Drive Green with Electric Vehicles MARKET ANALYSIS

Integrating SQL with PowerBi

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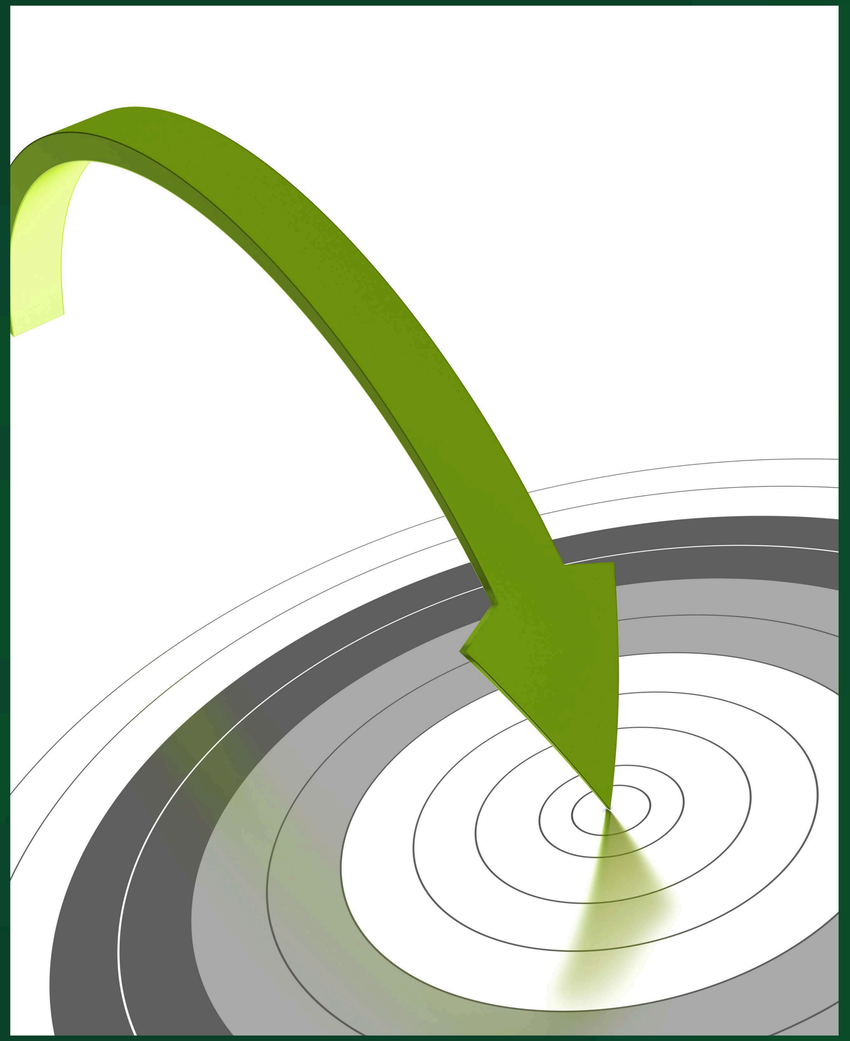
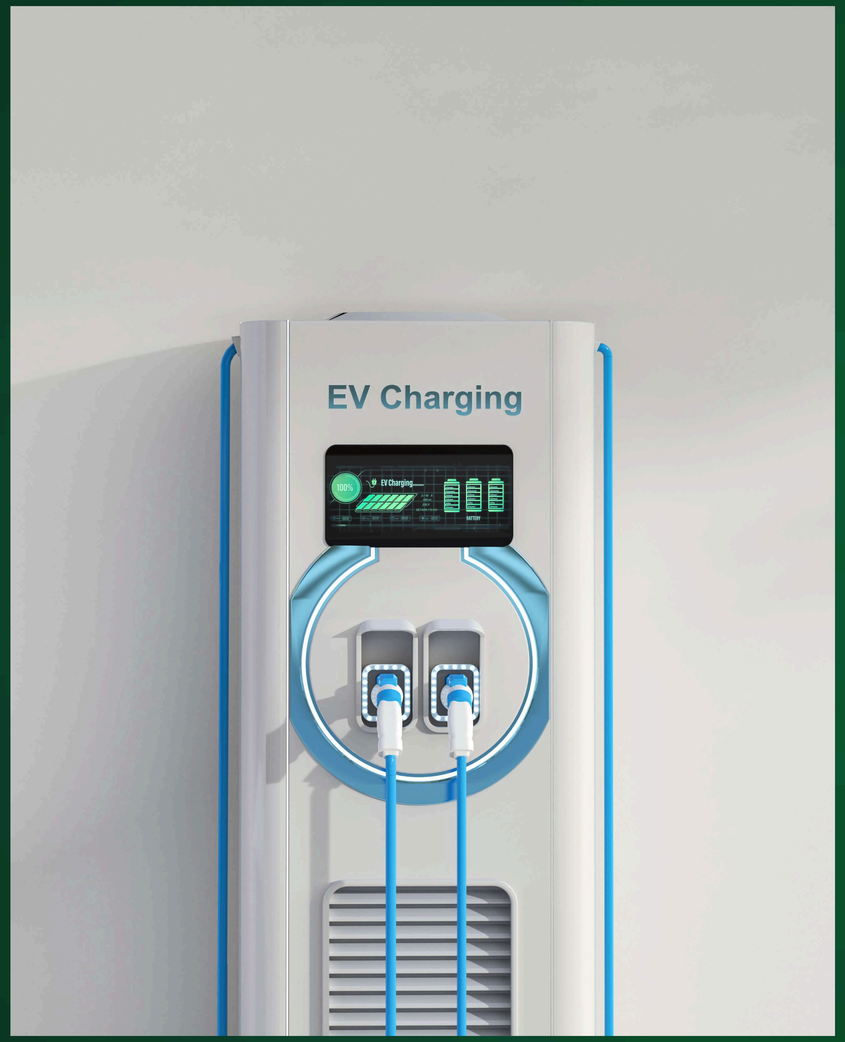
Objective

The purpose of this analysis is to explore electric vehicle (EV) sales trends and provide actionable insights into market dynamics. The key objectives include:

- Identifying top-performing and underperforming EV makers by sales volume.
- Analyzing state-wise EV penetration rates and sales performance.
- Examining sales growth trends and seasonal variations from 2022 to 2024.
- Projecting future EV sales for the year 2030 using historical data.





Data Sources

This analysis utilizes three key datasets:

1) dim_date: A date dimension table containing fiscal years, quarters, and months to enable time-based analysis.

2) electric_vehicle_sales_by_makers: A dataset detailing EV sales categorized by maker, vehicle type (2-wheelers and 4-wheelers), and sales volume.

3) electric_vehicle_sales_by_state: A dataset providing state-wise EV sales, total vehicle sales, and penetration rates, allowing for geographical comparisons and growth projections.

Key Terminology

1) Penetration Rate

- Definition: The percentage of EVs sold compared to total vehicles sold in a given region or category.
- Formula: (Total EV Sales / Total Vehicle Sales) * 100
- Context: Used to assess the adoption of EVs in different states and categories.

2) Compounded Annual Growth Rate (CAGR)

- Definition: The rate of return required for a value to grow from its beginning balance to its ending balance, assuming profits are reinvested annually.
- Formula: CAGR = (Ending Value / Beginning Value)^(1/n) - 1
- Context: Used to calculate the growth rate in EV sales from 2022 to 2024.

3) Projected number of EV sales

- EV sales projections for the year 2030 we used following formula
- Formula : Projected Sales (2030)=Total Sales (2024)×(1+CAGR)2030−2024

Key Insights & Findings

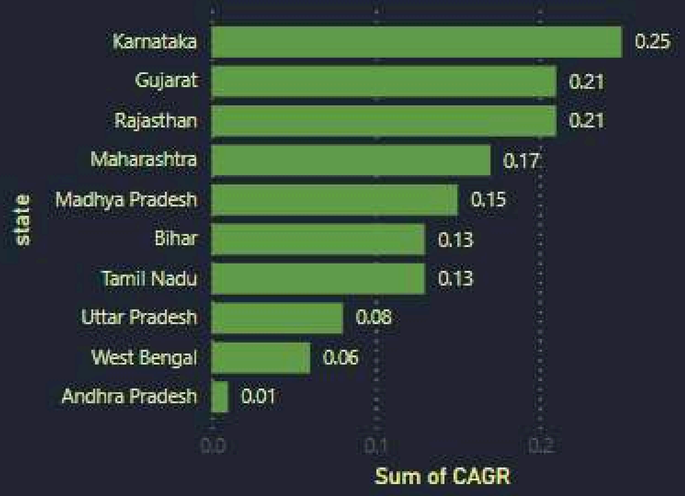
- Top and Bottom Makers (FY 2023-2024)
- Penetration Rates by State (FY 2024)
- Decline in EV Sales (2022-2024)
- Quarterly Sales Trends (2022-2024)
- Delhi vs. Karnataka Sales Comparison (FY 2024)
- CAGR of 4-Wheeler Makers (2022-2024)
- CAGR of Top 10 States (2022-2024)
- Peak and Low Seasons for EV Sales
- Projected EV Sales in Top 10 States (2030)

Electronic Vehicle Market Analysis

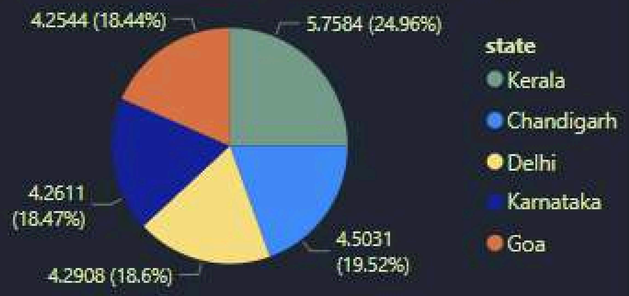
State Overview

CAGR of top 10 states according to the total vehicle sold

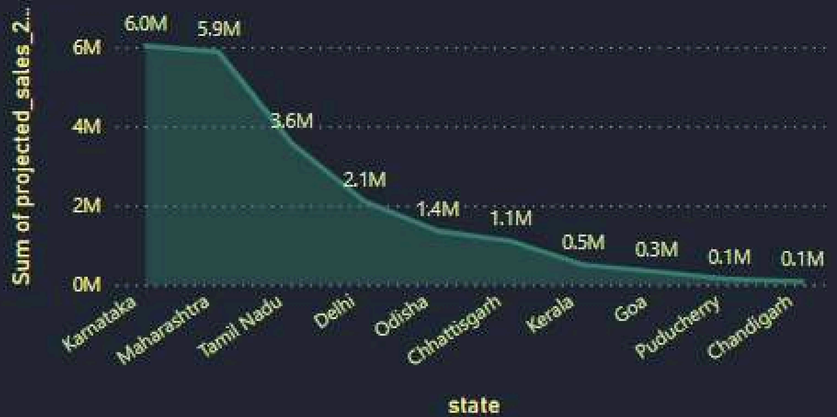
2-Wheelers | 4-Wheelers



Top 5 states with the highest penetration rate



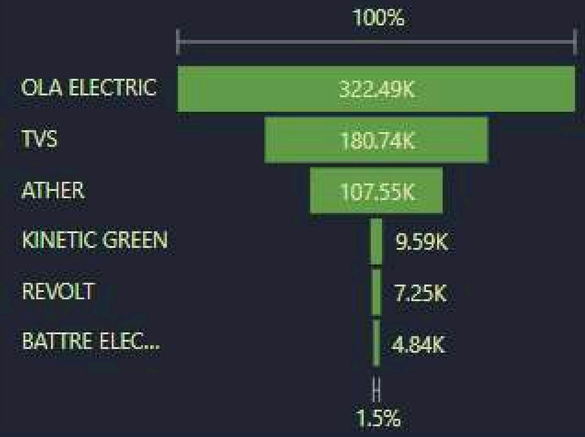
Projected sales of EV in 2030 by state :



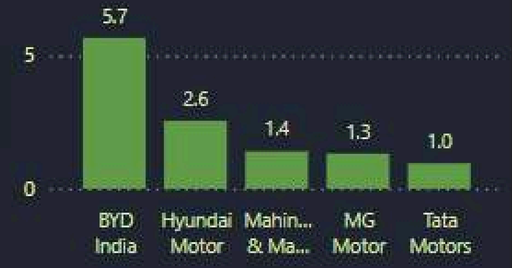
EV sales and penetration rates in Delhi compare to Karnataka for 2024?

Top 3 and Bottom 3 makers according to number of 2 wheeler sold

2023 | 2024

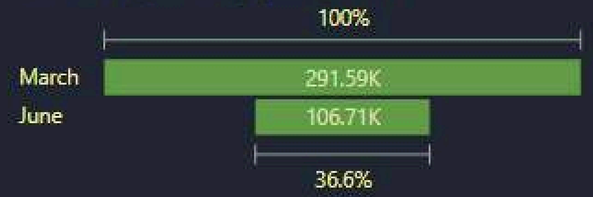


compounded annual growth rate (CAGR) in 4-wheeler units for the top 5 makers from 2022 to 2024.

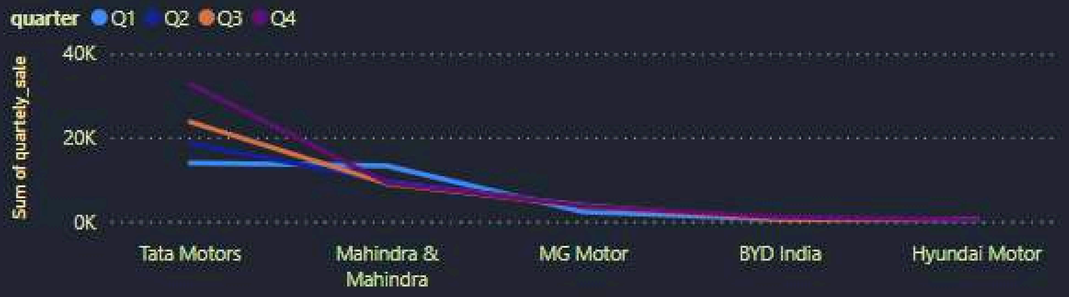


Date Trends:

Sum of ev_sales by peak_months



Quarterly trend of top 5 EV maker



1) Top 3 and bottom 3 makers for the fiscal years 2023 and 2024 in terms of the number of 2-wheelers sold.

- Top Performers: OLA ELECTRIC consistently led 2-wheeler sales in 2023 and 2024, with significant growth from 152,583 to 322,489 units.

- Bottom Performers: Smaller players like JITENDRA and BATTRE ELECTRIC struggled, recording the lowest sales in both years.

fiscal_year	maker	total_electric_vehicles_sold	rank_type
2023	PURE EV	11556	Bottom 3
2023	BEING	11018	Bottom 3
2023	JITENDRA	8563	Bottom 3
2023	OLA ELECTRIC	152583	Top 3
2023	OKINAWA	96945	Top 3
2023	HERO ELECTRIC	88993	Top 3
2024	KINETIC GREEN	9585	Bottom 3
2024	REVOLT	7254	Bottom 3
2024	BATTRE ELECTRIC	4841	Bottom 3
2024	OLA ELECTRIC	322489	Top 3
2024	TVS	180743	Top 3
2024	ATHER	107552	Top 3

2) Top 5 states with the highest penetration rate in 2-wheeler and 4-wheeler EV sales in FY 2024.

state	vehicle_category	penetration_rate
Goa	2-Wheelers	17.9923
Kerala	2-Wheelers	13.5249
Karnataka	2-Wheelers	11.5733
Maharashtra	2-Wheelers	10.0725
Delhi	2-Wheelers	9.4009
Kerala	4-Wheelers	5.7584
Chandigarh	4-Wheelers	4.5031
Delhi	4-Wheelers	4.2908
Karnataka	4-Wheelers	4.2611
Goa	4-Wheelers	4.2544

2-Wheelers: Goa (17.99%) and Kerala (13.52%) led the penetration rates, indicating strong EV adoption in FY 2024.

4-Wheelers: Kerala (5.76%) and Chandigarh (4.50%) emerged as top-performing states for 4-wheeler EV penetration.

3) Quarterly trends based on sales volume for the top 5 EV makers (4-wheelers) from 2022 to 2024?

- Tata Motors consistently led sales across all quarters, with Q4 sales reaching 32,723 units.
- BYD India showed steady growth, peaking at 1,055 units in Q4.
- Other makers like Mahindra & Mahindra and MG Motor experienced fluctuating sales throughout the year.

quarter	maker	quartely_sale
Q1	Mahindra & Mahindra	13286
Q1	MG Motor	2309
Q1	Tata Motors	13953
Q2	BYD India	423
Q2	Hyundai Motor	579
Q2	Mahindra & Mahindra	9670
Q2	MG Motor	3957
Q2	Tata Motors	18581
Q3	BYD India	454
Q3	Hyundai Motor	586
Q3	Mahindra & Mahindra	9025
Q3	MG Motor	3766
Q3	Tata Motors	23678
Q4	BYD India	1055
Q4	Hyundai Motor	519
Q4	Mahindra & Mahindra	9212
Q4	MG Motor	3721
Q4	Tata Motors	32723

4) States with negative penetration (decline) in EV sales from 2022 to 2024?

No states experienced a decline in EV penetration from 2022 to 2024.

5) How do the EV sales and penetration rates in Delhi compare to Karnataka for 2024?

state	fiscal_year	total_EV_sold	total_vehicle_sold	penetration_rate
Delhi	2024	46724	606348	7.7058
Karnataka	2024	160989	1581988	10.1764

- Karnataka had significantly higher EV sales (160,989 units) compared to Delhi (46,724 units).
- Delhi had a lower penetration rate of 7.71%, while Karnataka recorded a higher penetration rate of 10.18%.

6) The compounded annual growth rate (CAGR) in 4-wheeler units for the top 5 makers from 2022 to 2024.

- BYD India showed the highest CAGR of 5.67%, with sales increasing from 33 to 1,466 units.
- Hyundai Motor followed with a CAGR of 2.55%, growing from 110 to 1,390 units.
- Tata Motors experienced a slower growth rate, with a CAGR of 0.95%, from 12,708 to 48,181 units.

maker	2022_sales	2024_sales	CAGR
BYD India	33	1466	5.67
Hyundai Motor	110	1390	2.55
Mahindra & Mahindra	4042	23346	1.4
MG Motor	1647	8829	1.32
Tata Motors	12708	48181	0.95

7) Top 10 states that had the highest compounded annual growth rate (CAGR) from 2022 to 2024 in total vehicles sold.

state	2022_sales	2024_sales	CAGR
Karnataka	1007894	1581988	0.25
Gujarat	1094872	1590987	0.21
Rajasthan	880985	1300476	0.21
Maharashtra	1667002	2293994	0.17
Madhya Pradesh	967179	1286182	0.15
Bihar	892873	1132703	0.13
Tamil Nadu	1345017	1716940	0.13
Uttar Pradesh	2497288	2932347	0.08
West Bengal	860709	961909	0.06
Andhra Pradesh	772748	782865	0.01

- Karnataka led with the highest CAGR of 0.25%, followed by Gujarat and Rajasthan at 0.21%.
- States like West Bengal (0.06%) and Andhra Pradesh (0.01%) recorded relatively slower growth rates.

8) Peak and low season months for EV sales based on the data from 2022 to 2024?

- March emerged as the peak month with the highest sales of 291,587 units.
- June recorded the lowest sales, with only 106,709 units sold.

season	peak_months	ev_sales
Peak month	March	291587
Low month	June	106709

9) Projected number of EV sales (including 2-wheelers and 4-wheelers) for the top 10 states by penetration rate in 2030, based on the compounded annual growth rate (CAGR) from previous years?

state	projected_sales_2030
Karnataka	6034805.3
Maharashtra	5884471.29
Tamil Nadu	3574586.24
Delhi	2099677.61
Odisha	1356820.13
Chhattisgarh	1104220.49
Kerala	499488.7
Goa	329476.72
Puducherry	140560.58
Chandigarh	84443.61

- Karnataka and Maharashtra are expected to lead with projected sales of 6.03 million and 5.88 million units, respectively.
- Smaller states like Chandigarh and Puducherry show lower projections, with 84,443 and 140,560 units, respectively.

Electric Vehicles (EVs) are revolutionizing the automotive industry. This presentation provided a comprehensive analysis of sales trends, market insights. Understanding these dynamics is essential for stakeholders aiming to navigate the evolving landscape of sustainable transportation.

Thank You