Tech Saksham

Case Study Report

Data Analytics with Power BI

"ANALYSIS OF COMMERCIAL ELECTRICITY CONSUMPTION IN INDIAN STATE"

"A.P.C. MAHALAXMI COLLEGE FOR WOMEN"

NM ID	NAME
0D76DC71D318753BDC1451E6E9E36893	C.AISHWARYA BHANU

Trainer Name

R UMAMAHESWARI

Master Trainer

R UMAMAHESWARI

ABSTRACT

In this case study it has been focused on using data analytics to analyse the electricity consumption of all states in India. The data was obtained and analysed to understand the trends in consumption of electricity better. The analysis was used to create visualizations and graphs that helped to identify the consumption patterns of individual states as well as the overall trends in the area. Using the Power BI tool, a dashboard is created to showcase the results. The dashboard provides valuable information such as the graphs, charts, and maps to effectively visualize the data. This information can be used by utility companies to identify areas where consumption is high and to develop strategies to reduce overall electricity consumption. This study demonstrates the value of big data analytics in understanding complex patterns and identifying opportunities for energy savings.

INDEX

CHAPTER 1

INTRODUCTION

1.1 Problem Statement

In recent years, there has been a noticeable rise in electricity consumption, driven by the increasing use of electronic devices, appliances, and industrial machinery. This trend is expected to continue in the coming years, with the growth of emerging markets and the adoption of new technologies, such as electric vehicles and renewable energy systems. To meet the growing electricity demand, utility companies are exploring new ways to optimize energy production and distribution, while minimizing waste and reducing emissions. However, this growing dependence on electricity has led to a significant increase in its consumption, placing enormous pressure on energy resources and the environment. As a result, it has become imperative to analyse and control the supply and demand of electricity, to ensure its sustainable use and reduce the impact of its production on the environment.

1.2 Proposed Solution

The proposed system for this project report involved analyzing and predicting electricity consumption based on various states in India. The need for electricity consumption was a critical issue, and the analysis of the data provided insights into consumption patterns, which could help in better energy management. The first step in the proposed system was to sort the data and then conduct a thorough analysis. The analysis involved identifying patterns and trends in the data, as well as any differences that may have existed. Once the analysis was complete, the next step was to use the insights gained from the analysis to predict future consumption patterns. To create visuals for the project, the Power BI tool was used. This allows to create dynamic and interactive visuals as well as dashboards which helps to communicate the insights gained from the analysis and predictions effectively.

1.3 Feature

- **Commercial Electricity Consumption Analysis**: The dashboard will provide data about the analysis of commercial electricity consumption in Indian states.
- **State-wise Consumption Comparison:** Provides a comparative analysis of commercial electricity consumption across different states in India.
- **Trend Analysis**: Shows the trend of commercial electricity consumption in each state, allowing to identify patterns and anomalies.
- **Visualization tools**: Present the analysis through interactive maps, charts, and gra[hs to make the data more accessible and actionable for policymakers, utilities, and business.

1.4 Advantages

- **Policy Insights:** Helps Policy makers understand the effectiveness of energy policies and make informed decisions to optimize resource allocation.
- **Resource Management:** Enables utilities to better manage energy resources, optimize, distribution networks, and mitigates supply-demand imbalances.
- **Competitive Advantage:** Provides a competitive edge for states with efficient energy policies and infrastructure, attracting investment and fostering economic growth in the commercial sector.
- **Cost Reduction:** Identifies opportunities for energy efficiency improvements, leading to cost savings for commercial establishments and reducing overall electricity expenses.

1.5 Scope

The scope is to identify factors influencing commercial electricity consumption, such as economic activity, industrial growth, population density, urbanization, and technological advancements. To conduct statistical analysis to understand patterns and correlations within the data. This may involve techniques such as regression analysis, time series analysis, and clustering to identify clusters of high consumption areas. Periodically evaluate the effectiveness of interventions and adjust strategies as necessary to address changing conditions and emerging challenges. This compares commercial electricity consumption within the state to regional and national averages.

CHAPTER 2

SERVICES AND TOOLS REQUIRED

2.1 Services Used

- **Data Aggregation and Normalization:** Summarizing data to obtain relevant statistics at the state level, such as total electricity consumption, average consumption per capita, etc. and Scaling the data to a standard range to facilitate comparison between different variables.
- **Dashboard Design:** Designing the layout and components of the dashboard, including graphs, charts, maps, and tables, to effectively visualize the data and facilitate analysis.
- **Data Visualization and Reporting:** Communicate the results of the analysis effectively through visualizations, dashboards, and comprehensive reports. This helps to understand the implications of commercial electricity consumption trends and make informed decisions.

2.2 Tools and Software used

Tools:

- **Power BI**: The main tool for this project is Power BI, which will be used to create interactive dashboards for real-time data visualization.

- **Power Query**: This is a data connection technology that enables you to discover, connect, combine, and refine data across a wide variety of sources.

Software Requirements:

- **Power BI Desktop**: This is a Windows application that you can use to create reports and publish them to Power BI.

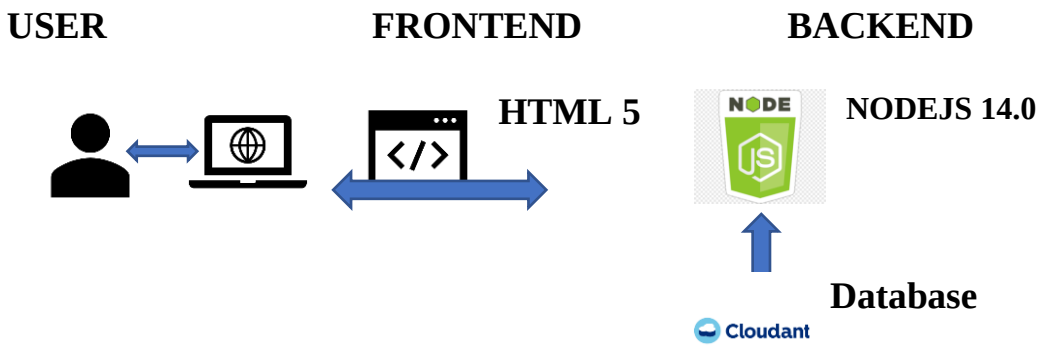
- **Power BI Service**: This is an online SaaS (Software as a Service) service that you use to publish reports, create new dashboards, and share insights.

- **Power BI Mobile**: This is a mobile application that you can use to access your reports and dashboards on the go.

CHAPTER 3

PROJECT ARCHITECTURE

3.1 Architecture



Here's a high-level architecture for the project:

1. **Data Collection**: The Data Sources are Collected from reliable sources such as government databases, energy regulatory authorities, or third-party providers also using ETL processes the data is extracted from various sources and transformed it into a consistent format
2. **Data Storage:** Store the cleaned and transformed data in a centralized repository such as a data warehouse or data lake. This allows for efficient storage and retrieval of large volumes of data.
3. **Data Processing:** Perform data processing tasks such as aggregation, filtering, and normalization to prepare the data for analysis.
4. **Data Analysis:** Conducting certain analysis to identify correlations, trends, and patterns in commercial electricity consumption and Utilizing Geographic Information Systems to analyse spatial patterns of electricity consumption across different Indian states.
5. **Data Visualization:** Utilizing the dashboarding tool, Power BI, to create interactive dashboards for visualizing the data. Designing visually appealing and informative visualizations such as charts, graphs, maps, and tables to convey insights about commercial electricity consumption.
6. **Data Access**: The dashboards created in Power BI can be accessed through Power BI Desktop, Power BI Service (online), and Power BI Mobile.

This project architecture provides a structured framework for analyzing commercial electricity consumption in Indian states, it involves a systematic approach encompassing data collection, processing, analysis, and visualization. By following this architecture, stakeholders can make informed decisions to address challenges and opportunities related to commercial electricity consumption effectively and valuable insights can be derived to understand the dynamics of electricity consumption in different states.

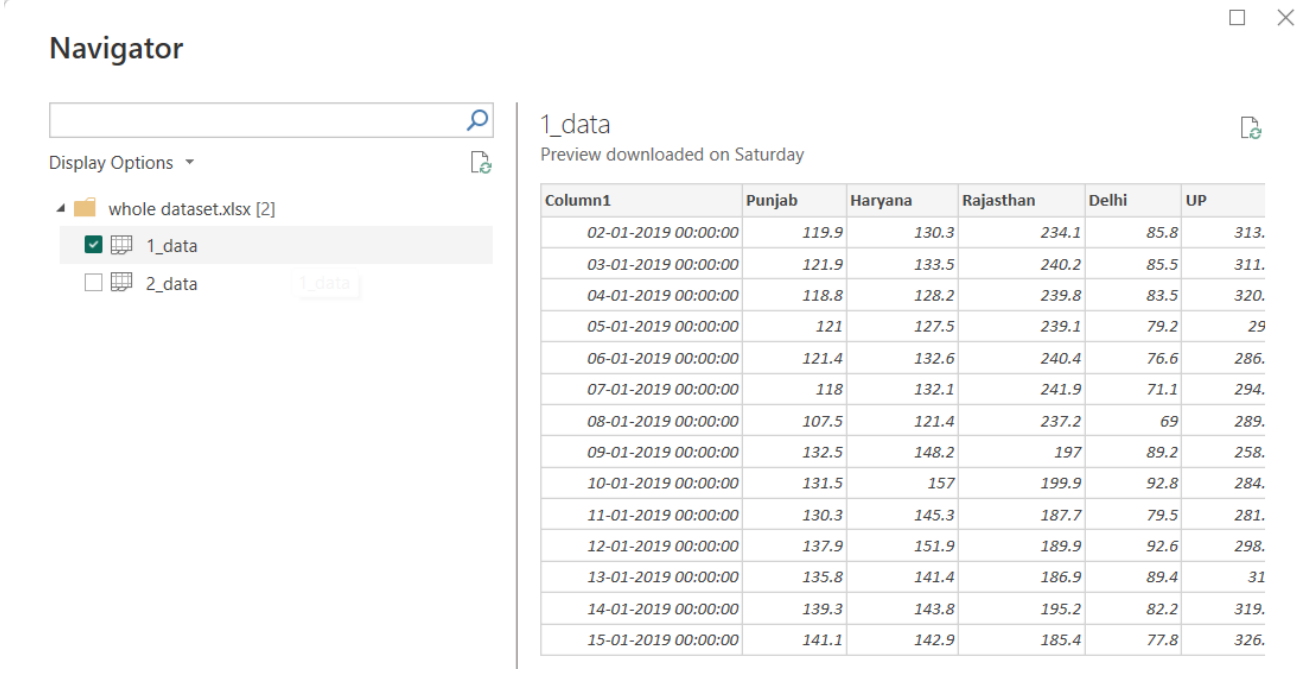
CHAPTER 4

MODELING AND RESULT

Manage relationship

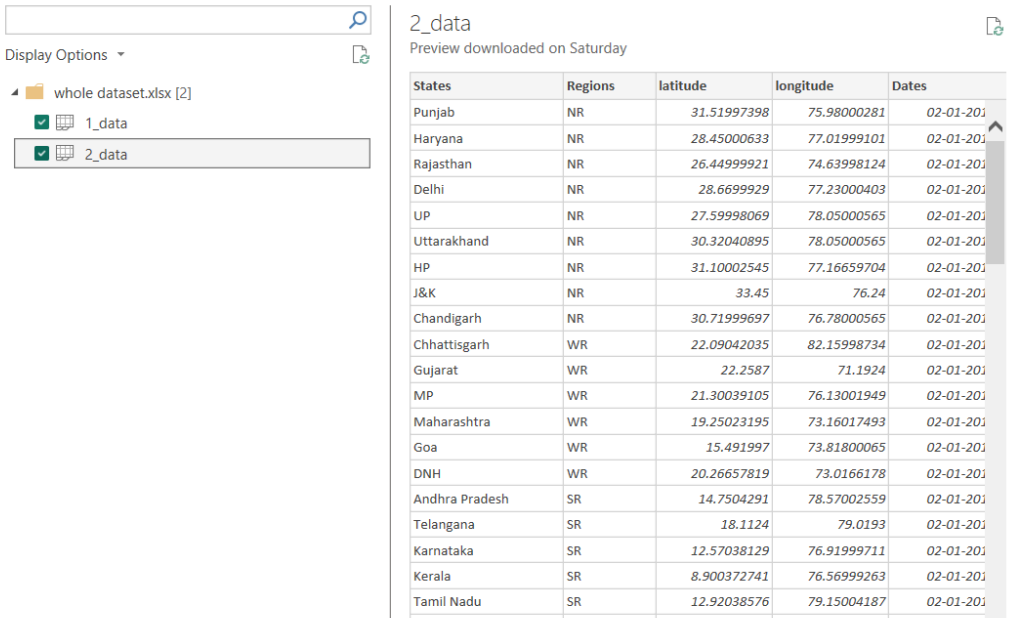
The Managing Relationships enables to establish partnerships between electricity providers and businesses to promote energy efficiency initiatives.

The Step by step process done in managing relationships are given below.



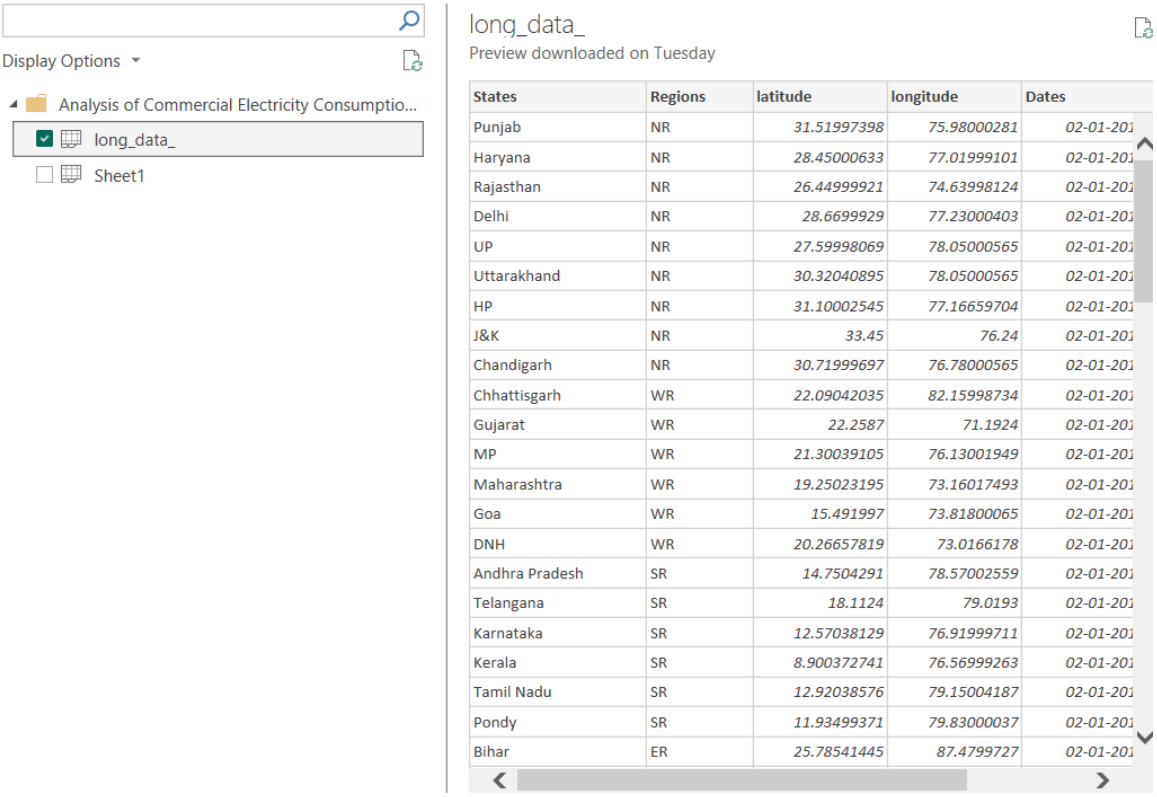
Column1	Punjab	Haryana	Rajasthan	Delhi	UP
02-01-2019 00:00:00	119.9	130.3	234.1	85.8	313.
03-01-2019 00:00:00	121.9	133.5	240.2	85.5	311.
04-01-2019 00:00:00	118.8	128.2	239.8	83.5	320.
05-01-2019 00:00:00	121	127.5	239.1	79.2	29
06-01-2019 00:00:00	121.4	132.6	240.4	76.6	286.
07-01-2019 00:00:00	118	132.1	241.9	71.1	294.
08-01-2019 00:00:00	107.5	121.4	237.2	69	289.
09-01-2019 00:00:00	132.5	148.2	197	89.2	258.
10-01-2019 00:00:00	131.5	157	199.9	92.8	284.
11-01-2019 00:00:00	130.3	145.3	187.7	79.5	281.
12-01-2019 00:00:00	137.9	151.9	189.9	92.6	298.
13-01-2019 00:00:00	135.8	141.4	186.9	89.4	31
14-01-2019 00:00:00	139.3	143.8	195.2	82.2	319.
15-01-2019 00:00:00	141.1	142.9	185.4	77.8	326.

Navigator

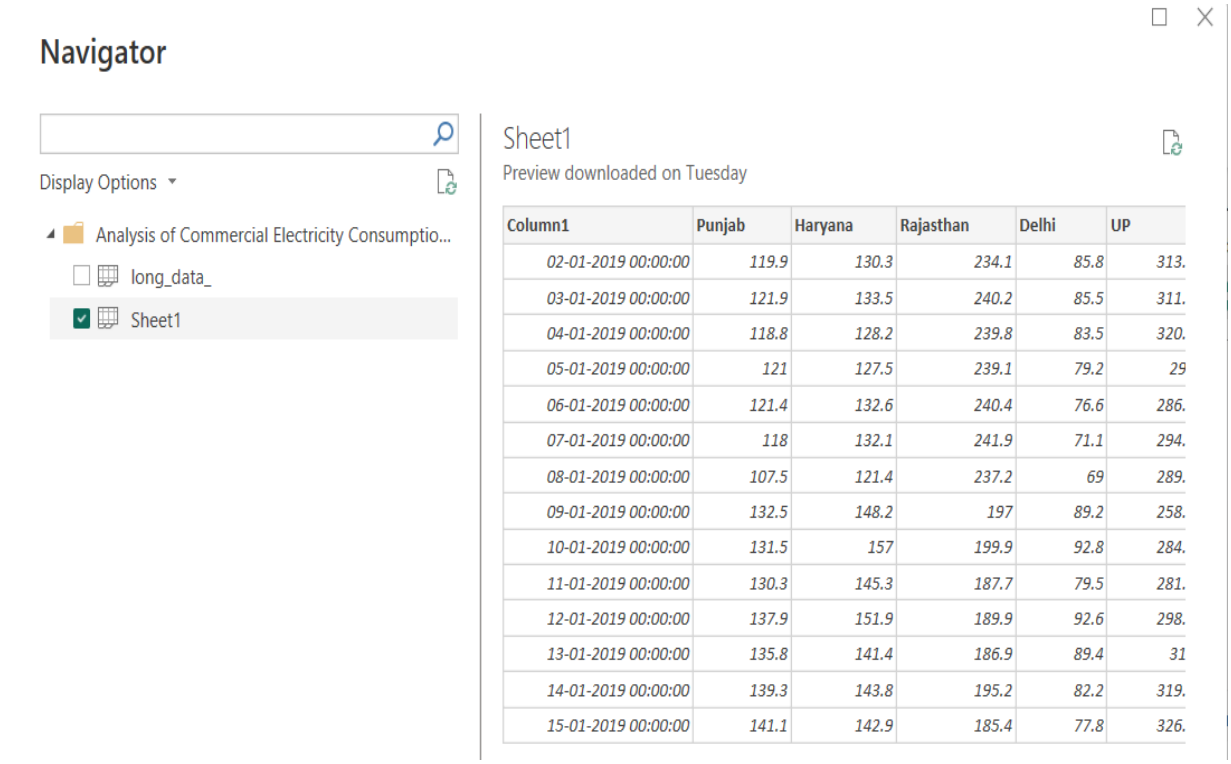


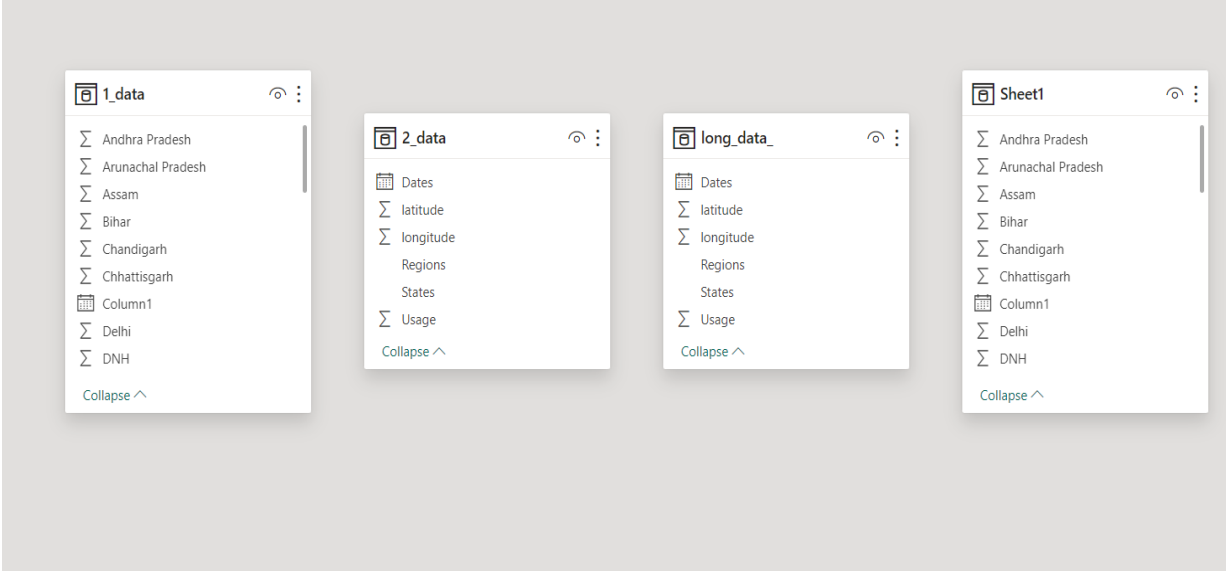
States	Regions	latitude	longitude	Dates
Punjab	NR	31.51997398	75.98000281	02-01-201
Haryana	NR	28.45000633	77.01999101	02-01-201
Rajasthan	NR	26.44999921	74.63998124	02-01-201
Delhi	NR	28.6699929	77.23000403	02-01-201
UP	NR	27.59998069	78.05000565	02-01-201
Uttarakhand	NR	30.32040895	78.05000565	02-01-201
HP	NR	31.10002545	77.16659704	02-01-201
J&K	NR	33.45	76.24	02-01-201
Chandigarh	NR	30.71999697	76.78000565	02-01-201
Chhattisgarh	WR	22.09042035	82.15998734	02-01-201
Gujarat	WR	22.2587	71.1924	02-01-201
MP	WR	21.30039105	76.13001949	02-01-201
Maharashtra	WR	19.25023195	73.16017493	02-01-201
Goa	WR	15.491997	73.81800065	02-01-201
DNH	WR	20.26657819	73.0166178	02-01-201
Andhra Pradesh	SR	14.7504291	78.57002559	02-01-201
Telangana	SR	18.1124	79.0193	02-01-201
Karnataka	SR	12.57038129	76.91999711	02-01-201
Kerala	SR	8.900372741	76.56999263	02-01-201
Tamil Nadu	SR	12.92038576	79.15004187	02-01-201

Navigator

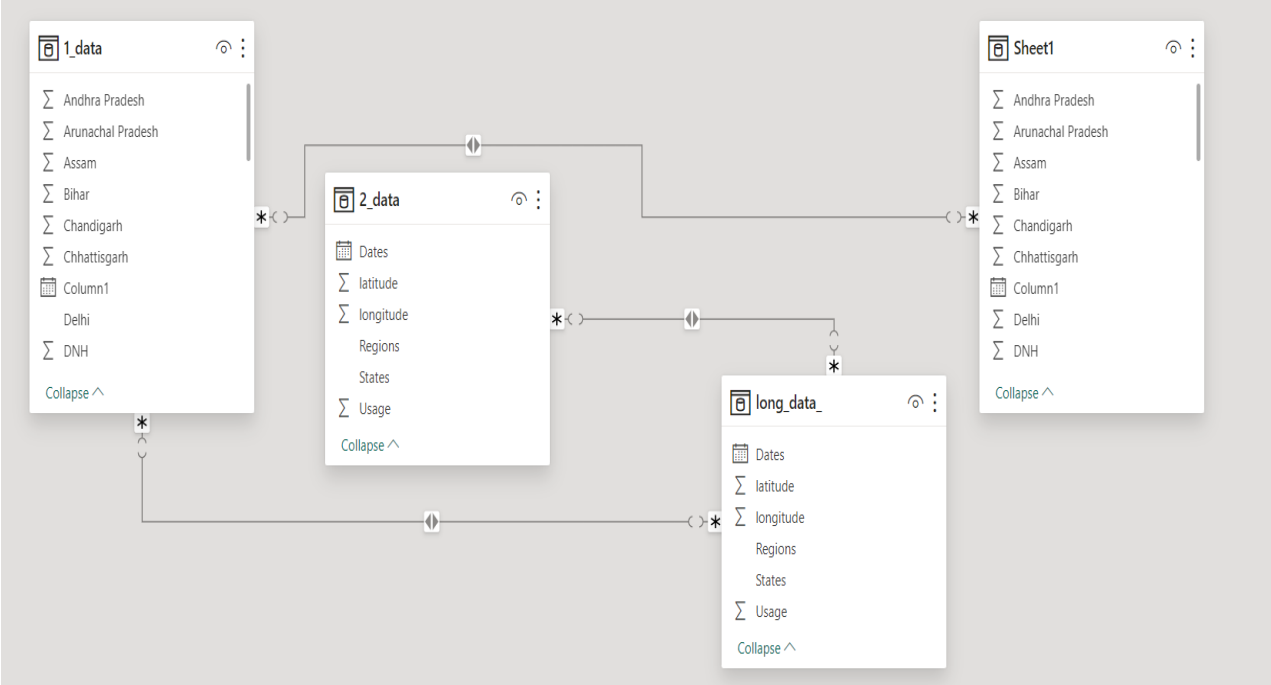


States	Regions	latitude	longitude	Dates
Punjab	NR	31.51997398	75.98000281	02-01-201
Haryana	NR	28.45000633	77.01999101	02-01-201
Rajasthan	NR	26.44999921	74.63998124	02-01-201
Delhi	NR	28.6699929	77.23000403	02-01-201
UP	NR	27.59998069	78.05000565	02-01-201
Uttarakhand	NR	30.32040895	78.05000565	02-01-201
HP	NR	31.10002545	77.16659704	02-01-201
J&K	NR	33.45	76.24	02-01-201
Chandigarh	NR	30.71999697	76.78000565	02-01-201
Chhattisgarh	WR	22.09042035	82.15998734	02-01-201
Gujarat	WR	22.2587	71.1924	02-01-201
MP	WR	21.30039105	76.13001949	02-01-201
Maharashtra	WR	19.25023195	73.16017493	02-01-201
Goa	WR	15.491997	73.81800065	02-01-201
DNH	WR	20.26657819	73.0166178	02-01-201
Andhra Pradesh	SR	14.7504291	78.57002559	02-01-201
Telangana	SR	18.1124	79.0193	02-01-201
Karnataka	SR	12.57038129	76.91999711	02-01-201
Kerala	SR	8.900372741	76.56999263	02-01-201
Tamil Nadu	SR	12.92038576	79.15004187	02-01-201
Pondy	SR	11.93499371	79.83000037	02-01-201
Bihar	ER	25.78541445	87.4799727	02-01-201



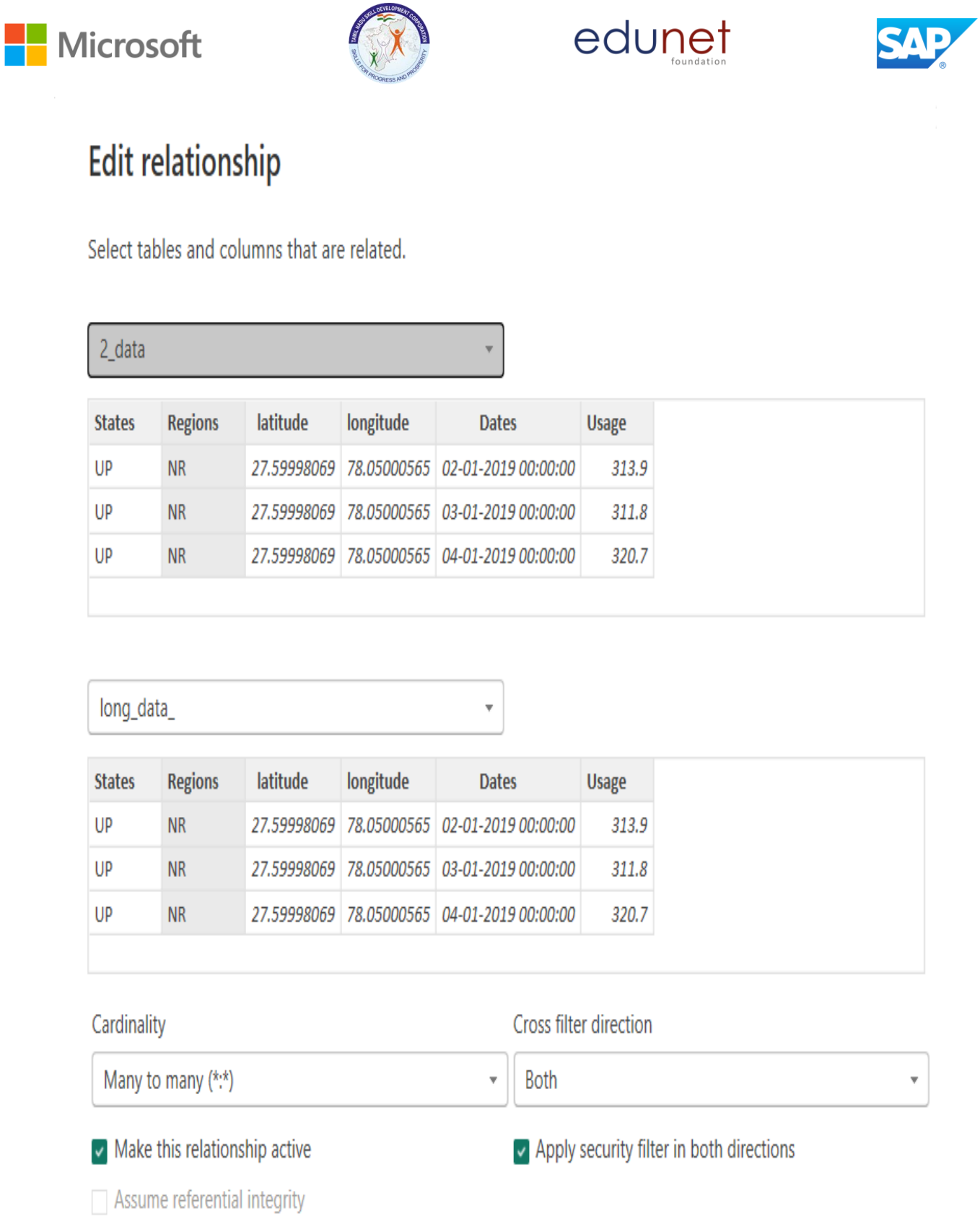


The required data sets are loaded in the Power BI and the managing relationships between the datasets are defined.



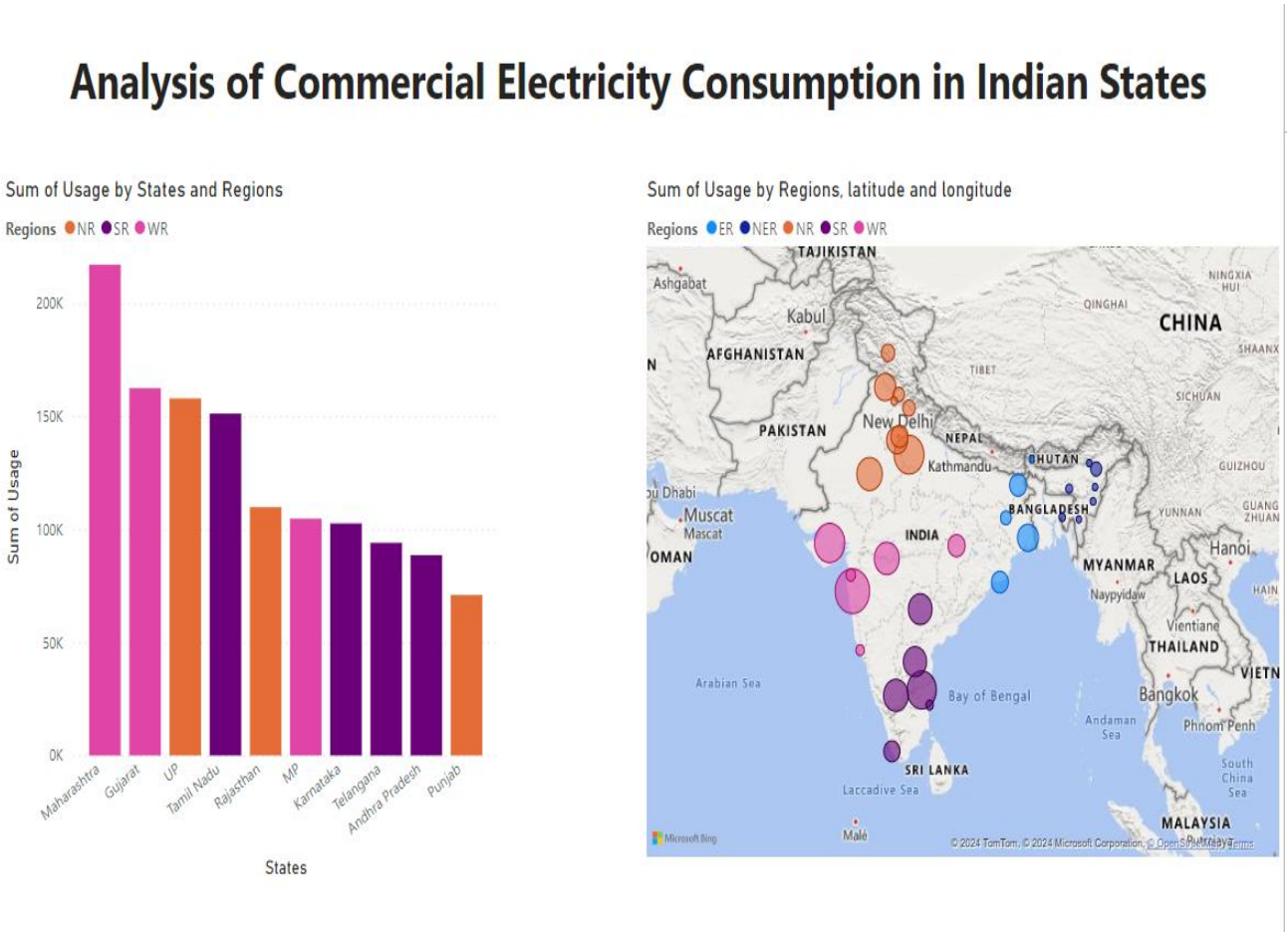
Manage relationships

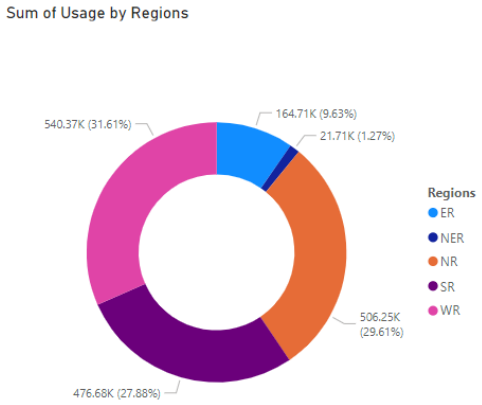
Active	From: Table (Column)	To: Table (Column)
☑	1_data (Delhi)	long_data_ (States)
☑	1_data (Punjab)	Sheet1 (Punjab)
☑	2_data (Regions)	long_data_ (Regions)

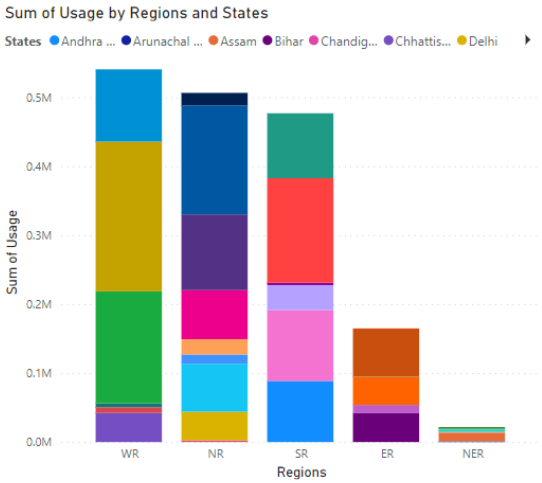


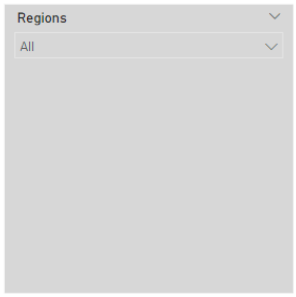
Dashboard

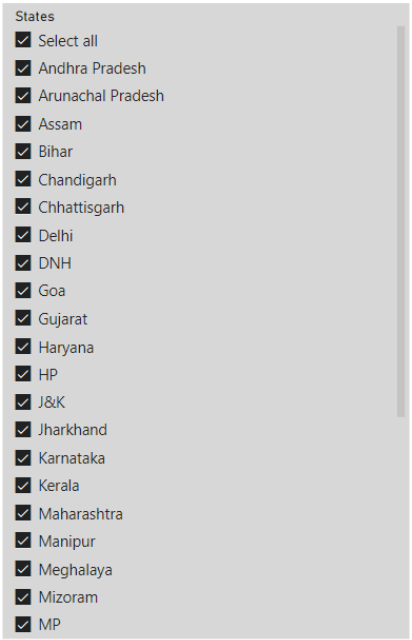
OBJECTIVE: *ANALYSIS OF COMMERCIAL ELECTRICITY CONSUMPTION IN INDIAN STATES*

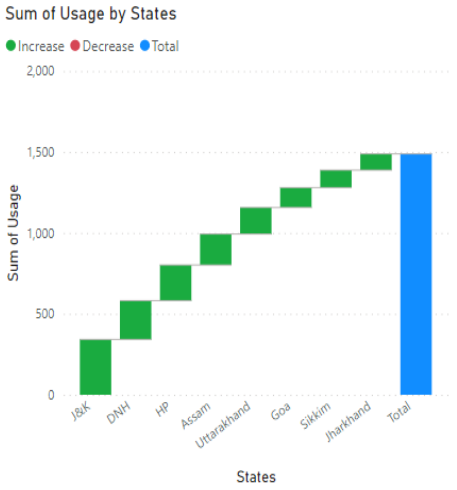


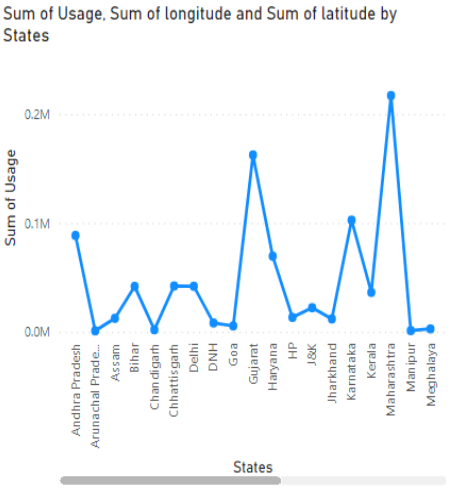


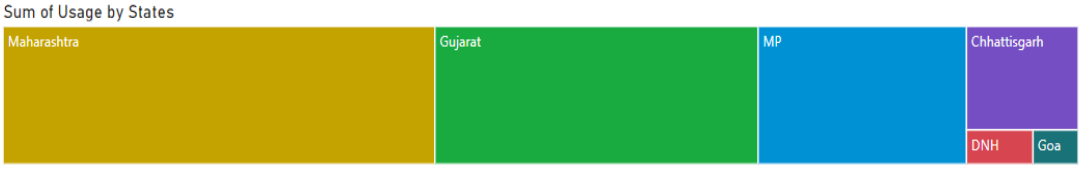


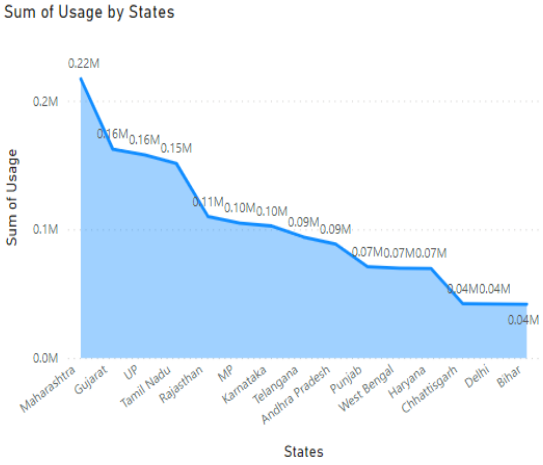


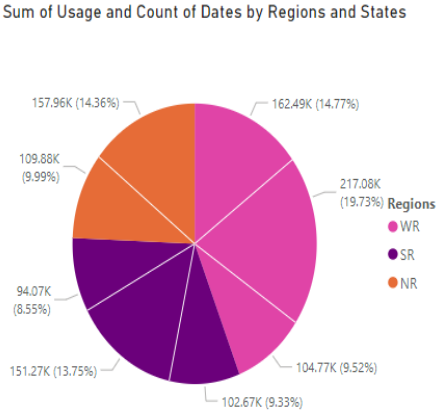












CONCLUSION

The project “Analysis of Commercial Electricity Consumption in Indian States” using Power BI provides valuable insights into energy usage patterns and trends. Identifying variations in commercial electricity consumption among different Indian states, highlighting regions with higher or lower usage rates. This could lead to further investigation into the underlying factors driving these disparities, such as economic development, industrial activity, or infrastructure. Understanding seasonal fluctuations in commercial electricity consumption, which could inform energy planning and resource allocation strategies. For example, identifying peak demand periods and implementing measures to manage load more effectively. Using historical consumption data to forecast future electricity demand in the commercial sector, helping utilities and policymakers anticipate infrastructure needs and plan for future energy generation capacity. Identifying opportunities for energy efficiency improvements and cost savings within the commercial sector, such as through the adoption of energy-efficient technologies or behavioural changes. Overall, by leveraging Power BI and creating a comprehensive dashboard, stakeholders can gain actionable insights into commercial electricity consumption in Indian states, enabling informed decision-making and targeted interventions to promote sustainable energy use and economic development.

FUTURE SCOPE

The “Analysis of Commercial Electricity Consumption in Indian States” offers promising future prospects. Future iterations of the analysis can incorporate predictive modeling techniques to forecast commercial electricity consumption trends. By leveraging historical data, demographic factors, economic indicators, and climate projections, stakeholders can anticipate future demand patterns and plan infrastructure investments accordingly. Integrating real-time data streams into the Power BI dashboard enables continuous monitoring of electricity consumption patterns. This dynamic approach allows utilities to respond promptly to fluctuations in demand, optimize grid operations, and implement demand-side management strategies to enhance system reliability and efficiency. The dashboard can be expanded to include benchmarks for energy efficiency performance across different commercial sectors and regions. The Power BI dashboard enables stakeholders to explore spatial relationships and identify localized consumption patterns. Tracking the key performance indicators over time, policymakers can assess the impact of policy interventions and refine strategies to achieve long-term energy and climate objectives. In conclusion, the future scope of analyzing commercial electricity consumption in Indian states using Power BI and Power Query dashboard is vast. By embracing advanced analytics techniques, real-time monitoring capabilities, and a holistic approach to data-driven decision-making, stakeholders can unlock new opportunities for enhancing energy efficiency, promoting renewable energy adoption, and building a more resilient and sustainable energy infrastructure for India's future.

REFERENCES

https://www.researchgate.net/publication/354401757_A_Study_on_Major_Commercial_Energy_Consumption_in_India

---

