

Project Report

ON

Visualization Tool for Electric Vehicle Charge and Range Analysis

Team ID: LTVIP2026TMIDS69068

BY

Team MemberS

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1.INTRODUCTION

1.1 Project Overview

The Visualization Tool for Electric Vehicle Charge and Range Analysis project focuses on analyzing and visualizing data related to electric vehicles (EVs) using Tableau. The project integrates multiple datasets containing EV specifications, pricing, brand performance, charging infrastructure, and regional distribution to provide meaningful insights.

The dashboard presents key information such as EV market trends, brand comparisons, efficiency metrics, price variations, and charging station availability across different regions. Various interactive visualizations like bar charts, maps, treemaps, and KPI indicators are used to simplify complex data and make it easy to understand.

This project helps users explore EV data effectively and supports data-driven decision-making for stakeholders such as customers, researchers, and policymakers.

1.2 Purpose

The main purpose of this project is to analyze electric vehicle data and present insights through an interactive and user-friendly dashboard. It aims to:

- Provide a clear understanding of EV market trends and growth
- Compare different EV brands based on performance, price, and efficiency
- Analyze charging infrastructure availability across regions
- Help users make informed decisions regarding EV selection
- Support awareness of sustainable transportation and future mobility trends

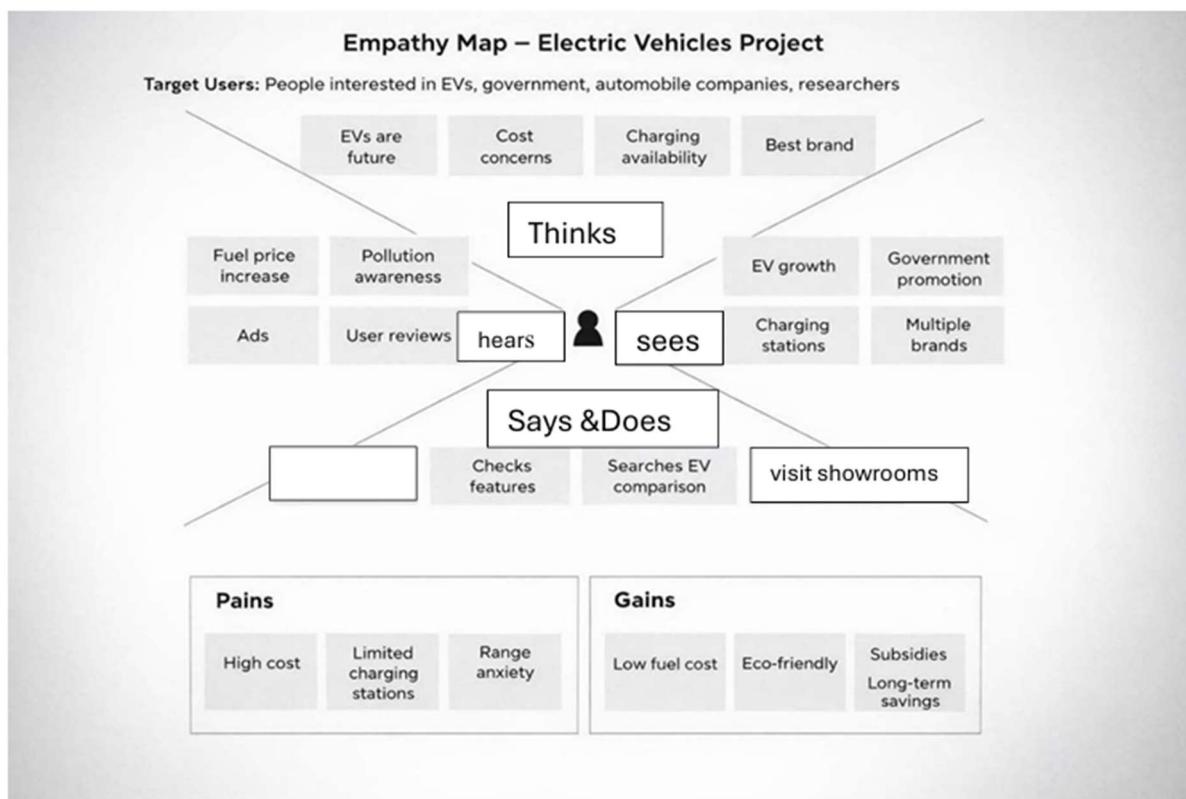
The project also demonstrates the use of data visualization tools like Tableau to transform raw data into actionable insights.

2. IDEATION PHASE

2.1 Problem Statement

Analysing different data from Multiple sources for Electric cars in India and Globally. We have 4 Different datasets we need to analyse the data and create Dashboard and story that can represent the data and show the Visuals for the data.

2.2 Empathy Map Canvas



2.2 Brainstorming

Step-1: Team Gathering, Collaboration and Select the Problem Statement

Our team gathered and discussed various real-world problems related to transportation, environment, and technology. After discussion, we selected the problem of analyzing electric vehicles growth and performance in India. This problem was chosen because EV adoption is increasing and needs proper analysis for better understanding and decision-making.

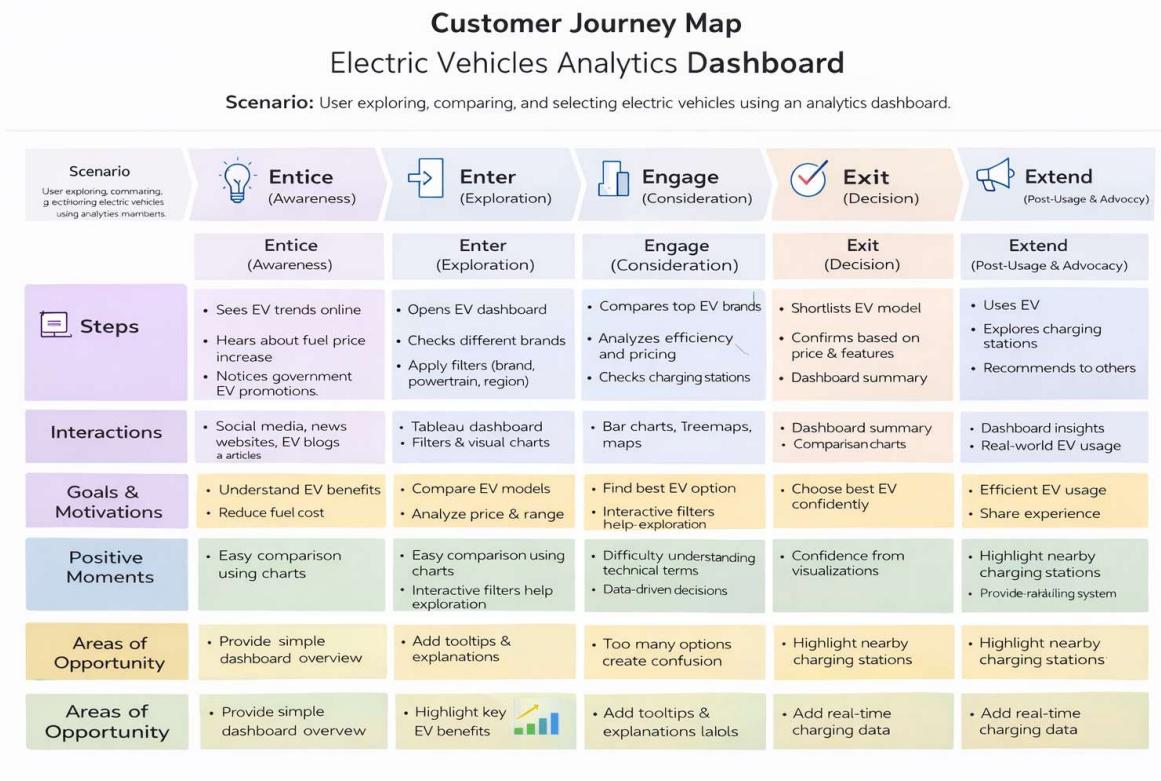
Step-2: Brainstorm, Idea Listing and Grouping The team brainstormed ideas such as EV sales trends, brand comparison, charging infrastructure, EV vs fuel vehicles, and price-performance analysis. These ideas were grouped into

categories like Sales Analysis, Brand Comparison, Performance Metrics, and Infrastructure Analysis.

Step-3: Idea Prioritization Ideas were prioritized based on feasibility, data availability, impact, and ease of implementation. Final selected ideas include EV growth trends, brand comparison, price-performance analysis, and charging infrastructure visualization.

3.REQUIREMENT ANALYSIS

3.1 Customer Journey Map



3.2 Solution Requirement

Functional Requirements

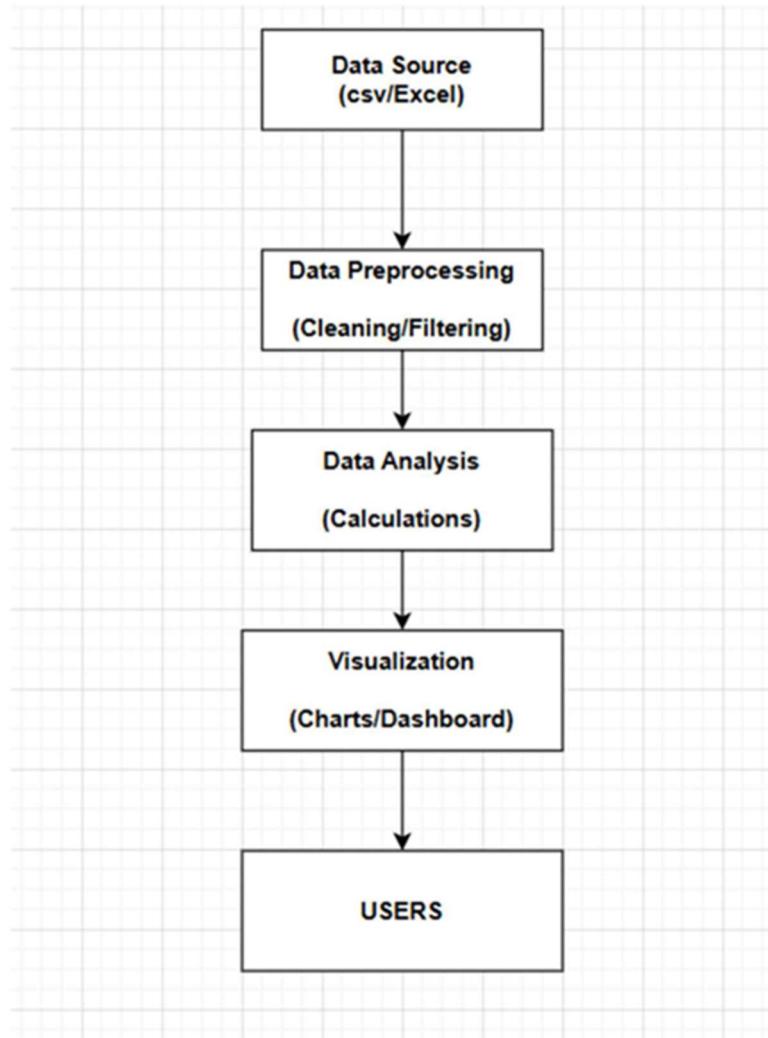
FR No.	Requirement	Description
FR-1	Data Input	System should accept EV data from Excel/CSV files
FR-2	Data Processing	System should clean and transform data using Tableau
FR-3	Dashboard Creation	System should generate interactive dashboards
FR-4	Story Creation	System should create a story for insights
FR-5	Publish to Tableau Public	System should publish dashboards online
FR-6	Web Integration	System should embed dashboard & story using iframe
FR-7	User Interaction	Users should be able to interact with filters and charts

NON Functional Requirements

NFR No. Requirement Description

- NFR-1 Performance Dashboard should load quickly in browser
- NFR-2 Usability Interface should be simple and user-friendly
- NFR-3 Reliability System should work without errors
- NFR-4 Scalability Should support larger datasets in future
- NFR-5 Compatibility Should work on all browsers (Chrome, Edge)
- NFR-6 Availability Website should be accessible online anytime

3.3 Data Flow Diagram

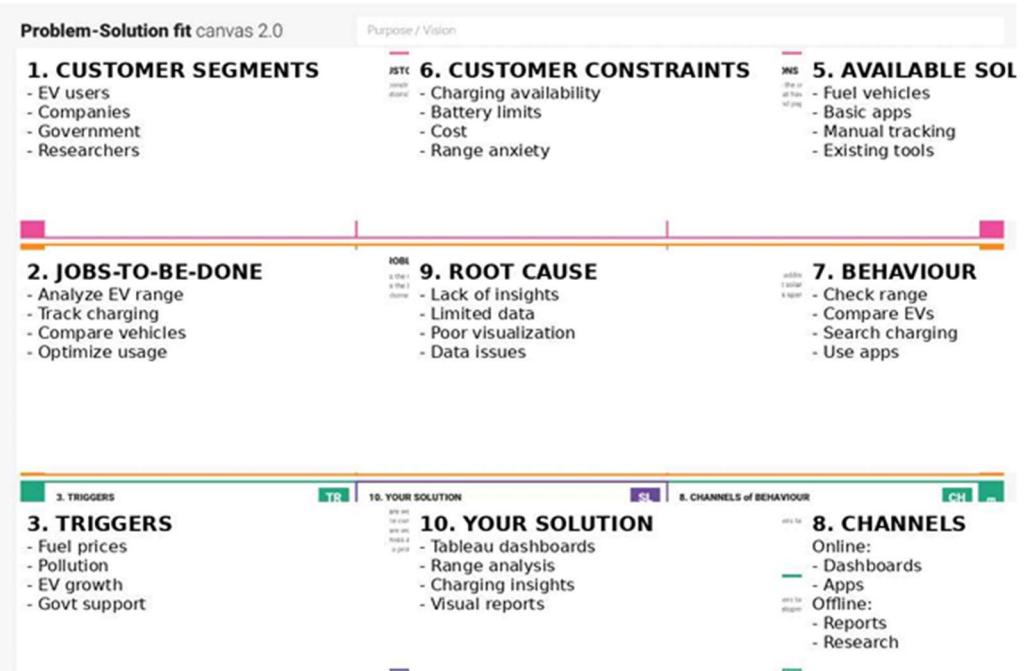


3.4 Technology Stack

Layer	Technology	Description
Data Source	Excel / CSV	Stores electric vehicle dataset (price, range, battery, etc.)
Data Processing	Tableau Prep / Tableau Desktop	Used for data cleaning and transformation
Query / Analysis	SQL (in Tableau)	Used for calculations and data querying
Visualization	Tableau Desktop	Creates dashboards, charts, and stories
Visualization Engine	Tableau Engine (VizQL)	Converts user actions into visual outputs
Visualization Hosting	Tableau Public	Publishes dashboards and provides shareable links
Web Structure	HTML	Builds the structure of the website
Styling	CSS	Designs layout, colors, and appearance
UI Framework	Bootstrap	Provides responsive design and UI components
Integration	iFrame	Embeds Tableau dashboard and story into webpage
Deployment	GitHub Pages	Hosts the website online for public access
Client Interface	Web Browser	Allows users to view and interact with the system

4.PROJECT DESIGN

4.1 Problem Solution Fit



4. EMOTIONS: BEFORE / AFTER (EM)

Before:

- Confusion with raw data
- Stress due to manual work
- Lack of clarity in decisions

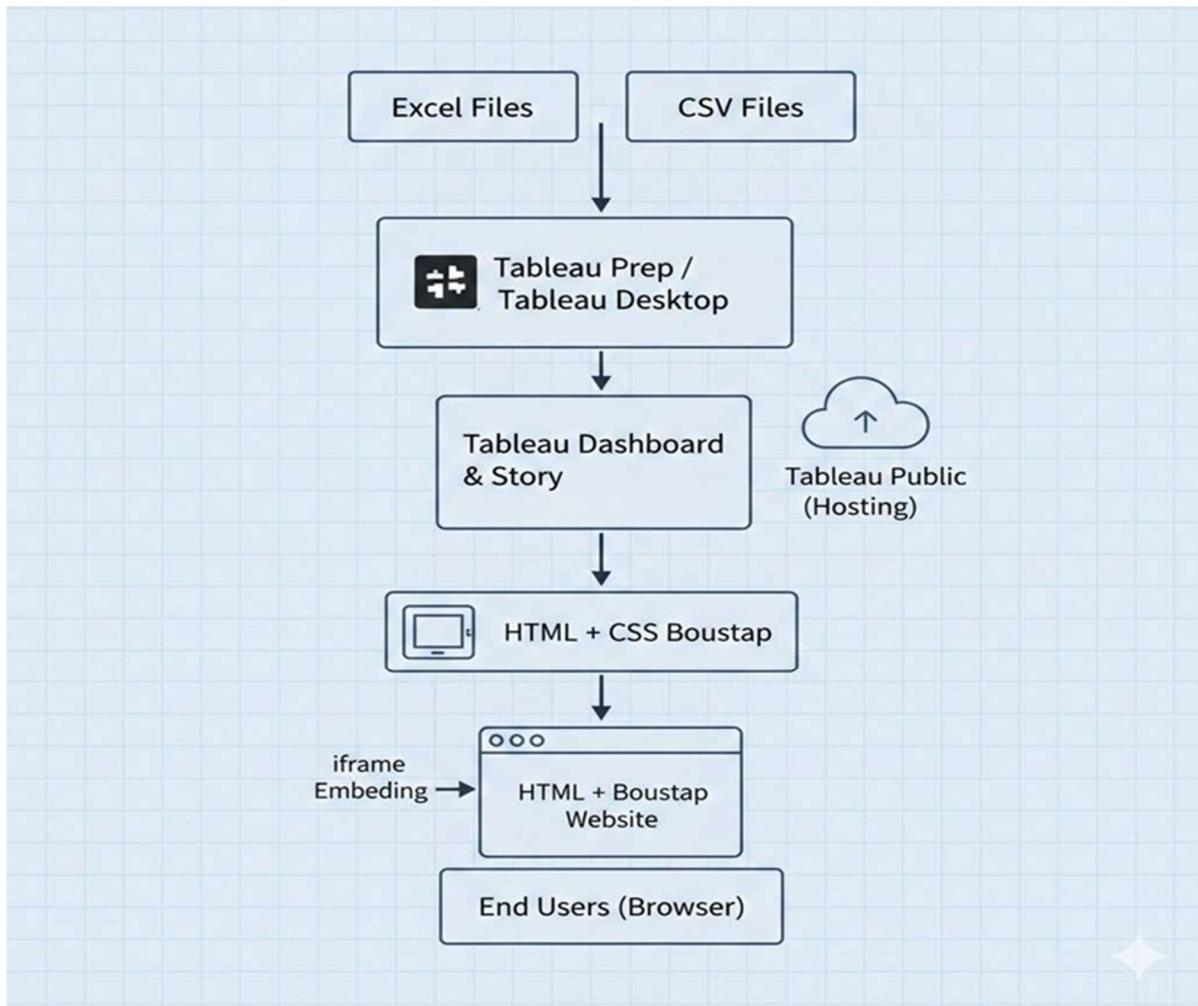
After:

- Confidence with insights
- Faster decision-making
- Satisfaction with clear visual reports

4.2 Proposed Solution

S.No.	Parameter	Description
1	Problem Statement (Problem to be solved)	The rapid growth of electric vehicles has generated large amounts of data related to pricing, battery capacity, range, and charging infrastructure. However, this data is not easily understandable for users, researchers, or decision-makers. There is a need for a system that can analyze and visualize EV data effectively to provide meaningful insights.
2	Idea / Solution description	The proposed solution is an Electric Cars Analytics Dashboard developed using Tableau. The system collects EV data from Excel/CSV sources, processes it using Tableau, and creates interactive dashboards and stories. These visualizations are published on Tableau Public and embedded into a responsive website built using HTML, CSS, and Bootstrap. Users can access and interact with the dashboard through the website.
3	Novelty / Uniqueness	Integration of Tableau dashboards with a web-based interface. Use of interactive storytelling for better understanding. Combination of data analytics and web development. Provides a user-friendly visualization for both technical and non-technical users.
4	Social Impact / Customer Satisfaction	Helps users understand electric vehicle trends and performance. Promotes environmental awareness by encouraging EV adoption. Supports researchers and policymakers with data-driven insights. Provides an interactive and user-friendly experience.
5	Business Model (Revenue Model)	Can be used as a subscription-based analytics platform. Can collaborate with automobile companies for market insights. Revenue can be generated through advertisements or premium analytics features. Can be extended as a data analytics service.
6	Scalability of the Solution	The system can handle larger datasets by integrating with databases. It can be extended to include real-time data. It can be scaled to analyze other types of vehicles. The website can be deployed on cloud platforms for better scalability.

4.3 Solution Architecture



5.PROJECT PLANNING AND SCHEDULDING

5.1 Project Planning

PRODUCT BACKLOG

Sprint	Functional Requirement (Epic)	User Story Number	User Story / Task	Story Points	Priority	Team Members
Sprint-1	Data Collection	USN-1	As a user, I can upload EV dataset (battery, range, charging time)	2	High	Team
Sprint-1	Data Cleaning	USN-2	As a user, I can clean and preprocess EV data for analysis	2	High	Team
Sprint-1	Data Integration	USN-3	As a user, I can integrate multiple EV datasets into one system	3	Medium	Team
Sprint-2	Visualization	USN-4	As a user, I can view EV range comparison charts	2	High	Team
Sprint-2	Visualization	USN-5	As a user, I can analyze charging time using graphs	2	High	Team
Sprint-2	Dashboard	USN-6	As a user, I can view interactive dashboard in Tableau	3	High	Team
Sprint-3	Filters & Analysis	USN-7	As a user, I can filter EV data by brand, battery, and range	2	Medium	Team
Sprint-3	Insights	USN-8	As a user, I can get insights on EV efficiency and performance	3	High	Team
Sprint-3	Comparison	USN-9	As a user, I can compare multiple EV models	2	Medium	Team
Sprint-4	Optimization	USN-10	As a user, I can identify best EV based on range & charging	3	High	Team

Sprint	Functional Requirement (Epic)	User Story Number	User Story / Task	Story Points	Priority	Team Members
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Sprint-4	Reporting	USN-11	As a user, I can generate reports from dashboard	2	Medium	Team
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Sprint-4	Deployment	USN-12	As a user, I can access dashboard online	3	High	Team
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SPRINT SCHEDULE

Sprint	Total Story Points	Duration	Start Date	End Date	Completed Points	Release Date
Sprint-1	7	6 Days	Day 1	Day 6	7	Day 6
Sprint-2	7	6 Days	Day 7	Day 12	7	Day 12
Sprint-3	7	6 Days	Day 13	Day 18	7	Day 18
Sprint-4	8	6 Days	Day 19	Day 24	8	Day 24

PROJECT TRACKER

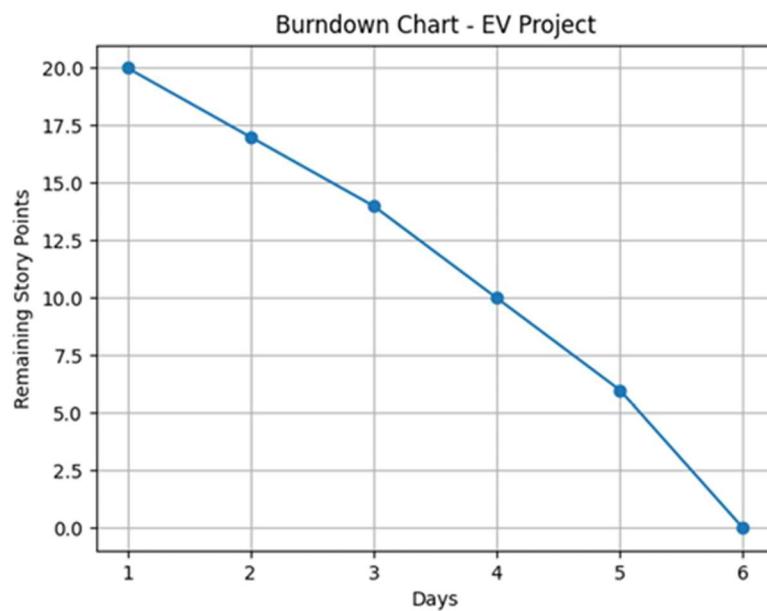
Sprint	Total Story Points	Duration	Sprint Start Date	Sprint End Date (Planned)	Story Points Completed	Sprint Release Date (Actual)
Sprint-1	20	6 Days	27 Jan 2026	01 Feb 2026	20	01 Feb 2026
Sprint-2	20	6 Days	03 Feb 2026	08 Feb 2026	18	09 Feb 2026
Sprint-3	20	6 Days	10 Feb 2026	15 Feb 2026	20	15 Feb 2026
Sprint-4	20	6 Days	16 Feb 2026	20 Feb 2026	19	20 Feb 2026

VELOCITY

- Sprint Duration = **10 days (example)**
- Story Points = **20**

$$\text{Velocity (AV)} = 20 / 10 = 2 \text{ story points/day}$$

Burndown Chart



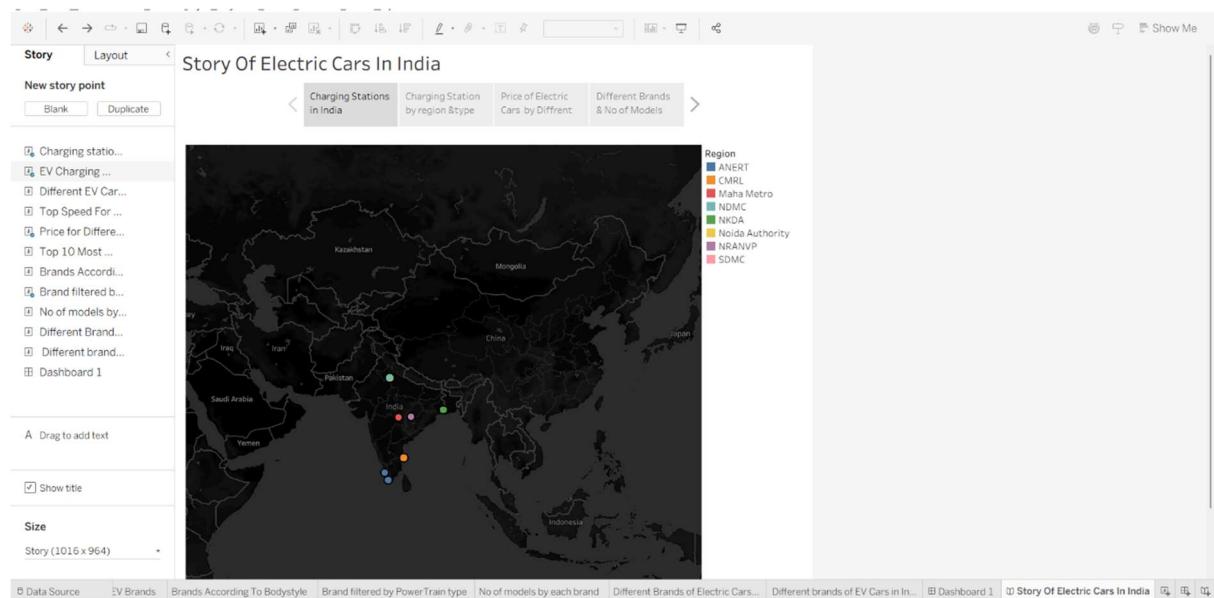
6. FUNCTIONAL AND PERFORMANCE TESTING

6.1 Performance Testing

S.NO	Parameter	ScreenShots/Values
1	Data Rendered	Rendered from CSV datasets including EV_Specifications.csv , Charging_Stations_Data.csv , Brand_Performance.csv , and EV_Regional_Distribution.csv , containing EV car specifications, charging infrastructure details, brand performance insights, efficiency metrics, pricing information, powertrain types, and regional distribution (1000+ records including vehicle and station data).
2	Data Preprocessing	Processed and transformed raw data from EV_Specifications.csv , Charging_Stations_Data.csv , Brand_Performance.csv , and EV_Regional_Distribution.csv using Tableau by handling missing values, correcting data types, standardizing formats, and organizing attributes such as price, range, brand, body style, and region for accurate analysis.
3	Utilization of Filters	Interactive filters applied on datasets (EV_Specifications.csv , Brand_Performance.csv) across attributes including powertrain type, brand, region, and body style to enable dynamic data exploration and user-driven insights.
4	Calculation Fields Used	Calculated fields created using data from EV_Specifications.csv and Brand_Performance.csv to derive insights such as average range, efficiency comparisons, vehicle counts per brand, ranking metrics, and aggregated performance indicators.
5	Dashboard Design	10 Visualizations are used For EV Analytics Dashboard 1. Charging Stations by region and type in India 2. Summary Cards of Different Brands Of EV Cars Globally 3. Summary Cards of Different Brands Of EV Cars in India 4. Brands according to Bodystyle 5. Top 10 most efficient EV Brands 6. Different EV Cars in india 7. No of Models by Each Brand

7.RESULTS

7.1 Output Screenshots



Electric Cars Analytics Dashboard

Different Brands of EV Cars Globally

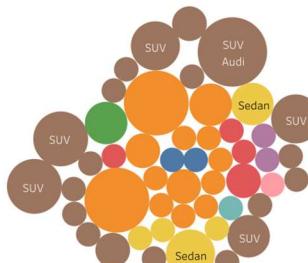
32

Different brands of EV Cars in India

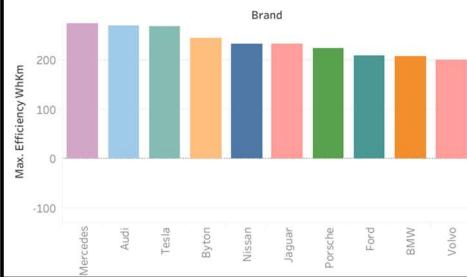
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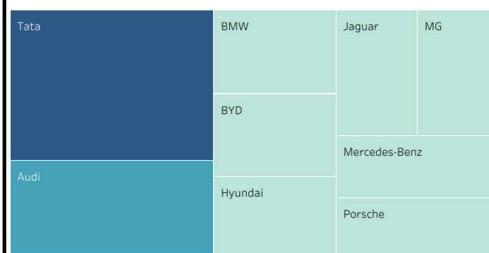
Brands According To Bodystyle



Top 10 Most Efficient EV Brands



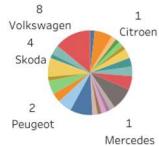
Brand Filtered By PowerTrain Type



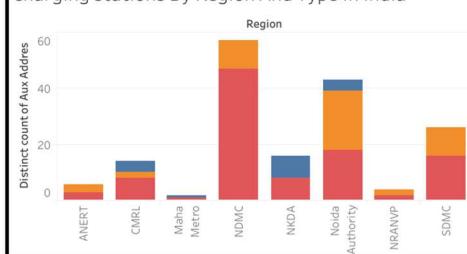
Different EV Cars In India



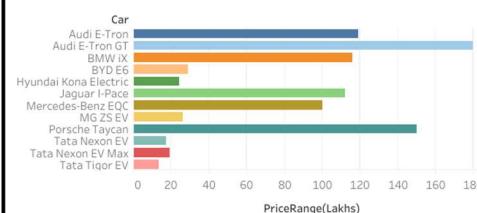
No of models by each brand



Charging stations By Region And Type In India



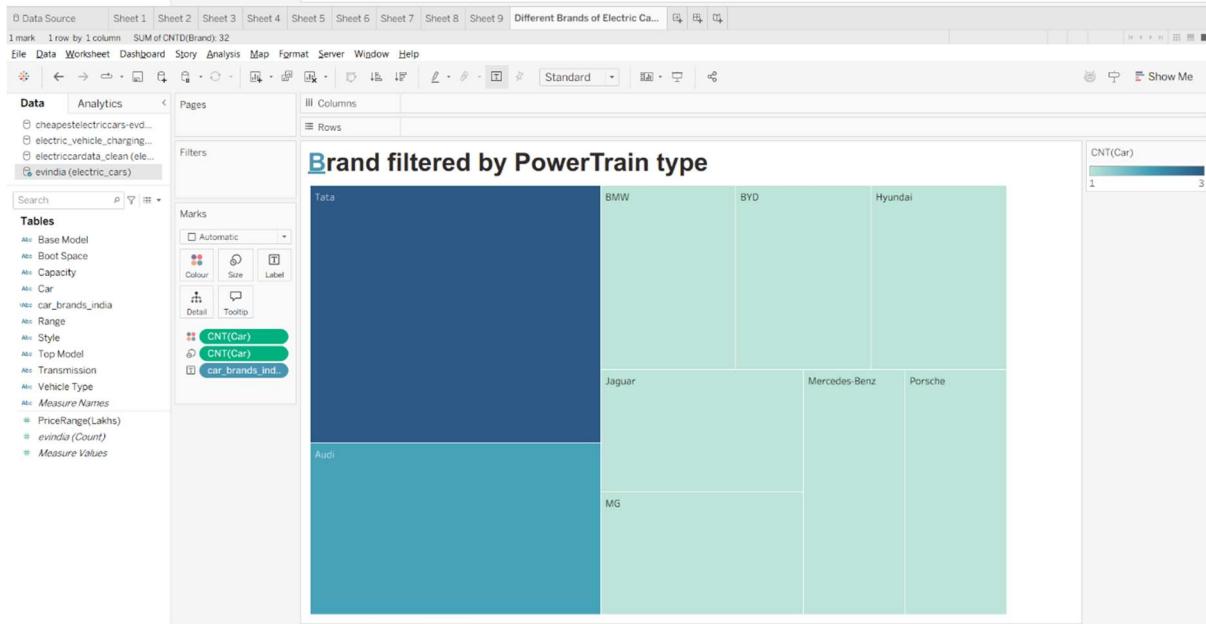
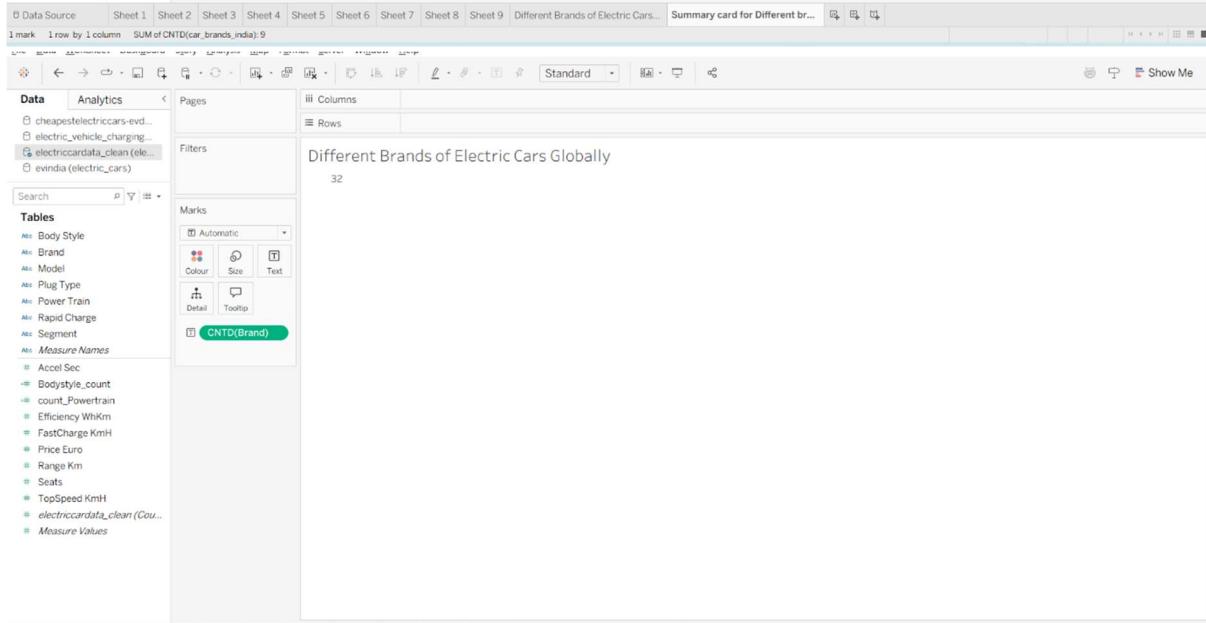
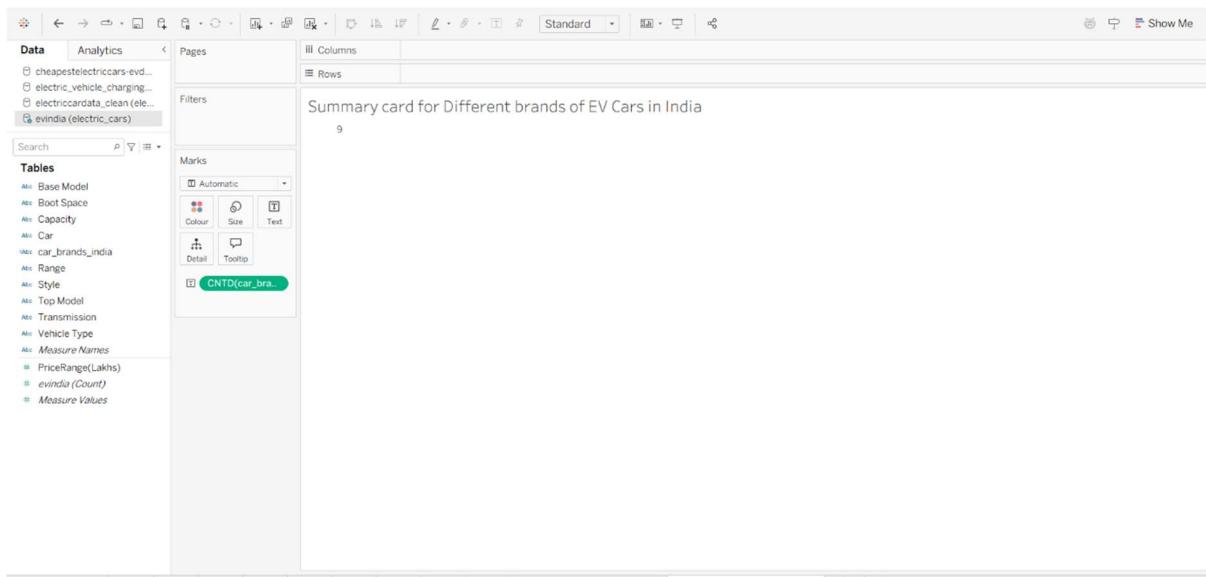
Price for Different Cars in India



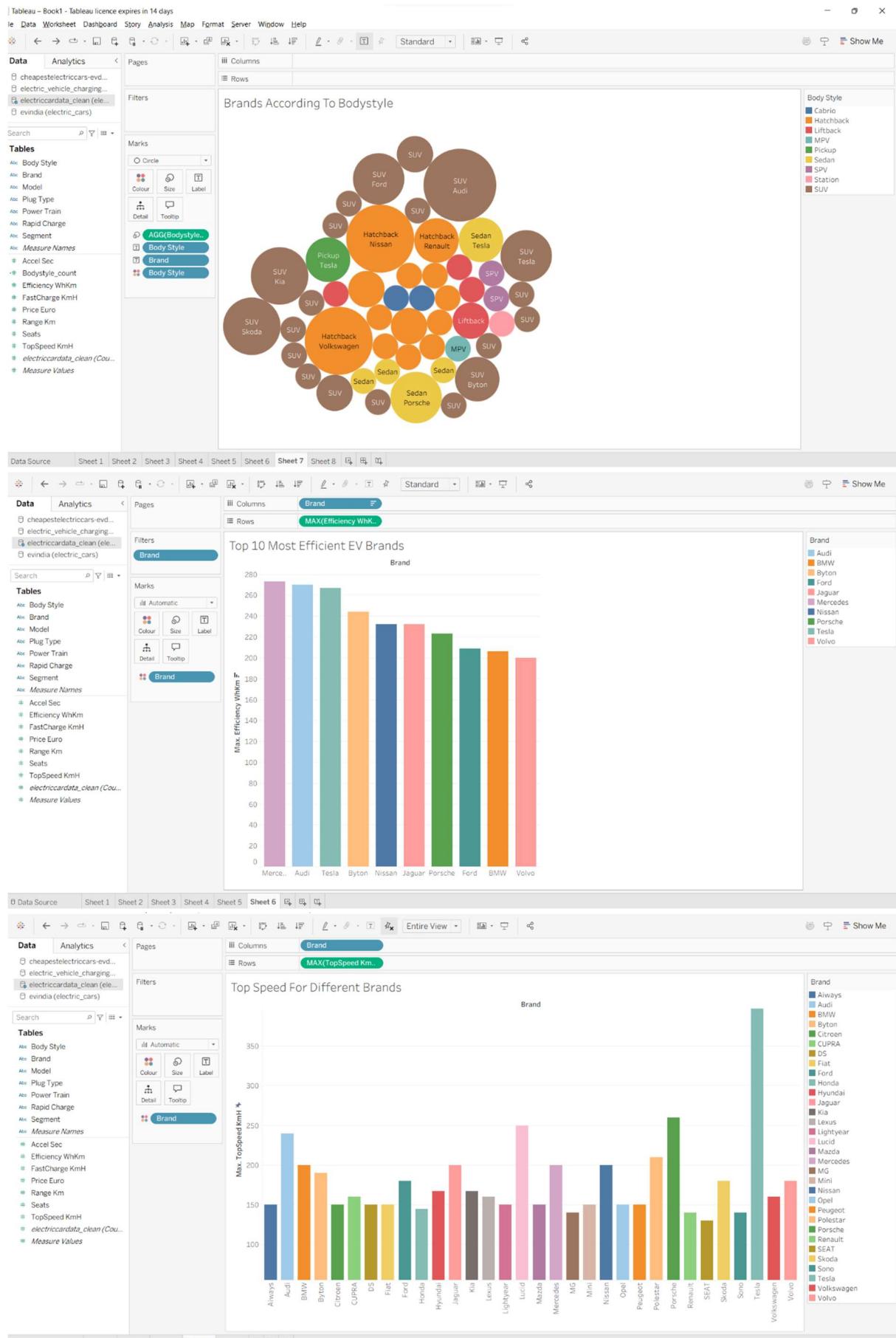
Top Speed For Different Brands

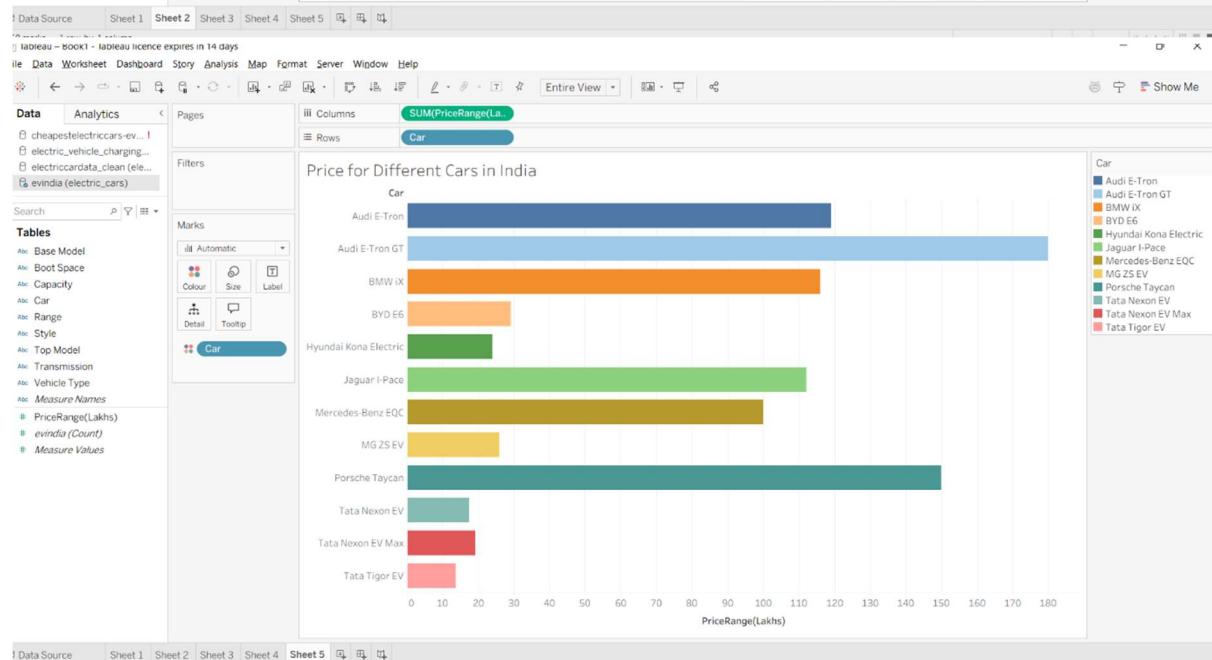
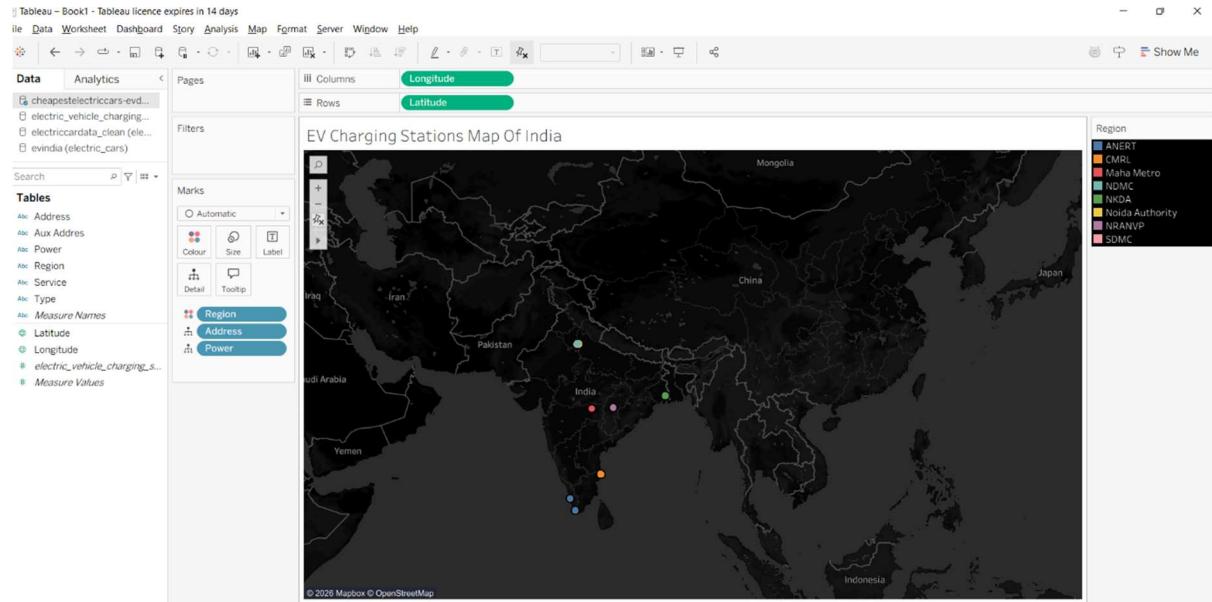


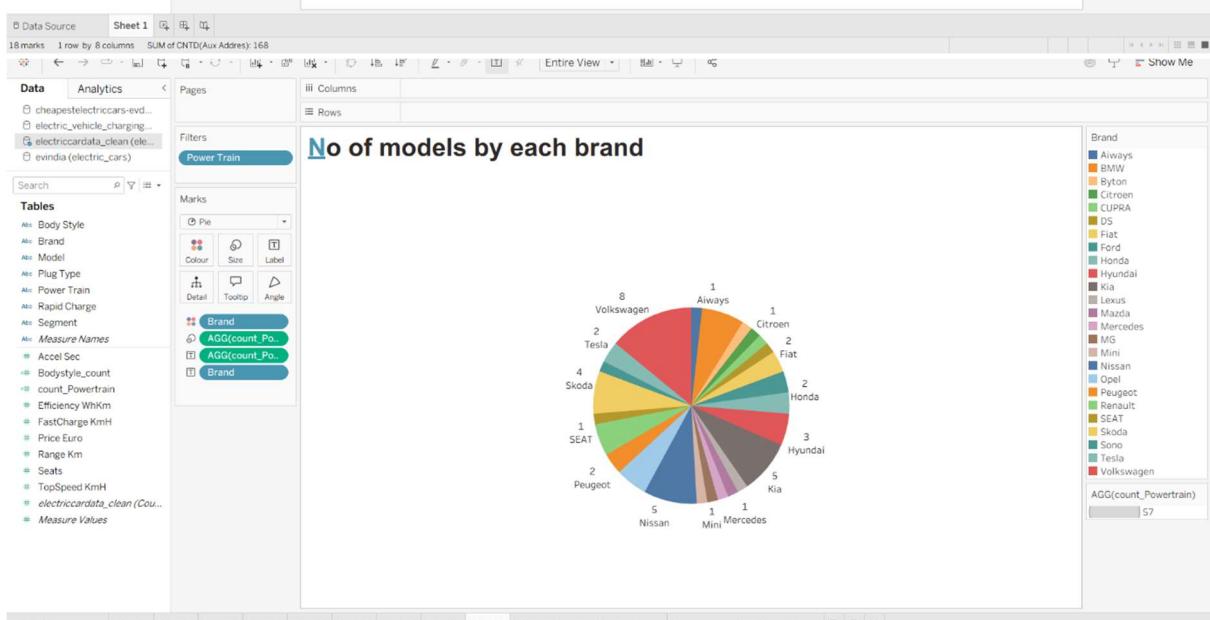
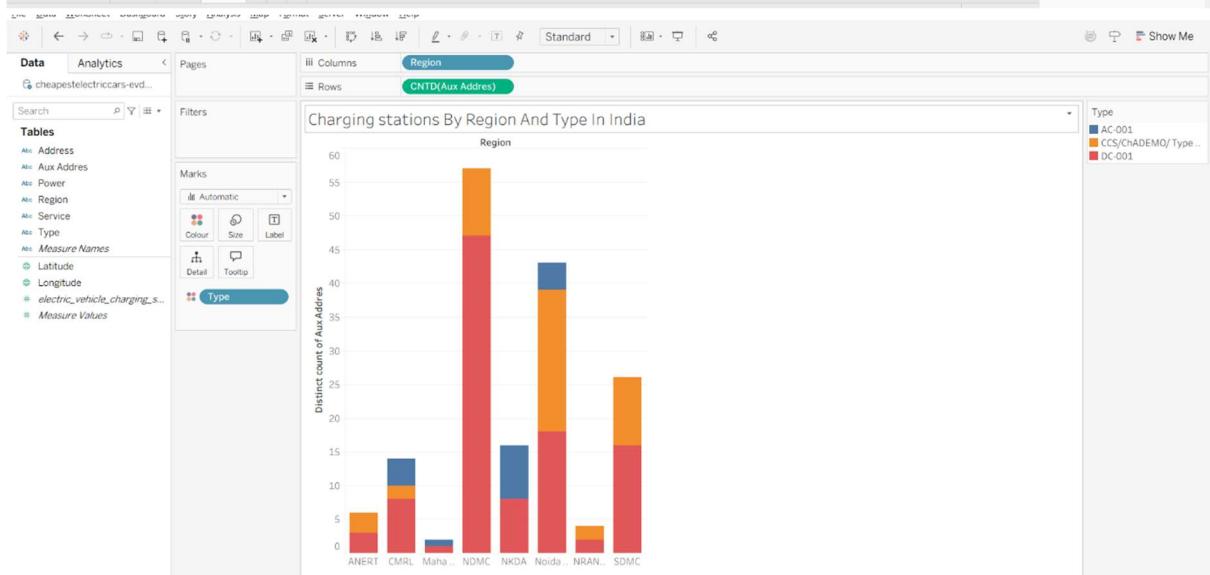
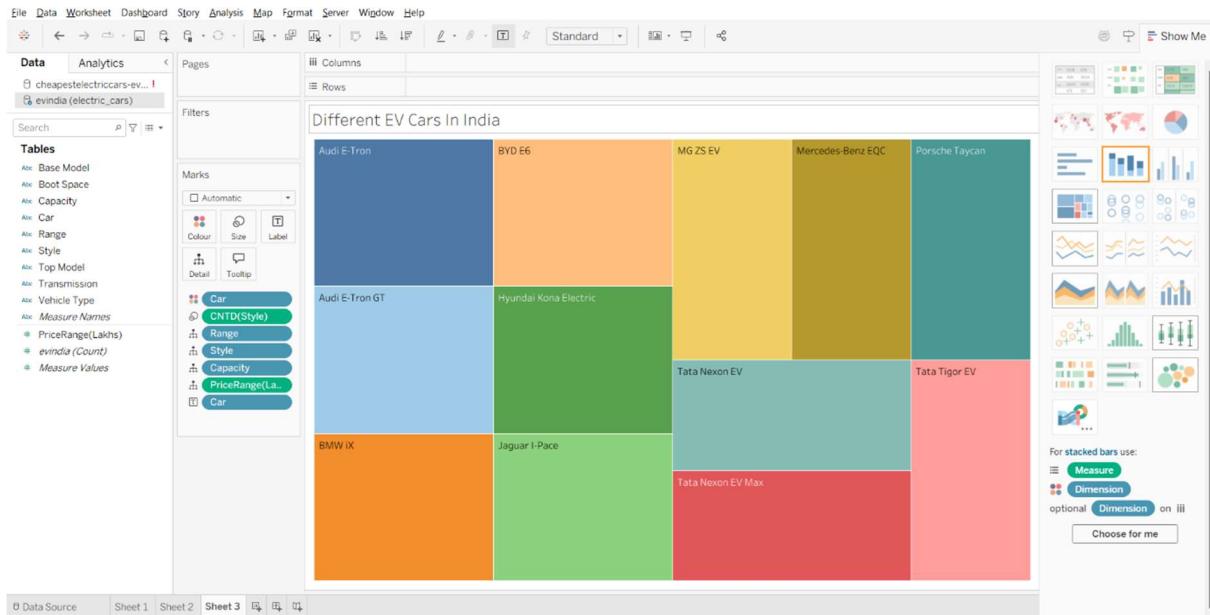
Body Style	Cabrio
Brand	BMW
Count of Car	1
Car	Audi E-Tron
Type	AC-001
Body Style	Hatchback
Brand	BMW
Count of Car	3
Car	Audi E-Tron GT
Type	CCS/ChADEMO / Typ..
Body Style	Liftback
Brand	BMW
Count of Car	57
Car	BMW iX
Type	DC-001
Body Style	MPV
Brand	BMW
Count of Car	57
Car	BYD E6
Type	DC-001
Body Style	Pickup
Brand	BMW
Count of Car	57
Car	Hyundai Kona Electr..
Type	DC-001
Body Style	Sedan
Brand	BMW
Count of Car	57
Car	Jaguar I-Pace
Type	DC-001
Body Style	SPV
Brand	BMW
Count of Car	57
Car	Mercedes-Benz EQC
Type	DC-001
Body Style	Station
Brand	BMW
Count of Car	57
Car	MG ZS EV
Type	DC-001
Body Style	SUV
Brand	BMW
Count of Car	57
Car	Porsche Taycan
Type	DC-001
Body Style	Tesla
Brand	BMW
Count of Car	57
Car	Tata Nexon EV
Type	DC-001
Body Style	Volvo
Brand	BMW
Count of Car	57
Car	Tata Tigor EV
Type	DC-001



9 marks... 1 row by 1 column... SUM of CNT(Car): 12







8.ADVANTAGES & DISADVANTAGES

✓ Advantages of the Project

-  **Easy Data Understanding**
Visual dashboards make EV data simple to understand
 -  **Interactive Analysis**
Users can apply filters and explore data dynamically
 -  **Accessible Anywhere**
Hosted online → can be accessed from any device
 -  **Saves Time**
No need for manual analysis
 -  **Better Decision Making**
Helps users analyze trends and insights
 -  **User-Friendly Interface**
Simple website using Bootstrap
 -  **Promotes EV Awareness**
Encourages eco-friendly decisions
-

✗ Disadvantages of the Project

-  **Internet Required**
Cannot work without internet connection
-  **Data Privacy Issues**
Tableau Public makes data visible to everyone
-  **Limited Customization**
Tableau Public has some feature limitations
-  **Dependent on Data Quality**
Wrong data → wrong insights

-  **No Real-Time Data**
Uses static Excel/CSV data
-  **Performance Issues (Large Data)**
May slow down with large datasets

9.CONCLUSION

The *Visualization Tool for Electric Vehicle Charge and Range Analysis* successfully provides a clear and interactive way to understand key aspects of electric vehicles such as charging time, battery capacity, and driving range. By using Tableau for data visualization, the project transforms raw data into meaningful insights through dashboards and stories. The integration of these visualizations into a web-based interface using HTML, CSS, and Bootstrap improves accessibility and user experience. Overall, the project helps users analyze EV performance effectively and supports better awareness and decision-making in the adoption of electric vehicles.

10.FUTURE SCOPE

- 1.Add real-time data instead of static Excel files
2. Use a database for better data storage
- 3.Develop a mobile app version
4. Add more advanced charts and filters
- 5.Include global EV data
- 6.Add user login system

11.APPENDIX

Source code :

```
<!DOCTYPE html>

<html lang="en">
<head>
<meta charset="UTF-8">
<title>E-CarStart</title>

<!-- Bootstrap CSS -->
<link href="https://cdn.jsdelivr.net/npm/bootstrap@5.3.2/dist/css/bootstrap.min.css" rel="stylesheet">

<!-- Custom CSS -->
<link rel="stylesheet" href="css/style.css">
</head>

<body>

<!-- NAVBAR -->
<nav class="navbar navbar-expand-lg navbar-dark bg-dark fixed-top">
<div class="container">
<a class="navbar-brand" href="#">E-CarStart</a>
<button class="navbar-toggler" data-bs-toggle="collapse" data-bs-target="#menu">
<span class="navbar-toggler-icon"></span>
</button>
```

```
<div class="collapse navbar-collapse" id="menu">
  <ul class="navbar-nav ms-auto">
    <li class="nav-item"><a class="nav-link" href="#dashboard">Dashboard</a></li>
    <li class="nav-item"><a class="nav-link" href="#story">Story</a></li>
  </ul>
</div>
</div>
</nav>
```

```
<!-- DASHBOARD SECTION -->
<section id="dashboard" class="container my-5">
  <h2 class="mb-3">Dashboard</h2>

  <!-- Dashboard iframe will come here -->
  <iframe
    src="https://public.tableau.com/views/SmartBridgeProject_17707335826020/Dashboard1?:showVizHome=no&publish=yes"
    width="100%"
    height="700"
    frameborder="0"
    allowfullscreen>
  </iframe>
</section>
```

```
<!-- STORY SECTION -->
<section id="story" class="container my-5">
```

```
<h2 class="mb-3">Story</h2>
```

```
<!-- Story iframe will come here -->
```

```
<iframe
```

```
src="https://public.tableau.com/views/SmartBridgeProject_17707335826020/  
StoryOfElectricCarsInIndia?:showVizHome=no&publish=yes"
```

```
width="100%"
```

```
height="700"
```

```
frameborder="0"
```

```
allowfullscreen>
```

```
</iframe>
```

```
</section>
```

```
<!-- Bootstrap JS -->
```

```
<script
```

```
src="https://cdn.jsdelivr.net/npm/bootstrap@5.3.2/dist/js/bootstrap.bundle.min.j  
s"></script>
```

```
</body>
```

```
</html>
```

DatasetsLink:

<https://drive.google.com/drive/folders/1jnEk8BjRbMRELOYApKTfvbCF51NgODzu?usp=sharing>

Github Link

<https://github.com/Bharathkata/visualization-tool-for-electric-vehicle-charge-and-range-analysis.git>

vedio demo

https://drive.google.com/file/d/1abEGcSazgfkgWre9VUQHefPXjw_ikb60/view?usp=sharing

