EV SALES AND FORCASTING

This report provides an analysis and forecast of EV sales in India from 2001 to 2024, focusing on the growth trends, market dynamics, and future projections in the EV sector. Using SQL for data exploration and Power BI for visualization, we present insights into sales by maker, category, location, and charging infrastructure.

Data Overview:

1.Detailed India EV Market Data 2001 - 2024 : This dataset provides a detailed overview of the electric vehicle (EV) market in India from 2001 to 2024. It includes monthly sales data, sales data categorized by manufacturer, and vehicle class-wise sales data for different manufacturers.

- **Source**: Kaggle's India EV Market Data (2001-2024).
- **Tables:**
    1. **EV Maker by Place:** List of popular EV Makers and their location of Manufacturing Plant
    2. **Operational PC:**Total Operational Public Charging Station for EV available in each state
    3. **Vehicle Class:** Total vehicles (includes electric and all other fuels) registered (manufactured) by category from 2001 - Aug 2024
    4. **ev_cat_01-24:**Total electric vehicles manufactured from 2001 - Aug 2024 and vehicle category.

5. **ev_sales_by_makers_and_cat_15-24:**Total electric vehicles manufactured by makers from 2015 - Aug 2024 with the vehicle class.

- **Source:**Global EV Sales: 2010-2024 : This dataset provides a detailed overview of the electric vehicle (EV) market globaly from 2010 to 2024.

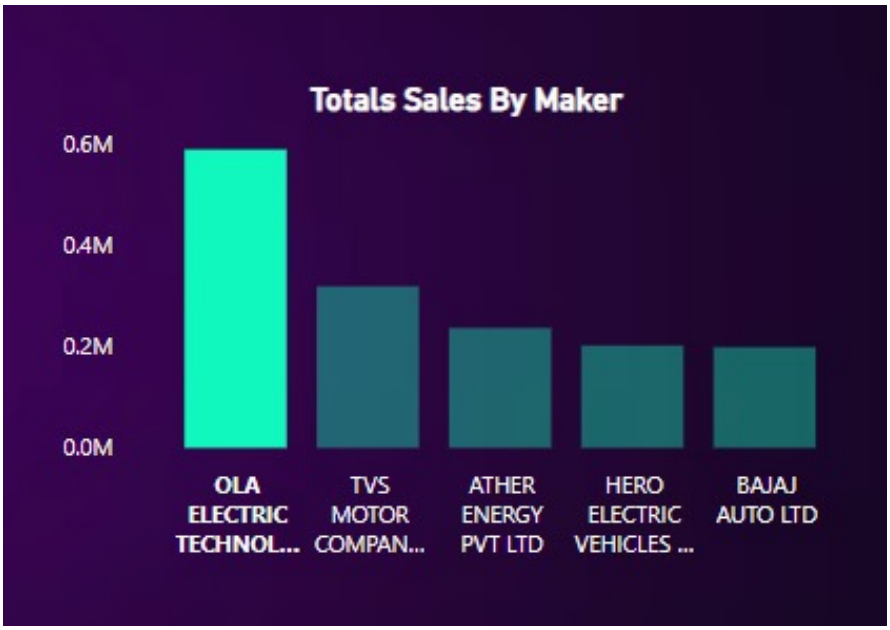
- **Source:** iea.org's Electric Vehicle Charging Stations Datase : This dataset provides a detailed overview of the electric vehicle (EV) charging points globaly from 2010 to 2023.

EV SALES IN INDIA AND FORCASTING

- **Total Sales of Electric Vehicle from year 2015-2024 is 4441098.**

- **Total vehicle manufactured in 2001-2024 are 37,55,99,832 out of which 64,18,1330 are electric vehicles.**

- **Ola Electric Technologied PVT LTD has the highest marker share in Electric vehicle manufacturing in India.**



- **2W electric vehicle category has the highest sales between 2015 - Aug 2024 .**

```
SELECT SUM(total_sales) AS sales, ï»¿Cat FROM yearly_sale
GROUP BY ï»¿Cat
ORDER BY sales DESC
LIMIT 10;
```

	sales	ï»¿Cat
▶	2279448	2W
	1934263	3W
	206388	LMV
	20195	ï»¿Cat
	804	MMV

- **OLA Electric Technologies PVT LTD has the greatest maket share 10.78.**

	maker	total_sales	market_share
▶	OLA ELECTRIC TECHNOLOGIES PVT LTD	267355	6.02
	OLA ELECTRIC TECHNOLOGIES PVT LTD	211273	4.76
	TVS MOTOR COMPANY LTD	166580	3.75
	OLA ELECTRIC TECHNOLOGIES PVT LTD	109398	2.46
	ATHER ENERGY PVT LTD	104735	2.36
	OKINAWA AUTOTECH PVT LTD	103620	2.33
	TVS MOTOR COMPANY LTD	98516	2.22
	HERO ELECTRIC VEHICLES PVT. LTD	97828	2.20
	AMPERE VEHICLES PRIVATE LIMITED	79857	1.80
	BAJAJ AUTO LTD	73698	1.66

EV Sales Globaly

- **China has the highest sales between 2010-2024 Rs.1234572173.**

- **EV Cars has the highest sales in the year 2023,2022,2021 and 2020 and EV two wheeler has the highest sales in 2023.**

```
SELECT
  SUM(value) AS sales, mode,year FROM global_ev
  WHERE
  year BETWEEN 2010 AND 2024
 GROUP BY mode , year

 ORDER BY sales DESC;
```

- **China has the highest sales with powertrain BEV .**

BEV stands for **Battery Electric Vehicle**, an electric vehicle powered entirely by rechargeable batteries without an internal combustion engine.

EV charging points in India

There are total 12146 ev charging station in India in the year 2001-2024.

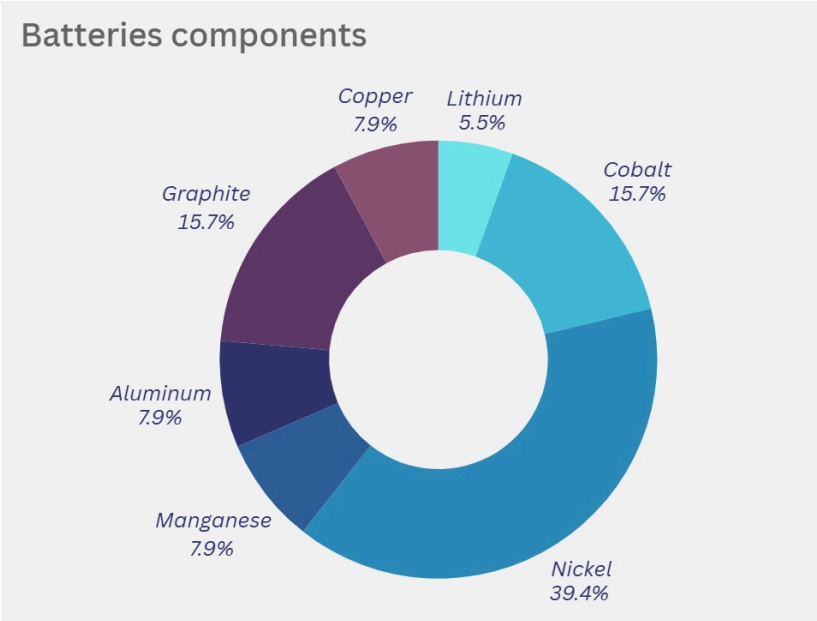
EV charging points in Globaly

- Europe has the highest charging points.

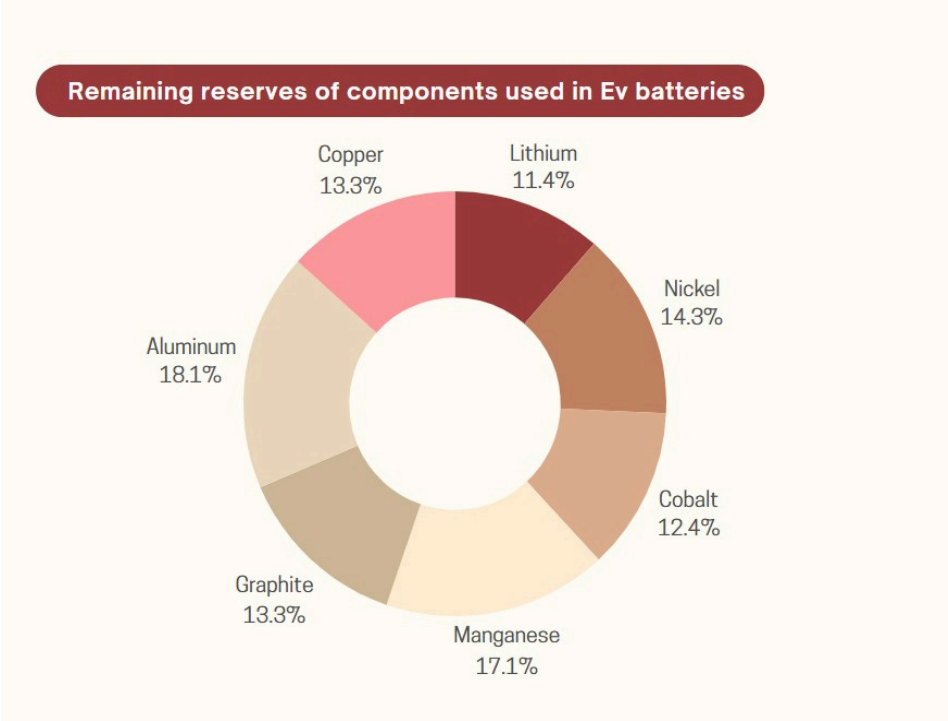
region	Sum of value
Australia	12,861.00
Austria	43,602.00
Belgium	1,04,469.00
Brazil	8,275.40
Canada	1,10,677.00
Chile	2,928.00
China	76,43,000.00
Denmark	64,459.00
Europe	25,15,464.00
Total	**2,66,75,954.60**

- There are 371 Publicly available fast charging points and 379 slow charging points.

EV Natural Components Used In EV Batteries



EV Natural Components Reserve Left



According to the research there are total ev manufactured between 2001-2024 in India is 64,18,1330, that means approximatly Copper 50,70,325 kg, Lithium 35,29,973, Nickel 2,52,87,444 kg ,Cobalt 1,00,76,468,Manganese 50,70,325 kg, Graphite 1,00,76,468 kg ,Aluminum 50,70,325 kg.

Left in reserve (approximately):

Lithium: About 21 million tons
Copper: 880 million metric tons
Cobalt: 7 million metric tons
Aluminum: 75 billion metric tons
Nickel: 94 million metric ton
Manganese: 73 matric million tones

Graphite : 300 million matric tons.

Assumptions for Material Usage Per EV:

1. **Lithium:** Each EV uses approximately 15 kg of lithium (for the battery).
2. **Copper:** Each EV uses approximately 80 kg of copper (for wiring, battery, motor, etc.).
3. **Cobalt:** Each EV uses approximately 10 kg of cobalt (for the battery).
4. **Aluminum:** Each EV uses approximately 200 kg of aluminum (for the body, frame, etc.).
5. **Nickel:** Each EV uses approximately 30 kg of nickel (for the battery).
6. **Manganese:** Each EV uses approximately 10 kg of manganese (for the battery).
7. **Graphite:** Each EV uses approx 45kg of graphite for the battery.

Ev vehicel can be manufactured using remaining reserves

- **Lithium -**

  21,000,000 metric tons/ 15kg per ev

21,000,000 * 1000/kg $=2.1\times10^{10}$/kg

21,000,000,000kg /15kg =1,40,00,00,000

So, approximately 1.4 billion ev's can be manufactured with the available lithium reserve.

- **Cobalt**

7,000,000,000kg/10kg

Approximately 700 million ev can be manufactured.

- **Nickel -**

  94,000,000,000kg/30kg per ev

  Approximately 3.13 billion ev's can be manufactured.

- **Graphite -**

  3000,000,000kg/45kg per ev

Approximately 6.67 billion more vehicle.

- **Copper -**

  880,000,000,000kg/80kg

Approximately 11billion more ev's can be manufactured.

- **Manganese -**

  73,000,000,000kg/10kg

Approximately 7.3 billion ev's can be manufactured.

- **Aluminium -**

  75,000,000,000,000kg /200kg

Approximately 375 billion more ev can be manufactured with the remaining reserve of aluminium.

Conclusion

Based on the available global resources of copper, manganese, and aluminum, the number of EVs that can be manufactured is

limited by copper (11 billion EVs). However, the global reserves of manganese and aluminum would be more than sufficient to support the manufacturing of many billions (even trillions) of EVs.

As a result, copper is likely the most limiting factor in terms of the number of EVs that can be manufactured from non-renewable resources.