CODE-BASICS RESUME PROJECT CHALLENGE #12

PROJECT TITLE

Provided Insight to an automotive company on electric vehicles launch in India

Project Overview

1. Identify Problems

Defined ten real-time business issues for analysis.

2. Data Collection

Gathered relevant dataset

3. Tool Selection

MySQL: For writing and executing SQL queries.

Excel: For generating insights and visualizations.

4. Query Development

Created and executed SQL queries to extract data insights.

5. Data Analysis

Analyzed results to identify trends and key metrics.

6. Visualization

Used Excel to create charts and pivot tables.

7. Reporting

Compiled findings into a report with actionable recommendations

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

```sql
WITH two_vehicle AS (
    SELECT  m.maker, d.fiscal_year,
        SUM(m.electric_vehicles_sold) AS total_sold
    FROM electric_vehicle_sales_by_makers m
    JOIN dim_date d ON m.date = d.date
    WHERE m.vehicle_category = '2-Wheelers'
      AND d.fiscal_year IN (2023, 2024)
    GROUP BY m.maker, d.fiscal_year
)
SELECT fiscal_year, maker, total_sold,
       CASE
           WHEN rank_desc <= 3 THEN 'Top 3'
           WHEN rank_asc <= 3 THEN 'Bottom 3'
           ELSE NULL
       END AS category
FROM (
    SELECT fiscal_year, maker, total_sold,
           RANK() OVER (PARTITION BY fiscal_year
           ORDER BY total_sold DESC) AS rank_desc,
           RANK() OVER (PARTITION BY fiscal_year
           ORDER BY total_sold ASC) AS rank_asc
    FROM two_vehicle
) RankedMarkets
WHERE rank_desc <= 3 OR rank_asc <= 3
ORDER BY fiscal_year, rank_desc;
```

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

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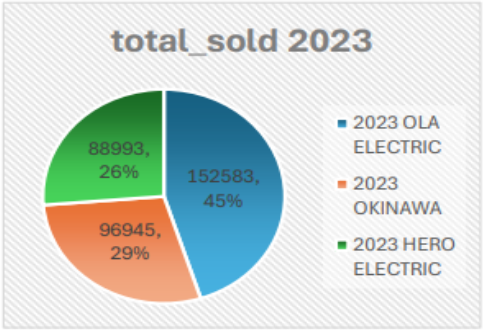
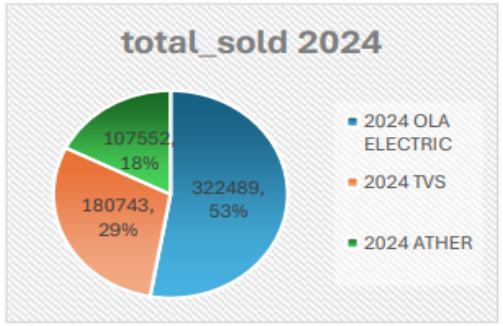
TOP 3 MAKERS TOTAL SOLD BY 2023,2024

fiscal_year	maker	total_sold
2023	OLA ELECTRIC	152583
2023	OKINAWA	96945
2023	HERO ELECTRIC	88993
2024	OLA ELECTRIC	322489
2024	TVS	180743
2024	ATHER	107552

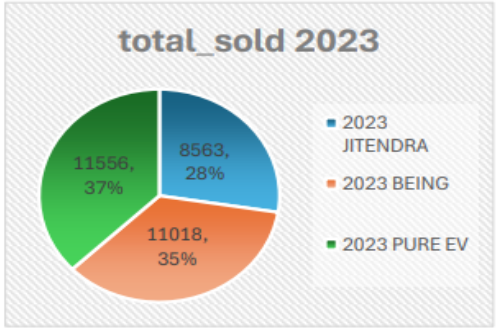


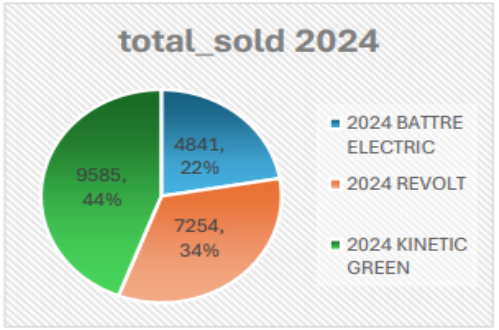


top_3_makers

BOTTOM 3 MAKERS TOTAL SOLD BY 2023,2024

fiscal_year	makers	total_sold
2023	JITENDRA	8563
2023	BEING	11018
2023	PURE EV	11556
2024	BATTRE ELECTRIC	4841
2024	REVOLT	7254
2024	KINETIC GREEN	9585





bottom_3_makers

Top Sellers:

- **OLA ELECTRIC** leads in both 2023 and 2024 with strong sales growth.
- **OKINAWA** and **HERO ELECTRIC** performed well in 2023; **TVS** and **ATHER** emerged in 2024.

Bottom Sellers:

- **PURE EV**, **BEING**, and **JITENDRA** struggled in 2023.
- **KINETIC GREEN**, **REVOLT**, and **BATTRE ELECTRIC** continued to face challenges in 2024.

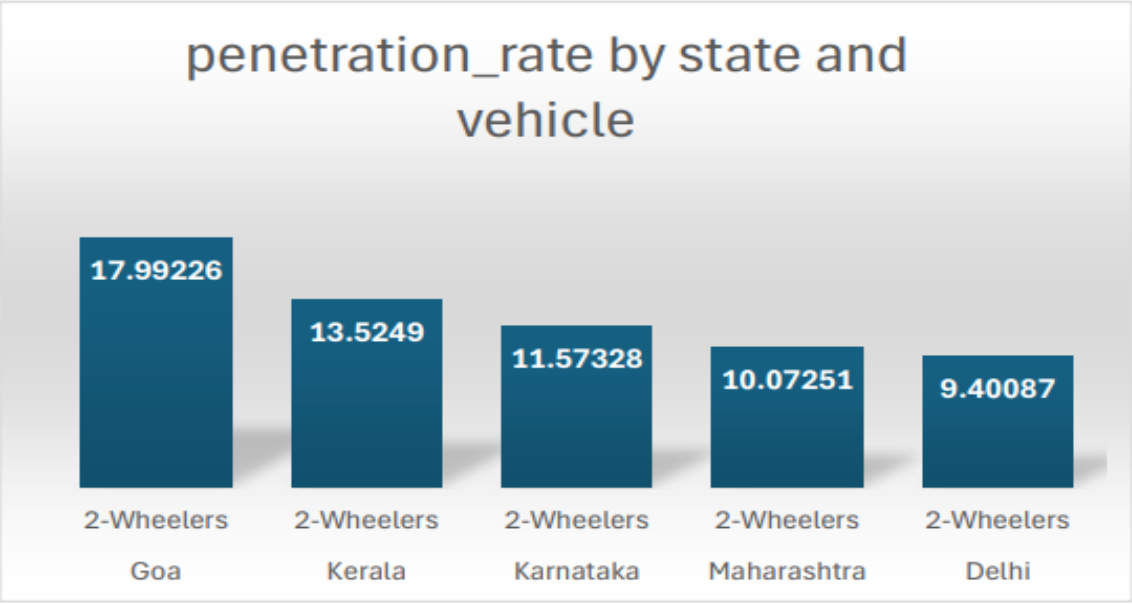
2. Identify the top 5 states with the highest penetration rate in 2-wheeler and 4-wheeler EV sales in FY 2024.

```sql
WITH EV_Sales AS (
    SELECT
        e.state, e.vehicle_category,SUM(electric_vehicles_sold) AS total_electric_sold,
                                    SUM(total_vehicles_sold) AS total_sold
    FROM  electric_vehicle_sales_by_state e
        join dim_date d
        on  e.date = d.date
    WHERE fiscal_year = 2024
    GROUP BY state, vehicle_category
),
Penetration AS (
    SELECT
        state, vehicle_category, total_electric_sold, total_sold,
        (total_electric_sold * 100.0 / NULLIF(total_sold, 0)) AS penetration_rate
    FROM EV_Sales
)
SELECT
    state, vehicle_category, penetration_rate
FROM Penetration
WHERE  vehicle_category IN ('2-Wheelers', '4-Wheelers')
ORDER BY penetration_rate DESC LIMIT 5;
```

state	vehicle_category	penetration_rate
Goa	2-Wheelers	17.99226
Kerala	2-Wheelers	13.52490
Karnataka	2-Wheelers	11.57328
Maharashtra	2-Wheelers	10.07251
Delhi	2-Wheelers	9.40087

Visualization, Insights

state	vehicle_category	penetration_rate
Goa	2-Wheelers	17.99226
Kerala	2-Wheelers	13.5249
Karnataka	2-Wheelers	11.57328
Maharashtı	2-Wheelers	10.07251
Delhi	2-Wheelers	9.40087



- **Goa Leads (17.99%)**
Tourism and favorable geography drive 2-wheeler adoption.

- **Future Growth in 4-Wheelers**
Strong 2-wheeler demand hints at expanding 4-wheeler potential.

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3. List the states with negative penetration (decline) in EV sales from 2022 to 2024.

```sql
WITH sales_comparison AS (
    SELECT
        state,
        SUM(CASE WHEN YEAR(STR_TO_DATE(date, '%d-%b-%y')) = 2022
        THEN electric_vehicles_sold ELSE 0 END) AS sales_2022,
        SUM(CASE WHEN YEAR(STR_TO_DATE(date, '%d-%b-%y')) = 2024
        THEN electric_vehicles_sold ELSE 0 END) AS sales_2024
    FROM
        electric_vehicle_sales_by_state
    WHERE
        YEAR(STR_TO_DATE(date, '%d-%b-%y')) IN (2022, 2024)
    GROUP BY state
)
SELECT
    state, sales_2022, sales_2024,
    (sales_2024 - sales_2022) AS sales_difference
FROM
    sales_comparison
WHERE
   (sales_2024 - sales_2022) < 0
   order by sales_difference desc;
```

state	sales_2022	sales_2024	sales_difference
DNH and DD	103	92	-11
Andaman & Nicobar Isl	23	9	-14
Ladakh	30	14	-16
Manipur	126	39	-87
Tripura	196	78	-118
Puducherry	1454	1202	-252
Chandigarh	1129	763	-366
Assam	1984	1364	-620
Himachal Pradesh	988	276	-712
Jammu and Kashmir	2180	801	-1379
Goa	5616	3875	-1741
Uttar Pradesh	23791	21206	-2585
West Bengal	9363	6000	-3363
Punjab	7652	3700	-3952
Uttarakhand	6081	1707	-4374
Bihar	10071	5401	-4670
Jharkhand	6887	2208	-4679
Haryana	12529	4620	-7909
Chhattisgarh	16760	8485	-8275
Madhya Pradesh	22952	13923	-9029
Kerala	37258	22533	-14725
Andhra Pradesh	28050	12638	-15412
Odisha	26159	7969	-18190
Delhi	40238	13277	-26961
Tamil Nadu	64082	31547	-32535
Rajasthan	55600	19018	-36582
Karnataka	91247	51247	-40000
Gujarat	67388	20688	-46700
Maharashtra	129249	61823	-67426

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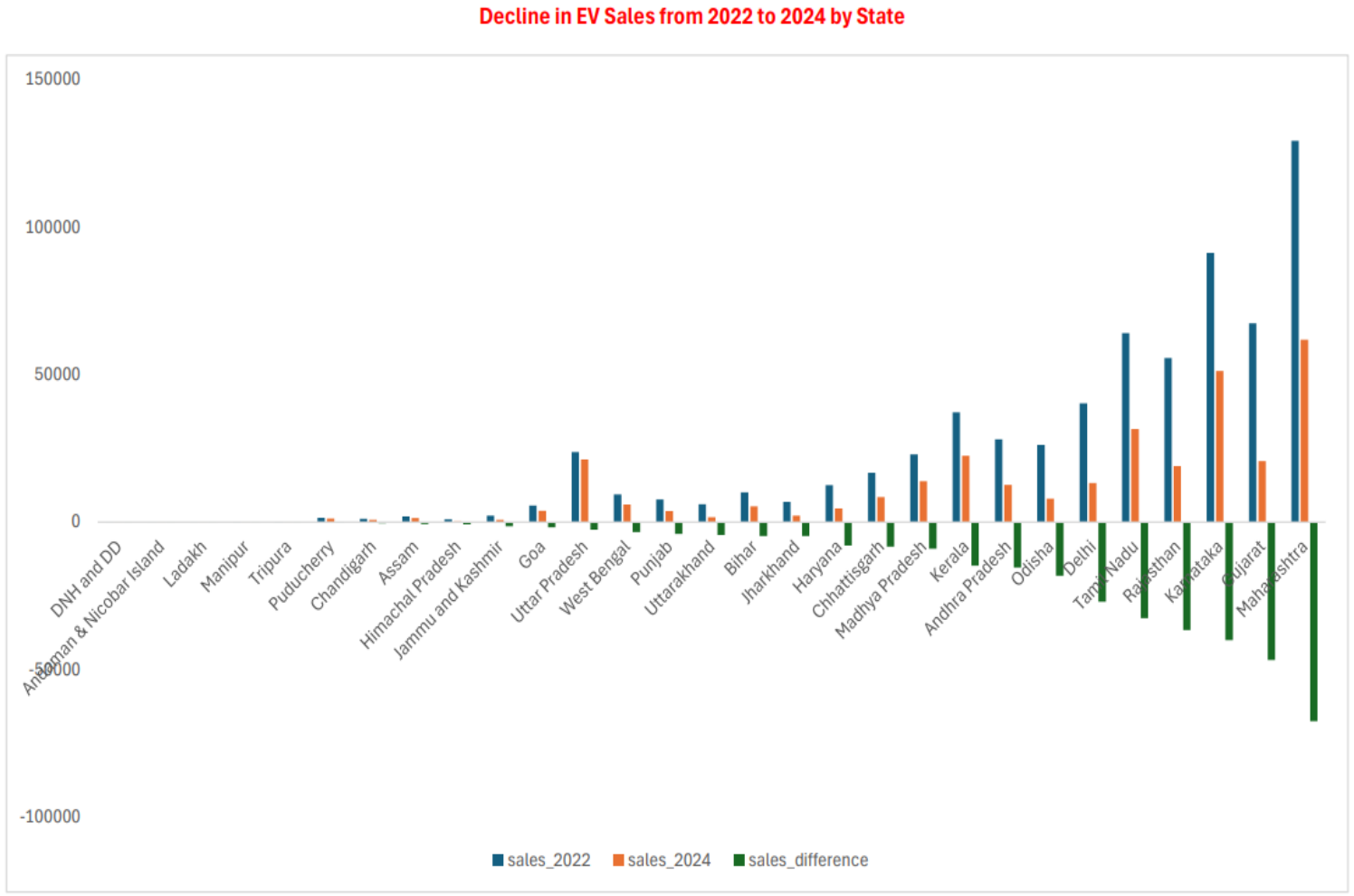

- **Maharashtra Leads Decline**
  67,426-unit drop, followed by Gujarat and Karnataka.

- **Revive EV Growth**
  High-potential states need incentives and better infrastructure.

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4. What are the quarterly trends based on sales volume for the top 5 EV makers (4-wheelers) from 2022 to 2024

```sql
WITH filtered_data AS (
    SELECT
        e.maker, e.vehicle_category,
        YEAR(STR_TO_DATE(e.date, '%d-%b-%y')) AS year,  -- Extracting year from date
        d.quarter,  -- Using the quarter from dim_date table
        SUM(e.electric_vehicles_sold) AS total_sales
    FROM electric_vehicle_sales_by_makers e
    JOIN dim_date d
      ON e.date = d.date
    WHERE e.vehicle_category = '4-Wheelers'
        AND YEAR(STR_TO_DATE(e.date, '%d-%b-%y')) BETWEEN 2022 AND 2024
    GROUP BY e.maker, e.vehicle_category, year, d.quarter
),
top_makers AS (
    SELECT maker, SUM(total_sales) AS total_maker_sales
    FROM filtered_data
    GROUP BY maker
    ORDER BY total_maker_sales DESC
    LIMIT 5
)
SELECT
    f.maker, f.year,  -- Using the extracted year
    f.quarter, f.total_sales
FROM filtered_data f
JOIN top_makers t
  ON f.maker = t.maker
ORDER BY f.total_sales DESC;
```

maker	year	quarte	total_sale
Tata Motors	2024	Q4	17361
Tata Motors	2023	Q3	13236
Mahindra & Mahindra	2023	Q1	10911
Tata Motors	2023	Q2	10337
Tata Motors	2023	Q4	9528
Tata Motors	2023	Q1	7247
Tata Motors	2022	Q3	6651
Tata Motors	2022	Q2	6192
Mahindra & Mahindra	2023	Q2	5855
Tata Motors	2022	Q4	5834
Tata Motors	2022	Q1	5675
Mahindra & Mahindra	2023	Q4	5243
Mahindra & Mahindra	2023	Q3	4264
Mahindra & Mahindra	2022	Q3	3378
Mahindra & Mahindra	2022	Q2	3164
MG Motor	2024	Q4	2622
MG Motor	2023	Q2	2524
Mahindra & Mahindra	2024	Q4	2316
MG Motor	2023	Q3	2190
Mahindra & Mahindra	2022	Q1	2020
Mahindra & Mahindra	2022	Q4	1653
MG Motor	2023	Q1	1493
MG Motor	2022	Q3	1165
MG Motor	2023	Q4	946
MG Motor	2022	Q2	635
BYD India	2023	Q4	623
MG Motor	2022	Q1	531
BYD India	2023	Q1	406
BYD India	2024	Q4	400
Hyundai Motor	2023	Q2	390
Hyundai Motor	2023	Q3	370
BYD India	2023	Q3	350
Hyundai Motor	2024	Q4	338
BYD India	2023	Q2	310
Hyundai Motor	2023	Q1	292
Hyundai Motor	2022	Q3	191
Hyundai Motor	2023	Q4	155
Hyundai Motor	2022	Q2	155
MG Motor	2022	Q4	153
BYD India	2022	Q2	113
BYD India	2022	Q3	103
BYD India	2022	Q1	81
Hyundai Motor	2022	Q1	75
BYD India	2022	Q4	32
Hyundai Motor	2022	Q4	26

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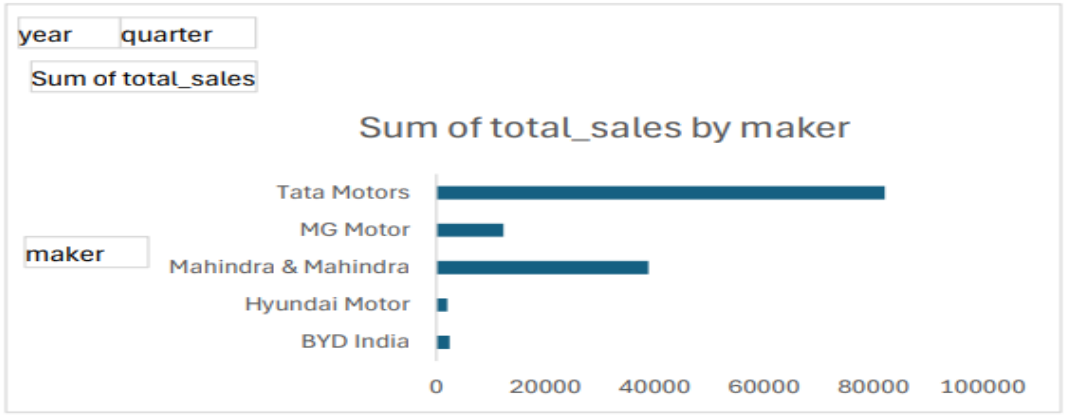
Quarterly Sales Trends of Top 5 EV Makers (4-Wheelers) from 2022 to 2024

year	(All)
quarter	(All)

maker	Sum of total_sales
BYD India	2418
Hyundai Motor	1992
Mahindra & Mahindra	38804
MG Motor	12259
Tata Motors	82061



Quarterly Trends in 4-Wheeler EV Sales (2022-2024)

Key Points:

- **Tata Motors**: Market leader, 17,361 units in Q4 2024.
- **Mahindra**: 10,911 units in Q1 2023, steady performer.
- **MG Motor**: Focused growth in 2023.
- **BYD India**: Fluctuating but improving sales.
- **Hyundai**: Lower sales, limited presence.
- **Q4**: Higher sales, indicating seasonal demand.
- **Takeaway**: EV adoption rising, competition expanding

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

```sql
WITH state_sales_2024 AS (
    SELECT
        state,
        SUM(electric_vehicles_sold) AS total_ev_sales,
        SUM(total_vehicles_sold) AS total_vehicle_sales
    FROM electric_vehicle_sales_by_state
    JOIN dim_date
      ON electric_vehicle_sales_by_state.date = dim_date.date
    WHERE fiscal_year = '2024'
        AND state IN ('Delhi', 'Karnataka')
    GROUP BY state
)
SELECT
state, total_ev_sales, total_vehicle_sales,
ROUND((total_ev_sales / total_vehicle_sales) * 100, 2) AS penetration_rate
FROM state_sales_2024;
```

state	total_ev_sales	total_vehicle_sales	penetration_rate
Delhi	46724	606348	7.71
Karnataka	160989	1581988	10.18

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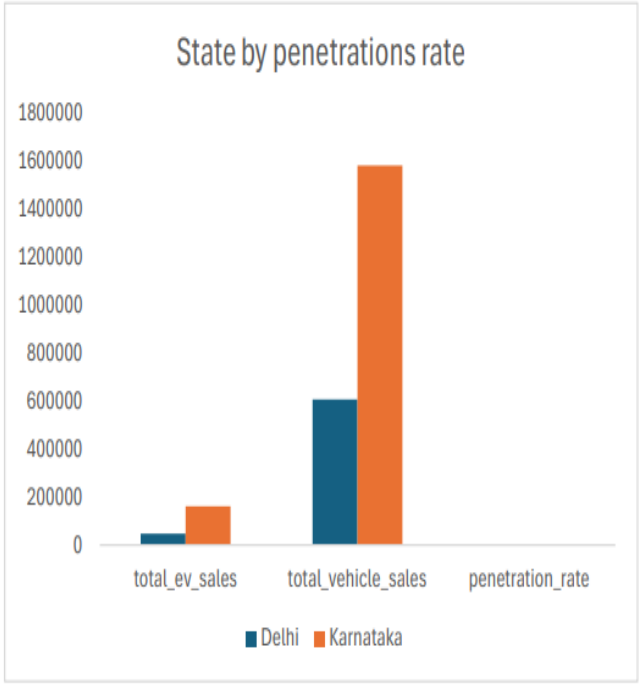
state	total_ev_sales	total_vehicle_sales	penetration_rate
Delhi	46724	606348	7.71
Karnataka	160989	1581988	10.18



- **Karnataka Leads EV Adoption**
  10.18% penetration vs. Delhi's 7.71%.

- **Delhi Needs Better Policies**
  Closing the gap requires improved infrastructure.

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

```sql
WITH maker_sales AS (
    SELECT
        e.maker,
        SUM(CASE WHEN d.fiscal_year = '2022'
        THEN e.electric_vehicles_sold ELSE 0 END) AS sales_2022,
        SUM(CASE WHEN d.fiscal_year = '2024'
        THEN e.electric_vehicles_sold ELSE 0 END) AS sales_2024
    FROM electric_vehicle_sales_by_makers e
    JOIN dim_date d ON e.date = d.date
    WHERE e.vehicle_category = '4-Wheelers'
    GROUP BY e.maker
    ORDER BY sales_2024 DESC
    LIMIT 5
)
SELECT
    maker, sales_2022, sales_2024,
    ABS(sales_2024 - sales_2022) AS abs_sales_growth,
    CASE
        WHEN sales_2022 = 0 AND sales_2024 > 0 THEN 100.0  -- New growth scenario
        WHEN sales_2022 = 0 AND sales_2024 = 0 THEN 0.0    -- No growth
        ELSE ROUND((POWER(sales_2024 / NULLIF(sales_2022, 0), 1.0 / 2) - 1) * 100, 2)
    END AS cagr_percent
FROM maker_sales;
```

maker	sales_2022	sales_2024	abs_sales_growth	cagr_percent
Tata Motors	12708	48181	35473	94.71
Mahindra & Mahindra	4042	23346	19304	140.33
MG Motor	1647	8829	7182	131.53
PCA Automobiles	0	1533	1533	100
BYD India	33	1466	1433	566.52

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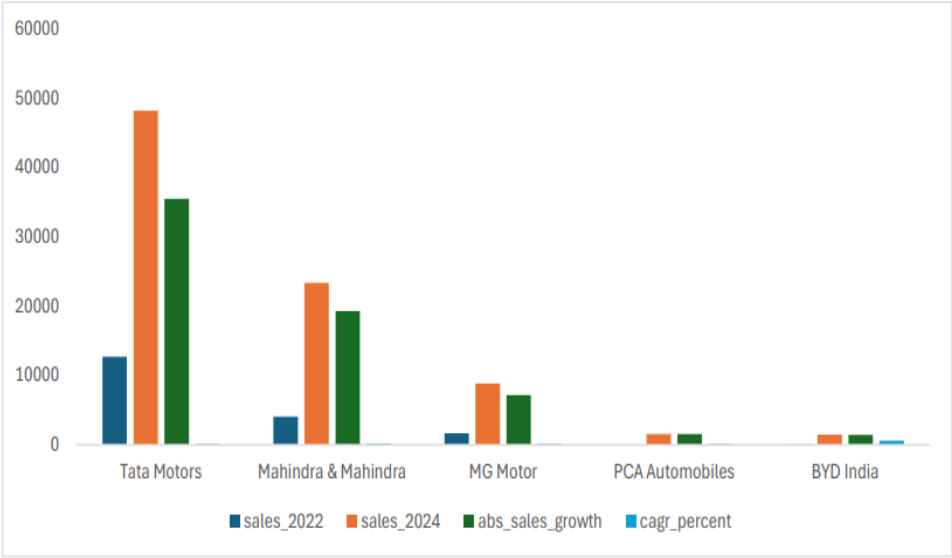
maker	sales_2022	sales_2024	abs_sales_growth	cagr_percent
Tata Motors	12708	48181	35473	94.71
Mahindra & Mahindra	4042	23346	19304	140.33
MG Motor	1647	8829	7182	131.53
PCA Automobiles	0	1533	1533	100
BYD India	33	1466	1433	566.52



Tata Motors:
94.71% CAGR, 12,708 → 48,181 units
•Strong market leadership and growing demand

Mahindra:
140.33% CAGR, 4,042 → 23,346 units
•Aggressive growth and market expansion

MG Motor: 131.53% CAGR
•Steady sales increase

PCA Automobiles:
1,533 units by 2024 (100% growth)
•New market entrant

BYD India:
566.52% CAGR, 33 → 1,466 units
•Rapid market penetration

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

```sql
WITH total_vehicles AS (
    SELECT
        state,
        SUM(CASE WHEN YEAR(STR_TO_DATE(date, '%d-%b-%y')) = 2022
        THEN total_vehicles_sold ELSE 0 END) AS total_2022,
        SUM(CASE WHEN YEAR(STR_TO_DATE(date, '%d-%b-%y')) = 2024
        THEN total_vehicles_sold ELSE 0 END) AS total_2024
    FROM  electric_vehicle_sales_by_state
    WHERE  YEAR(STR_TO_DATE(date, '%d-%b-%y')) IN (2022, 2024)
    GROUP BY state
)
SELECT
    state, total_2022, total_2024,
    CASE
        WHEN total_2022 = 0 AND total_2024 > 0 THEN 100.0  -- New growth scenario
        WHEN total_2022 = 0 AND total_2024 = 0 THEN 0.0    -- No growth
        ELSE ROUND((POWER(total_2024 / total_2022, 1.0 / 2) - 1) * 100, 2) -- Calculate CAGR
    END AS cagr_percent
FROM
    total_vehicles
ORDER BY
    cagr_percent DESC
LIMIT 10;  -- Get the top 10 states
```

state	total_2022	total_2024	cagr_percent
Andaman & Nicobar	0	660	100
Nagaland	14179	5483	-37.81
Puducherry	49662	17503	-40.63
Assam	433527	147611	-41.65
Chhattisgarh	432818	142456	-42.63
Haryana	618249	201143	-42.96
Karnataka	1343234	430905	-43.36
Meghalaya	30277	9628	-43.61
Tamil Nadu	1566918	495075	-43.79
Mizoram	24243	7420	-44.68

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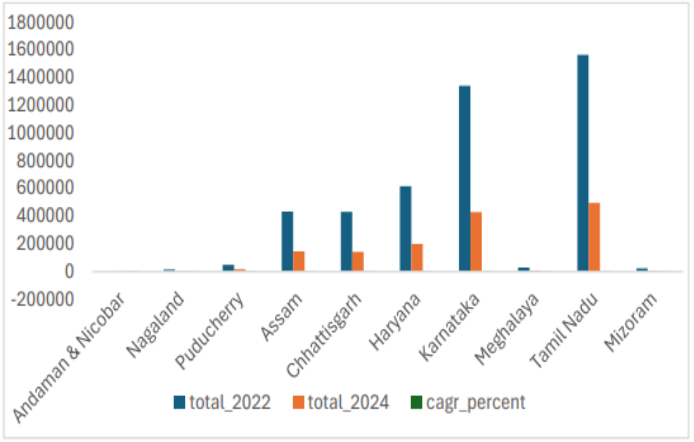
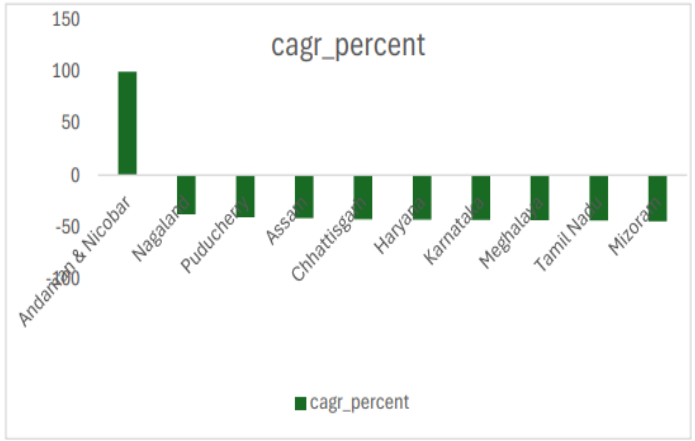
state	total_2022	total_2024	cagr_percent
Andaman & Nicobar	0	660	100
Nagaland	14179	5483	-37.81
Puducherry	49662	17503	-40.63
Assam	433527	147611	-41.65
Chhattisgarh	432818	142456	-42.63
Haryana	618249	201143	-42.96
Karnataka	1343234	430905	-43.36
Meghalaya	30277	9628	-43.61
Tamil Nadu	1566918	495075	-43.79
Mizoram	24243	7420	-44.68





Andaman & Nicobar:
•Highest growth with 660 vehicles sold in 2024 (none in 2022), achieving **100% growth**

Decline in Other States:
•Nagaland, Puducherry, Assam, and others: **Negative CAGRs** from **-37.81% to -44.68%**

Major Markets Affected:
•Karnataka and Tamil Nadu: Over **40% decline**, indicating challenges in EV or overall vehicle adoption

Trend:
•Andaman & Nicobar showed growth, but most regions experienced **significant declines** from 2022 to 2024

8. What are the peak and low season months for EV sales based on the data from 2022 to 2024?

```sql
WITH monthly_sales AS (
 SELECT
    MONTHNAME(STR_TO_DATE(date, '%d-%b-%y')) AS month_name,
    SUM(electric_vehicles_sold) AS total_ev_sales
FROM  electric_vehicle_sales_by_state
WHERE
    YEAR(STR_TO_DATE(date, '%d-%b-%y')) BETWEEN 2022 AND 2024
GROUP BY month_name
ORDER BY  total_ev_sales DESC
)
SELECT
    month_name, SUM(total_ev_sales) AS total_ev_sales
FROM monthly_sales
GROUP BY month_name
ORDER BY  total_ev_sales DESC;
```

month_name	total_ev_sales
March	291587
February	198049
January	189099
November	179037
October	162995
May	158370
December	151160
April	128342
September	126621
August	124808
July	111632
June	101222

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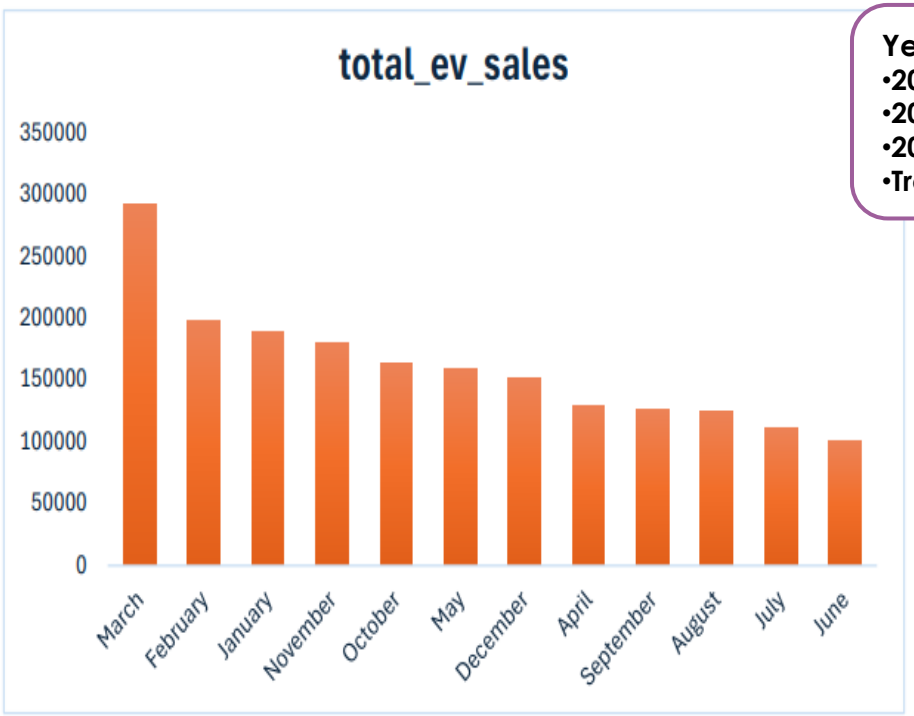
month_name	total_ev_sales
March	291587
February	198049
January	189099
November	179037
October	162995
May	158370
December	151160
April	128342
September	126621
August	124808
July	111632
June	101222



Yearly Sales Analysis:
- **2024**: March – 138,343 units
- **2023**: May – 112,997 units
- **2022**: October – 81,162 units
- **Trend**: Higher sales in **early months and spring**, lower in **late summer and fall**

Monthly Sales Analysis (2022-2024):
- **March**: Peak month with 291,587 units sold
- **June**: Lowest sales at 101,222 units
- **Trend**: Strong performance in **early spring**, decline in **summer**

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9. What is the 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.

```sql
WITH sales_data AS (
    SELECT  state,
        SUM(CASE WHEN YEAR(STR_TO_DATE(date, '%d-%b-%y')) = 2022
        THEN electric_vehicles_sold ELSE 0 END) AS sales_2022,
        SUM(CASE WHEN YEAR(STR_TO_DATE(date, '%d-%b-%y')) = 2024
        THEN electric_vehicles_sold ELSE 0 END) AS sales_2024
    FROM electric_vehicle_sales_by_state
    GROUP BY state
),
cagr_calculation AS (
    SELECT state, sales_2022, sales_2024,
        CASE
            WHEN sales_2022 = 0 THEN 0
            ELSE ROUND(POWER(sales_2024 / sales_2022, 1.0 / 2) - 1, 4)
        END AS cagr
    FROM sales_data
),
projected_sales AS (
    SELECT state, sales_2024, cagr,
        ROUND(sales_2024 * POWER(1 + cagr, 6), 2) AS projected_sales_2030
    FROM  cagr_calculation      -- 6 years from 2024 to 2030
)
SELECT
    state, projected_sales_2030
FROM projected_sales
ORDER BY projected_sales_2030 DESC LIMIT 10;
```

state	projected_sales_2030
Uttar Pradesh	15016.43
Karnataka	9077.17
Mizoram	7773.6
Maharashtra	6765.19
Kerala	4985.3
Tamil Nadu	3762.66
Madhya Pradesh	3109.02
West Bengal	1578.77
Goa	1273.32
Arunachal Pradesh	1250.11

Visualization, Insights

state	projected_sales_2030
Uttar Pradesh	15016.43
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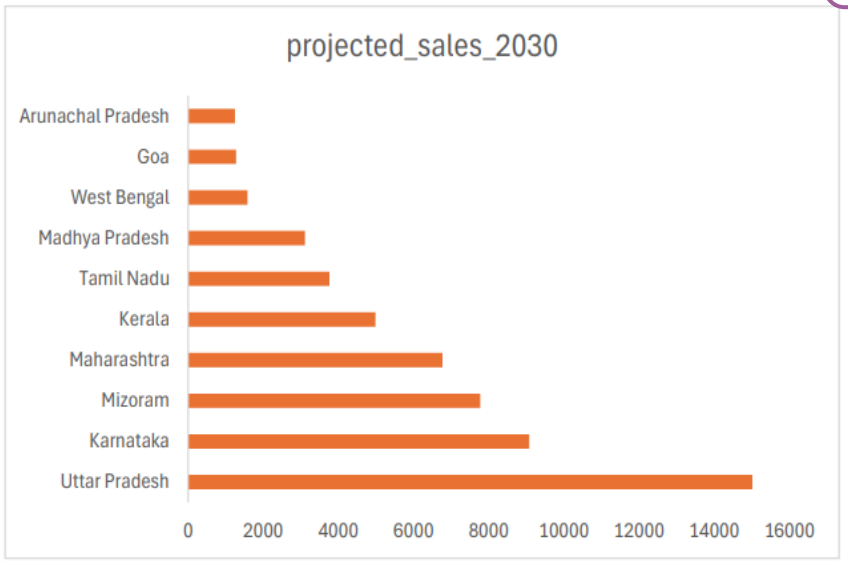


Uttar Pradesh is projected to lead EV sales in 2030 with **15,016 units**, followed by **Karnataka** with **9,077 units** and **Mizoram** with **7,774 units**.

Maharashtra and **Kerala** show significant growth potential, with projections of **6,765** and **4,985 units**, respectively.

States like **Tamil Nadu**, **Madhya Pradesh**, and **West Bengal** maintain competitive EV sales projections.

Smaller states, including **Goa** with **1,273 units** and **Arunachal Pradesh** with **1,250 units**, indicate expanding markets.

The high CAGR in several states suggests strong adoption trends, highlighting opportunities for **EV manufacturers** to enter or focus on these markets.

CODE BASICS

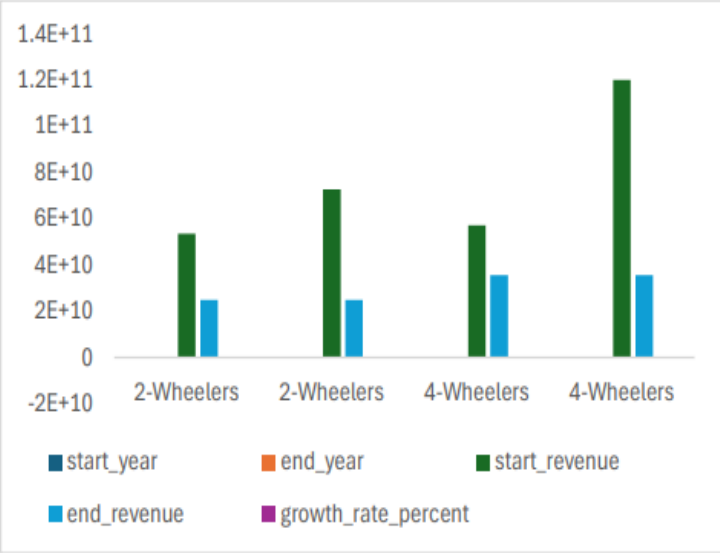
10. Estimate the revenue growth rate of 4-wheeler and 2-wheelers EVs in India for 2022 vs 2024 and 2023 vs 2024, assuming an average unit price

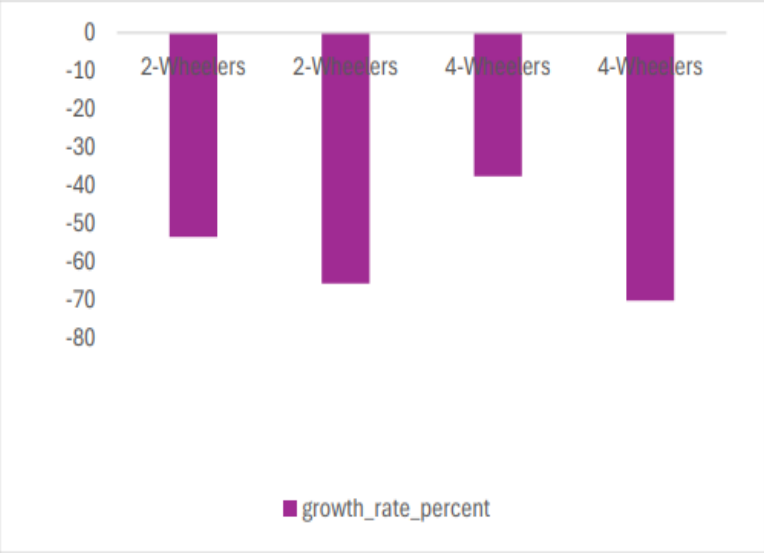
```sql
WITH yearly_revenue AS (
    SELECT
        YEAR(STR_TO_DATE(date, '%d-%b-%y')) AS year, vehicle_category,
        SUM(electric_vehicles_sold) AS total_units,
        SUM( CASE
                WHEN vehicle_category = '4-Wheelers' AND electric_vehicles_sold > 0
                 THEN electric_vehicles_sold * 1500000  -- Price for 4-wheelers
                WHEN vehicle_category = '2-Wheelers' AND electric_vehicles_sold > 0
                 THEN electric_vehicles_sold * 85000    -- Price for 2-wheelers
                ELSE 0
            END ) AS total_revenue
    FROM electric_vehicle_sales_by_state
    WHERE YEAR(STR_TO_DATE(date, '%d-%b-%y')) BETWEEN 2022 AND 2024
    GROUP BY year, vehicle_category)
SELECT
    r1.vehicle_category, r1.year AS start_year, r2.year AS end_year,
    r1.total_revenue AS start_revenue, r2.total_revenue AS end_revenue,
    -- Calculate revenue growth percentage
    ROUND(
        CASE
            WHEN r1.total_revenue = 0 THEN 0
            ELSE ((r2.total_revenue - r1.total_revenue) / r1.total_revenue) * 100
        END, 2) AS growth_rate_percent
FROM  yearly_revenue r1
JOIN  yearly_revenue r2
ON  r1.vehicle_category = r2.vehicle_category
    AND r2.year > r1.year
WHERE (r1.year, r2.year) IN ((2022, 2024), (2023, 2024))
ORDER BY r1.vehicle_category, r1.year;
```

vehicle_category	start_year	end_year	start_revenue	end_revenue	growth_rate_percent
2-Wheelers	2022	2024	53642650000	24897435000	-53.59
2-Wheelers	2023	2024	72831060000	24897435000	-65.81
4-Wheelers	2022	2024	57255000000	35691000000	-37.66
4-Wheelers	2023	2024	120181500000	35691000000	-70.30

Visualization, Insights

vehicle_category	start_year	end_year	start_revenue	end_revenue	growth_rate_percent
2-Wheelers	2022	2024	53642650000	24897435000	-53.59
2-Wheelers	2023	2024	72831060000	24897435000	-65.81
4-Wheelers	2022	2024	57255000000	35691000000	-37.66
4-Wheelers	2023	2024	1.20182E+11	35691000000	-70.3





Overall Decline: Revenue for **2-wheelers** dropped by **-53.59%** and for **4-wheelers** by **-37.66%** from **2022 to 2024**.

Steep Decline (2023 to 2024):
- **2-wheelers**: Revenue fell by **-65.81%**.
- **4-wheelers**: Revenue decreased by **-70.30%**.

Market Challenges: The significant declines indicate potential challenges in the market for both vehicle categories.

Secondary Research Questions:

1. What are the primary reasons for customers choosing 4-wheeler EVs in 2023 and 2024 (cost savings, environmental concerns, government incentives)

Factors Driving 4-Wheeler EV Adoption (2023-2024)

1.Cost Savings

1. EVs cut costs with cheaper fuel and low maintenance.

2.Environmental Concerns

1. Awareness of climate change drives buyers toward sustainable vehicles.

3.Government Incentives

1. Subsidies, tax credits, and perks like free parking boost EV purchases.

4.Advancements in Technology

1. Better battery life and charging options reduce range anxiety, enhancing EV appeal..

2. How do government incentives and subsidies impact the adoption rates of 2-wheelers and 4-wheelers? Which states in India provided most subsidies.

Incentives in Maharashtra, Gujarat, Delhi, and Tamil Nadu boost EV adoption by lowering costs and enhancing accessibility.

1. **Incentives Drive Adoption**: Government subsidies reduce EV costs and boost sales.
2. **2-Wheelers Dominate**: Faster adoption due to affordability and urban utility.

3. How does the availability of charging stations infrastructure correlate with the EV sales and penetration rates in the top 5 states?

Analysis of Charging Station Infrastructure and EV Sales

1.Data Overview

1. Use the electric_vehicle_sales_by_state table to extract sales data alongside state-specific charging infrastructure growth.

2.Correlation Assessment

1. Evaluate if states with significant increases in charging stations see corresponding rises in EV sales and penetration. For instance, states like California and New York typically demonstrate strong infrastructure supporting higher sales.

3.Trends Analysis

1. Look at trends over time, noting any lags in sales growth following charging station expansion, which might indicate a time lag in consumer adoption.

4.Penetration Rates

1. Calculate EV penetration rates relative to the total number of vehicles sold in each state, analyzing whether robust charging networks facilitate faster adoption rates.

Conclusion

•This analysis will illustrate the extent to which infrastructure influences EV market dynamics in these key states.

4. Who should be the brand ambassador if AtliQ Motors launches their EV/Hybrid vehicles in India and why

1. **Akshay Kumar** cares about the environment and fitness, matching **AtliQ Motors**' focus on sustainability, which attracts eco-friendly buyers.

2. His big fan base and active **social media** can reach younger customers and make the brand more trustworthy.

5. Which state of India is ideal to start the manufacturing unit. (Based on subsidies provided, ease of doing business, stability in governance etc.)

1. States like Gujarat and Maharashtra offer attractive subsidies and tax breaks for manufacturing units.

2. Gujarat has strong infrastructure with good transport systems and industrial parks that are important for manufacturing..

PROBLEM STATEMENT

AtliQ Motors is an automotive giant from the **USA** specializing in electric vehicles (EV). In the last 5 years, their market share rose to 25% in electric and hybrid vehicles segment in **North America**. As a part of their expansion plans, they wanted to launch their bestselling models in **India** where their market share is less than 2%. Bruce Haryali, the chief of **AtliQ Motors** India wanted to do a detailed market study of existing EV/Hybrid market in India before proceeding further. Bruce gave this task to the data analytics team of **AtliQ motors** and Peter Pandey is the **data analyst** working in this team.

Recommendations

6. Your top 3 recommendations for AtliQ Motors.

Top 3 Recommendations for AtliQ Motors

1.Enhance Charging Infrastructure

1. Collaborate with charging network providers to expand charging stations, making it easier for customers to charge their vehicles. This convenience can significantly improve customer satisfaction and encourage more people to switch to electric vehicles.

2.Diversify Product Range

1. Expand the product lineup to include a variety of electric vehicles, such as SUVs, commercial vehicles, and two-wheelers. Catering to different segments can attract a broader customer base and increase market share.

3.Customer Education Programs

1. Develop comprehensive education programs to inform potential customers about the benefits of electric vehicles, including cost savings and environmental impact. This can help alleviate concerns and misconceptions, driving higher adoption rates.

Recommendations

1. **Competitor Analysis:** Identify key competitors and their market shares.
2. **Consumer Preferences:** Survey buyers to understand their needs regarding price and features.
3. **Charging Infrastructure:** Assess availability and build partnerships to expand charging options.

CODE BASICS

THANK YOU