# VISUALIZATION TOOL FOR ELELCTRIC VEHICLE CHARGE AND RANGE ANALYSIS


**SUBMITTED BY**

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**ARCOT- 632503**

# PROJECT CONTENT

# 1.INTRODUCTION

## 1.1 OVERVIEW

A vehicle that can be powered by an electric motor that draws electricity from a battery and is capable of being charged from an external source and have an electric motor instead of an internal combustion engine. The Electric Vehicle (EV) is not new, but it has been receiving significantly more attention in recent years. Advances in both EV analytics and battery technologies have led to increased automotive market share. However, this growth is not attributed to hardware alone. The modern mechatronic vehicle marries electrical storage and propulsion systems with electronic sensors, controls, and actuators, integrated closely with software, secure data transfer, and data analysis, to form a comprehensive transportation solution. Advances in all these areas have contributed to the overall rise of EV's, but the common thread that runs through all these elements is data analytics. The new EV's are combined Electrical storage and propulsion systems with electronic sensors, controls, and actuators, integrated closely with software, secure data transfer to form a comprehensive transportation solution.

Electric bicycles have many advantages such as low cost,energy saving, and simple to use. By the end of 2015, Chinahas 210 million electric bicycles. Single electric bicyclecharging load is only around 100~200W. However, when thetotal number of electric bicycles reach millions, its overall load cannot be ignored. With great randomness and uncertainty, millions of electricbicycles charging load will cause a certain degree of impact onpower distribution network. The disordered charginbehaviorof electric bicycles may be superimposed with domesticelectricity demand, leading to the problem of "peak-plus-peak",which affects the safety and reliability of power transformers,especially those with smaller capacity.

Moreover, due to the combustion characteristics of lead-acid batteries, large-scalе́eelectric bicycle charging will cause fire hazards. These twoissues are urgent need to know by local electricity company. With the explosive growth in the number of electricvehicles, investigating the impact of large scale electricvehicles charging behavior has received much attention. Numerous studies have given insights into large scale electriccar charging

influence, Diana et al conducted a systematicliterature reviews and conclude there are mainly twoapproaches, environmental analyses as well as in traveldemand analysis .

Moreover, this study also uses heat map to visualize the charging demand on map. Darabi and Ferdowsi use US National travel survey to estimate demand curve. However, some researchers point out the scenarios for using EV isdifferent from conventional cars. For direct measure, data from electric vehicle charging pileare used in, and a Monte Carlo model is applied to analyze the influence to power network. Since electric bicycle as a special transportation tool in China. Rare of studies proposed similar study. Moreover, different from EVs which could find a reference objective (i.e.conventionalcar). There is no suitable reference for electric bicycle travel information because travel distance for an electric bicycle is much more higher than a conventional bicycle.

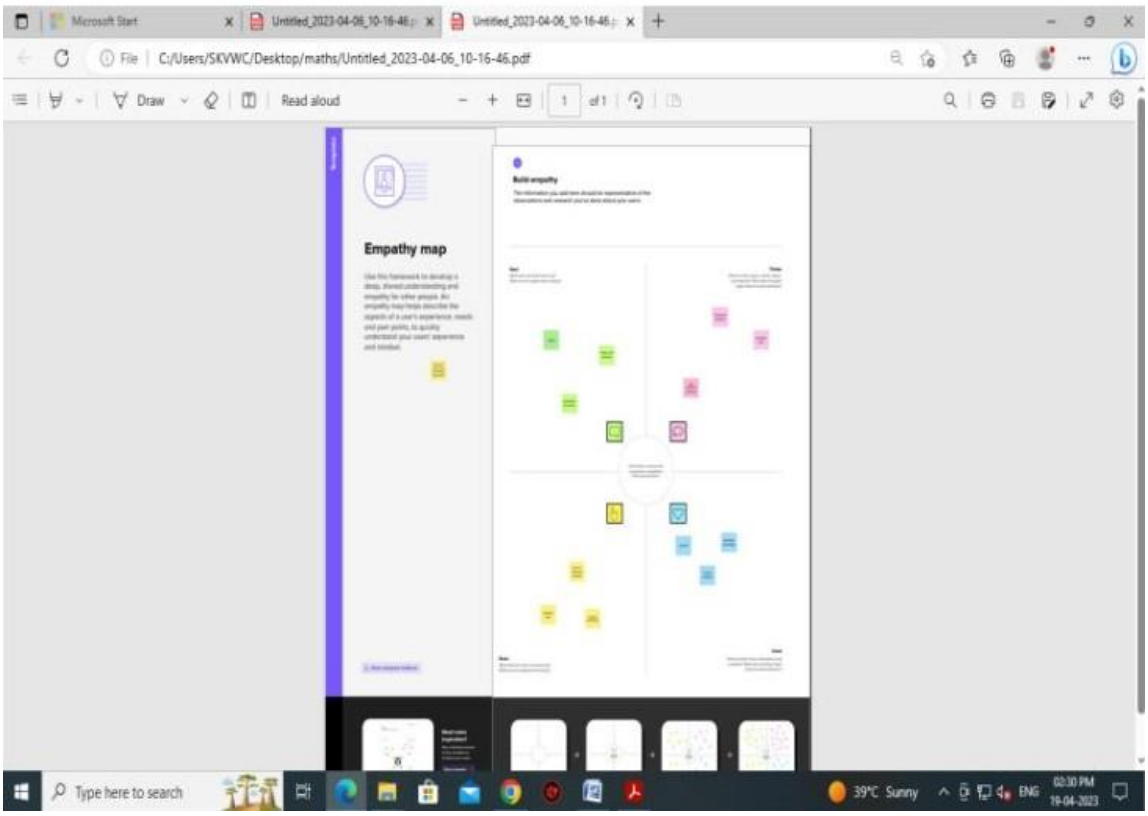
**1.2 PURPOSE**

This Data is based on the analysis of databases from nanning, a city with a total population of around 7 million people in China (3m urban citizens, 1.7m electric bicycles). The data were collected through online questionnaire. The questionnaire was administered in local electricity social media platform. The survey consists of two parts. Firstly, a map was shown with a question to collect charging location including longitude and latitude. Second, fifteen questions were designed through which we identify user's general information and dailyenergy consumption. Lastly, select the samples which meet the requirement. In this case study, the main selected factors are city and We measured user's behaviors through online questionnaire rather than measure the real energy consumption or distance by GPS tracker. This is because that: what we are focus on is the energy consumption by whole population not individual. Hence, the requirement of accuracy for a single sample is not high. The cost of a single sample is much lower compare to other methods, so that we could collect more samples within limited budget. majority of people refuse to take GPS tracker.

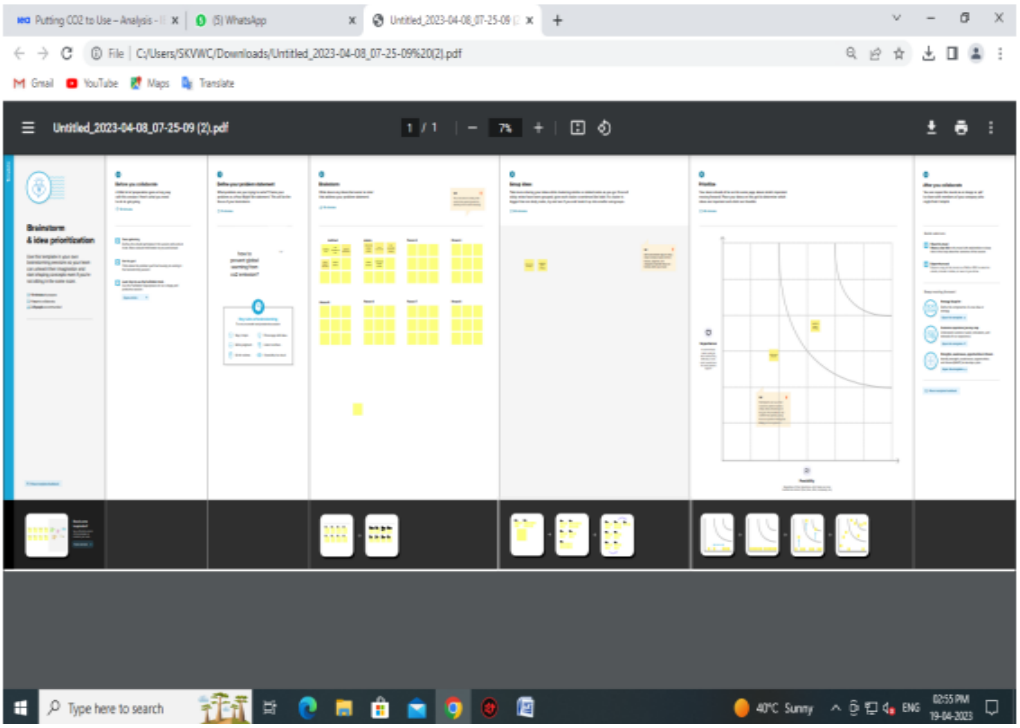
Background and sample characteristic. The background information for our case study city. The entire area of Nanning, including the county has 7 million people, and 3 million live in the urban. Electric bicycle are the main transportation tool for urban citizen with a total of 1.7 million. Majority of electricity bicycle use Lead-acid batteries, and Mainly divided into three battery models 48V,60V, 72V . In general, travel mileage is proportion to voltage rate.

# 2.PROBLEM DEFINITION & DESIGN THINKING

## 2.1. EMPTHY MAP



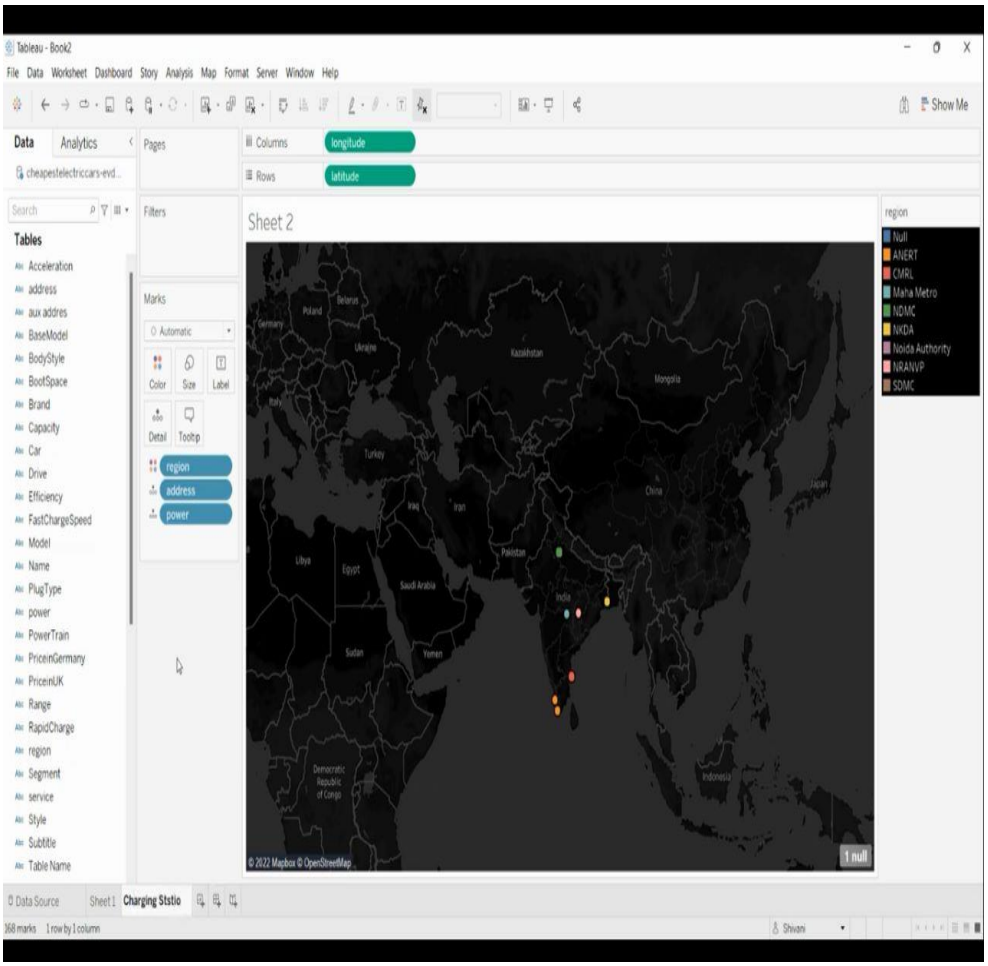

## 2.1 IDEATION AND BRAINSTROMING MAP



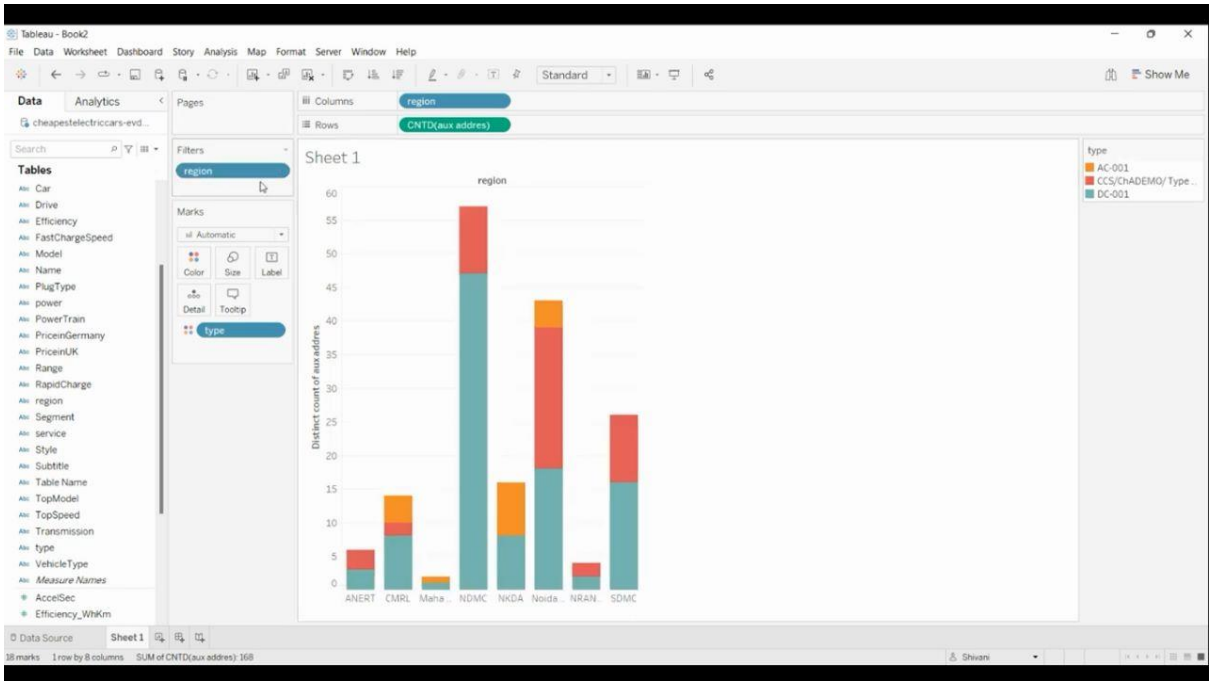
# 3.RESULTS

## 3.1 MILESTONE 1 (BUSINESS REQUIREMENTS)

The business requirements for analyzing the performance and efficiency of Electric cars include identifying KPIs, comparing performance across different parameters and brands also, identifying patterns and trends over time, identifying affecting factors, creating interactive dashboards and reports, identifying areas for improvement, making data-driven decisions, comparing to industry average and creating forecasting models for future performance. The ultimate goal is to gain insights and improve performance through data visualization techniques.

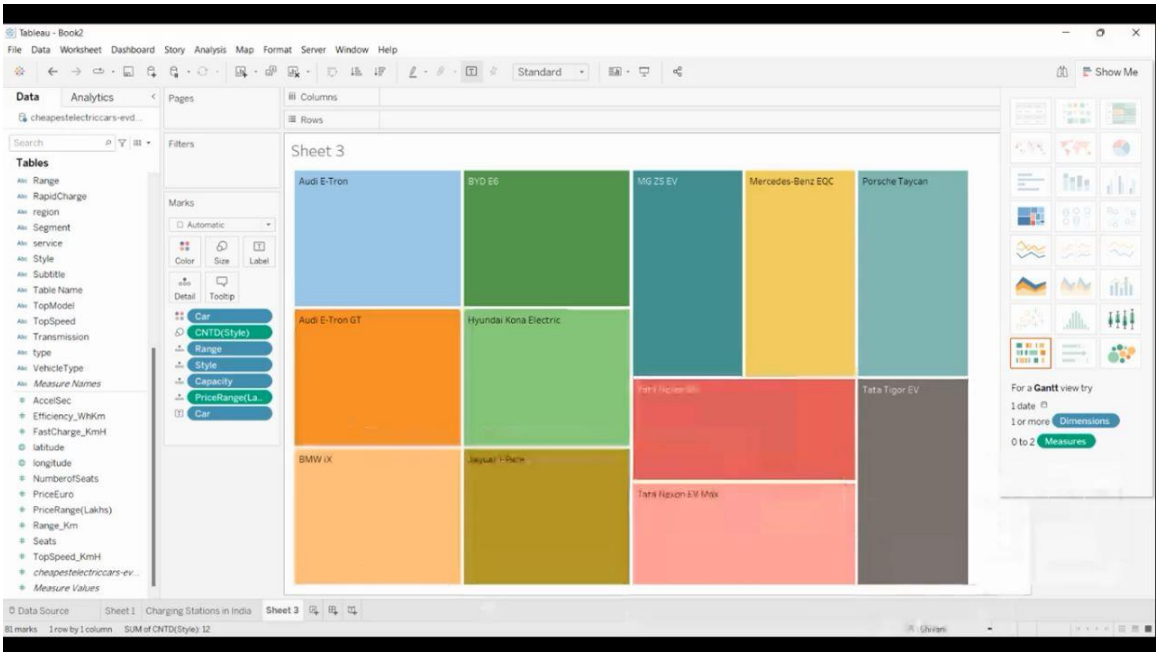


## 3.2. MILESTONE 2 (DATA COLLECTION)



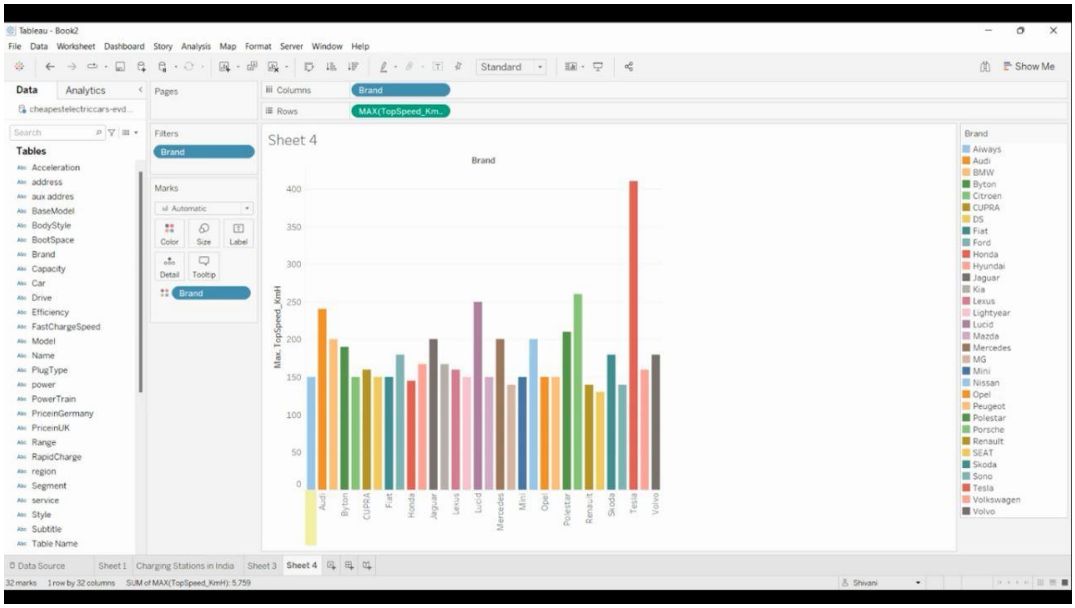

## 3.3. MILESTONE 3 (DATA PREPARATION)

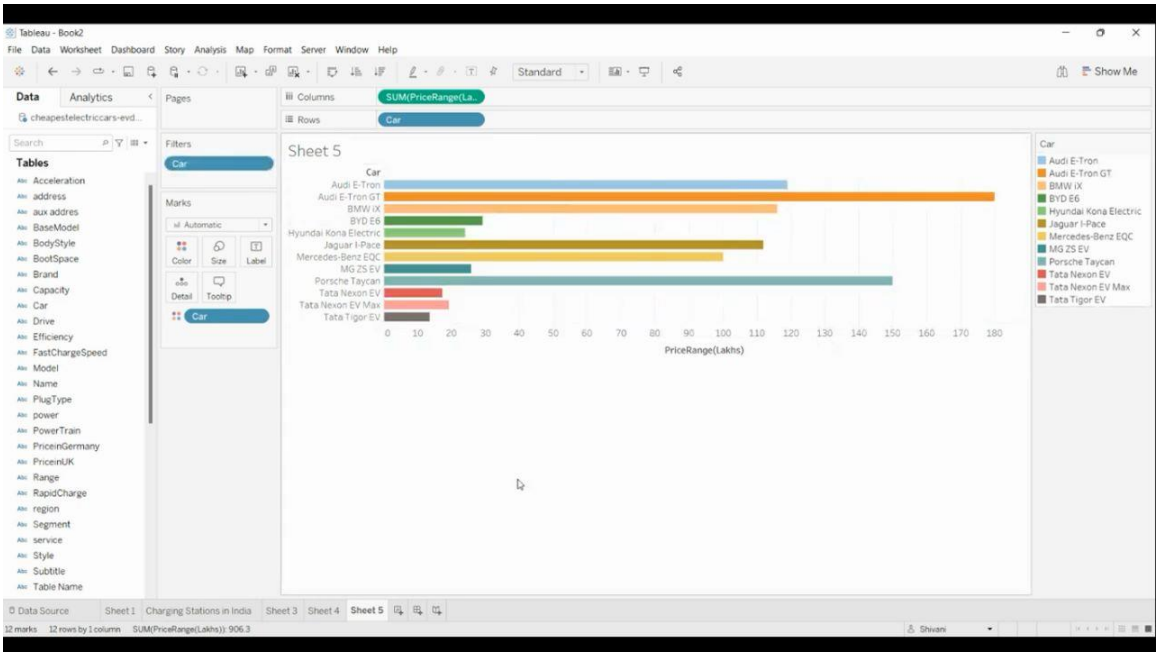
Preparing the data for visualization involves cleaning the data to remove irrelevant or missing data, transforming the data into a format that can be easily visualized, exploring the data to identify patterns and trends, filtering the data to focus on specific subsets of data, preparing the data for visualization software, and ensuring the data is accurate and complete. This process helps to make the data easily understandable and ready for creating visualizations to gain insights into the performance and efficiency.



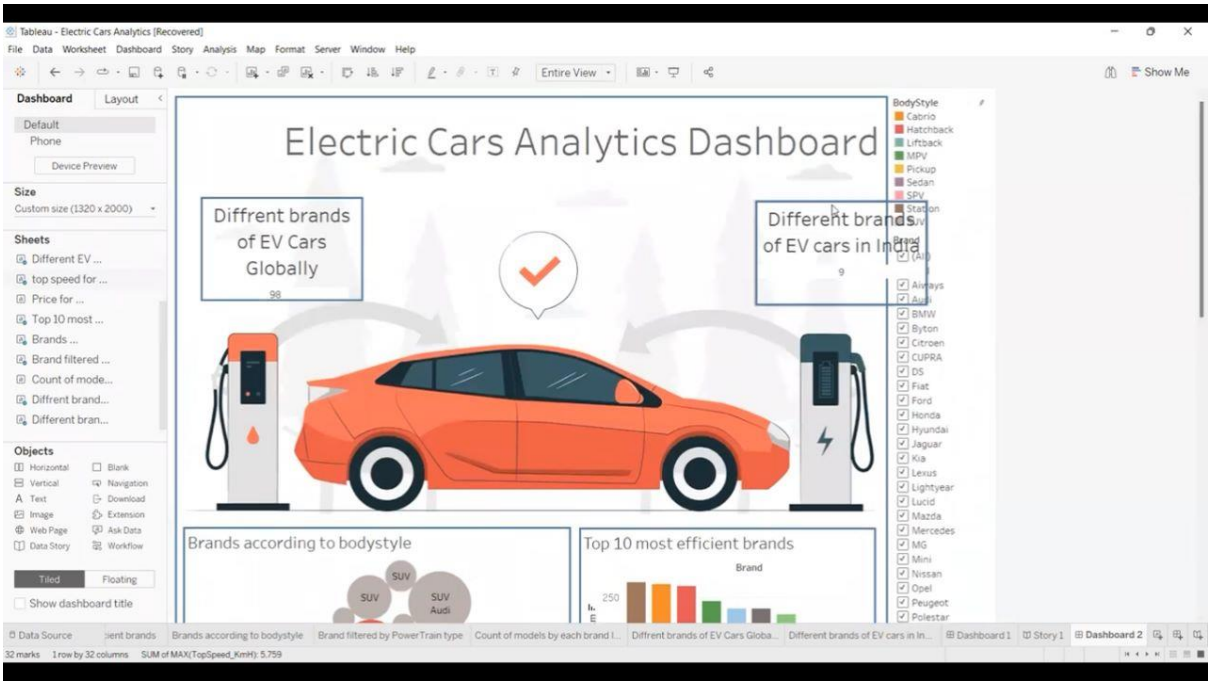

## 3.4. MILESTONE 4 (DATA VISUALIZATION)

Data visualization is the process of creating graphical representations of data in order to help people understand and explore the information. The goal of data visualization is to make complex data sets more accessible, intuitive, and easier to interpret. By using visual elements such as charts, graphs, and maps, data visualizations can help people quickly identify patterns, trends, and outliers in the data.






## 3.5. MILESTONE 5 (DASHBOARD )



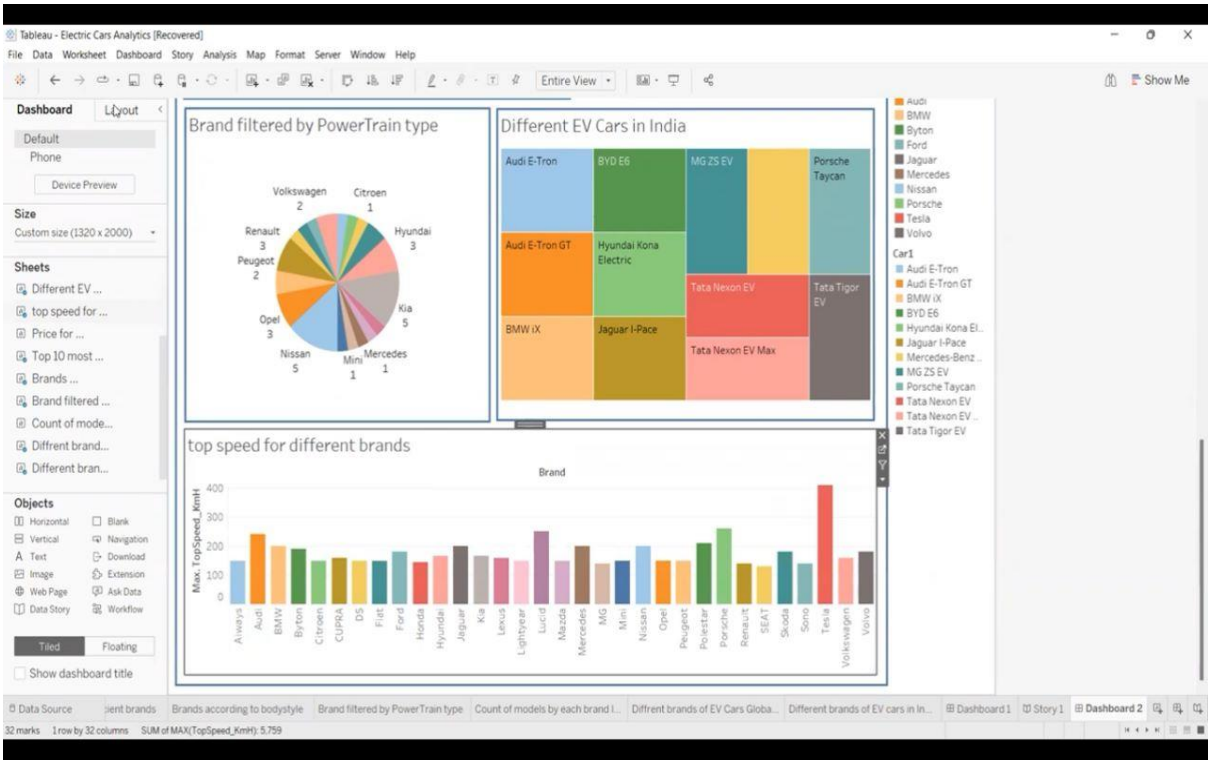
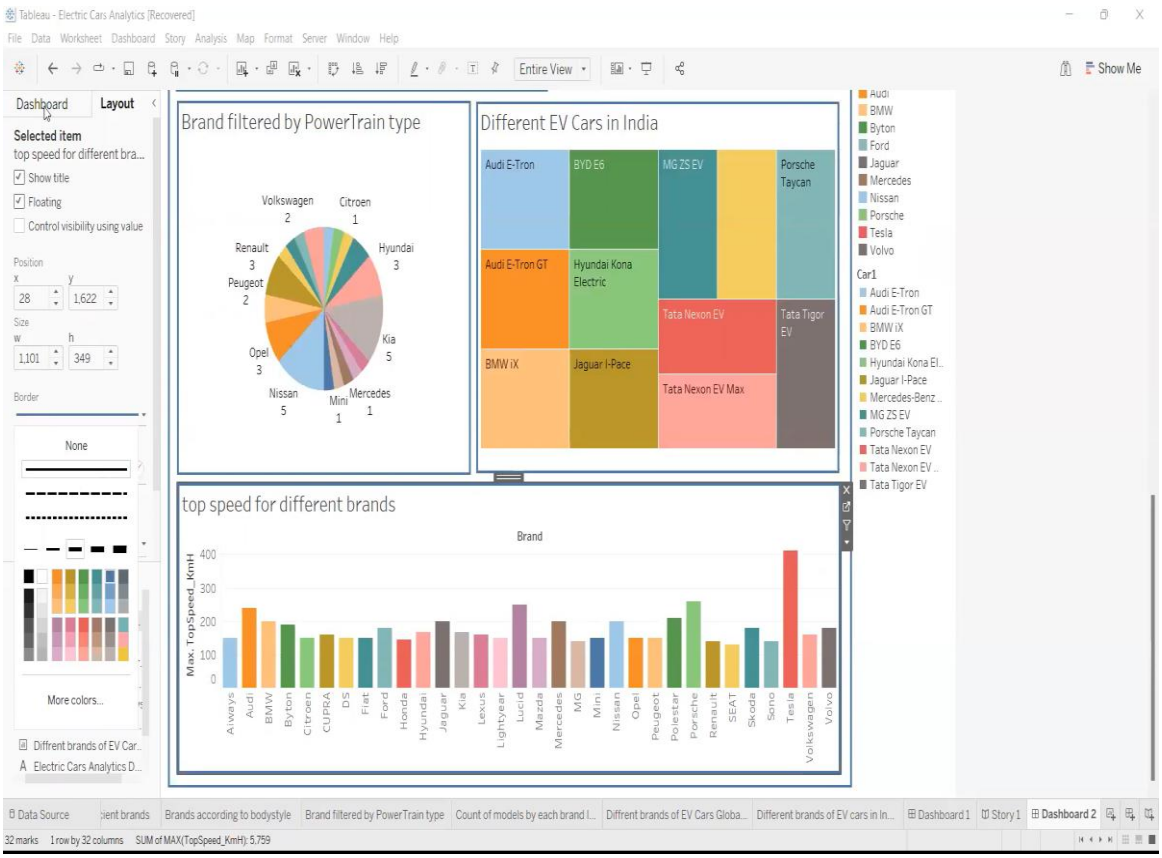


Tableau - Electric Cars Analytics [Recovered]
File Data Worksheet Dashboard Story Analysis Map Format Server Window Help
Entire View
Show Me
Dashboard
Layout
Default
Phone
Device Preview
Size
Custom size (1320 x 2000)
Sheets
Different EV ...
top speed for ...
Price for ...
Top 10 most ...
Brands ...
Brand filtered ...
Count of mode...
Diffrent brand...
Different bran...
Objects
Horizontal
Vertical
Text
Image
Web Page
Data Story
Blank
Navigation
Download
Extension
Ask Data
Workflow
Tiled
Floating
Show dashboard title
Brand filtered by PowerTrain type
Volkswagen 2
Citroen 1
Renault 3
Hyundai 3
Peugeot 2
Kia 5
Opel 3
Nissan 5
Mini 1
Mercedes 1
Different EV Cars in India
Audi E-Tron
BYD E6
MG ZS EV
Porsche Taycan
Audi E-Tron GT
Hyundai Kona Electric
Tata Nexon EV
Tata Tigor EV
BMW iX
Jaguar I-Pace
Tata Nexon EV Max
top speed for different brands
Brand
Max. TopSpeed_KmH
Aiways
Audi
BMW
Byton
Citroen
CUPRA
DS
Fiat
Ford
Honda
Hyundai
Jaguar
Kia
Lexus
Lightyear
Lucid
Mazda
Mercedes
MG
Mini
Nissan
Opel
Peugeot
Polestar
Porsche
Renault
SEAT
Skoda
Sono
Tesla
Volkswagen
Volvo
Car1
Data Source
Brands according to bodystyle
Brand filtered by PowerTrain type
Count of models by each brand i...
Diffrent brands of EV Cars Globa...
Different brands of EV cars in In...
Dashboard 1
Story 1
Dashboard 2
32 marks
1 row by 32 columns
SUM of MAX(TopSpeed_KmH): 5,759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Show Me
Dashboard
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Selected item
top speed for different bra...
Show title
Floating
Control visibility using value
Position
x
y
28
1,622
Size
w
h
1,101
349
Border
None
More colors...
Diffrent brands of EV Car...
Electric Cars Analytics D...
Brand filtered by PowerTrain type
Volkswagen 2
Citroen 1
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Hyundai 3
Peugeot 2
Kia 5
Opel 3
Nissan 5
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Mercedes 1
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BYD E6
MG ZS EV
Porsche Taycan
Audi E-Tron GT
Hyundai Kona Electric
Tata Nexon EV
Tata Tigor EV
BMW iX
Jaguar I-Pace
Tata Nexon EV Max
top speed for different brands
Brand
Max. TopSpeed_KmH
Aiways
Audi
BMW
Byton
Citroen
CUPRA
DS
Fiat
Ford
Honda
Hyundai
Jaguar
Kia
Lexus
Lightyear
Lucid
Mazda
Mercedes
MG
Mini
Nissan
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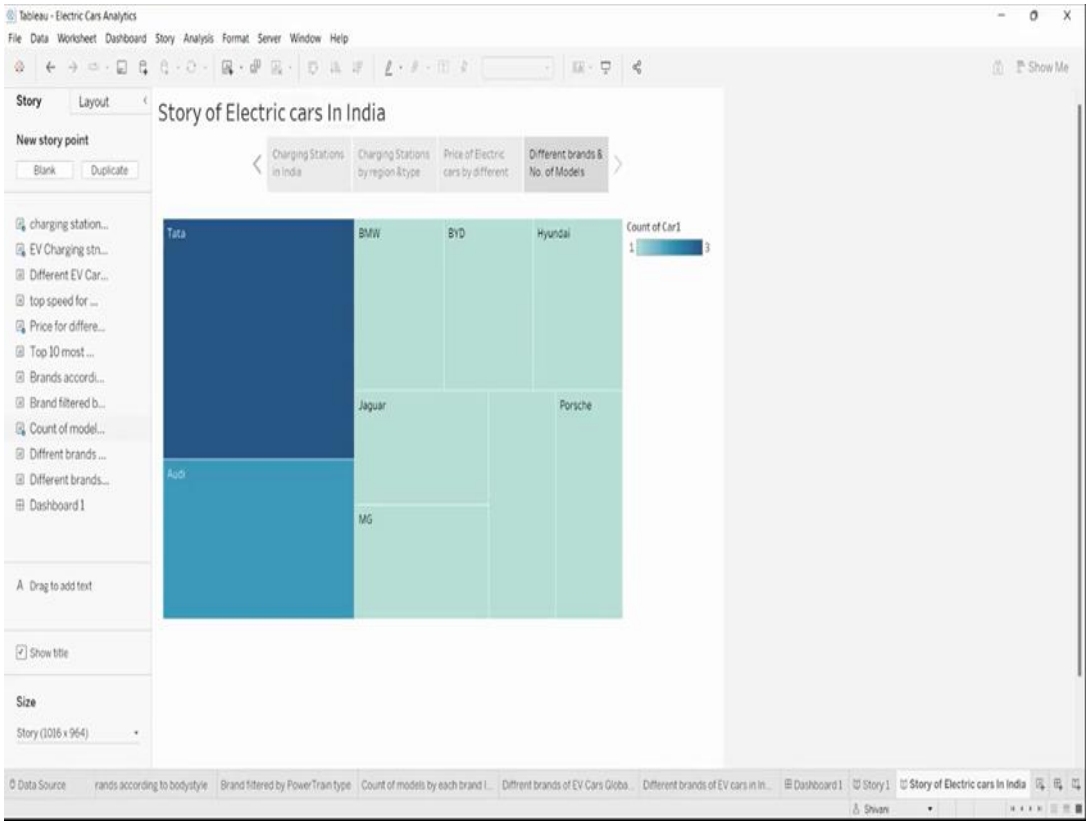
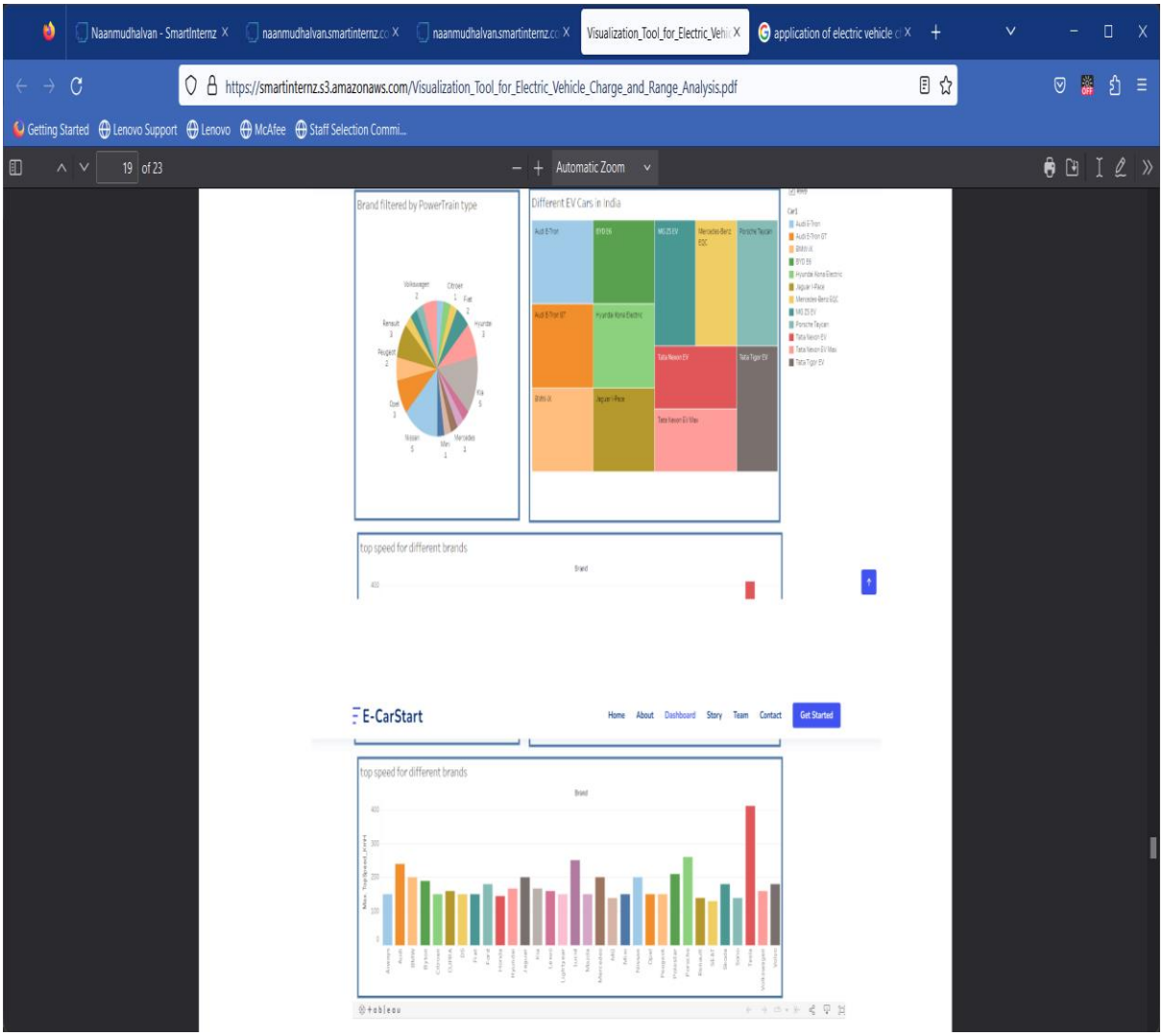
## 3.6. MILESTONE 6 (STORY)




## 3.7. MILESTONE 7 (WEB INTEGRATION)

Publishing helps us to track and monitor key performance metrics, to communicate results and progress. help a publisher stay informed, make better decisions, and communicate their performance to others.




## 4.ADVANTAGES AND DISADVANTAGES

### 4.1 ADVANTAGES

**1. Lower running costs**

Since you are not paying for petrol or diesel to keep your EV running, you save a lot of money on fuel. The cost to charge an electric vehicle compared to the price of petrol or diesel is substantially low. You can reduce the electricity cost further by utilising renewable energy sources such as solar.

**2. Low maintenance costs**

Petrol or diesel-powered vehicles require regular maintenance since they have multiple moving parts. That's not the case with electric vehicles since they have comparatively lesser moving parts. This means that your electric car is likely to have lower maintenance costs in the long run.

**3. Tax and financial benefits**

With India embracing the inclusion of EVs, the government offers several policies and incentives to encourage the usage of such vehicles. For instance, the registration fees and road tax on purchasing EVs are lesser than ICE vehicles.

**4. Better performance**

In the past, EVs were seen as impractical. However, that has changed over the years, with manufacturers offering well-designed and good-looking EVs. Even the performance of EVs has changed for the better. Electric Vehicles are lighter in weight, and their acceleration is impeccable compared to fuel-powered vehicles.

**5. Easy to drive and quiet**

With lesser moving parts and uncomplicated controls, EVs are easy to drive. Also, you can plug such a vehicle into a public or home charging station when you want to charge it. They are also quiet, thereby reducing the sound levels that fuel-powered vehicles generate.

**4.2 DISADVANTAGES**

**1. Higher Purchase Cost**

Compared to regular automobiles, electric vehicles are highly pricey. A gasoline vehicle costs between three and four lakh rupees. However, you would be surprised to learn that the beginning price of an electric vehicle is merely ten to twelve lakhs. Due to the high cost of purchasing, not everyone in this position can utilize it.

**2. Low Speed and Range**

An electric car will not be able to go vast distances. Electric vehicles cannot travel farther at a faster rate of speed than those powered by engines if speed is the issue. The driving range is also very limited in addition to this.

**3. Low Price on Selling**

Even though fuel-powered cars are expensive to maintain, they sell for a high price. When it comes to electric vehicles, you may acquire them for less than three times the price you paid. After operating an electric car, the relevance of its capacity reduces substantially, resulting in a low selling price.

**4. The Inconvenience of Service Station**

The utilization of electric vehicles is still in its infancy. As a result, the stations that serve it are similarly built in small numbers. Even after traveling great distances, service locations where cars may be refueled with electricity are few and far between.

**5. Low Energy**

The most significant disadvantage of electric vehicles is that they must be charged regularly. Aside from that, increasing the weight of these vehicles reduces their capacity. Electric cars with little energy and capacity can sometimes fall behind fuel-powered ones.

## 5. APPLICATION

- **Reduced Pollution**

  The transportation sector is now the largest source of carbon dioxide emissions in the U.S. The continued integration of EVs will help reduce this impact because they produce 54 percent less carbon dioxide emissions per mile than a conventional vehicle.

- **Cost Savings**

  EV batteries convert 59 to 62 percent of energy into vehicle movement while gas powered vehicles use 17 and 21 percent. EV drivers spend about $1.2 per gallon to charge, less than half the price of gasoline. The average operating cost of an EV is $485 annually compared to $1,117 for a conventional vehicle.

- **Economic Growth**

  According to the U.S. Department of Energy, in 2017, the U.S. imported 19 percent of the petroleum it used. Using Electric Vehicles can reduce our energy dependency

abroad and support the U.S. economy through the generation of new jobs, particularly in skilled electrical trades.

## 6. CONCLUSION

The nation has compelling reasons to reduce its consumption of oil and emissions of carbon dioxide. Plug-in hybrid electric vehicles (PHEVs) promise to contribute to both goals by allowing some miles to be driven on electricity drawn from the grid, with an internal combustion engine that kicks in when the batteries are discharged. However, while battery technology has made great strides in recent years, batteries are still very expensive.

Transitions to Alternative Transportation Technologies--Plug-in Hybrid Electric Vehicles builds on a 2008 National Research Council report on hydrogen fuel cell vehicles. The present volume reviews the current and projected technology status of PHEVs; considers the factors that will affect how rapidly PHEVs could enter the marketplace, including the interface with the electric transmission and distribution system; determines a maximum practical penetration rate for PHEVs consistent with the time frame and factors considered in the 2008 Hydrogen report; and incorporates PHEVs into the models used in the hydrogen study to estimate the costs and impacts on petroleum consumption and carbon dioxide emissions.

## 7. FUTURE SCOPE

Electric car manufacturing is getting increasingly popular, and its market share is likely to grow significantly. By 2022, India's GDP is predicted to increase by a staggering 25%. The best aspect is that, in addition to decreasing pollution, EVs can reduce oil imports by $60 billion by 2030. Currently, imports account for 82 per cent of India's oil requirement. As a result, it is clear how helpful it will be for the Indian economy if the import cost is decreased.