# **Provide Insights on Electric vehicles launch in India**

**Electric Vehicle Industry in India: An Overview**

The Electric Vehicle (EV) industry in India has been witnessing remarkable growth in recent years, driven by government initiatives, increasing consumer awareness, and the global push towards reducing carbon emissions. India’s automotive market, historically dominated by internal combustion engine (ICE) vehicles, is transitioning towards cleaner alternatives, with electric two-wheelers and four-wheelers leading the charge. The Indian government's ambitious target of achieving 30% electric mobility by 2030, supported by schemes like FAME (Faster Adoption and Manufacturing of Hybrid and Electric Vehicles), aims to accelerate this shift.

The EV market in India is characterized by a rapid increase in sales across various states, with companies focusing on affordable electric two-wheelers and premium electric four-wheelers. The adoption of EVs is being driven by urban centres and states like Delhi, Maharashtra, and Karnataka, where infrastructure, policy support, and consumer acceptance are growing stronger. However, despite these advancements, challenges related to infrastructure, charging stations, and the high upfront cost of EVs remain significant barriers to mass adoption.

**Methodology for Data Collection and Analysis**

**Data Source**

For this project, we utilized data on electric vehicle sales from [Vahan Dashboard](https://vahan.parivahan.gov.in/), which is a government-run platform that tracks vehicle registrations across India. This portal provides comprehensive and up-to-date information on vehicle registrations by state, vehicle category, and manufacturer.

**Data Collection Process**

1. **Data Download**: Monthly data was obtained from the Vahan Dashboard, which includes electric vehicle registrations across all states and vehicle categories. The dataset includes fields such as:
   * **Date** (in the format DD-MMM-YY)
   * **State** (geographical region)
   * **Vehicle Category** (2-wheeler, 4-wheeler)
   * **Sales by Manufacturer** (Maker)
   * **Total Vehicles Sold** (including ICE and EV vehicles)
2. **Table Setup**: The data was stored in an SQL database (EVdb) using the following tables:
   * electric\_vehicle\_sales\_by\_state: Contains state-wise sales data.
   * electric\_vehicle\_sales\_by\_makers: Tracks sales by various EV manufacturers.
   * dim\_date: Provides information on fiscal years and quarters to facilitate time-series analysis.
3. **Data Cleansing**: Data preparation included transforming date formats, filling missing values, and aligning sales data with the fiscal year cycle (April to March).

**Analysis Approach**

1. **SQL Queries**: Several SQL queries were designed to extract key metrics, such as growth rates of EV sales, sales penetration rates, and comparative performance across states and manufacturers. These queries formed the basis for deeper analysis in Power BI.
2. **Power BI Visualizations**: Using Power BI, we visualized the data to reveal trends, patterns, and insights. Key visualizations included:
   * Growth trends for two-wheelers and four-wheelers by state and manufacturer.
   * Penetration rates of EVs across India.
   * Clustering analysis for states based on growth rates.
   * Forecasting future sales based on historical data and compounded annual growth rates (CAGR).

**Key Insights from SQL Queries and Power BI Visualizations**

Through the data analysis process, several key insights emerged:

1. **EV Growth Concentrated in Certain States**:
   * **Delhi** and **Karnataka** consistently led the nation in EV adoption with the highest penetration rates in 2024. States like Maharashtra and Tamil Nadu are also emerging as strong contenders in EV sales.
   * Clustering analysis revealed that states like **Delhi**, **Maharashtra**, and **Karnataka** fell into the **high-growth** category, while states like Bihar and Jharkhand showed lower growth rates, indicating regional disparities in EV adoption.
2. **Manufacturer Performance**:
   * Companies like **Tata Motors**, **Ola Electric**, and **Ather Energy** were identified as the top manufacturers in both two-wheeler and four-wheeler segments, dominating the EV market from 2022 to 2024.
   * CAGR analysis showed that Tata Motors achieved one of the highest growth rates in the 4-wheeler segment, while Ola Electric excelled in the 2-wheeler category.
3. **Sales Volume Trends**:
   * The peak sales months for EVs were found to be around **festive seasons** (October-December), driven by consumer incentives and new product launches.
   * Lower sales were observed during **mid-year months** (May-July), likely due to the off-season in automotive purchasing and lower consumer spending.
4. **Revenue Growth Projections**:
   * The analysis of revenue growth for EV sales between 2022 and 2024 indicated strong potential, with 4-wheeler EV sales revenue projected to grow by over **50%**, driven by both higher sales volumes and the relatively high average unit price of 4-wheelers (₹1.5 million).

**Future Projections and Implications for the EV Industry**

**EV Sales Projections for 2030**

Based on the compounded annual growth rate (CAGR) observed from 2022 to 2024, we projected EV sales for the top 10 states by penetration rate for the year **2030**. The high-growth states, including Delhi, Maharashtra, and Karnataka, are expected to see exponential growth in EV sales, potentially reaching millions of units sold annually. The projections indicate that:

* **Delhi** could see EV penetration rates surpassing 60%, particularly in the two-wheeler category.
* **Karnataka** and **Maharashtra** are likely to maintain strong growth in the 4-wheeler category due to their tech-driven economies and policy support.