

EV Charge & Range Analysis Report

Project Title: Visualization Tool for Electric Vehicle Charge and Range Analysis

- By Priyanshu Kumar

1. INTRODUCTION

1.1 Project Overview

Electric Vehicles (EVs) are transforming the automotive industry with a strong focus on sustainability, efficiency, and smart technology. This project provides a unified data visualization tool for EV buyers, analysts, and decision-makers. Using Tableau, we created an interactive dashboard that integrates multiple datasets — including vehicle specifications, pricing, and charging infrastructure — to support insights and informed decisions. The dashboard allows users to compare EV models, analyze charging station distribution, and filter results by multiple parameters, making data exploration easy and insightful.

1.2 Purpose

The primary purpose of this project is to develop a visual analytics dashboard that helps understand EV trends, brand comparisons, and infrastructure availability across India and globally. The project simplifies EV decision-making by consolidating four different datasets into a single visualization tool using Tableau. This supports a wide range of users, from consumers evaluating EVs to analysts and policymakers planning for electric mobility expansion.

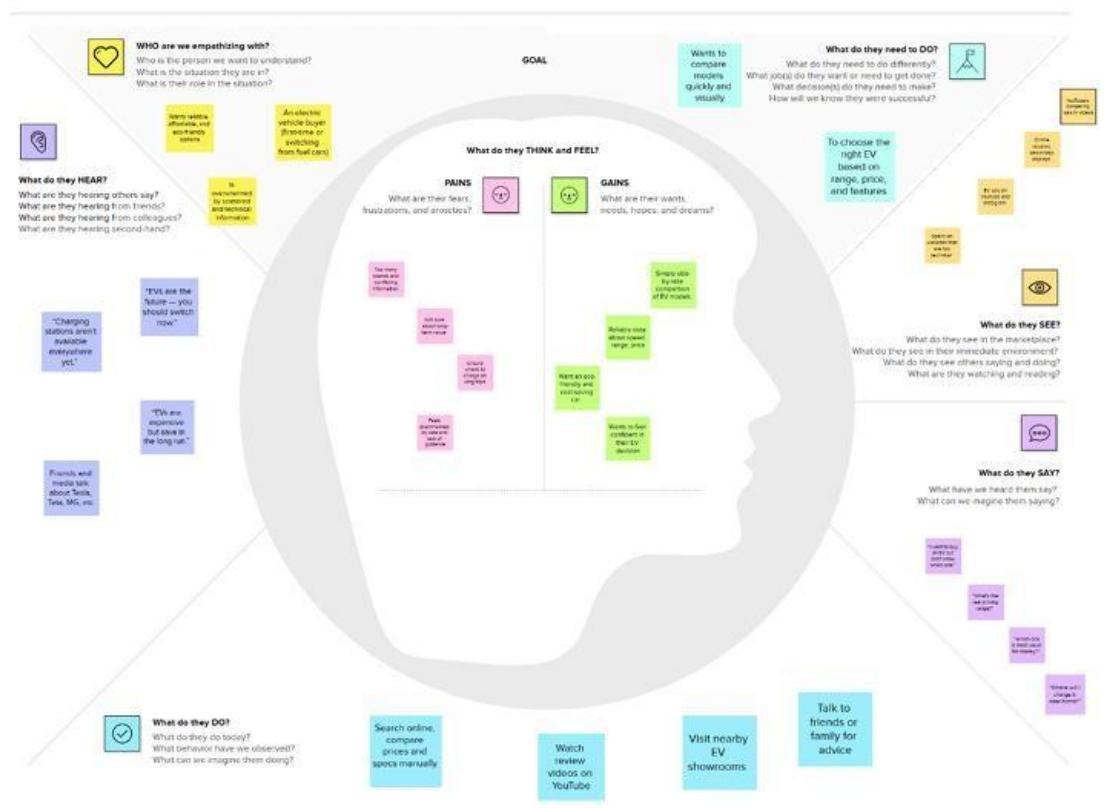
2. IDEATION PHASE

2.1 Problem Statement

How might we help EV buyers and stakeholders explore electric vehicle specifications, pricing, efficiency, and charging infrastructure in India and globally through interactive dashboards and storytelling?

Consumers and decision-makers often struggle to access consolidated EV-related information due to the scattered nature of online resources. This leads to inefficient planning, comparison difficulties, and a lack of clarity. Our project aims to solve this by integrating multiple EV datasets into a single, visually-driven analysis tool using Tableau.

2.2 Empathy Map Canvas

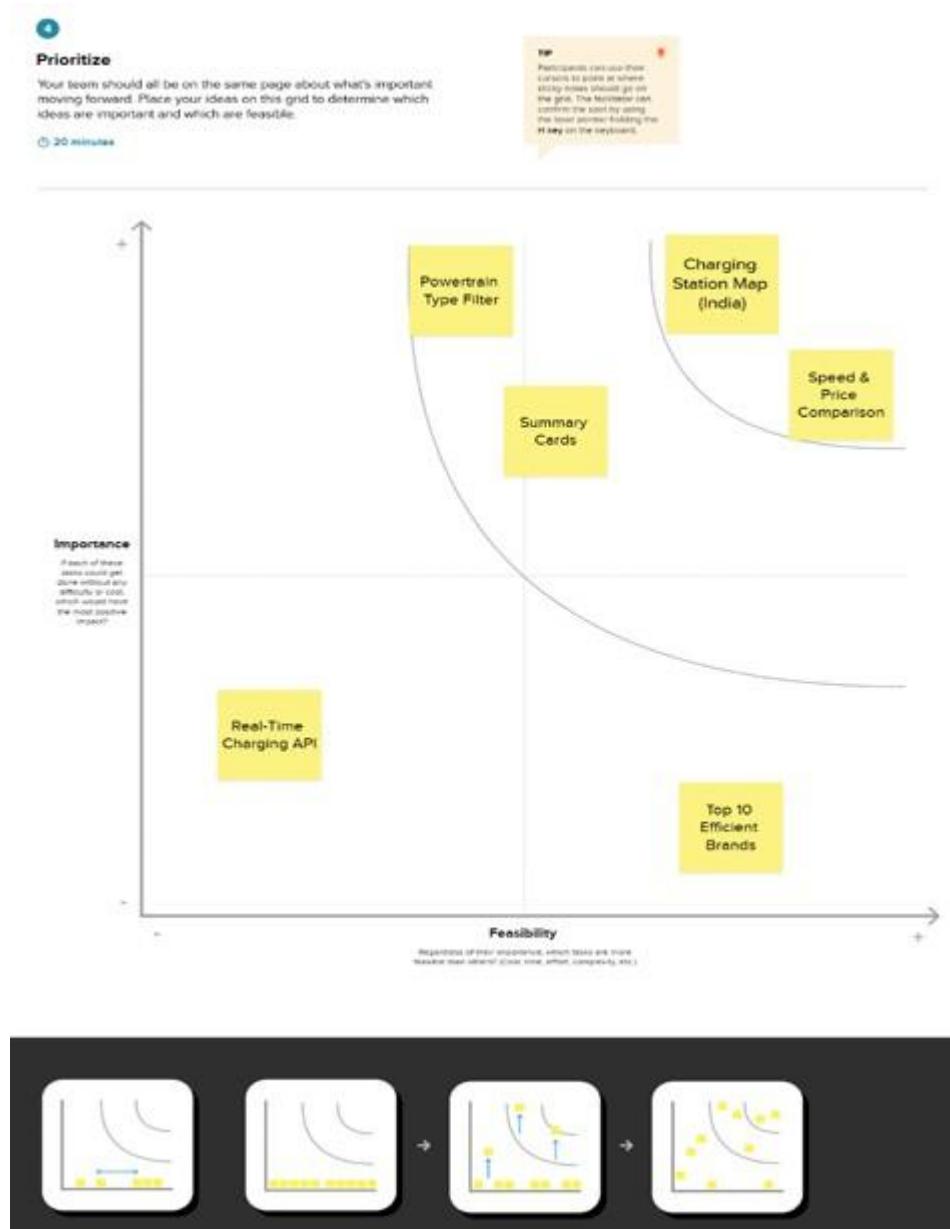


This empathy map helped us better understand user expectations and frustrations. It guided the design of filters, summaries, and visual maps in our dashboard.

2.3 Brainstorming (Idea Generation & Prioritization)

We generated and prioritized the following ideas:

Ideas Generated	Priority
Charging station map by state/region	High
Price vs Range comparison across models	High
Top 10 efficient EV brands visualized	High
Filters for powertrain type and body style	Medium
Summary cards comparing India and global EV trends	Medium
Dashboard KPI cards (Top Speed, Price, Efficiency)	High
Story view to guide non-technical users through insights	High



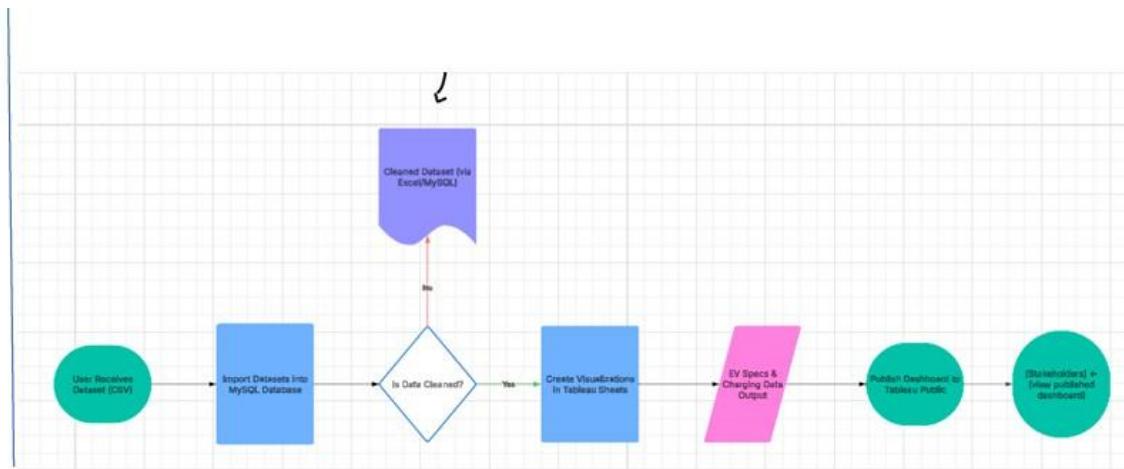
3. REQUIREMENT ANALYSIS

Stage	User Action	Experience	Opportunity
Awareness	Searches for EV models and charging station info	Overwhelmed by multiple sources	Provide a centralized dashboard with all info in one place
Consideration	Compares speed, price, and efficiency of EV brands	Lacks clarity and reliable data	Visualize comparisons with filters and charts

Decision Making	Shortlists cars based on performance and affordability	Struggles to prioritize	Add summary cards, KPI metrics, and ranking-based visuals
Post-Purchase	Looks for nearby charging infrastructure	Unsure of charging availability	Provide state-wise charging map and chargertype filters

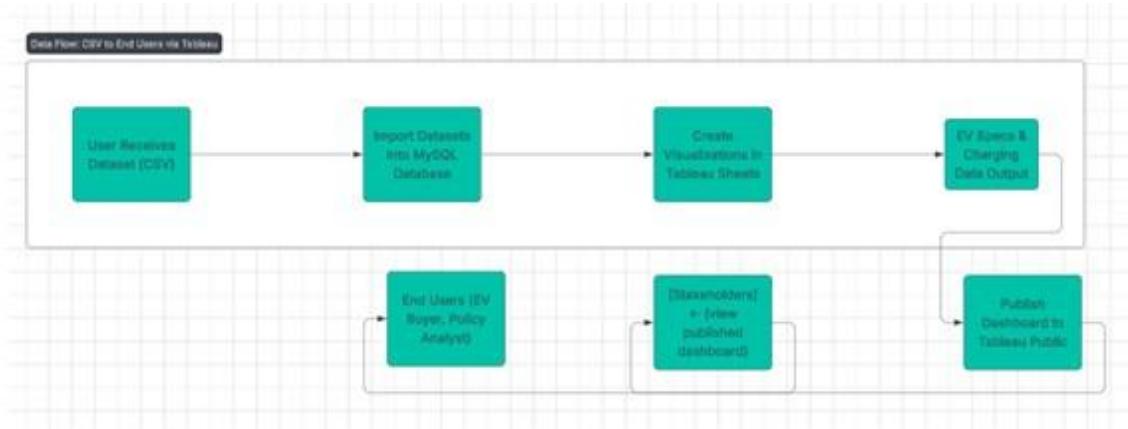
3.2 Solution Requirement

Requirement Type	Description
Functional Requirements	- Import EV datasets into a database - Create dashboards & story in Tableau
Data Requirements	- 4 datasets: EV specs, price, brand, and charging stations
Visualization Requirements	- Bar charts, maps, KPI cards, filters, and summary cards
User Requirements	- Dashboard should be user-friendly, visual, and filterable
Technical Requirements	- Use MySQL for data storage - Use Tableau Desktop & Public for visualization



3.4 Technology Stack:

The Deliverable shall include the architectural diagram as below and the information as per the table1 & table 2



Category	Tool/Technology Used
Data Source	CSV Files
Database	MySQL
Data Cleaning/Storage	SQL Queries (within MySQL)
Visualization	Tableau Desktop, Tableau Public
Documentation	MS Word, Google Docs
Project Sharing	GitHub, Tableau Public

4. PROJECT DESIGN

Problem	Proposed Solution
EV data is scattered across multiple sources, making comparisons difficult for consumers.	Centralized Tableau dashboard integrating multiple datasets for easy exploration.
No visual representation of available EV charging infrastructure across Indian states.	Interactive map and region-wise charts showing charger types and distribution.
Lack of user-friendly filtering (e.g., by price, brand, powertrain) for EV evaluation.	Dashboard filters for brand, powertrain type, body style, and top speed for decisionmaking.

This alignment between real-world user pain points and targeted dashboard features ensures usability and impact.

4.2 Proposed Solution

The proposed solution is an **interactive EV data visualization tool** built using **Tableau**, supported by a **MySQL** backend for structured data storage.

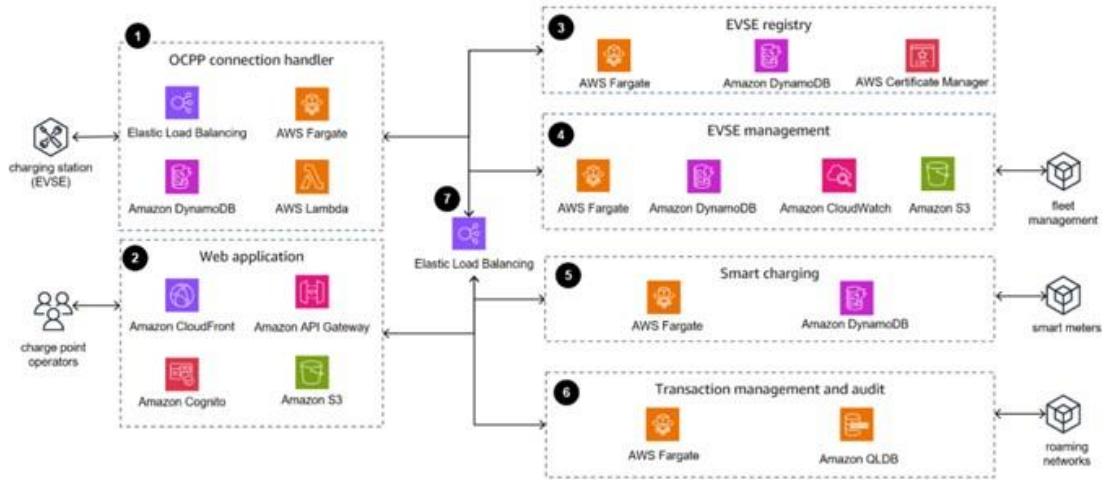
Key features include:

- Charts comparing **price, top speed, and efficiency** of EV models.
- **Filters** for brand, powertrain type, and body style.
- **Charging station data** shown using regional maps and bar charts.
- **Summary cards** and **KPI metrics** to simplify decision-making.
- A **narrative story view** that guides users step-by-step through EV insights.

4.3 Solution Architecture

You can represent this visually in your diagram, or describe it as below:

1. **Data Collection** – Four CSV files collected covering EV specs, prices, and charging stations.
2. **Data Storage** – Datasets imported into **MySQL**, with cleaned and structured tables.
3. **Data Connection** – Tableau Desktop connected to the MySQL database using server credentials.
4. **Visualization Layer** – Dashboards and stories built in Tableau with filters, maps, charts, and cards.
5. **Publishing** – Final visualizations published on **Tableau Public** for public access and sharing.



5. PROJECT PLANNING & SCHEDULING

5.1 Project Planning

We adopted an agile approach with two focused sprints to manage development and visualization work efficiently.

Sprint Planning Table

Sprint	Functional Requirement (Epic)	User Story No.	User Story / Task	Story Points	Priority	Team Members
Sprint-1	Data Connection	USN-1	Import all EV datasets into MySQL and verify schema	2	High	Gotloori Balaji
	Data Visualization (Cars)	USN-2	Create comparison views for EVs by price, speed, and efficiency	3	High	
	Data Visualization (Charging)	USN-3	Build visualizations for charging stations by region and type	2	High	

Sprint-2	Filtering Features	USN-4	Implement filters for body style, powertrain, and brand	2	Medium	
	Summary Cards	USN-5	Create summary KPIs for India vs Global EV data	2	Medium	
	Dashboard & Story Integration	USN-6	Combine sheets into interactive dashboard and design the story	3	High	
	Publish Dashboard	USN-7	Publish dashboard and story on Tableau Public	1	High	

Sprint Tracker

Sprint	Total Story Points	Duration	Sprint Start Date	Sprint End Date	Story Points Completed	Sprint Release Date
Sprint-1	7	5 Days	25 June 2025	29 June 2025	7	29 June 2025
Sprint-2	8	6 Days	30 June 2025	5 July 2025	8 (planned)	5 July 2025 (planned)

Velocity

Velocity = Story Points Completed ÷ Duration

Velocity = $7 \div 5 = 1.4$ story points/day

This helped us plan Sprint-2 more accurately by allocating 8 points over 6 days.

6. FUNCTIONAL AND PERFORMANCE TESTING

6.1 Performance Testing

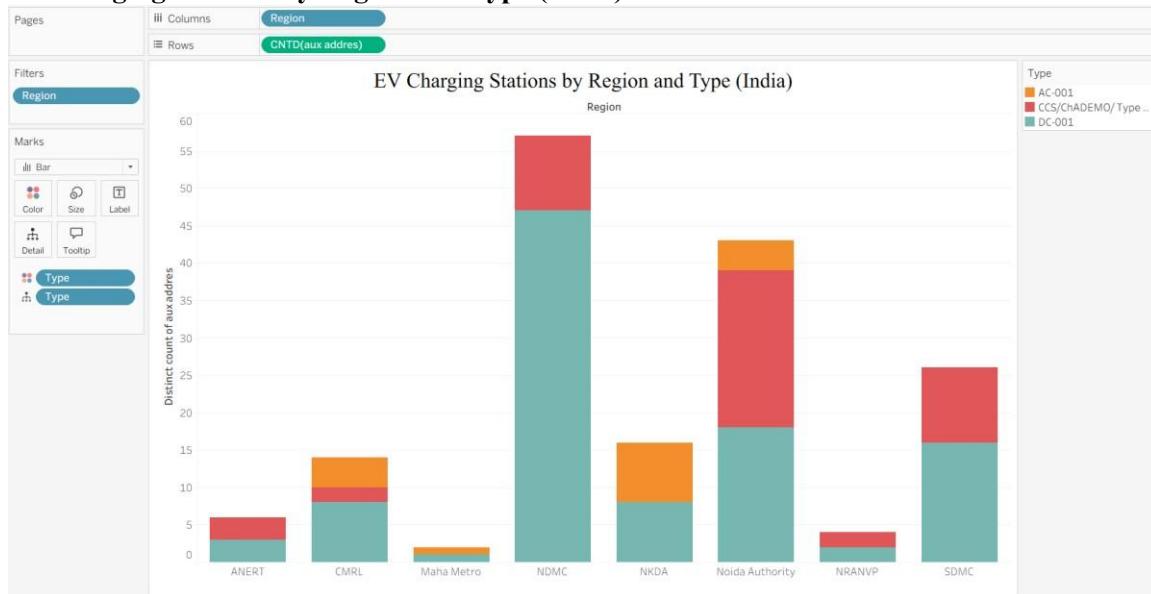
The dashboard was evaluated based on data rendering, filters, calculated fields, visual components, and story navigation. Below is a summary of key testing outcomes:

Model Performance Testing Table

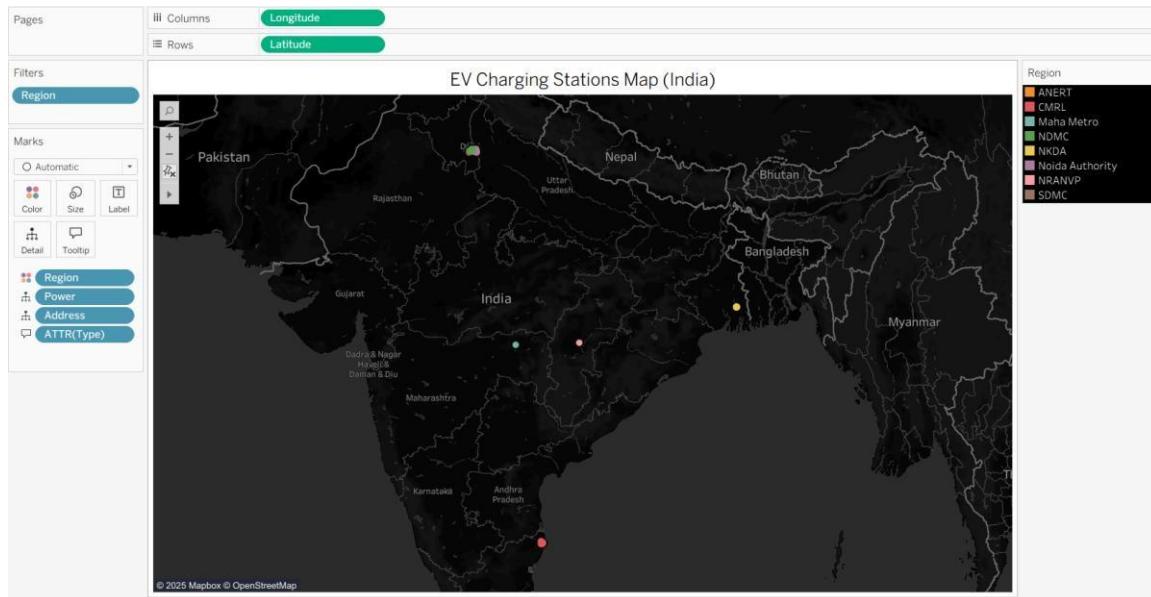
S.No	Parameter	Details
1	Data Rendered	Four datasets used: <ul style="list-style-type: none">• EVIndia.csv• ElectricCarData_Clean.csv• Cheapestelectriccars-EVDatabase.csv• electric_vehicle_charging_station_list.csv
2	Data Preprocessing	Cleaned using SQL: <ul style="list-style-type: none">• Null value removal• Column renaming• Duplicate elimination• Data typed and formatted in MySQL
3	Utilization of Filters	Filters included: <ul style="list-style-type: none">• Brand• Body Style• Powertrain Type• Region• Charger Type
4	Calculation Fields Used	Created fields for: <ul style="list-style-type: none">• Efficiency (Range ÷ Battery Capacity)• Price/Range Ratio• Speed Rank• Total Models by Brand
5	Dashboard Design	Dashboard has over 6 sheets with: <ul style="list-style-type: none">• Maps• Bar charts• KPI summary cards• Interactive filters
6	Story Design	Story consists of 6 scenes: <ul style="list-style-type: none">• Navigation across sheets• User-guided exploration• Brand & region comparison pages

7. RESULTS

EV Charging Stations by Region and Type (India)



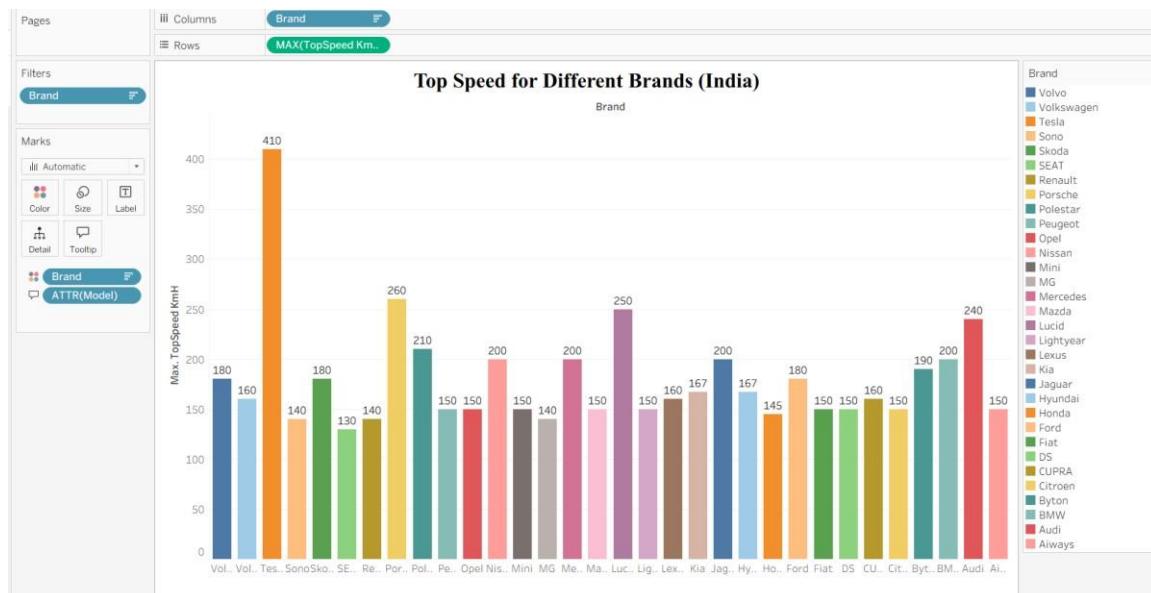
EV Charging Stations Map (India)



Different EV Cars in India



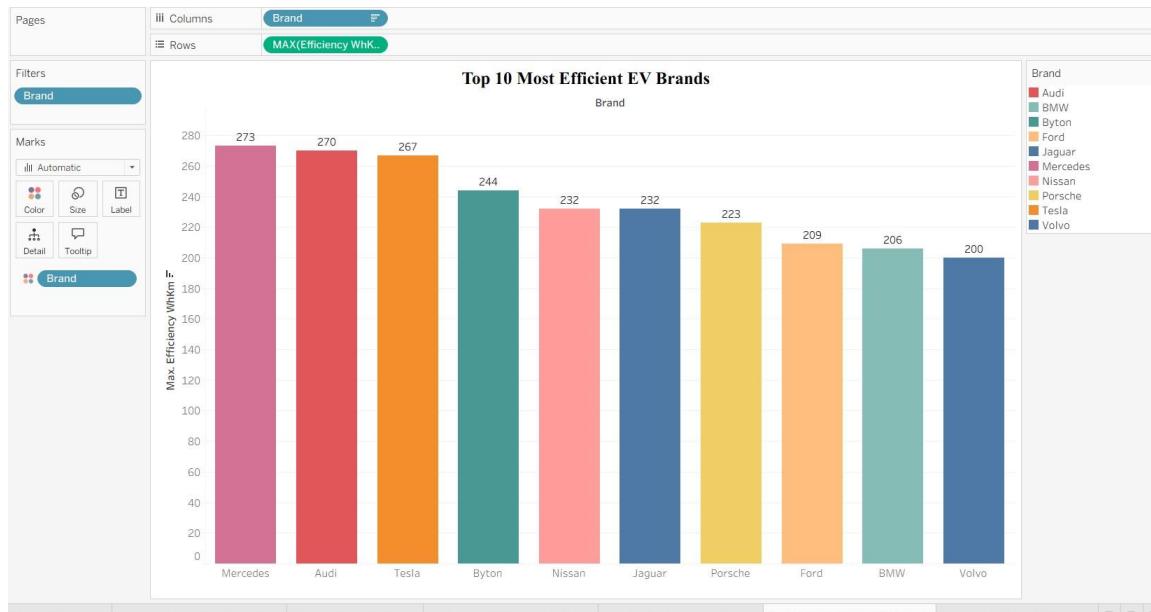
Top Speed for Different Brands (India)



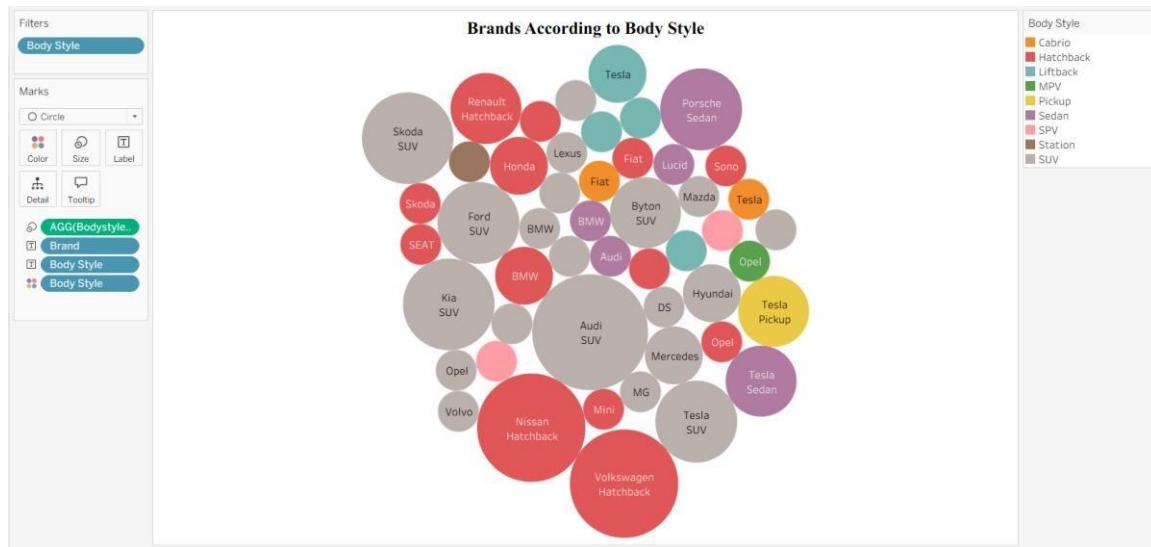
Price for Different Cars in India



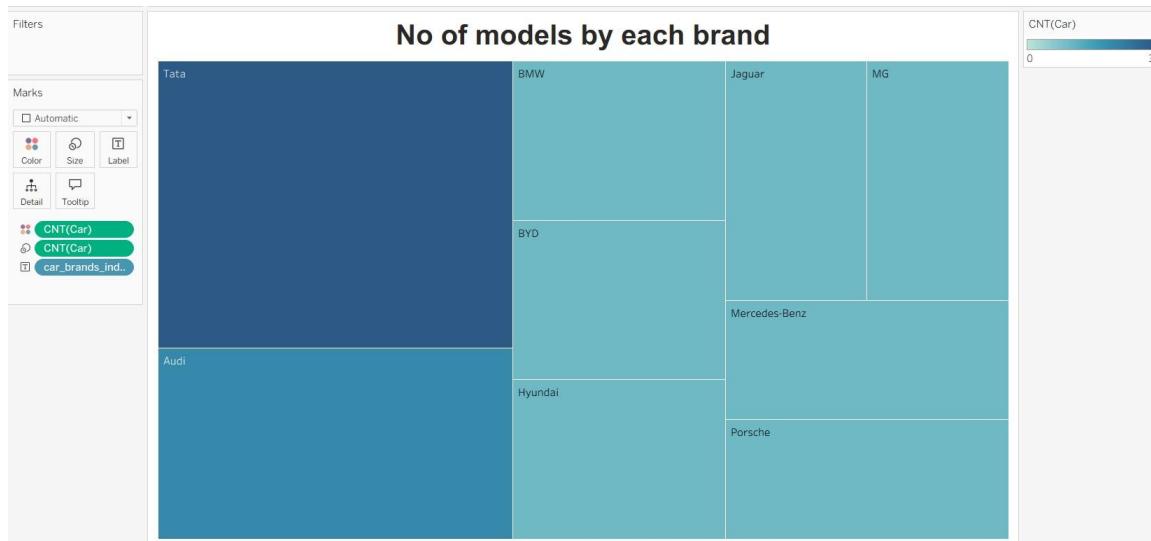
Top 10 Most Efficient EV Brands



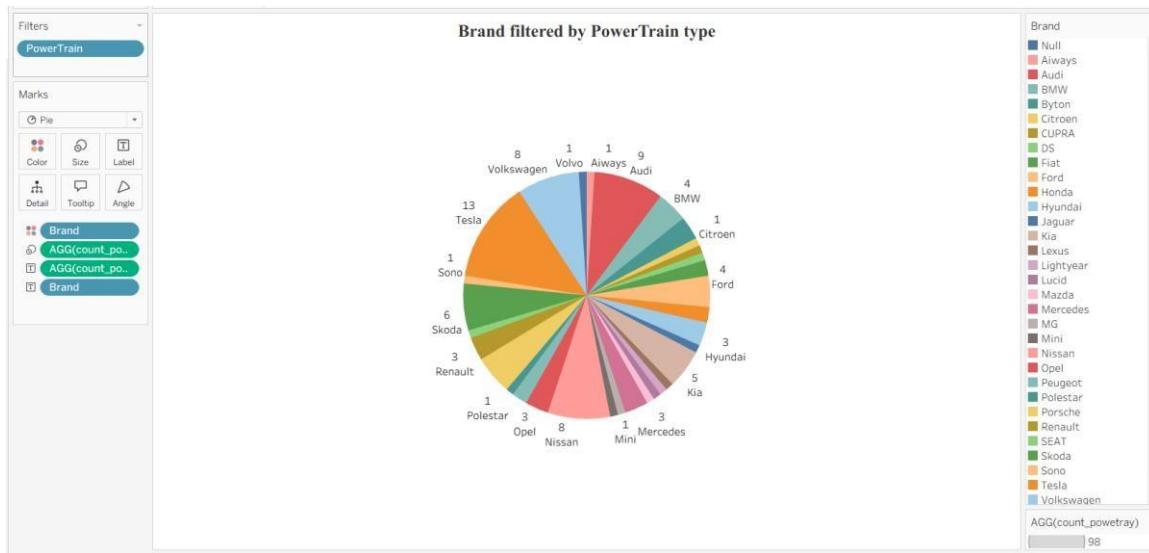
Brands According to Body Style



No of models by each brand

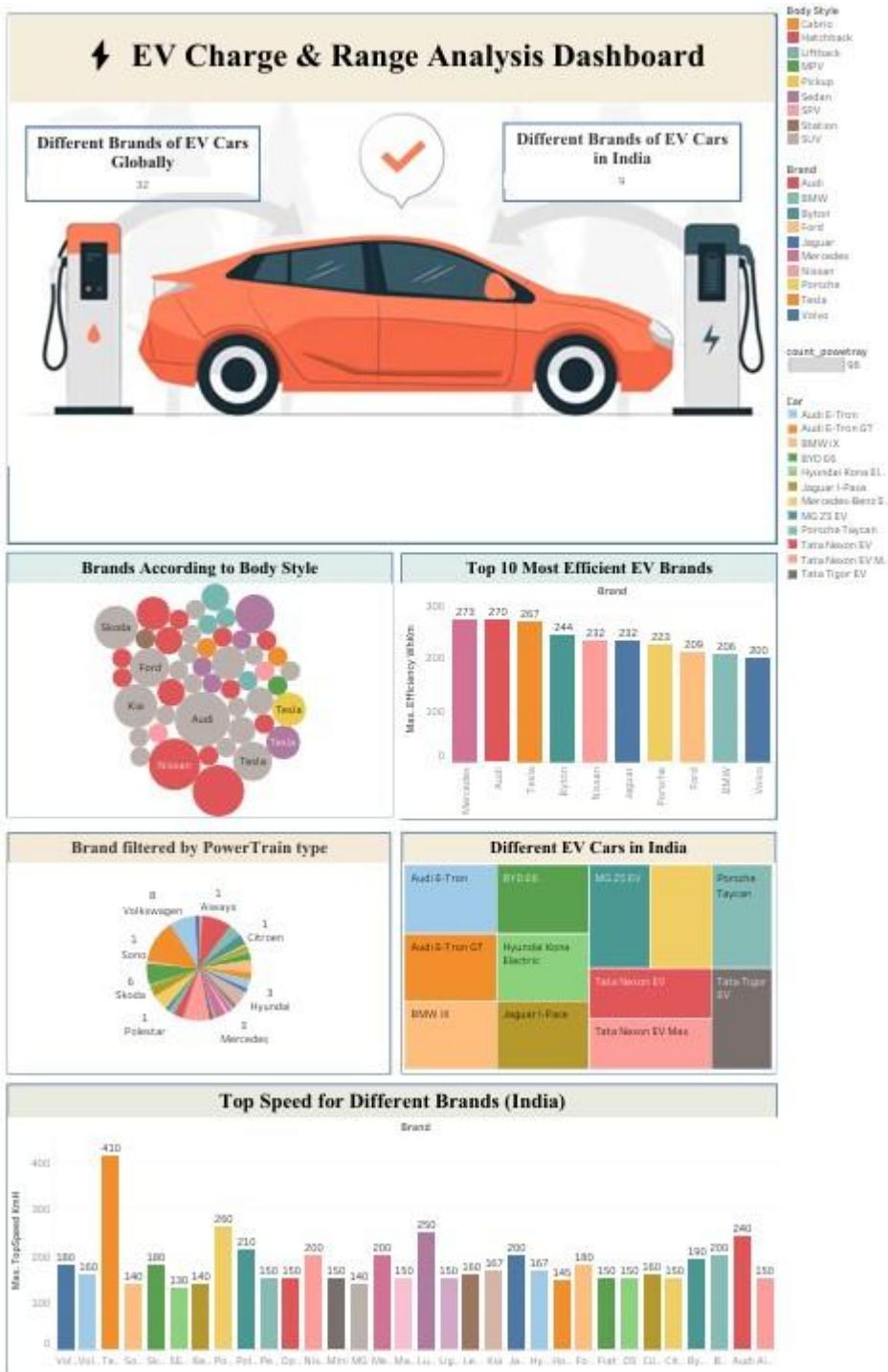


Brand filtered by PowerTrain type



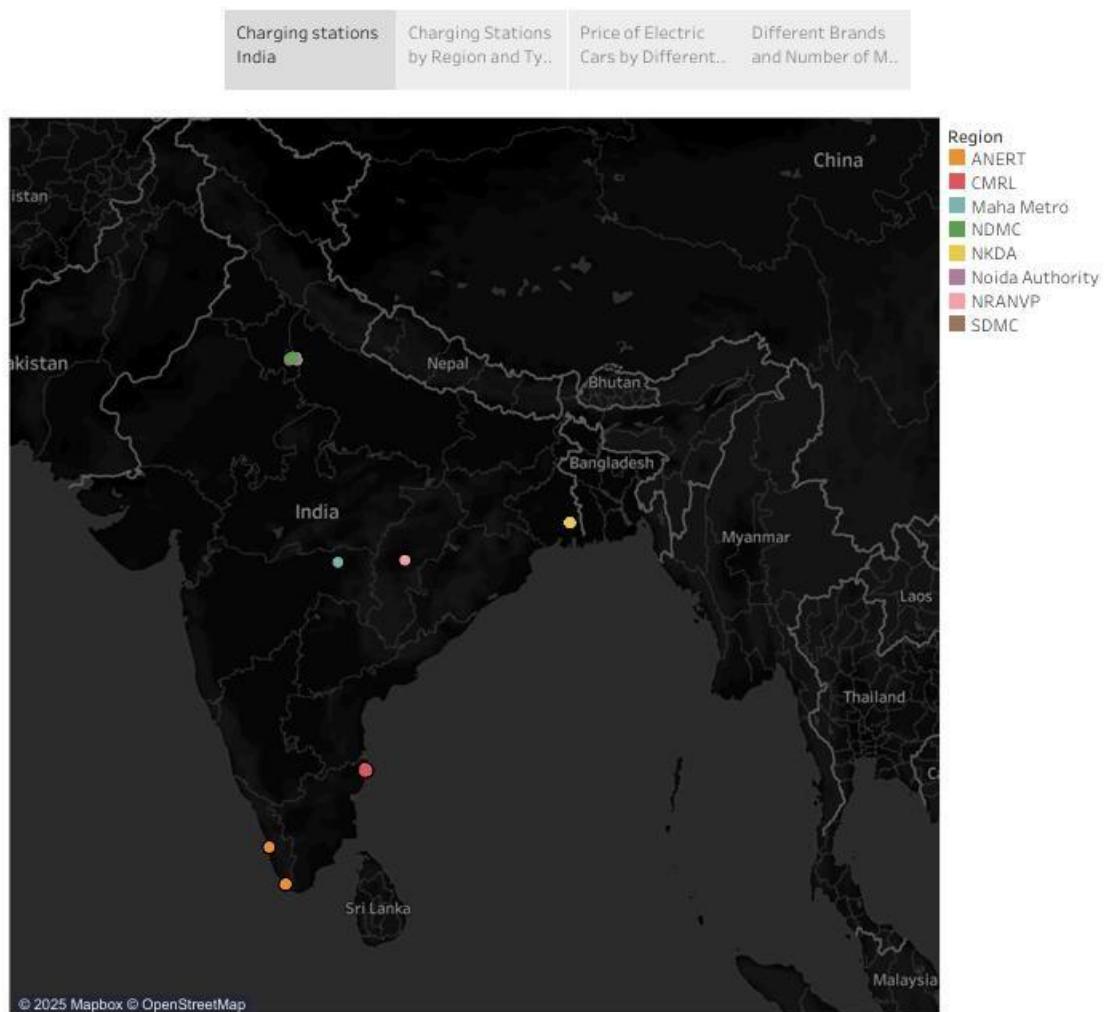
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EV Charge & Range Analysis Dashboard

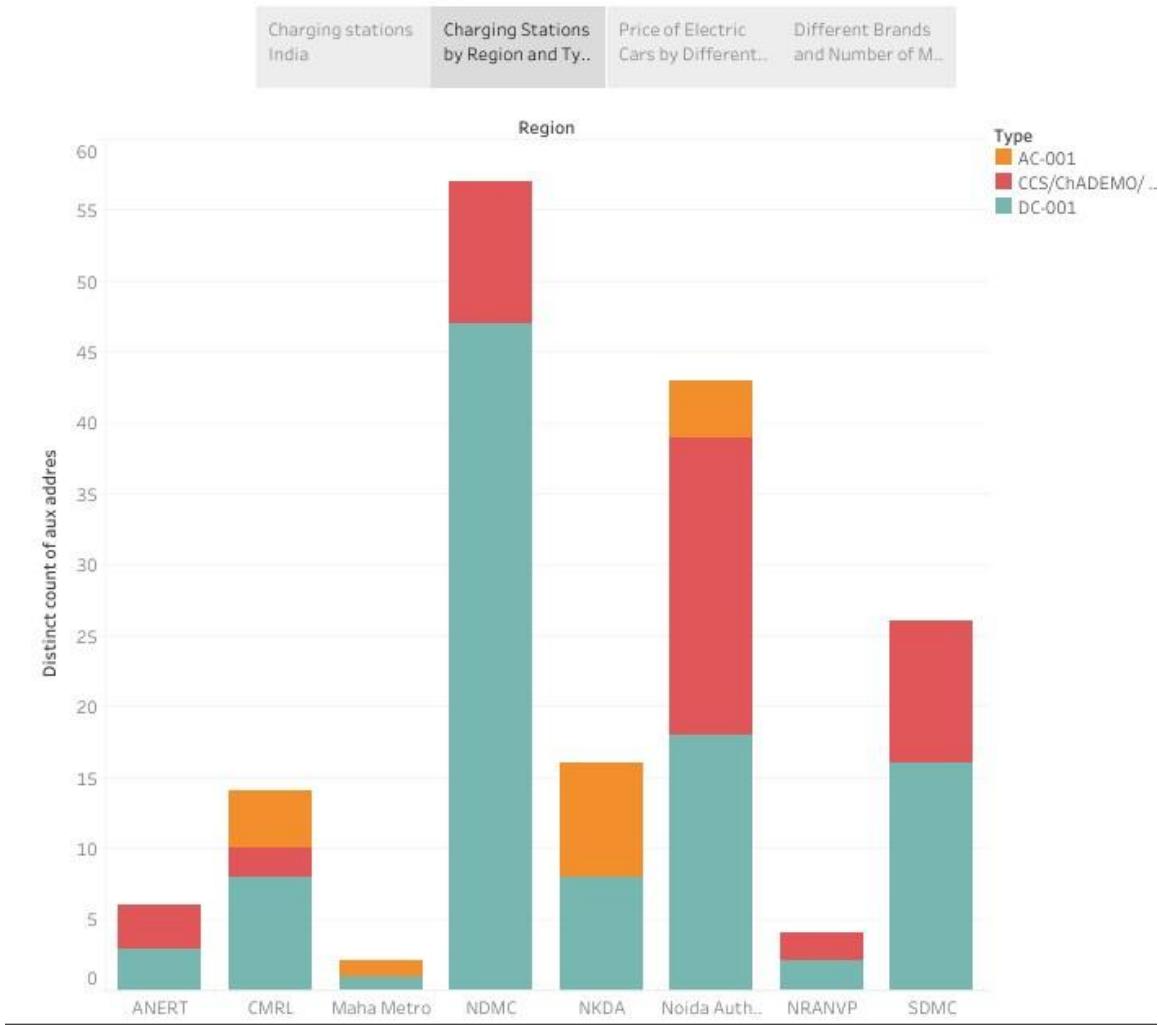


Story of Electric Cars In India

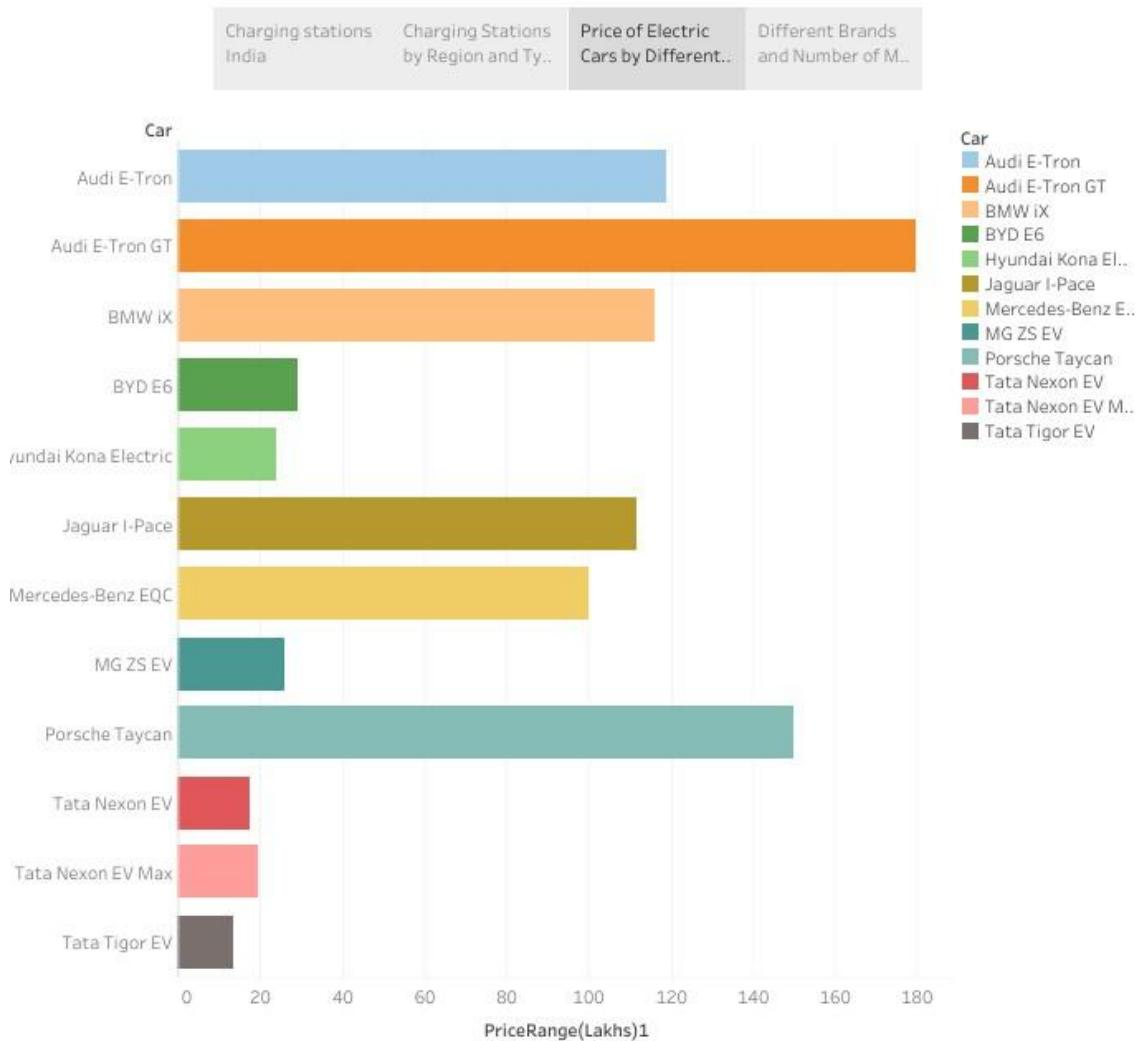
Story of Electric Cars In India



Story of Electric Cars In India



Story of Electric Cars In India



Story of Electric Cars In India



8. ADVANTAGES & DISADVANTAGES

Advantages

1. Centralized Visualization
Combines multiple EV datasets into one dashboard, reducing the need to browse multiple sources.
2. User-Friendly Interface
Interactive filters, maps, and summary cards make the dashboard easy to use for both technical and non-technical users.
3. Real-Time Analysis Capabilities

- Connected to a live database (MySQL), allowing future scalability with real-time updates.
- 4. Insightful Visuals
Enables clear comparisons between EV models, charging infrastructure, price, and performance metrics.
- 5. Storytelling Approach
The story feature in Tableau allows users to navigate insights in a guided, narrative-driven format.

Disadvantages

- 1. Static Dataset
As the data is not auto-updated, new EV entries or changes require manual refresh and reimport.
- 2. Limited Regional Coverage
Charging station data is currently India-focused; international charger info was not available.
- 3. Requires Internet Access
Tableau Public dashboards need internet connectivity to be accessed and shared.
- 4. Dependent on Dataset Quality
Accuracy is limited to the reliability and completeness of the source datasets.

9. CONCLUSION

The project successfully achieved its objective of creating a unified data visualization tool for electric vehicles using Tableau. By integrating and analyzing multiple datasets related to EV specifications, prices, efficiency, and charging infrastructure, we developed an interactive dashboard and a guided story view that simplifies complex data into actionable insights.

This solution helps consumers make informed decisions when selecting EVs, and also supports policymakers and analysts in understanding EV adoption trends and infrastructure needs. The visual format enhances clarity and accessibility, making the data usable for a wide range of stakeholders.

10. FUTURE SCOPE

1. Real-Time Data Integration

The current dashboard uses static datasets. Future enhancements could involve

connecting APIs or live data streams for real-time EV pricing, specifications, and charging station availability.

2. Expansion to Global Charging Infrastructure

Currently focused on Indian charging station data, future versions can include global charger locations and filters by country or continent.

3. User Login and Personalization

Integrating user login functionality with personalized dashboards can help users track preferred brands or nearby chargers based on geolocation.

4. Advanced Predictive Analytics

Future iterations can incorporate machine learning models to recommend EVs based on usage patterns or predict EV adoption trends region-wise.

5. Mobile-Responsive Dashboard

Optimizing the Tableau dashboard for mobile users would increase accessibility, especially for on-the-go EV buyers or travelers.