School Of Informatics
Department of Computer Applications

PROJECT PRESENTATION

DATA VISUALIZATION

ELECTRIC VEHICLE DATA ANALYSIS

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Contents

Abstract

This project focuses on analyzing electric vehicle (EV) registration data in the United States using Tableau. The goal is to visualize adoption trends, identify popular EV makes and models, evaluate state-wise distribution, and assess policy impact through CAFV (Clean Alternative Fuel Vehicle) eligibility. The dashboard transforms raw data into actionable insights through interactive charts, maps, and filters, offering valuable information for researchers, policymakers, and the general public. The findings highlight a steep rise in EV registrations post-2018, Tesla's market dominance, California's leadership in adoption, and the influence of environmental incentives on EV distribution.

Introduction

Electric vehicles are essential for reducing dependence on fossil fuels and combating climate change. With rising environmental awareness and supportive policies, EV adoption has surged in recent years. This project aims to leverage publicly available data and visualize it meaningfully using Tableau.

Objectives:

•Analyze EV growth patterns from 2011 onward.

•Identify dominant makes and models.

•Evaluate state-wise adoption rates.

•Assess the effectiveness of CAFV incentive programs.

•Present findings through an interactive dashboard.

The project covers U.S. EV registrations, focusing on metrics such as model year, make, model, range, location, and policy eligibility. The insights aim to help stakeholders understand market trends and plan for sustainable mobility solutions.

Literature Survey

"Consumer Adoption of Electric Vehicles" – Sierzchula et al. (2022)
Emphasizes policy support, cost, and infrastructure as main EV adoption drivers. Points out the lack of real-time analytical tools for public and policy use.

"EV Market Growth and Adoption Factors" – Zhou & Li (2024)
Highlights how brand trust, consumer awareness, and affordability influence EV uptake. Suggests more dynamic models are needed to understand regional variation.

"Integration of EVs into Smart Grids" – Clement-Nyns et al. (2022)
Discusses the impact of EVs on electrical grids and the need for smart infrastructure. Suggests infrastructure readiness influences adoption by state.

"Network Effects in EV Adoption" – Ma & Li (2024)
Uses economic modeling to show how peer influence and charging station growth, adoption. Does not provide tools to visualize this growth spatially.

"Range Anxiety and EV Purchase Decisions" – Franke & Krems (2023)
Explores how limited range and lack of visible charging options discourage adoption. Calls for user-centric tools to reduce uncertainty.

Literature Survey

Identified Gaps in Existing Literature

•Limited visual or interactive exploration of EV data

•Lack of geographical breakdowns of adoption trends

•Insufficient public-friendly tools for exploring EV statistics

•Missing CAFV policy impact analysis in dashboards

Purpose of This Project

•Visualize adoption patterns using Tableau dashboards

•Analyze EV types, top brands, and regional adoption

•Provide real-time filters for public and policy engagement

•Connect CAFV eligibility to adoption trends

•Bridge the gap between data analysis and public understanding

Methodology

Tools Used:

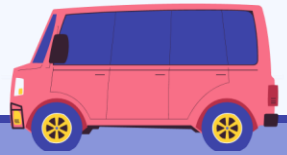
- **Tableau Desktop:** For building interactive dashboards
- **Microsoft Excel:** For data cleaning and preparation
- **Dataset:** U.S. Electric Vehicle Registration Data (CSV format)

Data Cleaning Steps:

- Removed missing/null values
- Standardized column formats (e.g., Make, Model, Year)
- Filtered records from the year 2011 onwards
- Consolidated similar vehicle models

Feature Engineering (in Tableau):

- Added EV Type: Battery Electric (BEV) or Plug-in Hybrid (PHEV)
- Calculated Average Range per model
- Identified CAFV Eligibility
- Created new metrics using calculated fields



Methodology

Visualization Strategy:

1.Line Chart: EVs by model year (2011 onward)

2.Map Chart: Vehicle distribution across states

3.Bar Chart: Top 10 makes (e.g., Tesla, Nissan)

4.Donut Chart: CAFV eligibility share

5.Heatmap: Top 10 models by count

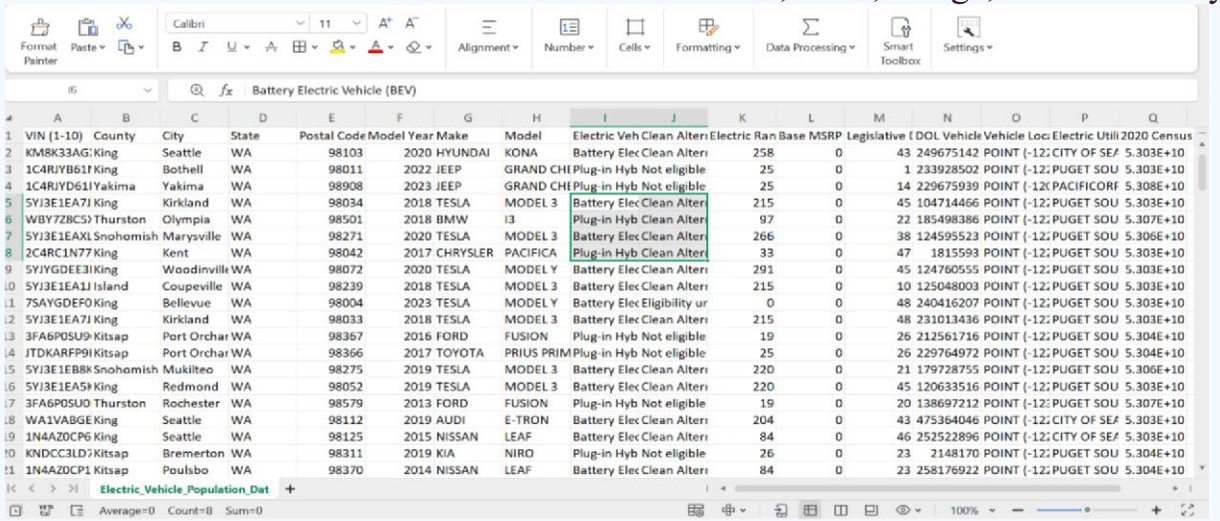
Dashboard Design in Tableau:

- Integrated charts with interactive filters: by State, Make, Year, Type
- Displayed KPIs: total EVs, BEV %, most common model
- Used color coding and tooltips for better clarity
- Ensured scalability for adding future data like emissions or charging stations

Implementation

Data Cleaning & Preparation:

- Cleaned the dataset in Excel by removing duplicates and null values.
- Filtered data to include only vehicles from 2010 onwards.
- Standardized fields like Make, Model, and CAFV Eligibility to avoid inconsistencies.
- Verified and formatted columns such as Model Year, State, Range, and Vehicle Type.



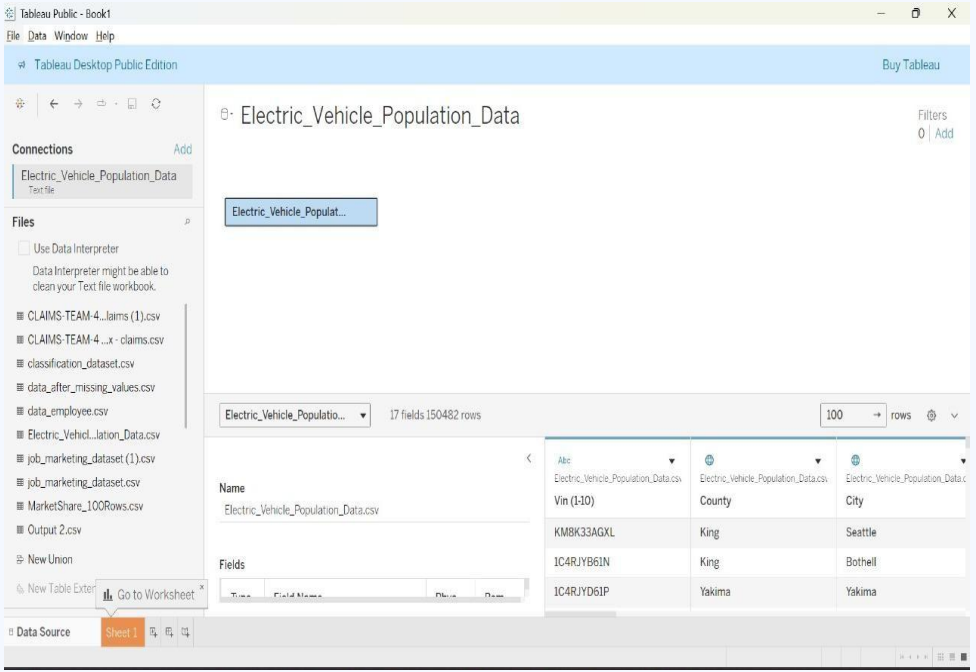
Implementation

Importing & Processing in Tableau:

•Imported the cleaned dataset into Tableau Desktop.

•Created calculated fields to:

- •Classify EV Types (BEV or PHEV)
- •Identify CAFV Eligibility
- •Derive KPIs like Total Vehicles, BEV %, Top Make & Model •Grouped data by Year, Make, Model, and State for visualization purposes.



Implementation

Visualization Development:

•Designed and developed the following visual components:

- **Line Chart** – EV registrations by model year
- **Map Chart** – Distribution of EVs across U.S. states
- **Bar Chart** – Top 10 EV manufacturers by count
- **Donut Chart** – Share of CAFV-eligible vehicles
- **Heatmap** – Most registered EV models

Dashboard Design & Features:

•Combined all visuals into a single interactive dashboard.

•Added filters for dynamic user control

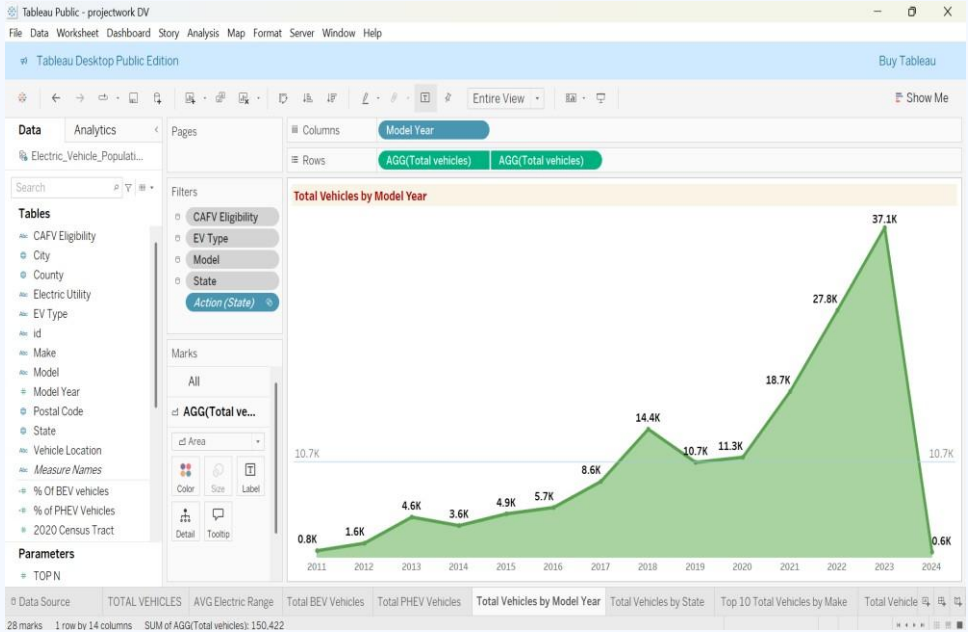
•Included KPI cards for quick summary

•Applied color coding, tooltips, and a grid layout for a clean and intuitive design.

Result

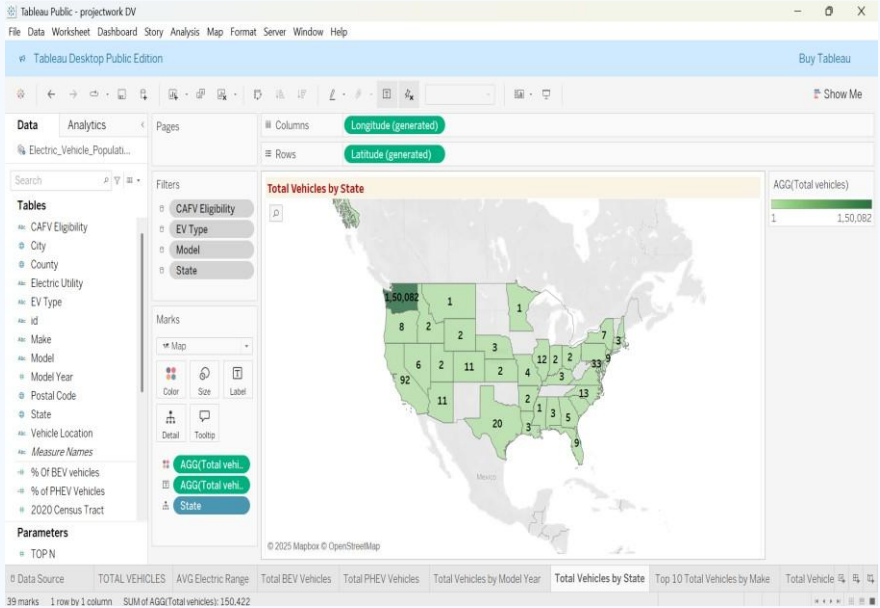
Total Vehicles by Model Year

1. **Visualization:** Line/ Area Chart
2. **Description:** This chart will illustrate the distribution of electric vehicles over the years, starting from 2011, providing insights into the growth pattern and adoption trends.
3. Line/Area charts are ideal for showing trends over time, making it easy to track the annual growth of EV adoption from 2011 onward.



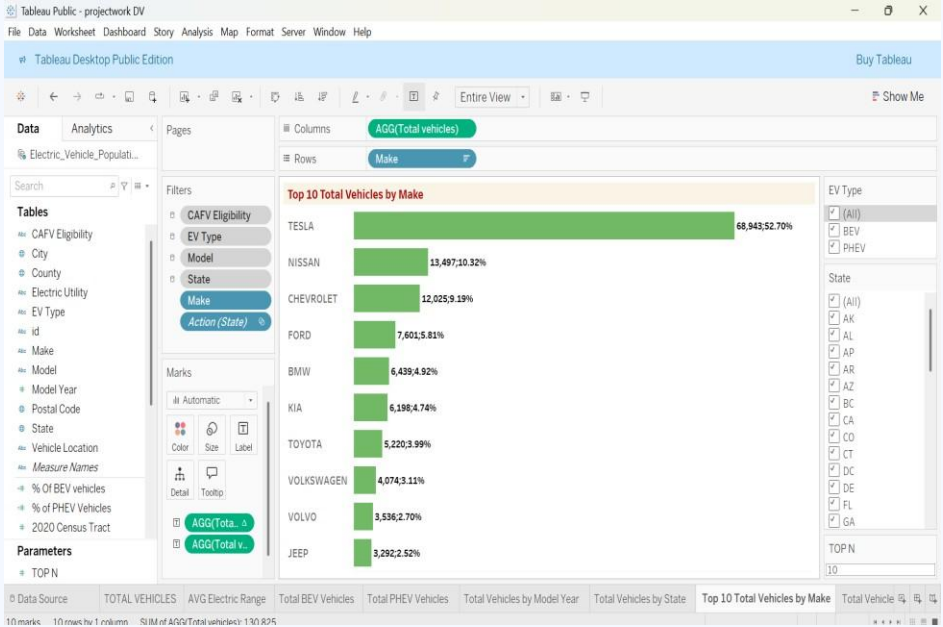
Total Vehicles by State

1. **Visualization:** Map Chart
2. **Description:** This chart will showcase the geographical distribution of electric vehicles across different states, allowing for the identification of regions with higher adoption rates.
3. A map chart is best for geographic comparison, helping to visualize which states have higher or lower EV registrations at a glance.



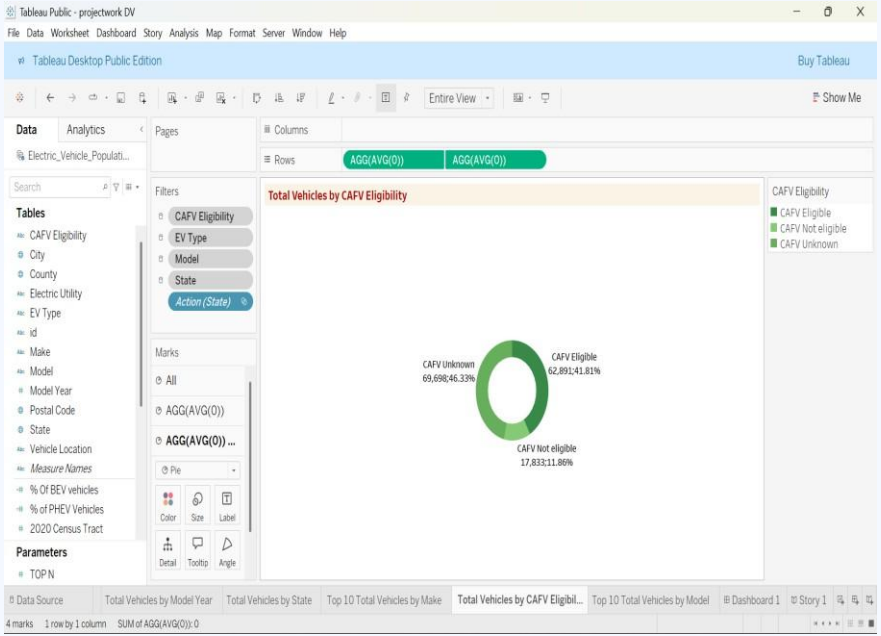
Top 10 Total Vehicles by Make

1. **Visualization:** Bar Chart
2. **Description:** Highlight the top 10 electric vehicle manufacturers based on the total number of vehicles, providing insights into the market dominance of specific brands
3. Bar charts effectively compare quantities across categories, making them perfect for ranking the top 10 EV manufacturers..



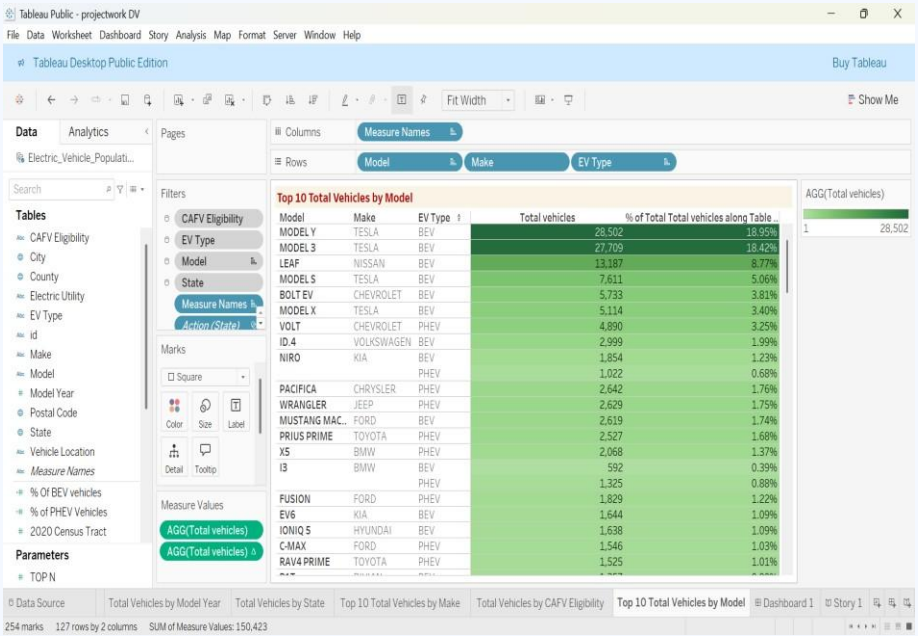
Total Vehicles by CAFV Eligibility

1. **Visualization:** Pie Chart or Donut Chart
2. **Description:** Illustrate the proportion of electric vehicles that are eligible for Clean Alternative Fuel Vehicle (CAFV) incentives, aiding in understanding the impact of incentives on vehicle adoption.
3. Donut charts are suitable for showing parts of a whole, which helps illustrate the proportion of CAFV-eligible vs. non-eligible vehicles.

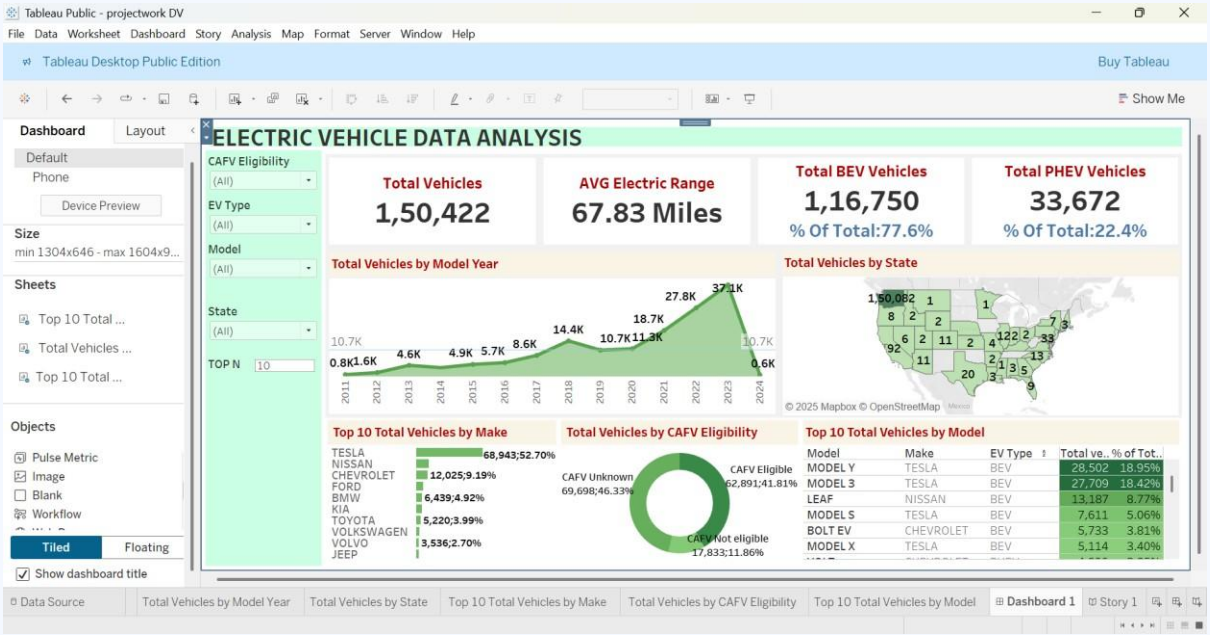


Top 10 Total Vehicles by Model

1. **Visualization:** Heat map
2. **Description:** Highlight the top 10 electric vehicle models based on the total number of vehicles, offering insights into consumer preferences and popular models in the market.



Dashboard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Size
min 1304x646 - max 1604x9...
Sheets
Top 10 Total ...
Total Vehicles ...
Top 10 Total ...
Objects
Pulse Metric
Image
Blank
Workflow
Tiled
Floating
Show dashboard title
ELECTRIC VEHICLE DATA ANALYSIS
CAFV Eligibility
(All)
EV Type
(All)
Model
(All)
State
(All)
TOP N
10
Total Vehicles
1,50,422
AVG Electric Range
67.83 Miles
Total BEV Vehicles
1,16,750
% Of Total:77.6%
Total PHEV Vehicles
33,672
% Of Total:22.4%
Total Vehicles by Model Year
10.7K
0.8K
1.6K
4.6K
4.9K
5.7K
8.6K
14.4K
10.7K
11.3K
18.7K
27.8K
37.1K
10.7K
0.6K
2011
2012
2013
2014
2015
2016
2017
2018
2019
2020
2021
2022
2023
2024
Total Vehicles by State
1,50,082
© 2025 Mapbox © OpenStreetMap
Top 10 Total Vehicles by Make
TESLA 68,943;52.70%
NISSAN
CHEVROLET 12,025;9.19%
FORD
BMW 6,439;4.92%
KIA
TOYOTA 5,220;3.99%
VOLKSWAGEN
VOLVO 3,536;2.70%
JEEP
Total Vehicles by CAFV Eligibility
CAFV Unknown 69,698;46.33%
CAFV Eligible 62,891;41.81%
CAFV Not eligible 17,833;11.86%
Top 10 Total Vehicles by Model
Model
Make
EV Type
Total ve..
% of Tot..
MODEL Y TESLA BEV 28,502 18.95%
MODEL 3 TESLA BEV 27,709 18.42%
LEAF NISSAN BEV 13,187 8.77%
MODEL S TESLA BEV 7,611 5.06%
BOLT EV CHEVROLET BEV 5,733 3.81%
MODEL X TESLA BEV 5,114 3.40%
Data Source
Total Vehicles by Model Year
Total Vehicles by State
Top 10 Total Vehicles by Make
Total Vehicles by CAFV Eligibility
Top 10 Total Vehicles by Model
Dashboard 1
Story 1

Discussion

- The dashboard revealed a significant increase in EV adoption after 2018, indicating improved public acceptance and supportive government policies.
- Tesla emerged as the dominant manufacturer, both in terms of total registrations and popular models like the Model 3.
- California led by a large margin in EV registrations, showing the impact of strong environmental policies and infrastructure.
- The low percentage of CAFV-eligible vehicles (around 42%) suggests there is still room to expand incentive programs nationwide.
- Minor challenges were faced during implementation, such as inconsistent naming conventions and missing values, but were addressed through data cleaning and calculated fields in Tableau.

Future Scope

- **Charging Infrastructure Mapping:**

Integrate data on public EV charging stations to assess accessibility and support for users across regions.

- **Environmental Impact Analysis:**

Estimate CO_2 savings and compare emission reductions between electric and conventional vehicles.

- **Predictive Analytics Integration:**

Use machine learning to forecast EV adoption trends by year, state, or manufacturer.

- **Real-Time Dashboard Deployment:**

Enable live updates and mobile/web accessibility to support policy decisions and public awareness.

Conclusion

- The project successfully analyzed U.S. electric vehicle data from 2010 onward using Tableau.
- EV registrations showed a sharp increase after 2018, indicating growing public adoption.
- Tesla emerged as the most dominant EV manufacturer across the dataset.
- California led all other states in total EV registrations, driven by strong incentives and infrastructure.
- The dashboard provided interactive insights through charts, KPIs, and filters.
- CAFV eligibility analysis revealed policy influence but also highlighted areas for improvement.
- The design is scalable and adaptable for future metrics like emissions or charging data.
- The project met its objectives and supports better decision-making for EV growth.

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THANK YOU!!