and etc.As for the private charging stations, the government will give 100 per cent subsidy on installation of charging point up to ₹30,000 per charging point for the first 10,000 points in residential or non- residential buildings. This is for those people who owns transportation business and who have trucks and buses which are used for commercial use. These are some steps which government will apply to make control on pollution.

But as we know electric vehicles cost will be very high and cost of maintenance will also be very high and its parts and services of electric vehicles will also cost very high which will hit the pockets of people very badly. Setting up the infrastructure for electric vehicles will also cost government. So, all these will

going to be challenges in front of government as well as public because electric vehicle is going to be very expensive to buy or to take on rent.

1.2 BACKGROUND OF THE STUDY

But electric vehicle will also improve the air quality index and also reduces the noise pollution. So, it's like spending some more money for some good cause and it will only give the advantage to us because we need to reduce pollution by taking small steps and electric vehicle is a small step towards reduction of pollution

Whether we can change our bad environment into better or we can go with our expenses which suits our pocket. This will be huge issue in near future because Indian people will consider their pocket first than environment and it will be very difficult for government also to setup this kind of structure because electric vehicles are expensive enough to make decision whether we should buy it or not, but it will also helps to improve our environment. So, this is will come out as huge dilemma in front of everyone in future.

So, let's see what will happen in future as pollution is major problem in front of India but will public keep environment first rather than their pocket.

To achieve the India's pollution gas reduction, we must remove the fuel engines to electric batteries for betterment of environment of India.

1.2.1 What is an electric vehicle

An electric vehicle (EV) is avehicle which runs on the 4 or 5 electric batteries and batteries are made up of lithium-ion which helps to generate power in the vehicle through which they run effortlessly and durably.

The electricity used to run the motor could come through either transmission wires, as in the case with electronic metro trains, and trams itcome through batteries, as is the case in electric bikes and electric cars it could be generated on board using a electric cells.

Electric vehicles are mainly categorized as:-

- Electric two-wheelers (E2Ws) is used for both electric bicycles.
- Electric four-wheelers (E4Ws) is used for electric cars
- E3W is used to refer to electric 3-wheelers (including E-rickshaws)
- E bus refers to electric buses.

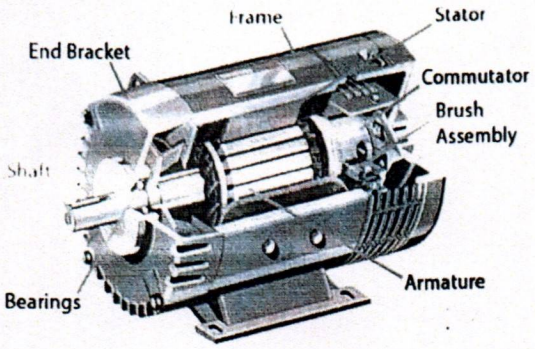
Electric vehicles is classified into two types:-

- BATTERY ELECTRIC VEHICLES (BEVs) - Which have an electric motor in place of combustion engine and use electricity from the panels stored in batteries.
- PLUG-INHYBRID ELECTRIC VEHICLED (PHEVs) - It use batteries to power an electric motor and liquid fuel engines as gasoline or diesel to power an internal combustion engine.

INSIDE ELECTRIC VEHICLES (EV)

- An electric motor

Electric motor is a device which changes electric energy into mechanical energy.

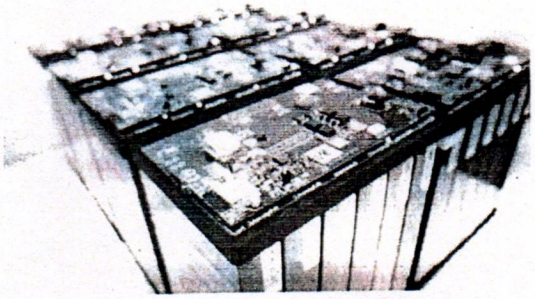


- Motor controllers

The motor controllers serve in a manner to make sure that electric motor perform efficiently and effectively.

- Batteries

A battery is device which includes one or more electrochemical cells with external connections to give power to electric devices.



CHAPTER 2

2. OBJECTIVES OF THE STUDY

2.1 Problem of statement

The research addresses the obstacles or hurdles occurring in the growth of electric vehicles or hybrid electric vehicles in India.

2.2 OBJECTIVE OF THE STUDY

The study is done to know what are the obstacles are occurring in the growth of electric vehicles which will help to make environment clean and green in future. The functional objective of the research is given to tackle the obstacles.

- To study and explore the charging infrastructure in India.
- To study and analyze the Scope of electric vehicles in India.
- To study and explore the Policies and Incentives on electric vehicle in India.
- To study that there will there be a zero-carbon fantasy.

2.3 HYPOTHESIS STATEMENT

The hypothesis is as follows:

HYPOTHESIS 1:

Null hypothesis – Indian people will not buy electric vehicles because of its features and efficiency.

Alternative hypothesis – Indian people will buy electric vehicles because of its features and efficiency.

HYPOTHESIS 2:

Null hypothesis – Electric vehicles will create no pollution which will make our environment condition bad.

Alternative hypothesis – Electric vehicles will create pollution which will make our environment condition bad.

HYPOTHESIS 3:

Null hypothesis – Electric vehicles prices are not high in India due to fewer variants.

Alternative hypothesis – Electric vehicles prices are high in India die to fewer variants.

HYPOTHESIS 4:

Null hypothesis – Customers fuel prices will not get reduced by purchasing of electric vehicles.

Alternative hypothesis – Customers fuel prices will get reduced by purchasing of electric vehicles.

HYPOTHESIS 5:

Null hypothesis – Government benefits and incentives will not attract and influence people of India to buy the electric vehicles.

Alternative hypothesis – Government benefits and incentives will attract and influence people of India to buy the electric vehicles.

2.4 RESEARCH QUESTIONS

- The people of India will buy electric vehicles as they are so expensive?
- Is there a future of electric buses (e-buses) and electric trucks (e-trucks) for transportation in India?
- Can electric vehicles or hybrid electric vehicles survive in India?
- Will electric vehicles or hybrid electric vehicles affect the demand of oil in India?

CHAPTER 3

3. LITERATURE REVIEWS

3.1 Introduction

To have a better understanding of the topic chosen for the research, it is important to make a review of the literature available on works done by the various researcher. This chapter reviews the relevant data of social feasibility of electric vehicles. It covers the policies of government on electric vehicles, scenario of electric vehicles in India and other countries, Tax on electric vehicles and GST reduction done by Indian government so, that people can buy electric vehicles to make environment clean and green, scope of electric vehicles or hybrid electric vehicles in India, conditions of charging infrastructure in India, electric vehicles or hybrid electric vehicles which are present in India.

3.2 CHARGING INFRASTRUCTURE IN INDIA

We know that if government want to make electric vehicle concept successful then it is very important that there should be a proper infrastructure so that everyone can easily access to the charging woes and charge their vehicles.

Government should try building electric pumps near in malls parking, opening parking slots, in market parking and on every place where the people can easily reach or access to the charging woes and charge their vehicles.

Infrastructure of this concept is very important because electric vehicle is totally depend upon high electricity supply and if India fail to get a proper electric supply then the concept of electric vehicle will never get success and no one will buy electric vehicle. So, it is very important to build the proper infrastructure.

The rate at which charging range of Electric vehicles depends are: battery type, and type of electric vehicles supply equipments (EVSE).

The following are typical rates for a light duty vehicle.

- LEVEL 1 : low power charges up to 1.6kW (in Delhi, service voltage is 230V, so any charger on a circuit with a capacity up to 6.5 amps is considered level 1)
- LEVEL 2 : medium power charges up to 25Kw
- Dc Fast : direct current fast chargers ranging from 30-100kW
- Battery Swapping Stations: stations where vehicle batteries can be replaced with pre-charged batteries.
- Solar panel charging

So, these are some ways through which electric vehicle can be charge with proper electric supply. According to research 2023 more 40% vehicle will get electric in India which means government and electric vehicle industry should work on rapid pace on building the proper infrastructure for the electric vehicle and electric vehicle companies should make vehicle that can be get charge through solar power, should have fast charging system and make a vehicle that good that they can run on good miles on less battery also.

3.3SCOPE OF ELECTRIC VEHICLES IN INDIA:-

According to research India stands on third position that emits CO2. The transport sector accounts for 15% of India's energy related co2 emissions (INCCA, 2010).

In India transport sector still consumed 95% of oil which produces around 22% of CO2 in air every year and causes air pollution and if every year this much pollution is created by transport sector than it is making India's air very polluted and this will lead to many diseases in future which may take people towards the death.

ADVANTAGES AND CHALLENGES OF ELECTRIC VEHICLES

ADVANTAGES:-

- Economy of fuel is high where operating cost is low

- Fueling will be flexible
- Efficient and effective performance
- Carbon emission will be low
- Energy security
- Clear benefit of savings in yearly running costs example : Mahindra e20 cost comparison with the conventional cars
- Lifestyle will become easy and smooth by charging the vehicle at home overnight or anytime.
- Easy and feasible to operate

CHALLENEGS:-

- Electric vehicle will have less driving range.
- Electric will take good amount of time to get charge.
- Batteries which will be used in the electric vehicle will also be very expensive.
- Batteries wait is very bulky which will make a vehicle curb weight very heavy and this will cause into less power and vehicle will not run fast.
- Electric vehicle maintenance will be high.

DRIVERS AND CHALLENGES OCCURS IN GROWTH OF ELECTRIC VEHICLES IN INDIA.

DRIVERS:-

- Increasing oil prices – As we know in India crude oil prices fluctuates every other day and majorly they fluctuates by getting more higher so, it is getting very difficult for people to refuel their vehicle by lots of money and it is best time for electric vehicles to launch because people expenses get reduce by not giving fuel charges.

- Increasing demand for Electric vehicles in world market– As we know that people are getting aware of electric vehicle all over the world and they show the intention to buy it because it causes less pollution and helps to maintain the environment clean and green.

- Manufacturers and government are providing incentives to attract buyers- Now a day's government and manufactures are also providing some benefits or incentives to people who are buying electric vehicle and this is good step by them because it influence and attract more and more people towards buying the electric vehicle and helps to maintain their towns and cities clean and green.

CHALLENGES:-

- New and better technologies and infrastructure for electric vehicle

Electric vehicle need better technology and good infrastructure to get successful in India but for now India don't have both of them because of lack of support and funds. Both of these elements are necessary for electric vehicle so that they can survive in India.

- Electric vehicle High prices as compared to conventional cars.

An average conventional vehicle with necessary features cost around 5 to 6 lakh INR but an average electric vehicle with necessary feature cost around 14 to 15 lakh INR this is huge difference between both of them in respect of price and Indian people complete their needs as per their pockets so for them this price for a vehicle will be very high and many people will deny to buy because they are getting same featured car in low price. So, electric vehicle companies focus on low price sale.

- Lack of spare parts in local market

It is very difficult to get spare parts of electric vehicle in India's local markets because they are expensive and lack of skilled labor who can replace the parts. So, it is very difficult for electric vehicle companies to provide their vehicle parts to people through local market shops.

- Infrastructure for charging the vehicle

Electric vehicle need to charge every day as their range is very less and it can be charge through charging woes which means that India government need to build a strong and high electric supply infrastructure so that they can provide electric supply to charge the vehicle to people. They need to build charging woes in malls, in open market slots and in petro pumps. Infrastructure is necessary.

- Resale value of electric vehicle

Resale values of conventional cars are good and anybody can get second hand average looking and featured conventional car in good amount. But, if someone wants to buy second hand electric car it will cost him around the same price at which average featured new conventional vehicle can come. So, the resale value of electric vehicle is also so high that people will not buy even second hand electric vehicle.

3.4 POLICIES AVAILABLE FOR ELECTRIC VEHICLES IN INDIA

AUTOMATIVE MISSION PLAN (2006-2016)

Its aim is to emerge as the destination of choice in the world for design and manufacture of automobiles and auto components with output reaching a level of US$ 145 billion accounting for more than 10% of the GDP and providing additional employment to 25 Million people by 2016.

NATIONAL ELECTRIC MOBILITY MISSION PLAN (NEMMP) (2020)

Its aim is to achieve national fuel security by promoting hybrid and electric vehicles in the country. There is an ambitious target to achieve 6-7 million sales of hybrid and electric vehicles year on year from 2020 onwards. With the support from the Government of India, the cumulative sale is expected to reach 15-16 Million by 2020. It is expected to save 9500 Million Liters of crude oil equivalent to Rs. 62000 Cr. Savings.

SMART CITY INITIATIVE

The policies and regulations pertaining to improve the acceptability of the electric vehicles have always been present but the smart city initiative undertaken by the MoUD has given a greater boost to improve the electric vehicles segment in India.

FASTER ADOPTION AND MANUFACTURING OF (HYBRID &) ELECTRIC VEHICLES (FAME)

Based on NEMMP 2020, the Government of India approved the FAMEIndia initiative undertaken by DHI so as to formulate the road map for a new paradigm in road transportation focusing around hybrid and electric vehicles. Based on the Ministry of Finance's approval, FAME India scheme with an outlay of Rs. 795 Cr. Has been launched for the initial two years – Phase 1 (2015-17).

PILOT PROJECTS UNDER FAME

- Running of electric vehicles (7 seaters) in the area of 5 km to 10km near the monuments(Taj Mahal, Qutub Minar and etc.) tourists.
- Two-wheeler Electric vehicle for home delivery.
- Electric vehicle used for collecting garbage and for the distribution of vegetables and fruits.

- Electric vehicles such as cars and buses for pick and drop for airport and railway stations

3.5 SCENARIO OF ELECTRIC VEHICLES INTERNATIONALLY

Internationally, cost of battery has gone down and utilization electric vehicles is gone up and has multi-modal with 49,000 electric buses and 245 million electric two-wheelers and total electric vehicles spending by nation governments equalized 18 billion USD between 2010-2014.

- The Global electric vehicles stock stands at more than 7, 65,000 through the end of 2014, which accounts to 0.10% of the total passenger cars sold.
- The global electric vehicle supply equipments (EVSE) stands more than 16000 for fast charging points and 97000 for slow charging points.
- Example: China accounts for 230 million e-bike, 83000 e-cars and around 36500 e-buses.
- Norway is the country with the highest market penetration per capita in the world, with four plug-in electric vehicles per 1000 inhabitants in 2023.
- In March 2014, Norway became the first country where over 1 in every 100 passenger cars on the roads is a plug-in electric.
- Norway also has the world's largest plug-in electric segment market share of total new car sales.

ONE TIME PURCHASE/REGISTRATION TAX

In Denmark, registration tax is calculated based on vehicle price, safety equipment on board, and fuel consumption, BEVs are exempt from registration tax.

In Norway, registration tax is based on vehicle weight, engine power, and CO2 emission. BEVs are exempt from registration tax.

Example: for the Volvo V60, a registration tax of about 37000 EUR applies to the PHEV version, compared with about 35000 EUR for the regular diesel version.

COMPANY CAR TAX

The basic idea behind the company car system is as follows:

Instead of paying a higher salary to its employee, the company offers to provide him/her a car and to pay all related charges, usually including fuel costs.

The company can claim the costs for the vehicle and associated charges as business expenditures and is subject to a lower profit tax.

The employee, on the other hand, has access to a vehicle that he/she can also use for private trips.

In return, the employee has to pay a special company car tax to account for the monetary benefit of having free access to a vehicle.

3.6GST ON ELECTRIC VEHICLE GET REDUCED BY 12% TO 5% IN INDIA

Government states that people who willbuy electric vehicles will get an additional income tax deduction of Rs. 1.5 lakh on the interest paid on loans taken to buy electric vehicles. This scheme will help government to attract more and more people to buy electric vehicles and this will also help them to influence them.

Government also decided to deduct the goods and service tax (GST) to 5% so that people can buy electric vehicles on good prices and this step of government allow people to think about to purchase the electric vehicle.

A specially convened GST Council meeting via video conference will take up the proposal on July 25, a senior Government official privy to the development told

ET. The committee of officials looking at fitment of GST rates "has by and large agreed that rate on EV should be cut to 5% from 12%".

Some states had some concerns on the move, but the committee has backed it. The Narendra Modi-led NDA Government has identified electric vehicles as part of its big plan to promote clean tech and cut dependence on fossil fuels. The Union budget has announced a number of measures to promote EVs, including tax incentives for manufacturers and buyers.

Those buying electric vehicles will get an additional income tax deduction of Rs. 1.5 lakh on the interest paid on loans taken to buy EVs.

"This amounts to a benefit of around 2.5 lakh over the loan period to the taxpayers who take loans to purchase electric vehicle," finance minister Nirmala Sitharaman has said in her budget speech. The government is now keen to pus tax changes on the indirect taxes side to complement the measures taken in budget.

Besides bringing down GST on electric vehicles, it is also proposed to cut GST on chargers for e-vehicles to 12% from 18% said the official cited earlier.

FUEL COST SAVINGS

Electric vehicles are more energy efficient than comparable combustion engines. They run fully on electricity which saves fuel expenses of people. Electricity is as compared to refueling of fuel every week is less expensive because the average rate of per unit of electricity is Rs. 6 in India and everyone can bear this much amount for their vehicle. This saves lots of money of people and electric vehicle companies are making more efficient and long life batteries so that vehicle can cover more distance with less battery consumption. This will help Indian people to save lots of money by not refueling their vehicles every week and an average Indian refuel his or her vehicle in every 3 days with an average amount of Rs 1200 which cost around Rs 9600 per month which is a lot for any middle class family in month for refueling the vehicle. But now electric vehicle companies will definitely reduce this burden from people by giving efficient and durable running electric vehicles.

3.7 SCENARIO OF ELECTRIC VEHICLES IN INDIA

As per the data available, around 42000 electric vehicles were sold in 2012-2013 and nearly 20000 hybrid and electric vehicles were sold in 2013-2014.

In the year 2012-2013, most of the electric vehicles sold were electric low speed scooters.

It is good sign that people are getting aware about it about these numbers are very less because of some disadvantages that electric vehicle have and issues that were occurring in it from past few years. As the new companies like lexus, kia and Renault are coming with some new electric vehicle and scooters companies like Honda, Piaggio and hero also have done very well by coming up with their new types of electric vehicles and trying to making as much as good out of it. This is very good sign of initiative against pollution from the automobiles companies.

Government is also giving benefits and incentives who are buying electric vehicles because people should also get appreciated who is taking step against pollution and it is necessary that in future everyone should replace theirconventional vehicles with electric vehicle to make our towns and cities clean and green. By 2023 the number of sale of electric vehicles will going to be increased because many are getting aware.

THE WAVE

The wave was road trip of electric vehicles which covers over 28000 kilometers of southern India. It begins at Mumbai and stops at schools, colleges, malls, and other places of importance in major Indian cities such as Pune, Hyderabad, Bangalore, and Goa. The purpose of this is only to aware people about the electric vehicles and because of these cars we can control the our bad air quality India which will become huge problem for all of us in future. This will benefit both electric vehicle companies and Indian people because companies will good profit by selling electric vehicles because people are getting aware about it and people

will save their money of fuel and also help them to take initiative against air pollution.

This wave helps lots of people in northern India also because people are getting aware of it and they also show intention to buy these electric vehicles and make their cities and town clean and green.

The wave covers malls and open are parking because they want that government should build infrastructure for their electric vehicles in these places because people come at these places frequently and it will also give people faith that if we buy electric vehicle we have suitable charging stations to charge the vehicles at stations. In coming few years this wave will help more people to influence to buy these electric vehicles and take step to reduce air pollution.

MUMBAI METROPOLITAN REGIONAL AUTHORITY (MMRDA)

In April 2015, 50 AC electric and hybrid electric taxi and 10 electric buses were launched which in railway station for the public.

NEW DELHI MUNICIPAL CORPORATION

- Their aim is to start electric three wheeler rickshaws from the every metro station of Delhi, around 50 from each metro station.
- Delhi has infrastructure around 31 single electric woes in some places like: lodhi road market, Hauz khas and in some parts of western and southern Delhi.

BANGALORE MUNICIPAL CORPORATION

- Bangalore Municipal Corporation launched first electric bus in 2014 for the test whether public will like it or not and will it suitable for Bangalore roads conditions.
- Bangalore has taken very good initiative of building up electric station in malls and parking area for electric vehicles.

- Bangalore municipal transport corporation gave exemption of road tax and value added tax for electric vehicle.

3.8 ELECTRIC VEHICLES MANUFACTURERS IN INDIA

MAHINDRA

Mahindra is an Indian company which make Mahindra reva which totally electric vehicle and its plant based in banglore and it is the first electric vehicles of Mahindra manufacturers.

AJANTA OREVA

"Ajanta Manufacturing Ltd. (OREVA Group)" is the name of the corporate presence behind the leading "OREVA" brand of the country. It is India's leading manufacturer of lights which are used in vehicles like led lights, fog lamps and etc and also manufactures electric cars and electric bikes.

HERO ELECTRIC

Hero is a Indian company which serves two wheelers in India and they are making electric two wheelers and three wheelers for India on reasonable rate so that Indians can afford them.

TATA MOTORS

Tata Motors Limited (formerly TELCO, short for Tata Engineering and Locomotive Company) is an Indian multinational automotive manufacturing company headquartered in Mumbai, Maharashtra, India and a subsidiary of the Tata Group. Its products include passenger cars, trucks, vans, coaches, buses, construction

equipment and military vehicles. It is the world's 17th largest motor vehicle manufacturing company, fourth-largest truck manufacturer, and second-largest bus manufacturing with a volume.

Tata Megapixel offers a range of up to 900 km (with a single tank fuel), path-breaking CO2, emissions of just 22g/km and fuel economy of 100km/litre under a combined driving mode.

All the manufacturers are trying to make better electric vehicle for the future as they want to make customer permanent by giving them incentives, benefits and best after sale services which help them to influence people to electric vehicles.

3.9 TAX STRUCTURE FOR ELECTRIC VEHICLES IN INDIA

CUSTOM DUTIES

These rates include:-

- Basic custom duty (35 %)
- Special excise duty (24 %)
- Additional duty (16 %)
- Surcharge on customs duty (10 %)
- Special additional duty of customs (4 %)
- Motor vehicle cess (0.125 %)

EXCISE DUTIES

The excise duty on the cars depends on the length of the vehicle and the engine size.

- Less than 4 meters – 8%
- More than 4 meters – 20%
    - Less than 1200 cc (petrol) and 1500 cc (diesel) – 20 percent
    - More than 1500 cc (petrol and diesel_ - 24 percent

3.10 SWOT ANALYSIS OF THE ELECTRIC VEHICLE INDUSTRY IN INDIA

STRENGTH:-

- Less running cost for maintenance and recharge environmental friendliness.
- Efficiency helps to produce more energy.
- No emission of nitrogen or carbon substances.
- Carbon produced will be very low.
- Smooth and comfortable driving experience with upgraded features.
- Less variable can reduce dependence on foreign oil imports.
- Decrease utility prices as electric vehicles get charged typically at night, when electricity is cheapest to generate.
- Government gives rebate and incentives or benefits.
- Manufacturing facilities of conventional cars can be used.
- Electric vehicles will save lots of fuel expense this will give profit to electric vehicle companies.

WEAKNESS:-

- Electric vehicle have high initial prices (around 40% more than equivalent conventional cars)
- Electric vehicles have limited capacity to cover the distance (range) than conventional vehicle.
- Electric takes lots of time to recharge the batteries.
- There will be shortage of parts of electric vehicles in Indian markets.
- As electric vehicles are expensive so it will leads to low sale which means low profits for companies.
- Electric vehicles don't have much variety of designs.

OPPORTUNITIES:-

- Electric vehicles have greater opportunities for research and development.
- Electric vehicle companies will create job opportunities in India.

- Availability of cheap labor in India.
- Companies can develop more efficiency of electric vehicles and improve range for the hybrid electric vehicles.
- Companies can provide training programs to dealers and can increase the sale.
- Companies can optimize production process to minimize expenses.
- Improve the governmental mission and schemes for electric vehicles and can develop the strong infrastructure.
- Companies can provide limitedbenefits or incentives for a longer duration to improve acceptability by public on electric vehicles.

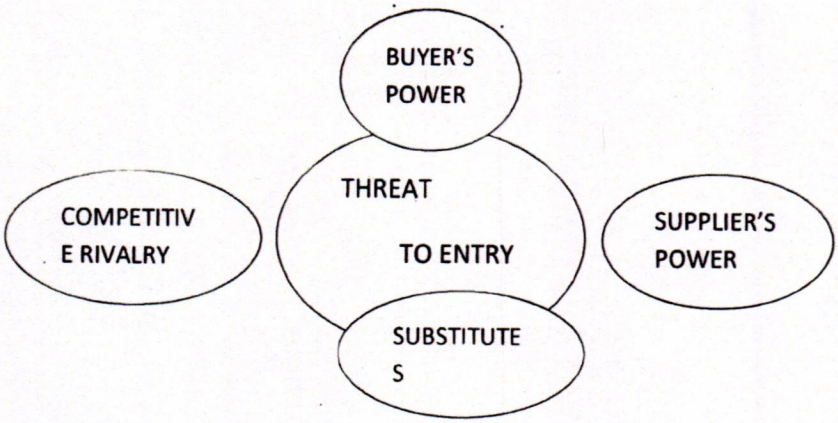
THREATS:-

- Lack of skilled labor and support in India.
- Lack of charging infrastructure in India.
- Less improvement in sale of electric vehicles due to high prices.
- Sale of electric vehicles can be reduced due to decrease in rates of fuels.
- Sale of electric vehicle can also be affected due to Bharat Stage 6 (BSVI) launch in India.

3.11 SOCIAL ANALYSIS OF ELECTRIC VEHICLES INDUSTRY IN INDIA

- Lucrative market in rural India can produce huge amount of profits.
- In India labor cost is very less than any other country.
- Buying electric vehicle can become the image of clean and green planet.
- Many social initiatives are being taken up to improve the living standards.

PORTER'S FIVE FORCES ANALYSIS



THREAT OF ENTRY

- East Asian companies can dominate the electric vehicle sector in India.
- Import duties can be reduced.
- Not much presence of skilful labor.

BUYER POWER

- Due to **HIGH RATES** buyers will dominate to reduce the rates.
- Imports by individuals.
- Customer services and support.
- Buyers will always look for close substitutes like BSVI engine cars.
- Second hand market.

COMPETITIVE RIVALRY

- Nature of the business
- Price wars will be there.

- Ease of access to the buyers.

SUPPLIER POWER

- Rate of registration
- Companies can create brand loyalty.
- Wide networks of dealerships are available.

SUBSTITUTES

- People will use public transport as it is cheap.
- BSVI engine vehicles.

RECOMMENDATIONS:-

The policies of electric vehicles are present in India from long time and government and electric vehicles companies spreading awareness about electric vehicles and providing benefits and incentives to people who will buy electric vehicles but Indian government and automobiles companies should work on the problems that will occur in launching electric vehicles and should do the waves to build more awareness. Companies should come up with more improved technologies so that they can produce more efficient, effective and budgeted electric vehicles.

TECHNOLOGY

- Reduction of batteries will help to increase the power of vehicles.
- Range of electric vehicles can increased or improved with the better research and development on technology.
- Companies can provide better system for feasibility and ease.
- Improvement in the charging infrastructure along with universal charging systems, hence, better integration between the manufacturers is required.

- India also has a good potential of solar energy which will help to charge the car any where under the sunlight. This will make charging more easy and suitable for public.

POLICY

- Need to create public – private platform model for the success of electric vehicles.
- Ensure stricter fuel economy and emissions regulations
- Need to enable good markets for parts or equipment of electric vehicles.
- Promotion of research and development of electric vehicles is necessary.
- Develop policies and incentives for electric vehicles.
- Governmental need to make incentives for those who will help to invest for infrastructure of electric vehicles.
- Laws regulating type and use of electric vehicles on state highways.

FINANCIAL

- Encourage for funds to build good infrastructure for electric vehicles.
- Government should share the cost of market development for electric vehicles. along with private investors
- Model like leasing of battery should be implemented.
- Should develop resale market.

MARKET

- Help to provide infrastructure for companies like Tesla Motors to enter the Indian market. So, that they can bring new and innovative kind of electric vehicle which helps to reduce the pollution.
- Should create retail partnerships for wider coverage of the market helps to increase the sale of electric vehicle.
- Good customer services need to be provided all over India. So, that reaching to people becomes easy.

- Provide proper market driven electric vehicles supply equipments.
- Need to promote the charging woes in work places. So, that people can get aware of it.
- Improvement is needed on public awareness for Electric vehicles.
- Need to develop market penetration strategies for electric vehicles which will help for low end society which accounts for the largest number of consumers in India. Example, cars like Tata Nano should be manufactured and promoted as electric vehicle. This will improve image, sale and also improve the market
- There should be uniformity in the technology provided in terms of consumer interface

Now Indian government know that for the success of electric vehicles concept in India government need to build good infrastructure and need to improve and build new technologies so that they make effective and efficient vehicles.

Both of these elements are necessary to done for the success of electric vehicle in India.

CHAPTER 4

4. COLLECTION OF PRIMARY DATA

4.1 METHODOLGY

This section examines the methods which have been used to know more about the study. All the examinations of all methods has been undertaken to ensure that they are best suitable for research.

4.1.1 SCOPE OF STUDY

This study has been done to know the social and financial feasibility of electric vehicles or hybrid electrics in India. Following the literature reviews done in

previous section suggests the scope of electric vehicles or hybrid electric vehicles but there is very less research about the areas where electric vehicles are lacking behind and need an improvement to become successful in India by 2023.

The study has conducted into two phases: exploratory and descriptive. The review uses mixed-methods approach, qualitative and quantitative research methods.

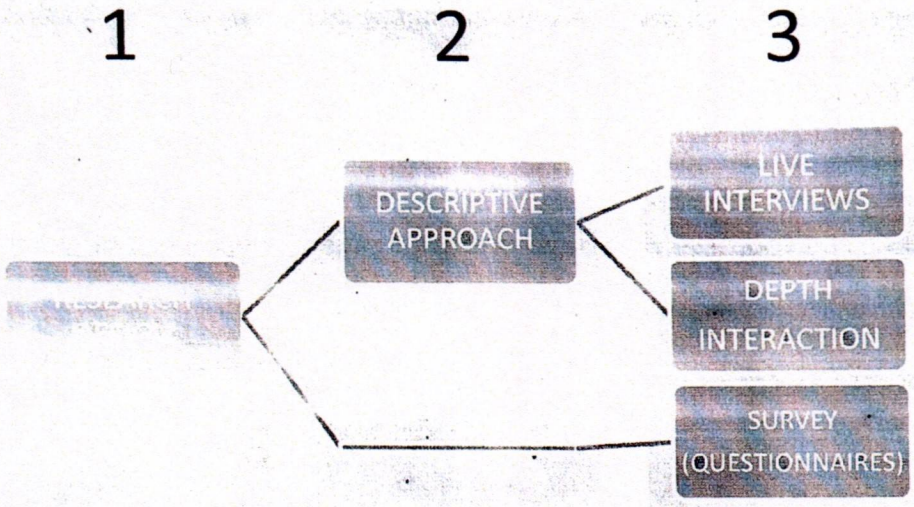
- Mixed-method approach allows researcher to have an impressive display of questions.
- A qualitative and quantitative method allows the researcher to clarify or validate data in terms of numbers.

4.2 RESEARCH DESIGN

Research design is a way of research methods and techniques applied by researcher to do its study. It creates a blueprint by experiments, surveys, descriptive case-study and helps researcher to analyze and collect the measures of the variables suspected in the researcher's problem.

4.2.1 TYPES OF RESEARCH

The research has been conducted in descriptive stage way. It also includes some statistical tools in respect to know how electric vehicles or hybrid electric vehicles are performing in India. This study focus majorly on how to improve and develop the concept of electric or hybrid electric vehicles in India by doing qualitative and quantitative methods which allows the researcher to clarify or validate data in terms of numbers and also the survey is done by the questionnaire which clearly gives the perfect picture of this study.



4.2.2 QUANTITATIVE DATA

Quantitative data plays an important role in a research as it gives a overall all data of the study. Some advantages of quantitative data are:

- It helps to give researcher a specific and generalized result.
- It saves lots of time and easy to work on.
- Quantitative data helps to make analysis more significant and straight forward.

Some, example of t study on the basis of quantitative data that how can electric or hybrid electric vehicles can be improved in India.

IMPROVING THE PROBLEM OF CHARGING INFRASTRUCTURE:-

POSSIBLE SITES FOR CHARGING STATIONS CAN BE :

- Petrol pump

Because there are many petrol pumps in every city of India and they have lots of space too. Charging woes can be placed their because it will easy for people to find out woes and they can easily get it near them. Like, in India every petrol pump have the puncture man shop in built their so, 2 electric woes in every petrol pump can also be build so that people can found it easily and it will be feasible to all.

- Charging stations near malls, big complexes

As we know that many people come and enjoy or do jobs or they have their offices in malls and complexes and everybody go there by their cars or two wheelers so, it is mandatory to place charging woes in parking slots so that they can charge their electric vehicle then and there. This will influence and attract more people to buy electric vehicle because when they see that woes are available in these places where they can charge their electric vehicle by doing their work. This concept influences them to buy electric vehicle.

- Open Parking slots

We know in India there are many open parking slots available in markets parking in which people park their vehicle but what if they get charging slots their which will charge their electric vehicle very efficiently and quickly. This parking slots electric woes concept will allows and attracts many people to buy electric vehicle because this will show that electric woes are feasible everywhere and they are very easy to operate and can charge their electric vehicle quickly and easily. This is a good concept because if electric vehicle woes are available in openparking

slots it will be very feasible and easy for people to use or access it for charging their vehicles

CURRENTLY THREE WAYS TO CHARGE AN ELECTRIC VEHICLE:

- Direct supply
- Quick charging technologies
- Using renewable sources like solar panels to enhance charging capacity.

ONE METHOD - is to integrate the solar panel on the roof, of the vehicles (example, Fisker Karma cars) which can help in constant charging of the cars.

SECOND METHOD - can be the use of PHEV in which the gasoline engine is used to charge the batteries on the car which are convenient to use but in a way also add to the carbon emissions.

INTEGRATING ENVIRONMENT FRIENDLY WAYS TO CHARGING INFRASTRUCUTURE

People should use solar panels to charge their vehicles while running the car under the sunlight which will help people also because it is free of cost and we cannot take stop in between the journey to charge the vehicle.

People who have solar panels on their house roof like in suburban and rural many people have solar panels on their roofs which can be used to charge the vehicle very easily on low cost.

TESLA's POWERWALL

Tesla launches a very innovative product which is made up of lithium-ion battery which helps to store electricity in grid generated from the solar panels on the roof. The stored electricity can be later on use to charge the vehicle as it will as a backup charging provider for vehicle.

PRIVATE OWNERSHIP

Privately owned systems present the greatest threat to utilities and retailers, as customers with these systems are theoretically able to provide all their own energy needs and most importantly charge their electric vehicles along with their homes.

4.2.3 QUALITATIVE DATA

A qualitative data helps researcher to make the research more meaning – making by explaining the study by the depth study on the electric and some face to face interactions with the people who are showing interest towards electric or hybrid electric vehicles because they want that environment should get clean and green and want to aware more and more people about it through influencing them socially.

This data helps researcher to take the depth study of the topic because of depth interactions and face to face interaction with people and here are some result about it which they states which are good for environment.

- **ELECTRIC VEHICLES AND THE ENVIRONMENT**

Electric vehicle attracts more people towards it as it helps to reduce pollution which is a major concern for everybody now and everyone wants to improve by taking small steps. Implementation of electric vehicle is one of the steps that are taken towards the reduction of pollution.

Research has shown that electric vehicles are better for the environment. They produce less greenhouse gases and air pollutants over their life than petrol or a diesel car. This is even after the production of the vehicle and the generation of the electricity required to fuel them.

Now a day's everyone is showing their interest in buying the electric vehicle which is a good thinking towards improving the environment from air pollution and noise pollution caused carbon emission vehicle. From manufacturing concerns to the way in which the electricity is generated, we look at some of the facts surrounding electric cars and their environmental impact.

- **ARE ELECTRIC CARS BETTER FOR THE ENVIRONMENT?**

The major benefit of electric cars is that they can improve air quality because of their zero emission and this will helps to make our cities and town clean and green.

Zero emission vehicles which are electric vehicle helps to make our air quality improved and this also leads to make environment clean and green. Less pollution means there is no harm to health also. So, electric vehicle genuinely improves the air quality which helps everyone live joyfully.

Study is done which states that if on every road or street one electric car runs then it can save approximately 1.8 million grams of carbon dioxide which means it is equivalent of five return flights from Barcelona to London. It means a lot because it controls lots of pollution and let's assumes that if 100 cars run on road it will make a huge distance.

As we know that electric vehicle is more silent than conventional vehicle which helps causing less noise pollution which is a good thing for both humans and animals in cities and towns. Electric vehicles are more peaceful to drive than conventional vehicle because they easy and comfy to drive and person don't get exhausted in the electric vehicle because of its comfortable and durable drive.

So, electric cars are friendly and best for environment because it helps to improve the air quality index in cities and towns and also reduces the noise pollution which is good for humans as well as animals. Electric vehicle will work as long lasting friend with environment in future.

- **ELECTRIC CAR PRODUCTION EFFECT ON ENVIRONMENT**

Manufacturing of electric vehicles use a lot of energy. The pollution created during the production of an electric vehicle is measured higher than a conventional car. Emissions which are created during the production of electric cars causes lots of pollution and it very injurious to health also as it contains some severe chemicals such as lithium, copper and nickel particles are not good for health. Many people are their which can get affected by these chemicals very badly and can leads to some severe disease which will cause a huge problem to those people or labor in future.

This is due to the manufacture of lithium ion batteries which are essential part of an electric car. More than a third of the lifetime CO2 emissions from an electric car come from the energy used to make the car itself.

As technology is getting more advances, it is changing for the betterment of nature. With more efficient and developed manufacturing techniques, the amount of pollution created during the production of batteries will improve.

- **REUSING AND RECYCLING BATTERIES IS ALSO A GROWING MARKET**

Reusing and recycling of batteries is growing market as it saves lots money and time of people. Soon the day will come that every house will have battery which they reuse or recycle for their own benefit. Opportunities like this will reduce the lifetime environmental impact of battery manufacture. This will help more energy saving instrument which can be used in the case of emergency.

Reusing and recycling the battery will help everyone of to save the money because rather to buy a new battery which will be costly we can rather used second hand battery to which is in a good condition and this will help to keep our environment clean and green and save lots of money and we get long run and feasible batteries for the electric vehicles as well as for our home usages.

ADVANTAGES OF ELECTRIC CARS

There are many advantages of an electric vehicle

- Reduces or even eliminate fuel cost.
- Reduction in car emission helps to improve environment.
- Energy dependent

Top three benefits are:

1. Reduce or even eliminate fuel costs

   4 to 5 days visit to the gas station to fuel up a car are expensive, especially when the ever-fluctuating price of fuel is high. By choosing an electric vehicle, consumers can get freedom from fueling their vehicles frequently in week and can get comfortable and safe ride in electric vehicles. Electricity is less expensive than gasoline, electricity has less rates per unit as compared to per liter fuel which help consumer to save their lots of money.

   You can reduce your costs even further by installing a rooftop with solar panel to charge your electric vehicle. When you produce your own free electricity, you avoid increasing your monthly electric bill by plugging your electric vehicle

into the grid. Due to the remarkable flexibility of electricity generation, it is possible to entirely remove fuel from your life.

2. Reduce car emissions to help the environment

Humans have negative impact on environment by polluting it with different ways like: pollution caused by vehicles and switching to an electric vehicle is one way to reduce future damage to the Earth. Carbon dioxide emissions from conventional vehicles contribute to greenhouse gases in the atmosphere and accelerate climate change.

Electric vehicles contain big batteries which help vehicle to run and it can be charged by solar panels also while moving but in conventional vehicle we need to take break to refuel it. So, electric vehicles make it very easy that you can enjoy your journey without having any stop in between.

3. Energy dependent

As we know that electric vehicles have independent energy resource like they get charged by solar panels or in homes and vehicles store energy or electricity in their battery grids which provides an appropriate amount of energy to engine of vehicle.

On the other hand if we take conventional vehicle we know that if we want to refuel we need to take it to the fuel station which may be far away from people house or far from people in between journey.

Electric vehicles have positive sign here that they energy dependency which makes it different from conventional vehicles as it makes our journey smooth and feasible. This is what people want from their any vehicle.

DISADVANATGES OF ELECTRIC VEHICLES

Everything have two aspects and the same goes with electric vehicles if it have advantages then it also have disadvantages which points questions on electric vehicles will it be worth to buy?

The following are the disadvantages of electric vehicles:-

- Charging woes
  Electric vehicles required charging stations which need to be located strategically. Also recharging of batteries often takes about 5 to 6 hours for electric vehicles, which nowhere matches the efficiency of a gas fuel and of course there's the charging equipment that need to be carried in vehicles to charge them in emergency.
  This state of batteries is one of the reasons referenced by private owners as a solid reason for not owing an electric vehicle. We know that in India people use public transport more in peak office timings and peak timing means e-bus need to run 5 to 10 constantly but if it battery goes down then it need to be stopped again between and need to be charged with portable equipment which will take lots of time of people because it people reach at their places very late and for next time they will not use it because wastage of time. Long journeys like private transporters vehicles make they travel around 200 km to 300 km and more than that on single filling of gas but if they opt for electric vehicles then it will cost them a lot and their wastage of time will be there. So, for long journeys like 5 to 10 hours of electric vehicle could be a problem. Then also government can do the sensible planning by installing charging woes in every gas station and electric vehicle companies also need to give longer battery life for long running and to cover bigger ranges. This problem can be solved with sensible planning and support of everyone.

- Travelling distance (range)

  The electric vehicle can travel about 150 to 180 miles in a day with fully charging battery on average. This figure is not suitable for Indian conditions because here an average car runs around 200 to 250 miles a day on gas and trucks and buses travel around 300 to 350 miles per day on diesel. As per the technology of Chrysler's proposed electric vehicles batteries is supposed to run longer though but the time changes and electric batteries aren't what they used to be and as we know bodies of e-buses and trucks are very heavy and if there is heavy weight and more power is required then the electric battery utilization will also be very high and this will affect on the range of the vehicle. It is true, it won't match gasoline in terms of range and availability, but the companies are working on technology and trying to improve it before electric vehicle get fully established in India as public transport.

- Lack of power

  In general electric vehicles are still behind the gas powered vehicles in their ability to accelerate and climb quickly because the body of electric vehicles are heavy and they need lots of power to run especially when they are fully loaded but when they run on gas they get accurate power that they want to run when they are fully loaded and can climb up, run fast, clear all the hurdles that occurs when we drive on roads like pot holes, not well built roads and etc. For electric buses in India people always calculate their time and travel so, they reach on accurate time at bus stands and force bus drivers to move the vehicle fast as they will get late and driver accelerates bus generate good power and took good pick up and run fast in gasoline but in electric buses don't have that much of power so they won't be able to make good pick up and then the people will complain and same will happen with e-trucks as they loaded will tones of weight they genuinely need extreme amount of power which gas emission give them perfectly but if electric vehicles want to give at least good amount of power then they

need to improve a lot and work upon their technology to improve electric batteries.

- Overloaded batteries

We know that heart of electric industry is the vehicle's batteries. Every car needs accessories like radios, car air conditioners, etc which uses up electric power from batteries and this causes drainage of battery because the instruments or equipment which are fitted in electric cars they require high power to run specially air conditioner, head lights, indicators, display light of instrument cluster and these didn't get accurate power then it will be very difficult for anyone to drive the car and after giving them power battery takes lot of time to recharge again which causes load on battery and due to which battery can blast or can get damaged heavily which will leads to huge expensive to customer in future.

Cars which are running on gases also have batteries but their batteries are used in only giving power to air conditioner, head lights, instrument cluster light and etc. and they don't give power to engine that's why battery charges side by side very fast because vehicle is running on gas.

But in future technician may get a solution for this disadvantage because of which many people are not buying electric vehicle.

- They are expensive

  Batteries that power these vehicles are a costly. The promising and long-lasting lithium-ion batteries cost about thousands of dollars, most the parts of electric vehicles are expensive and the batteries last only 5 years, they could add to the maintenance cost.

  There is no disputing that electric vehicles are expensive. The batteries require lithium, which is a rare metal that can only be mined in a handful of

countries. So, it is not east to get lithium. They are expensive to produce and very heavy in weight. Lithium battery is the heart of electric vehicle which is expensive feature. An average electric car carries four batteries in it to functionalize so, think how much will e-bus and e-truck will going to carry, with an estimate average e-bus is going to carry around 10-12 lithium batteries depending upon the curb weight of the bus. Cost of per KW is approximately $125 which very expensive Indian market government will think 1000 times before purchasing them for each and every e-bus. Countries like China, USA, Russia and Germany are producing lithium-ion batteries for electric vehicles on very high price which will be very difficult for India to buy it for its e-buses. So, these are some factors which makes electric vehicles expensive for this the solution is that in future India should also build lithium-ion batteries for electric vehicles to cut down the cost and time but this will take more 10 to 15 years as it will going to take good infrastructure and amount of investment of many and support.

- They cause pollution

  Even 100% electric vehicles are not a zero-carbon solution. Sometimes minerals used for batteries, dismantling batteries which have deteriorated, and building and delivering vehicles to customers worldwide all involve substantial CO2 emissions. It is impossible to break all of the links. Manufacturing an electric vehicle generates more carbon emissions than building a conventional vehicle, mostly because of its battery, the union of concerned scientist has found it. The materials used in batteries production are harmful to the environment. The mining and processing of metals such as lithium, copper, and nickel requires much energy and it can release toxic compounds. So, production of battery also causes our environment badly and also it harms the health and environment by releasing toxic compounds. Now a day's electric vehicle companies are considering it and working on it and somehow in future they will get success because we all know that one day in whole world only electric vehicles will operated by people.

- They are heavy

  Batteries make vehicles heavy. A pack of battery of an average electric vehicle (e-bus) can weigh up to 2500 to 3000 pounds it is a disadvantage because weight puts pressure on batteries and they can drain out and it will show the affect on performance of vehicle.

  We know as the vehicle get heavier its performance goes down and heavy battery pack will going to give pressure on batteries because of which batteries can get harm very badly and life of batteries will also get reduced. But we should remember that earlier phone were also so big and heavy and they look like a big prop of movie but now a day's look at the smart phones we have they are superb and light in weight works great and this all can happen due lots of improvement in technology time to time and it took years to make smart phones and it goes same with the batteries they heavy and big now but in future there will be a solution for this also and people will make lighter and small lithium-ion batteries for e-buses which will be powerful in performance, strong in durability and long last to travel good range of kms.

SKILLED LABOR WORKING FOR ELECTRIC VEHICLES IN INDIA

According to researcher there is very big difference between how to think and how to execute or implement the thing.

Everybody know about the how technically and mechanically electric vehicle can be made but in India we have lots of labor but we don't have skilled labor which is major issue to build a electric vehicle in India and MANPOWER OR LABOR is important for the initial state to assemble the infrastructure of electric vehicles.

We need to address this knowledge gap.

In India, we have very less knowledge of development of product and its challenges which will be faced in future by people. People need to understand

that it is very important to understand the knowledge gap and try to fulfill it so that everyone know how to deal with problems that will come in future.

- ✓ Indian government is now working on new policies which aim to increase investments in electric vehicle manufacturing, batteries and smart charging, instead of only giving benefits on sales. It is important because if government will not invest in electric vehicles and in its equipment then how will they can spread the awareness towards the people to buy electric vehicles to reduce the pollution and make their cities and town clean and green. If government gets success in getting investment from people to buy electric vehicle then there will be no issues of giving benefits on sales to people. People need to understand and support the government.

- ✓ The government is also pushing Indian public to use more public transportation which electric like: e-rickshaws and hybrid electric taxi cars. Because when public will start using they slowly and steadily staking a step towards the reduction of pollution. Government also investing more In electric rickshaws and by 2025 government will try to launch and invest in electric buses which will be a very good step towards the environment of India. It is a very good initiative by government because they are taking pollution problem very seriously by doing different things which in favor of decreasing the pollution but it's not only about government, public should also support the government by using and take advantage of their policies towards making control on pollution.

4.3 RESEARCH QUESTION

- **Will the public will buy electric vehicle as they are so expensive?**

As per the research an average well featured electric vehicle will cost around 14 to 15 lac INR. This cost is very expensive for a car for any middle class family who tends to buy a car. An average well featured diesel or petrol vehicle will come under 6 to 7 lac INR and on Indian customer will prefer the car which is in his or her budget and maintenance of vehicle should be less also. But when we talk about electric vehicle it is expensive enough and its maintenance is also very high and this will affect the pockets of Indian customers.

But now a day's people mentality is changing as they are thinking about the pollution first and they want to take initial steps to delete the pollution from air.

As per survey 10 out of 6 people agree on fact that they will buy electric vehicle to control the pollution level and make the environment clean and green for future.

But we never know how public will react to this problem. So, people need to make the choice between their pockets and clean environment and we know that we need to sacrifice something to achieve some good thing and here we need to sacrifice our pocket budget to make our environment clean and green.

Government also has some policies in which customers will get purchase benefits from that automobiles company will give to customers when they buy the electric vehicles.

- **Is there a future for electric buses (e-buses) as public transportation in India?**

As per the research China has about 90% of e-buses for public transportation which helps them to reduce the air pollution but in India there is no e-bus available. If in India e-buses get launched then their will drastic change in environment because in India every state have thousands of buses which runs on GAS or Diesel which causes lots of pollution and think if all of them get replaced by electric buses it will change the environment of India into pollution free country because many people use public transportation to travel and many buses take many rounds of cities to drop people from one place to another in gas buses which causes lots of pollution and if they travel electric buses there will be not an issue of pollution.

Indian government also working on this and trying to launch 1000 electric buses by 2025 in Delhi, Mumbai, Chennai, Punjab and Haryana. This is a very good initiative from the government as it will reduce lots of pollution from these cities and in future these state will become pollution free and then government will try to launch e-buses in whole India.

- **Can Electric vehicles survive in India?**

It will be very difficult for automobile to establish electric vehicle in India because there are some factors which can become trouble in survival of electric vehicle in INDIA:

1. Expensive batteries - Batteries which are made up of lithium-ion uses a expensive materials like cobalt and nickel which raises up the price of battery and companies could not cut down the battery equipments because it will be essential part of electric car. So, it is huge dilemma in India because not much people will prefer expensive battery cars.

2. Less power supply - To run the electric vehicles smoothly and durability on roads India will need to have excess supply of power so that charging stations can be spread all over the India.
3. High maintenance requirement – Electric vehicle require high maintenance as the batteries are expensive its maintenance cost will be high and Indian public will not spend too much on the maintenance because they want vehicle that is in budget and it's maintenance should be less.

So, survival of electric vehicle is difficult in India but it is possible it's just matter of time and implementation of right technology on right place to improve the loop holes occurring in between the survival of electric vehicles.

- **Will electric vehicles affect oil demand in future?**

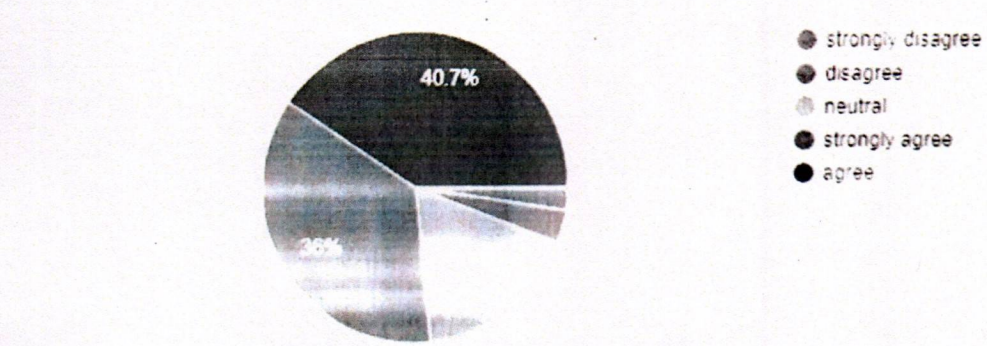
As per the researcher by 2030 in India electric vehicles number will increase up to 60% and this will definitely affect the oil demand in future because more than 50% of people will run electric vehicle which will more electricity than petroleum which means there will definitely decrease in demand of oil.

Reduction of oil demand will cause reduction in pollution and this step will make our environment clean and green in future. Many other countries like France, Germany, USA and China have electric vehicles like e-cars and e-buses which already made their oil demand less by 4 to 5% every year which is a positive sign for their countries environment.

Indian government is also now taking the environment problem seriously and various policies for electric vehicles which will help people to buy it and reduce the usage of oil and try to make their cities clean and green for the future generations.

4.4 Analysis of questionnaires.

1. Will you buy these electric vehicles because they will help to reduce pollution in India?



Strongly agree – 31 (36%)

Agree – 35 (40.7%)

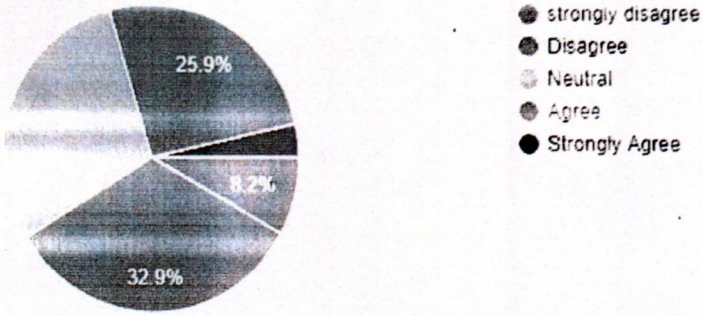
Neutral – 15 (17.4%)

Disagree – 3 (3.5%)

Strongly disagree –2 (2.3%)

2. **Will you buy these electric vehicles as they are more expensive than conventional vehicle?**

Will you buy these electric vehicles as they are more expensive than conventional vehicle?



Strongly agree – 3 (3.5%)

Agree – 22 (25.9%)

Neutral – 25 (29.4%)

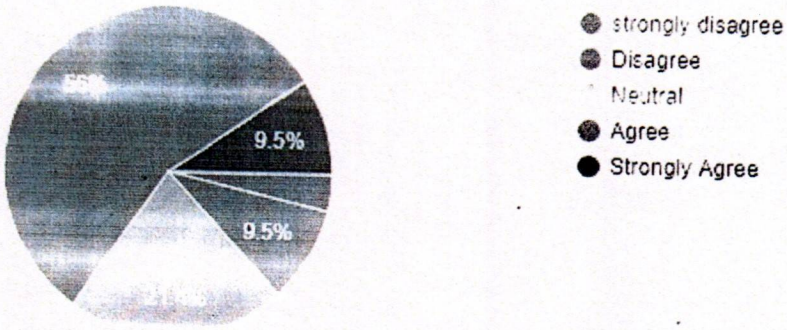
Disagree – 28 (32.9%)

Strongly disagree – 7 (8.2%)

3. **Will you buy these electric vehicles because of their comfort and efficiency?**

Will you buy these electric vehicles because of their comfort and efficiency?

84 responses



Strongly agree – 8 (9.5%)

Agree – 47 (56%)

Neutral – 18 (21.4%)

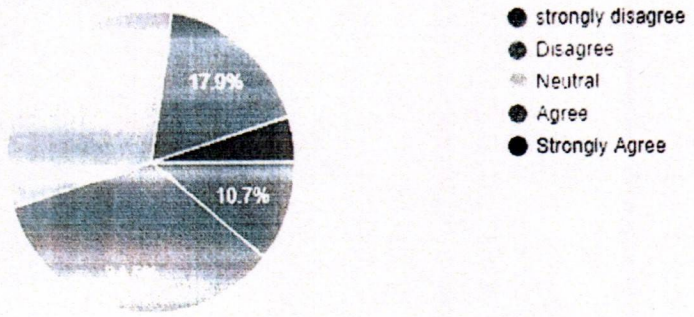
Disagree -8 (9.5%)

Strongly disagree –3 (3.6%)

4. Will you buy these electric vehicles if they are heavy and less in power than conventional vehicles?

Will you buy these electric vehicles if they are heavy and less in power than conventional vehicles?

84 responses



Strongly agree – 4 (4.8%)

Agree – 15 (17.9%)

Neutral – 27 (32.1%)

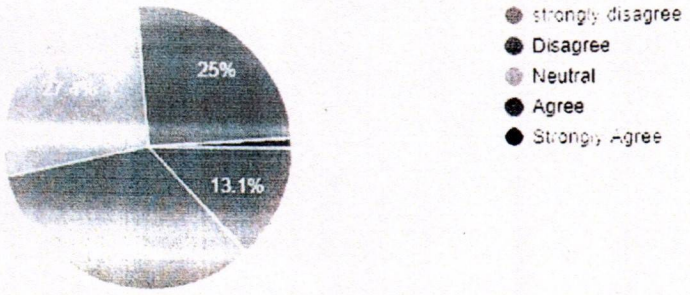
Disagree – 29 (34.5)

Strongly disagree –9 (10.7%)

5. Will you buy these electric vehicles if they cover less range (distance) than conventional vehicles?

Will you buy these electric vehicles if they cover less distance than conventional vehicles?

84 responses



Strongly agree – 1 (1.2%)

Agree – 21 (25%)

Neutral – 23 (27.4%)

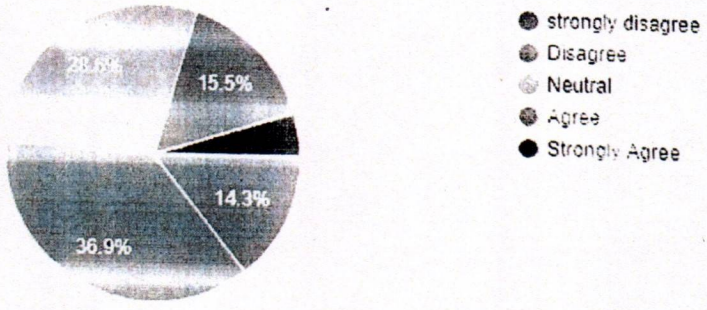
Disagree – 28 (33.3%)

Strongly disagree –11 (13.1%)

6. Will you buy these electric vehicles if they are ugly as compared to conventional vehicles?

Will you buy these electric vehicles if they are ugly as compared to conventional vehicles?

84 responses



Strongly agree – 4 (4.8%)

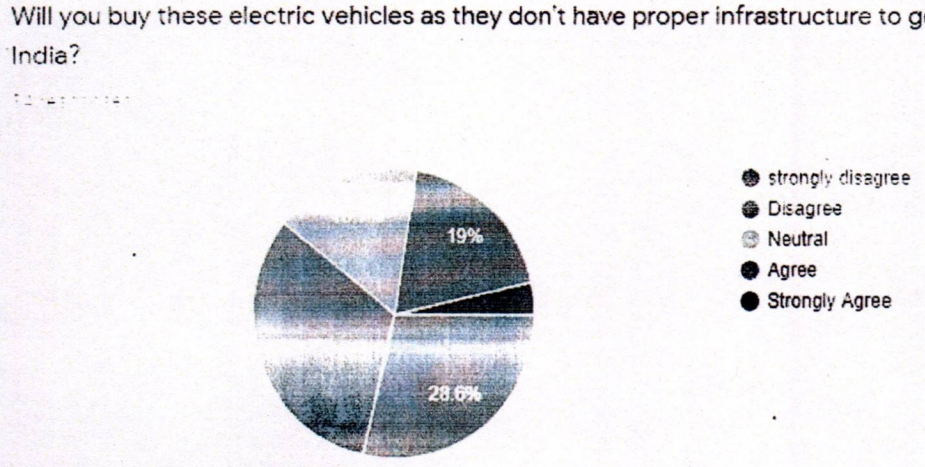
Agree – 13 (15.5%)

Neutral – 24 (28.6%)

Disagree – 31 (36.9%)

Strongly disagree –12 (14.3%)

7. Will you buy these electric vehicles as they don't have proper infrastructure to get charged in India?



Strongly agree – 3 (3.6%)

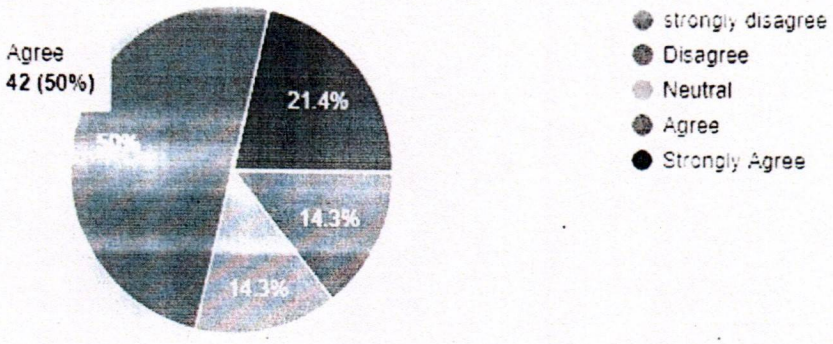
Agree – 16 (19%)

Neutral – 14 (16.7)

Disagree – 27 (32.1%)

Strongly disagree –24 (28.6%)

8. Will you buy these electric vehicles if they demolish your fuel expenses?



Strongly agree – 18 (21.4%)

Agree – 42 (50%)

Neutral – 12 (14.3%)

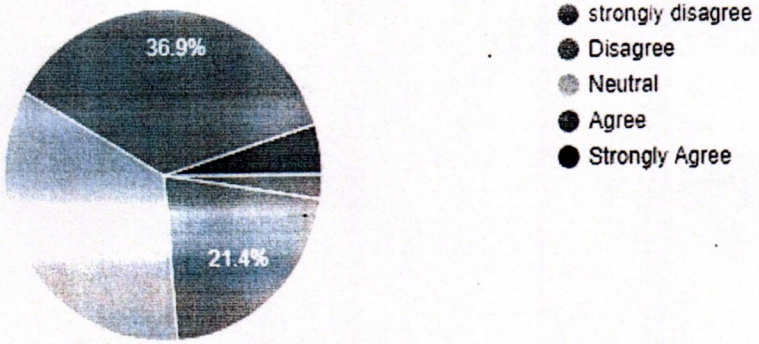
Disagree – 12 (14.3%)

Strongly disagree – 0 (0%)

9. Will you preferyour friend to buy electric vehicles if manufacturers don't have many variants?

Will you prefer your friend to buy electric vehicles if manufacturers don't have many variants?

84 responses



Strongly agree – 4 (4.8%)

Agree – 31 (36.9%)

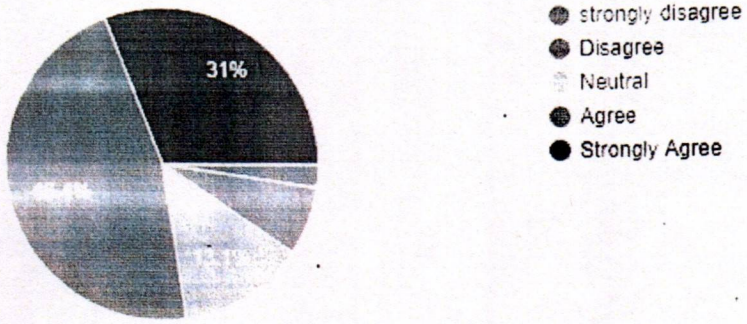
Neutral – 29 (34.5%)

Disagree – 18 (21.4%)

Strongly disagree –2 (2.4)

10. Will you buy these electric vehicles if government gives benefits and incentives?

Will you buy these electric vehicles if government gives benefits and incentives?



Strongly agree – 26 (31%)

Agree – 39 (46.4%)

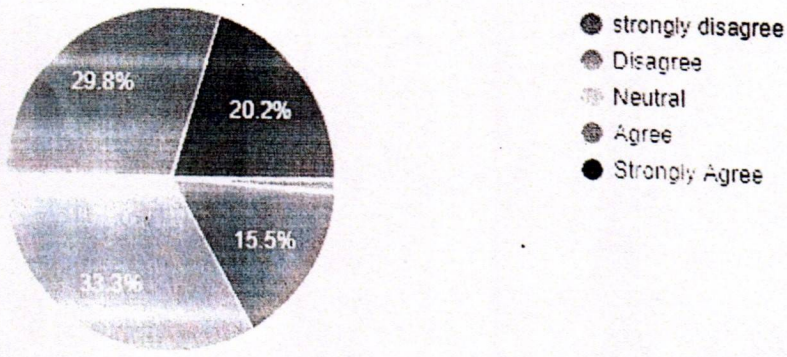
Neutral – 11 (13.1%)

Disagree – 6 (7.1%)

Strongly disagree –2 (2.4%)

11. Do you think electric vehicles are totally pollution free vehicles?

Do you think electric vehicles are totally pollution free vehicles?



Strongly agree – 17 (20.2%)

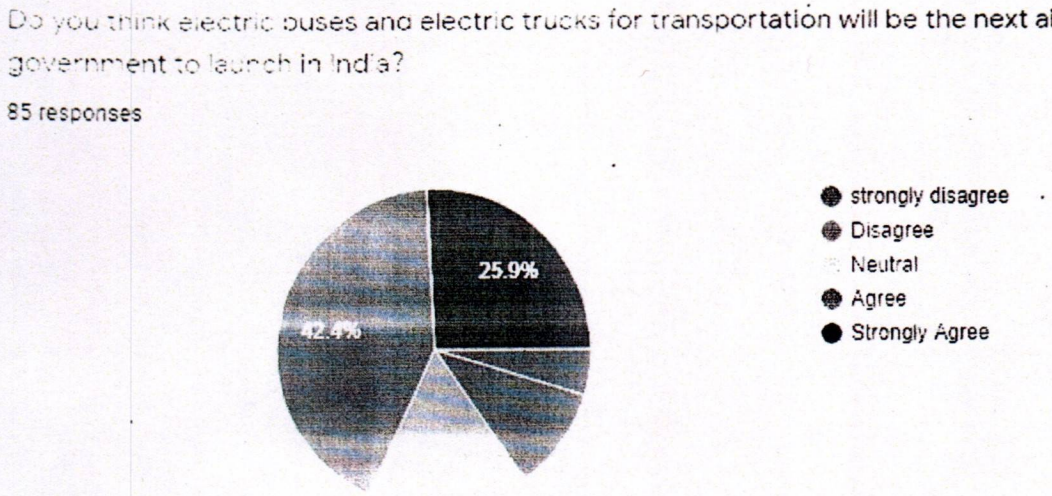
Agree – 25 (29.8%)

Neutral – 28 (33.3%)

Disagree – 13(15.5%)

Strongly disagree –1 (1.2%)

12. Do you think electric buses and electric trucks for transportation will be the next aim of government to launch in India?



Strongly agree –22 (25.9%)

Agree – 36 (42.4%)

Neutral –14 (16.5%)

Disagree – 9 (10.6%)

Strongly disagree –4 (4.7%)

These are analysis done by the researcher on the basis of questionnaires which gives the proper image what customer want in India and it will help tomake electric vehicles manufacturer to think what they can do to make the people attracted and influence towards their electric vehicles and it will also help

government to make take some important steps which will help manufacturers to sell their electric vehicles and same for people also.

CHAPTER 5

5. ANALYSIS AND CONCLUSIONS

5.1 HYPOTHESIS TESTING

Hypothesis testing is method or practices which researcher use to compare hypothesis with null hypothesis. Researcher is using one-tailed test.

If the p value is less than 0.05 then we will reject the null hypothesis and if the p value is more than 0.05 then we will not reject null hypothesis.

HYPOTHESIS 1:

Null hypothesis – Indian people will not buy electric vehicles because of its features and efficiency.

Alternative hypothesis – Indian people will buy electric vehicles because of its features and efficiency.

N	MEAN	STANDARD DEVIATION

84	2.738	1.007

T	DEGREE OF FREEDOM	SIGNICANE (ONE TAILED)	STANDARD ERROR
24.909	83	0 (which is 1.40208E-40 approximately o)	0.109

The t stat value is 24.909, which gives us p value as 0. This means that null hypothesis is rejected as p value is not greater than 0.05. So, it means that alternative hypothesis is accepted which states that Indian people will buy electric vehicles because of its features and efficiency.

HYPOTHESIS 2:

Null hypothesis – Electric vehicles will create no pollution which will make our environment condition bad.

Alternative hypothesis – Electric vehicles will create pollution which will make our environment condition bad.

N	MEAN	STANDARD DEVIATION
84	3.22	1.045

T	DF		STANDARD DEVIATION	STANDARD ERROR	SIGNIFICANCE LEVEL (ONE – TAILED)
28.285	**83**		**1.045**	**0.114**	**0 (1.10729E-44)**

So, t stat value is 28.285 and p value is 0. Which means null hypothesis is rejected and alternative hypothesis is accepted which states that electric vehicles will create pollution which will make our environment condition bad.

HYPOTHESIS 3:

Null hypothesis – Electric vehicles prices are not high in India due to fewer variants.

Alternative hypothesis – Electric vehicles prices are high in India due to fewer variants.

So, here we can see that value of p is greater than t which shows that null hypothesis can be rejected. This states that electric vehicles prices will be high in India.

N	MEAN	STANDARD DEVIATION
84	3.130	1.138

T	DF	STANDARD DEVIATION	STANDARD ERROR	SIGNIFICANCE VALUE (ONE – TAILED)

25.207	83	1.138	0.124	0(5.86237E-41)

SO, here t stat value is 25.207 and p value is 0. Which means that null hypothesis is rejected and alternate hypothesis is accepted which states that electric vehicle prices will be high in India due to fewer variants.

HYPOTHESIS 5:

Null hypothesis – Government benefits and incentives will not attract and influence people of India to buy the electric vehicles.

Alternative hypothesis – Government benefits and incentives will attract and influence people of India to buy the electric vehicles.

N	MEAN	STANDARD DEVIATION

84	3.011	1.047

T	DF	STANDARD DEVIATION	STANDARD ERROR	SIGNIFICANCE LEVEL (ONE – TAILED)
26.364	83	1.047	0.114	0 (2.12532E-42)

So, here T stat value is 26.364 and p value is 0. Which means that null hypothesis is rejected and alternate hypothesis is accepted which states that government benefits and incentives will attract and influence people of India to buy the electric vehicles.

HYPOTHESIS 4:

Null hypothesis – Customers fuel expenses will not get reduced by purchasing of electric vehicles.

Alternative hypothesis – Customers fuel expenses will get reduced by purchasing of electric vehicles.

N	MEAN	STANDARD DEVIATION

84	3	1.140

T	DF	STANDARD DEVIATION	STANDARD ERROR	SIGNIFICANCE LEVEL (ONE TAILED)
24.103	83	1.140	0.124	0 (1.54916E-39)

So, here t stat value is 24.103 and p value is 0. Which means null hypothesis is rejected and alternate hypothesis is accepted which states that customer's fuel expenses will get reduced by purchasing of electric vehicles.

CHAPTER 6

6. CONCLUSIONS AND RECOMMENDATIONS

6.1 CONCLUSION

In India that day is not far when every vehicle will become electric. India is become pollution conscious country who like to reduce the pollution by implementing electric vehicles in India and citizens of India are also now getting aware about it and taking a step ahead to invest their money in buying electric vehicles. We know that oil rates are increasing day by day which will make oil demand less in future because people will shift to the alternative of electric vehicle which will also help to maintain their environment clean and green. Government is also supporting the concept the of electric vehicle in India and the new policies for electric vehicle which are in favor customers which has incentives in it this kind of strategies and policies of government force public to buy electric vehicle to keep their environment clean and green.

- Success of electric vehicle in India will majorly depend on acceptance of it by customers of India. Customers need to be highly influenced and attracted towards electric vehicle which will help electric vehicle industry to

increase their profits. Policies of government should accept by the citizens because according to them only they will buy the electric vehicles.

- If electric vehicles concept get successful in India it will help to reduce the pollution and make the environment clean and green by reducing carbon emissions vehicles in India. If the demand of electric vehicle will increase then oil demand will automatically go down.
- Increase in demand of electric vehicle will also create the job opportunities in India which will help India to grow its economy and because of new technology used in electric vehicle then it will make Indian labor into skilled labor who have a knowledge everything which they are making.
- Reduction of oil demand will cause reduction in pollution and this step will make our environment clean and green in future. Many other countries like France, Germany, USA and China have electric vehicles like e-cars and e-buses which already made their oil demand less by 4 to 5% every year which is a positive sign for their countries environment.Indian government is also now taking the environment problem seriously and various policies for electric vehicles which will help people to buy it and reduce the usage of oil and try to make their cities and town clean and green for the future generations.
- Indian government also working on launching of e-buses and trying to launch 1000 electric buses by 2025 in Delhi, Mumbai, Chennai, Punjab and Haryana. This is very good initiative from the government as it will reduce lots of pollution from these cities and in future these state will become pollution free and then government will try to launch e-buses in whole India.

6.2 RECOMMENDATIONS

If electric vehicles wants to create a boom in market then there are certain points that Indian government and electric vehicle companies need to take care of like skilled labor, proper infrastructure and should have trained personnel and these

steps will help government and companies to make electric vehicles concept successful in India.

Yes it true government is trying to launch electric vehicles but they are lack in funds because this reason they are not able to support the companies and also they are lack in making infrastructure for electric vehicles. As we all know there are electric two wheelers and electric three wheelers and these can be charged at homes because their batteries are small and get charged in 3 to 4 hours at home. These vehicles need less power to generate as they are less in weight and batteries installed in them are also less and they cover around 100 to 200 km in full charged battery it is good distance for small vehicles and there are small battery charging station in city and they are very few. As we know that for bigger vehicle like e-cars, e-buses or e-truck we need to have big infrastructure which means bigger battery charging stations and should be in good in quantity all around the city and each electric battery station should have at least 5 to 6 woes like gas stations have.

Infrastructure is very important for the concept of electric vehicles in India majorly small vehicles have electric battery concept because they are small in size, light in weight and can easily be charged at home and also more running kms than e-cars, e-buses or e-trucks. Infrastructure for bigger vehicle like e-cars, e-buses and e-trucks there will be a requirement of huge investment because installation of 5 to 6 electric woes in every station will not be easy as it will require lots of electric and labor work and it will also take lots of time to done it properly.

Lack of battery technology is also one of the major concerns for electric industry in India. According to a report all the lithium-ion batteries are imported from China and import of battery also increases cost of vehicle. So, battery technology should be establish in India to make the concept of electric vehicle successful otherwise importing of lithium-ion for long term will become very costly.

Major issues with charging infrastructure and lack of battery technology, there is lack of trained personnel faced by electric vehicle industry in India. According to researcher there is shortage of experts on design, products, infrastructure and

storage for electric industry in India. According to researcher automobile seniors said that electric vehicle space is at a nascent stage and thus firms will face challenges in talent acquisition in India.

So, these are some recommendations on which government and electric vehicles companies' need to work up firstly because a good infrastructure, battery technology and trained personnel are some major gaps which are obstacle in front of electric vehicle industry to launch electric vehicles. Government should support companies so that they can launch e-cars, e-buses and e-trucks and this concept successful.

For good technology Battery National Democratic Alliance (NDA) government is exploring new battery technology such as polymer-based solid state batteries in order to reduce dependency on lithium-ion batteries.

6.3 ETHICAL IMPLICATIONS

Government and people both need to take certain steps to reduce the air pollution by choosing the alternative of conventional vehicles which is electric vehicles.

- Government should change policies and incentives on electric vehicles time to time so that more and more people should buy them.
- People know the ground reality of buying electric vehicles but to save the environment we have to take this step as soon as possible.
- Government should stop using CNG public buses and start launching electric buses as it will be good initiative.
- People who are blessed with good financial condition should start buying electric vehicles so that a middle class or lower middle class person at least buys a two-wheeler electric vehicle.
- All the NGOs and big MNCs should promote to buy electric vehicles so that people could knowledge about it.

- State Governments in India should also promote electric vehicles as the symbol to promote electric vehicles to reduce the pollution in near future.
- It's all about working mutually on the same cause both people and government have to think and take step towards it as soon as possible.

6.4 PEOPLE PREFERNCE TOWARDS ELECTRIC VEHCILES.

Statement	N	MEAN	DF	STD. DEVIATION	STD. ERROR	SIG. VALUE(ONE-TAILED)	T-STAT VALUE
Will you buy these electric vehicles because they will help to reduce pollution in India?	86	3.046	85	0.944	0.101	0 (3.38E-47)	29.914

Will you buy these electric vehicles as they are more expensive than conventional vehicle?	85	3.517	84	1.201	0.13	0 (1.82E-43)	26.996
Will you buy these electric vehicles because of their comfort and efficiency?	84	2.738	83	1.007	0.109	0 (1.40E-40)	24.909
Will you buy these electric vehicles if they are heavy and less in power than conventional vehicles?	84	3.666	83	1.133	0.123	0 (3.19E-46)	29.643
Will you buy these electric vehicles if they cover less distance than conventional vehicles?	84	3.599	83	1.195	0.13	0 (1.67E-43)	27.279
Will you buy these electric vehicles if they are ugly as compared to conventional vehicles?	84	3.773	83	1.112	0.121	0 (8.38E-48)	31.093

Will you buy these electric vehicles as they don't have proper infrastructure to get charged in India?	83	3.771	82	1.107	0.121	0 (2.32E-47)	31.01
Will you buy these electric vehicles if they demolish your fuel expenses?	84	3	83	1.14	0.124	0 (1.55E-39)	24.103
Will you prefer your friend to buy electric vehicles if manufacturers don't have many variants?	84	3.13	83	1.138	0.124	0 (5.89E-41)	25.207
Will you buy these electric vehicles if government gives benefits and incentives?	84	3.011	83	1.047	0.114	0 (2.13E-42)	26.364
Do you think electric vehicles are totally pollution free vehicles?	84	3.226	83	1.045	0.114	0 (1.11E-44)	28.285
Do you think electric buses and electric trucks for transportation will be	85	3.094	84	1.075	0.116	0 (7.12E-43)	26.512

the next aim of government to launch in India?							

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Appendices: Questionnaire of the study

Rate the following statements on a scale of 1 to 5 where 1 is showing the strongly agree and 5 is showing strongly disagree.

STATEMENTS	STRONGLY AGREE(1)	AGREE(2)	NEUTRAL(3)	DISAGREE(4)	STRONGLY DISAGREE (5)
Will you buy these electric vehicles because they will help to reduce pollution in India?					
Will you buy these electric vehicles as they are more expensive than conventional vehicle?					
Will you buy these electric vehicles because of their comfort and efficiency?					
Will you buy these electric vehicles if they are heavy and less					

in power than conventional vehicles?					
Will you buy these electric vehicles if they cover less distance than conventional vehicles?					
Will you buy these electric vehicles if they are ugly as compared to conventional vehicles?					
Will you buy these electric vehicles as they don't have proper infrastructure to get charged in India?					
Will you buy these electric vehicles if					

they demolish your fuel expenses?					
Will you prefer your friend to buy electric vehicles if manufacturers don't have many variants?					
Will you buy these electric vehicles if government gives benefits and incentives?					
Do you think electric vehicles are totally pollution free vehicles?					
Do you think electric buses and electric trucks for					

transportation will be the next aim of government to launch in India?					