Electric Vehicle Sales Analysis in India

June 9, 2025

[34]:
```
import pandas as pd
df = pd.read_csv('EV_Dataset.csv')
df.head()
```

[34]:

	Year	Month_Name	Date	State	Vehicle_Class	Vehicle_Category	Vehicle_Type	EV_Sales_Quantity
0	2014.0	jan	1/1/2014	Andhra Pradesh	ADAPTED VEHICLE	Others	Others	0.0
1	2014.0	jan	1/1/2014	Andhra Pradesh	AGRICULTURAL TRACTOR	Others	Others	0.0
2	2014.0	jan	1/1/2014	Andhra Pradesh	AMBULANCE	Others	Others	0.0
3	2014.0	jan	1/1/2014	Andhra Pradesh	ARTICULATED VEHICLE	Others	Others	0.0
4	2014.0	jan	1/1/2014	Andhra Pradesh	BUS	Bus	Bus	0.0

[35]:
```
import pandas as pd
import numpy as np
import matplotlib.pyplot as plt
import seaborn as sns

sns.set(style="whitegrid")  # Optional
```

[36]:
```
df = pd.read_csv('EV_Dataset.csv')
df.head()
```

[36]:

	Year	Month_Name	Date	State	Vehicle_Class	Vehicle_Category	Vehicle_Type	EV_Sales_Quantity
0	2014.0	jan	1/1/2014	Andhra Pradesh	ADAPTED VEHICLE	Others	Others	0.0
1	2014.0	jan	1/1/2014	Andhra Pradesh	AGRICULTURAL TRACTOR	Others	Others	0.0
2	2014.0	jan	1/1/2014	Andhra Pradesh	AMBULANCE	Others	Others	0.0
3	2014.0	jan	1/1/2014	Andhra Pradesh	ARTICULATED VEHICLE	Others	Others	0.0
4	2014.0	jan	1/1/2014	Andhra Pradesh	BUS	Bus	Bus	0.0

```
2          Others       Others                0.0
3          Others       Others                0.0
4             Bus          Bus                0.0
```

[37]:
```
# understanding the dataset
print("Shape of the dataset:", df.shape)
df.info()
df.isnull().sum()
df.describe(include='all')
```

```
Shape of the dataset: (96845, 8)
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 96845 entries, 0 to 96844
Data columns (total 8 columns):
 #   Column             Non-Null Count  Dtype
---  ------             --------------  -----
 0   Year               96845 non-null  float64
 1   Month_Name         96845 non-null  object
 2   Date               96845 non-null  object
 3   State              96845 non-null  object
 4   Vehicle_Class      96845 non-null  object
 5   Vehicle_Category   96845 non-null  object
 6   Vehicle_Type       96845 non-null  object
 7   EV_Sales_Quantity  96845 non-null  float64
dtypes: float64(2), object(6)
memory usage: 5.9+ MB
```

[37]:

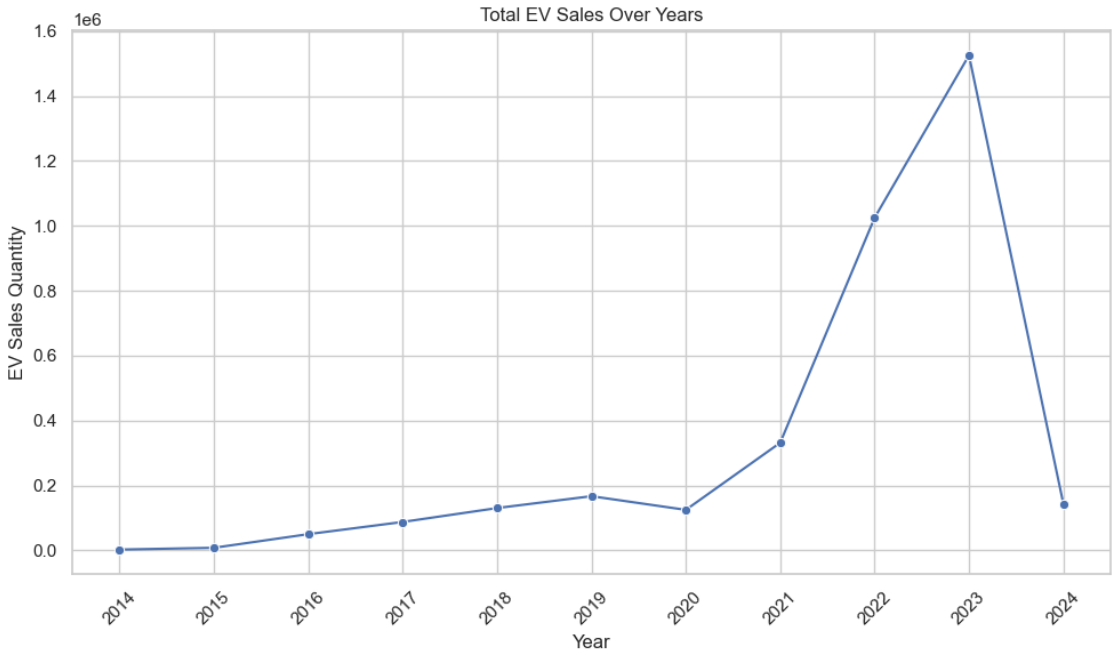
	Year	Month_Name	Date	State	Vehicle_Class	\
count	96845.000000	96845	96845	96845	96845	
unique	NaN	12	121	34	73	
top	NaN	jan	3/1/2020	Maharashtra	MOTOR CAR	
freq	NaN	8853	933	4912	4111	
mean	2018.622768	NaN	NaN	NaN	NaN	
std	2.895581	NaN	NaN	NaN	NaN	
min	2014.000000	NaN	NaN	NaN	NaN	
25%	2016.000000	NaN	NaN	NaN	NaN	
50%	2019.000000	NaN	NaN	NaN	NaN	
75%	2021.000000	NaN	NaN	NaN	NaN	
max	2024.000000	NaN	NaN	NaN	NaN	

	Vehicle_Category	Vehicle_Type	EV_Sales_Quantity
count	96845	96845	96845.000000
unique	5	12	NaN
top	Others	Others	NaN
freq	54423	54423	NaN
mean	NaN	NaN	37.108896
std	NaN	NaN	431.566675
min	NaN	NaN	0.000000

```
25%                  NaN          NaN            0.000000
50%                  NaN          NaN            0.000000
75%                  NaN          NaN            0.000000
max                  NaN          NaN        20584.000000
```

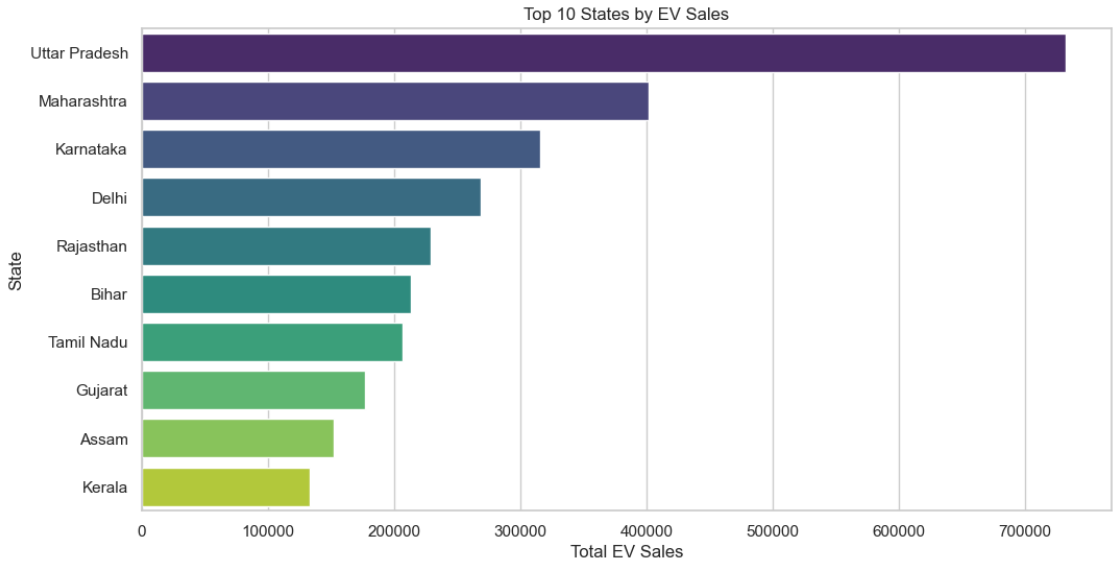
[38]:
```
import warnings
warnings.filterwarnings('ignore')
```

[39]:
```
ev_trend = df.groupby('Year')['EV_Sales_Quantity'].sum().reset_index()

plt.figure(figsize=(10, 6))
sns.lineplot(data=ev_trend, x='Year', y='EV_Sales_Quantity', marker='o')
plt.title('Total EV Sales Over Years')
plt.xlabel('Year')
plt.ylabel('EV Sales Quantity')
plt.xticks(ev_trend['Year'].astype(int), rotation=45)
plt.tight_layout()
plt.show()
```

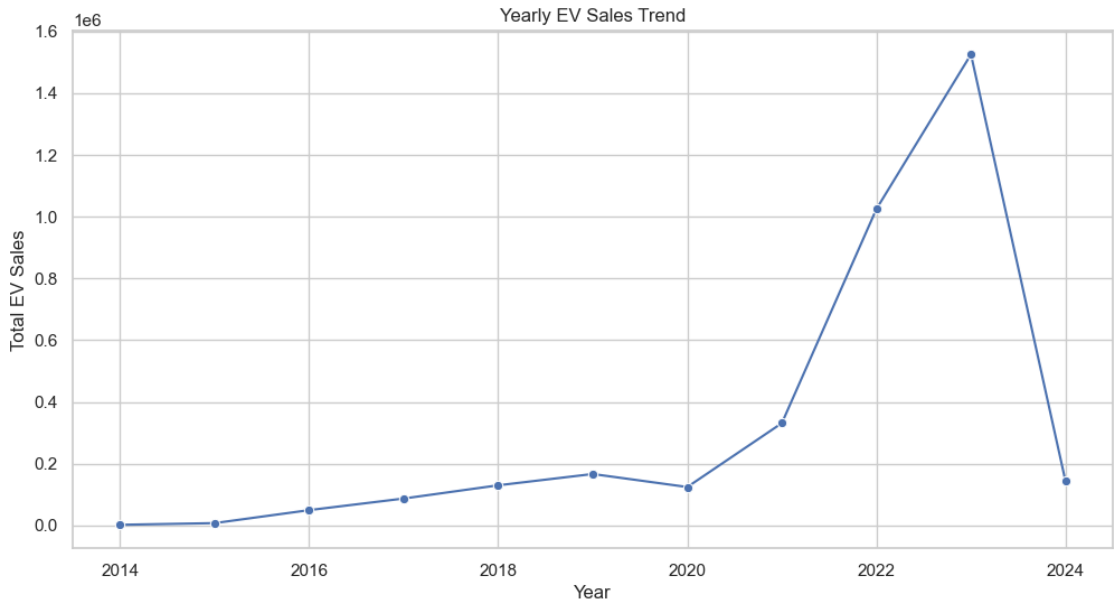


[40]:
```
state_sales = df.groupby('State')['EV_Sales_Quantity'].sum().
 ↪sort_values(ascending=False).head(10)

plt.figure(figsize=(12, 6))
sns.barplot(x=state_sales.values, y=state_sales.index, palette='viridis')
plt.title('Top 10 States by EV Sales')
```

```
plt.xlabel('Total EV Sales')
plt.ylabel('State')
plt.show()
```



[41]:
```
yearly_sales = df.groupby('Year')['EV_Sales_Quantity'].sum()

plt.figure(figsize=(12, 6))
sns.lineplot(x=yearly_sales.index, y=yearly_sales.values, marker='o')
plt.title('Yearly EV Sales Trend')
plt.xlabel('Year')
plt.ylabel('Total EV Sales')
plt.grid(True)
plt.show()
```

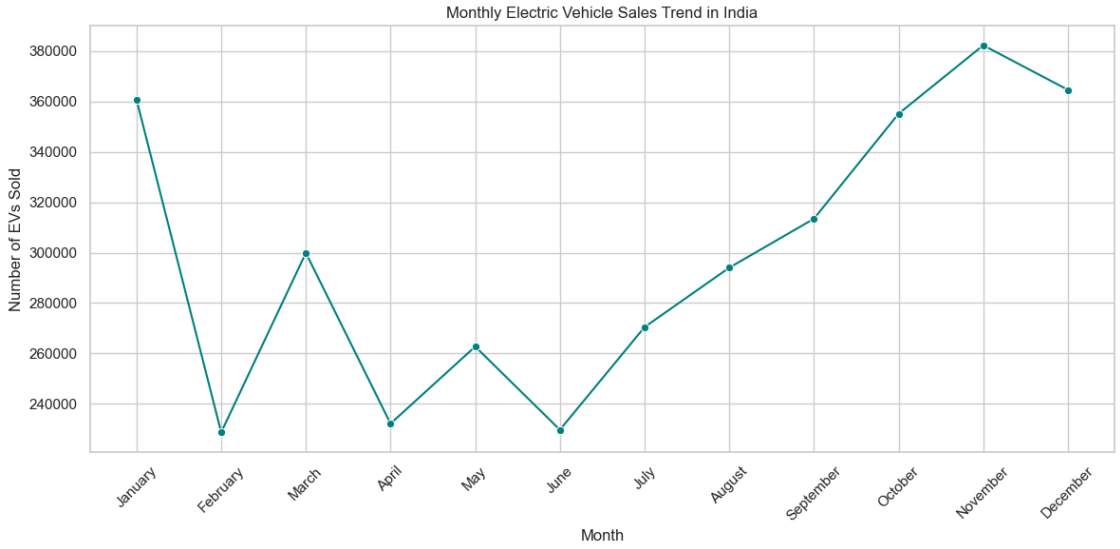


[42]:
```
print(df.columns)
```

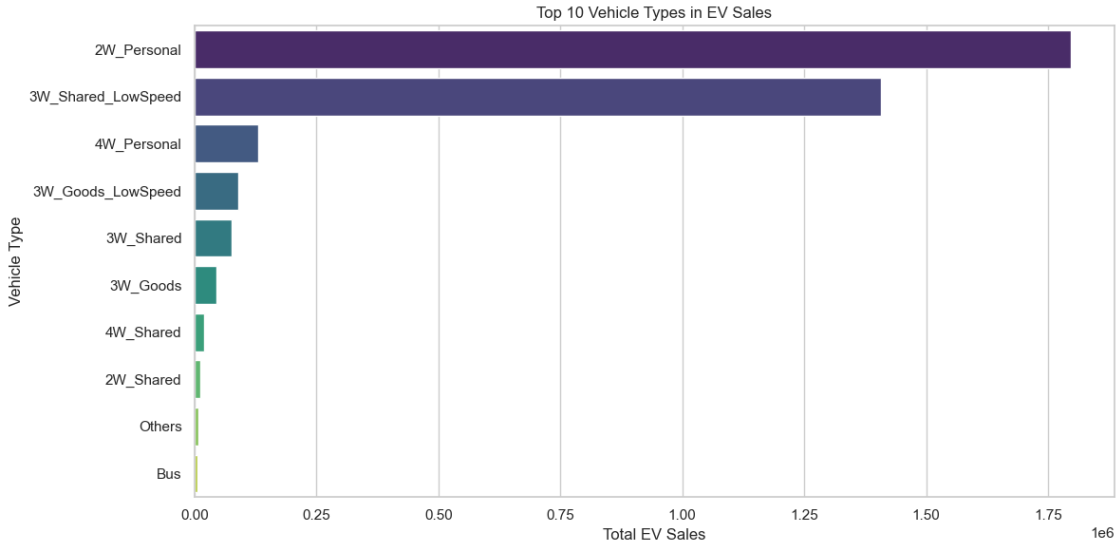
```
Index(['Year', 'Month_Name', 'Date', 'State', 'Vehicle_Class',
       'Vehicle_Category', 'Vehicle_Type', 'EV_Sales_Quantity'],
      dtype='object')
```

[43]:
```
df['Date'] = pd.to_datetime(df['Date'], errors='coerce')
```

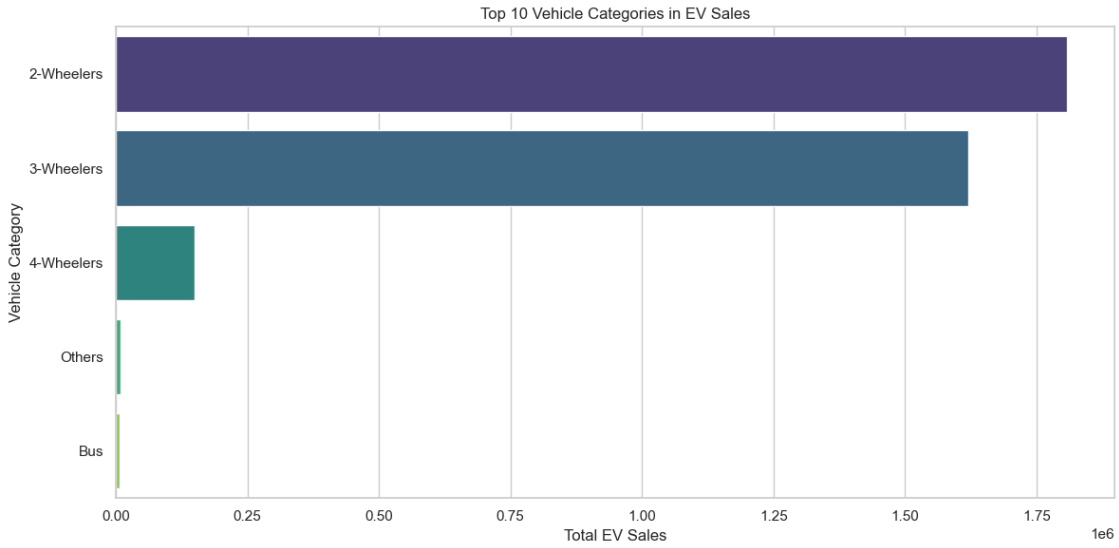
[44]:
```
df['Month'] = df['Date'].dt.month_name()
monthly_sales = df.groupby('Month')['EV_Sales_Quantity'].sum()

from pandas.api.types import CategoricalDtype
month_order = ['January', 'February', 'March', 'April', 'May', 'June',
               'July', 'August', 'September', 'October', 'November', 'December']
df['Month'] = pd.Categorical(df['Month'], categories=month_order, ordered=True)
monthly_sales = df.groupby('Month')['EV_Sales_Quantity'].sum().
 ↪reindex(month_order)
plt.figure(figsize=(12,6))
sns.lineplot(x=monthly_sales.index, y=monthly_sales.values, marker='o',␣
 ↪color='teal')
plt.title("Monthly Electric Vehicle Sales Trend in India")
plt.xlabel("Month")
plt.ylabel("Number of EVs Sold")
plt.xticks(rotation=45)
plt.tight_layout()
plt.show()
```



[45]:
```
#  which companies are contributing most
top_types = df.groupby('Vehicle_Type')['EV_Sales_Quantity'].sum().
 ↪sort_values(ascending=False).head(10)

plt.figure(figsize=(12, 6))
sns.barplot(x=top_types.values, y=top_types.index, palette='viridis')
plt.title("Top 10 Vehicle Types in EV Sales")
plt.xlabel("Total EV Sales")
plt.ylabel("Vehicle Type")
plt.tight_layout()
plt.show()
```

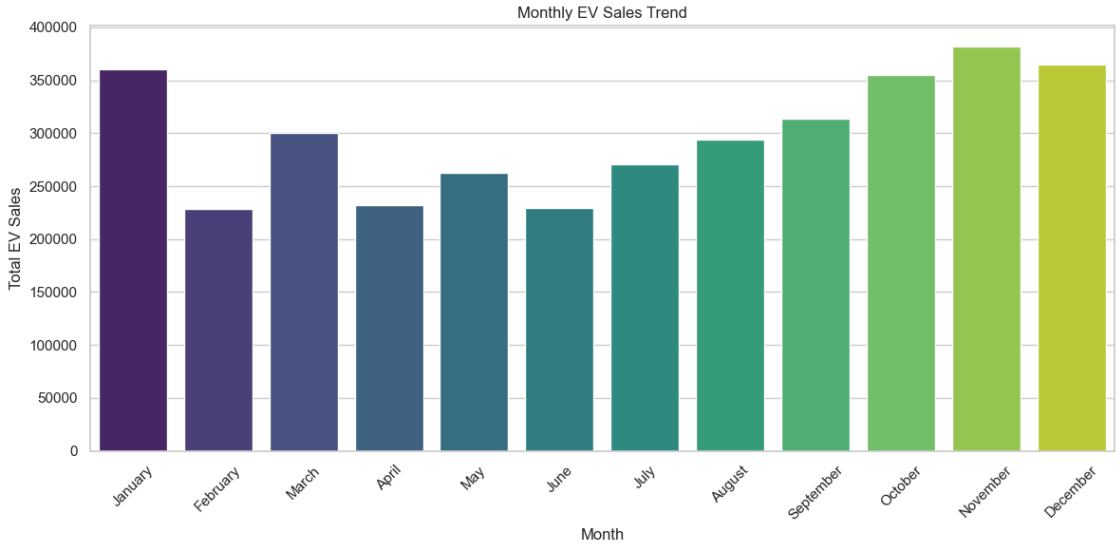


[46]:
```
top_categories = df.groupby('Vehicle_Category')['EV_Sales_Quantity'].sum().
 ↪sort_values(ascending=False).head(10)

plt.figure(figsize=(12, 6))
sns.barplot(x=top_categories.values, y=top_categories.index, palette='viridis')
plt.title("Top 10 Vehicle Categories in EV Sales")
plt.xlabel("Total EV Sales")
plt.ylabel("Vehicle Category")
plt.tight_layout()
plt.show()
```

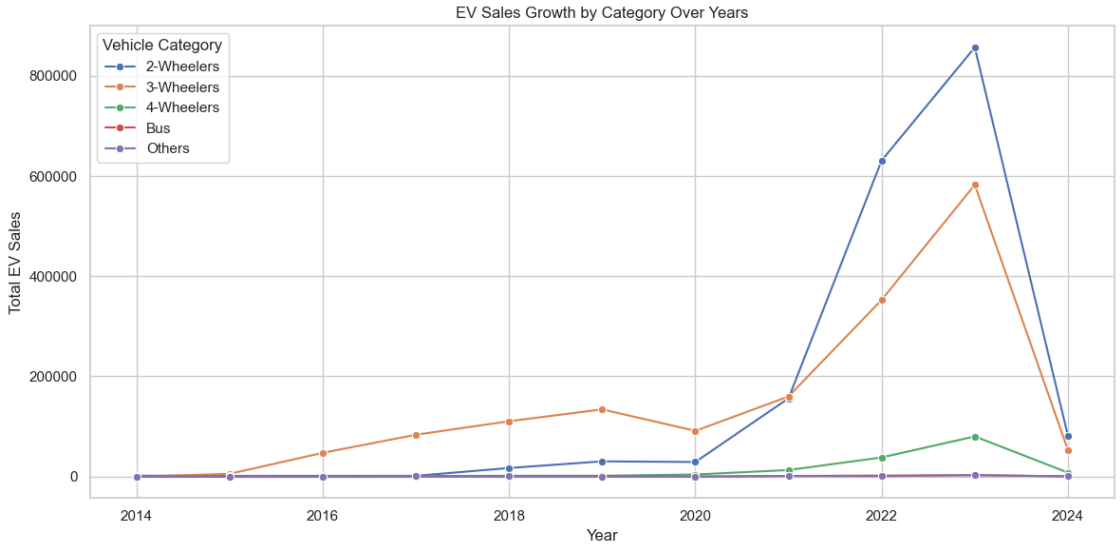


[47]:
```
df['Date'] = pd.to_datetime(df['Date']) #'Date' column is datetime
df['Month'] = df['Date'].dt.month_name()
from pandas.api.types import CategoricalDtype
month_order = CategoricalDtype(
    ['January', 'February', 'March', 'April', 'May', 'June',
     'July', 'August', 'September', 'October', 'November', 'December'],
    ordered=True
)
df['Month'] = df['Month'].astype(month_order)
monthly_sales = df.groupby('Month')['EV_Sales_Quantity'].sum()

plt.figure(figsize=(12, 6))
sns.barplot(x=monthly_sales.index, y=monthly_sales.values, palette='viridis')
plt.title('Monthly EV Sales Trend')
plt.xlabel('Month')
plt.ylabel('Total EV Sales')
```

```
plt.xticks(rotation=45)
plt.tight_layout()
plt.show()
```



[48]:
```
category_trend = df.groupby(['Year', 'Vehicle_Category'])['EV_Sales_Quantity'].
↪sum().reset_index()

plt.figure(figsize=(12, 6))
sns.lineplot(data=category_trend, x='Year', y='EV_Sales_Quantity',␣
↪hue='Vehicle_Category', marker='o')
plt.title('EV Sales Growth by Category Over Years')
plt.xlabel('Year')
plt.ylabel('Total EV Sales')
plt.grid(True)
plt.legend(title='Vehicle Category')
plt.tight_layout()
plt.show()
```



[49]:
```
## Final Summary: Electric Vehicle Sales Analysis in India

In this project, I analyzed Electric Vehicle (EV) sales data across Indian␣
 ↪states to uncover trends and insights from 2014 to 2024.

## What I Did:
- Cleaned and explored a real-world dataset containing 96,000+ entries.
- Performed visual analysis on:
  - State-wise and year-wise EV sales
  - Most sold vehicle types and categories
  - Monthly and category-wise sales trends
- Created clean and meaningful visualizations using `seaborn` & `matplotlib`.

## Key Insights:
- **Uttar Pradesh** & **Maharashtra** lead in total EV sales.
- **2-Wheelers** & **3-Wheelers** dominate the EV market.
- **Sales peak during festive season months (Oct-Dec)**.
- EV adoption has **rapidly grown** post-2021.

## Tech Stack:
- Python, pandas, matplotlib, seaborn, Jupyter Notebook

## Final Thoughts:
This project helped me:
- Strengthen my EDA and visualization skills
- Understand EV market trends in India
- Practice beginner-friendly data storytelling
```

```
  Cell In[49], line 20
    - **Sales peak during festive season months (Oct-Dec)**.
                                                           ^
SyntaxError: invalid character '-' (U+2013)
```