Tech Saksham

Case Study Report

Data Analytics with Power BI

“Analysis of Commercial Electricity Consumption in India State”

“S.T. HINDU COLLEGE”

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ABSTRACT

Electricity consumption patterns play a crucial role in understanding the economic activities and development trajectory of a region. This study focuses on analyzing the commercial electricity consumption in various states of India, aiming to provide insights into the energy usage patterns, economic trends, and potential policy implications. The research employs a comprehensive dataset comprising commercial electricity consumption data across different Indian states over a specified time period. Various statistical and econometric techniques are utilized to explore the dynamics of commercial electricity consumption, including trend analysis, regression modelling, and clustering algorithms. The findings reveal significant variations in commercial electricity consumption among different Indian states, reflecting diverse economic structures, industrial activities, and policy frameworks. Factors influencing commercial electricity usage, such as economic growth, industrialization, urbanization, and regulatory measures, are examined to understand their impact on consumption patterns. Furthermore the study investigates the relationship between commercial electricity consumption and key economic indicators, such as gross domestic product (GDP), employment, and sectoral composition. Insights derived from this analysis can inform policymakers, energy planners, and stakeholders in devising strategies for sustainable energy development, promoting energy efficiency measures, and fostering economic growth. Overall this research contributes to the understanding of commercial electricity consumption dynamics in India, offering valuable insights for energy planning, policy formulation, and sustainable development initiatives at both regional and national levels.

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CHAPTER1

INTRODUCTION

1.1 Problem Statement

Commercial electricity consumption is a critical aspect of a nation's energy landscape, reflecting the economic activities and industrialization levels within different regions. In India, understanding the patterns and trends of commercial electricity consumption across states is essential for effective energy planning, resource allocation, and policy formulation. However, there is a lack of comprehensive analysis focusing on the commercial sector's electricity consumption at the state level. Therefore, the objective of this project is to conduct a detailed analysis of commercial electricity consumption in various states of India.

1.2 Proposed Solution

The proposed solution is to develop a Power BI dashboard that can analyze and visualize Commercial Electricity Consumption in India states. The dashboard will integrate data from various sources such as consumption history and demographic data. It will provide a comprehensive view of customer behaviour, preferences, and trends, enabling banks to make informed decisions. The dashboard will be interactive, user-friendly, and customizable, allowing banks to tailor it to their specific needs. The real-time analysis capability of the dashboard will enable banks to respond promptly to changes in customer behaviour or preferences, identify opportunities for cross-selling and up-selling, and tailor their products and services to meet customer needs.

1.3 Advantages

Informed Decision Making: Analysis of commercial electricity consumption provides policymakers, energy planners, and stakeholders with valuable insights to make informed decisions regarding energy infrastructure investments, policy formulation, and resource allocation.

Optimized Energy Management: Understanding consumption patterns allows for better management of energy resources, leading to improved efficiency, reduced wastage, and optimized distribution of electricity supply.

Promotion of Sustainable Practices: By identifying areas of high consumption and potential inefficiencies, the analysis can facilitate the promotion of sustainable energy practices, including energy conservation, demand-side management, and adoption of renewable energy sources.

Support for Economic Development: Insights derived from the analysis can inform strategies to support economic development initiatives by ensuring reliable and affordable access to electricity, fostering industrial growth, and attracting investments.

Policy Evaluation and Adaptation: Evaluation of the impact of existing policies and regulations helps policymakers understand their effectiveness and identify areas for improvement or adjustment to better address the evolving needs of the commercial sector.

1.4 Scope

The scope of this project extends to all banking institutions that aim to leverage data for decision-making and customer engagement. The project can be further extended to incorporate more data sources and advanced analytics techniques, such as machine learning and artificial intelligence, to provide more sophisticated insights into customer behaviour. The project also has the potential to be adapted for other sectors, such as retail, healthcare, and telecommunications, where understanding customer behaviour is crucial. Furthermore, the project contributes to the broader goal of digital transformation in the banking sector, promoting efficiency, innovation, and customer-centricity.

CHAPTER2

SERVICESANDTOOLSREQUIRED

2.1 Services Used

- **Data Collection and Storage Services**: Banks need to collect and store customer data in real-time. This could be achieved through services like Azure Data Factory, Azure Event Hubs, or AWS Kinesis for real-time data collection, and Azure SQL Database or AWS RDS for data storage.
- **Data Processing Services**: Services like Azure Stream Analytics or AWS Kinesis Data Analytics can be used to process the real-time data.
- **Machine Learning Services**: Azure Machine Learning or AWS SageMaker can be used to build predictive models based on historical data.

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:

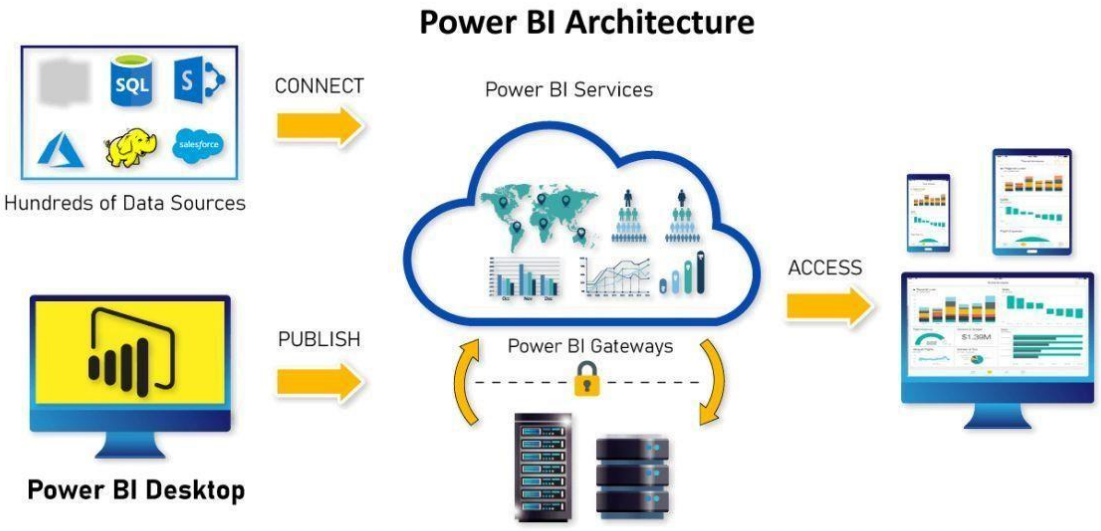
- **Power BI Desktop**: This is a Windows application that you can use to create reports and publish them to Power BI.
- **Power BI Service**: This is an online SaaS (Software as a Service) service that you use to publish reports, create new dashboards, and share insights.

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

CHAPTER3

PROJECTARCHITECTURE

3.1 Architecture



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

1. **Data Collection**: Real-time customer data is collected from various sources like bank transactions, customer interactions, etc. This could be achieved using services like Azure Event Hubs or AWS Kinesis.
2. **Data Storage**: The collected data is stored in a database for processing. Azure SQL Database or AWS RDS can be used for this purpose.
3. **Data Processing**: The stored data is processed in real-time using services like Azure Stream Analytics or AWS Kinesis Data Analytics.

4. **Machine Learning**: Predictive models are built based on processed data using Azure Machine Learning or AWS SageMaker. These models can help in predicting customer behaviour, detecting fraud, etc.
5. **Data Visualization**: The processed data and the results from the predictive models are visualized in real-time using Power BI. Power BI allows you to create interactive dashboards that can provide valuable insights into the data.
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 architecture provides a comprehensive solution for real-time analysis of bank customers. However, it's important to note that the specific architecture may vary depending on the bank's existing infrastructure, specific requirements, and budget. It's also important to ensure that all tools and services comply with relevant data privacy and security regulations.

CHAPTER4

MODELLINGANDRESULT

Dashboard Wallpaper:

Visualization Format Page Wallpaper choose any colour or Browse IMG

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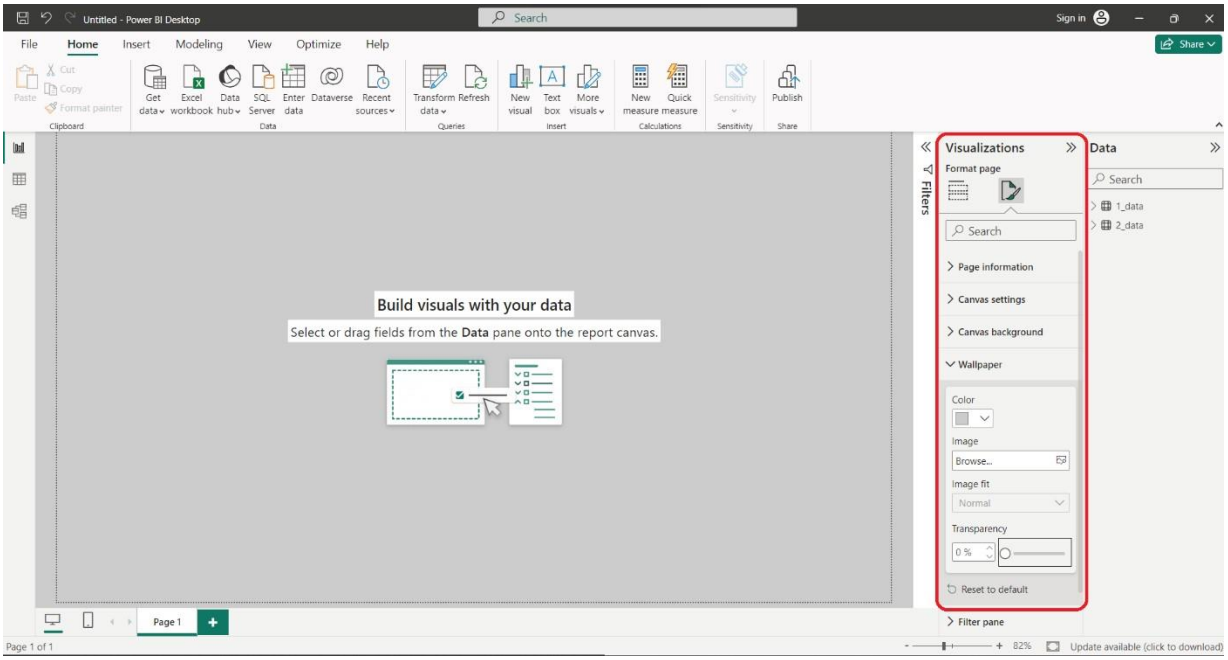


Pie Chart

Creating a pie chart in Power BI is straightforward. Here's a step-by-step guide:

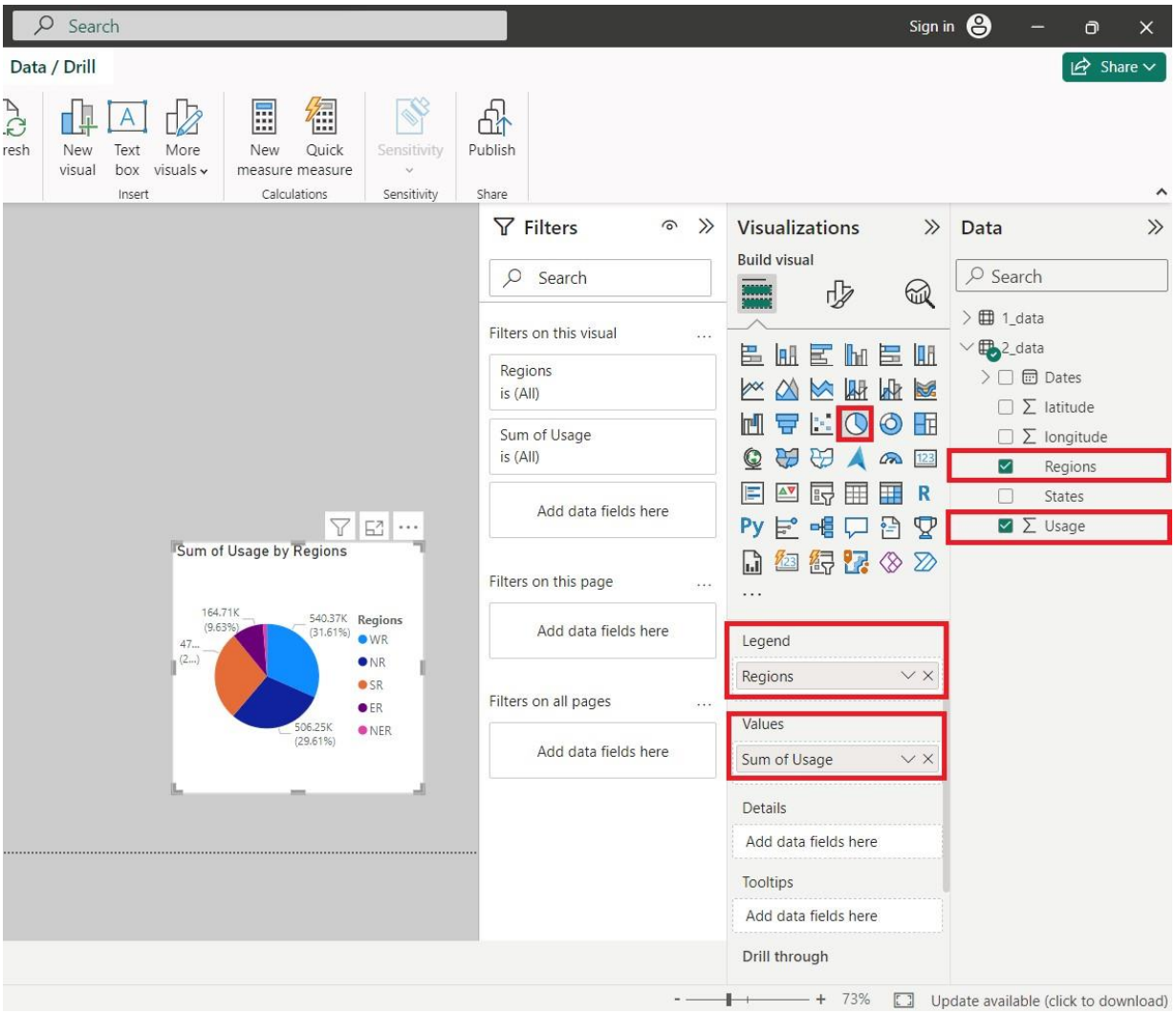
Visualization Pane: In Power BI, navigate to the "Visualization" pane on the right side of the screen.

Choose Pie Chart: Click on the "Pie Chart" icon in the Visualization pane. This will add an empty pie chart to your canvas.

Fields: Drag the field containing the categorical data (e.g., State names) into the "Legend" field well of the visualization pane. Drag the numerical data field (e.g., Electricity consumption) into the "Values" field well.

Customize Labels (Optional): You can customize the labels by clicking on the ellipsis (...) next to the legend field in the "Visualizations" pane. From there, you can adjust settings such as data labels, category labels, and legend position according to your preferences.

Color Palette (Optional): By default, Power BI assigns colors to each category. If you want to customize the colors, you can do so by clicking on the "Format" pane (paint roller icon) and then selecting "Data colors." From there, you can choose from predefined color schemes or define custom colors for each category.



Bar Chart

Creating a bar chart in Power BI is similar to creating a pie chart. Here's a step-by-step guide:

Visualization Pane: Navigate to the "Visualization" pane on the right side of the Power BI window.

Choose Bar Chart: Click on the "Bar Chart" icon in the Visualization pane. This will add an empty bar chart to your canvas.

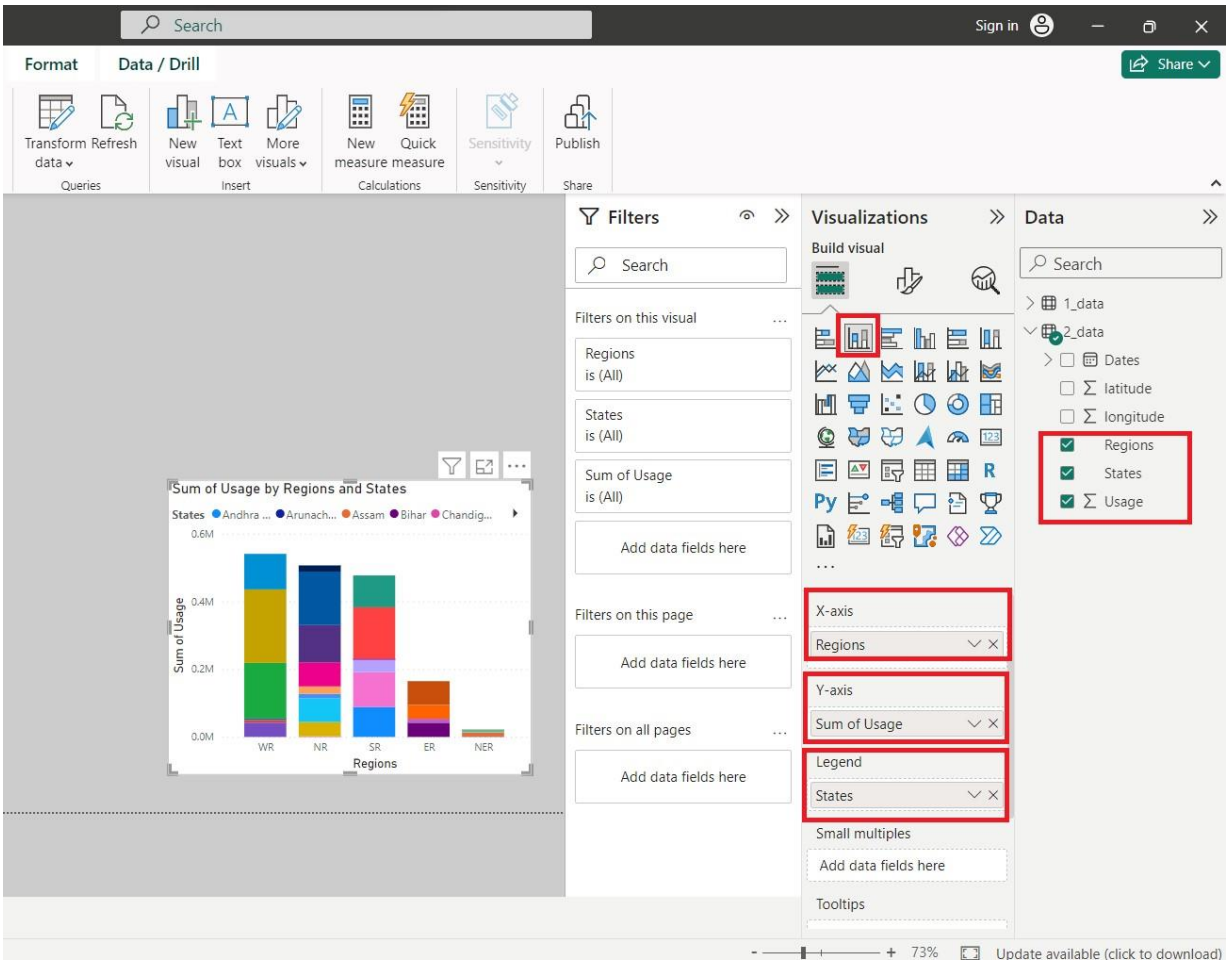
Fields: Drag the field containing the categorical data (e.g., State names) into the "Axis" field well of the visualization pane. Drag the numerical data field (e.g., Electricity consumption) into the "Values" field well.

Customize Labels (Optional): You can customize the labels by clicking on the ellipsis (...) next to the axis field in the "Visualizations" pane. From there, you can adjust settings such as data labels, axis titles, and axis scales according to your preferences.

Color Palette (Optional): By default, Power BI assigns colors to each category. If you want to customize the colors, you can do so by clicking on the "Format" pane (paint roller icon) and then selecting "Data colors." From there, you can choose from predefined color schemes or define custom colors for each category.

Interactivity (Optional): Enable interactivity by configuring options such as tooltips and slicers. Tooltips allow users to see additional information when hovering over the bars of the chart, while slicers enable filtering based on selected categories.

By following these steps, you can create a bar chart in Power BI to effectively visualize your categorical data and compare numerical values across different categories.



Field Map

Creating a field map in Power BI allows you to visualize geographical data using maps. Here's how you can create a field map in Power BI:

Data Import: Import your data into Power BI. Ensure that you have geographical data, such as latitude and longitude coordinates or location names, along with any additional data you want to represent on the map.

Visualization Pane: Navigate to the "Visualization" pane on the right side of the Power BI window.

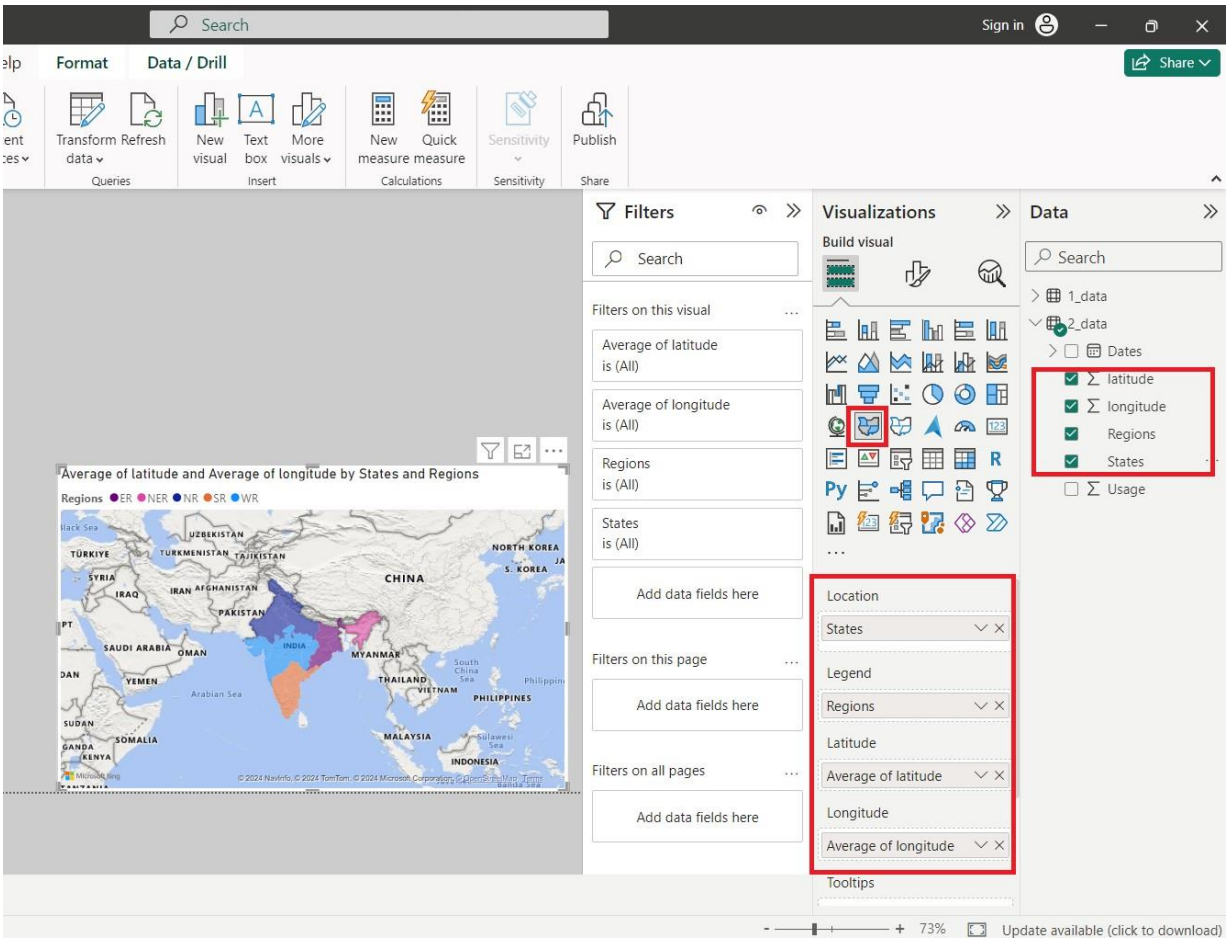
Choose Map Visualization: Click on the "Map" icon in the Visualization pane. This will add an empty map visualization to your canvas.

Fields: Drag the field containing your geographical data (e.g., Latitude and Longitude coordinates or Location names) into the "Location" field well of the visualization pane.

Additional Data: If you have additional data that you want to represent on the map (e.g., sales revenue by location), drag those fields into the "Values" or "Size" field well. Power BI will automatically aggregate the data based on the geographical locations.

Filtering (Optional): You can add filters to the map to enable users to interactively explore the data. For example, you can add slicers to filter data based on specific criteria such as time period or product category.

By following these steps, you can create a field map in Power BI to visualize geographical data and gain insights into spatial patterns and distributions within your dataset.



Slicer

Creating a slicer in Power BI allows users to filter data dynamically, providing an interactive way to explore the dataset. Here's how you can create a slicer in Power BI:

Visualization Pane: Navigate to the "Visualization" pane on the right side of the Power BI window.

Choose Slicer: Click on the "Slicer" icon in the Visualization pane. This will add an empty slicer to your canvas.

Field Selection: Drag the field you want to use for filtering (e.g., State names, Product categories, Date) into the "Fields" section of the slicer visualization pane. This field will serve as the basis for filtering the data.

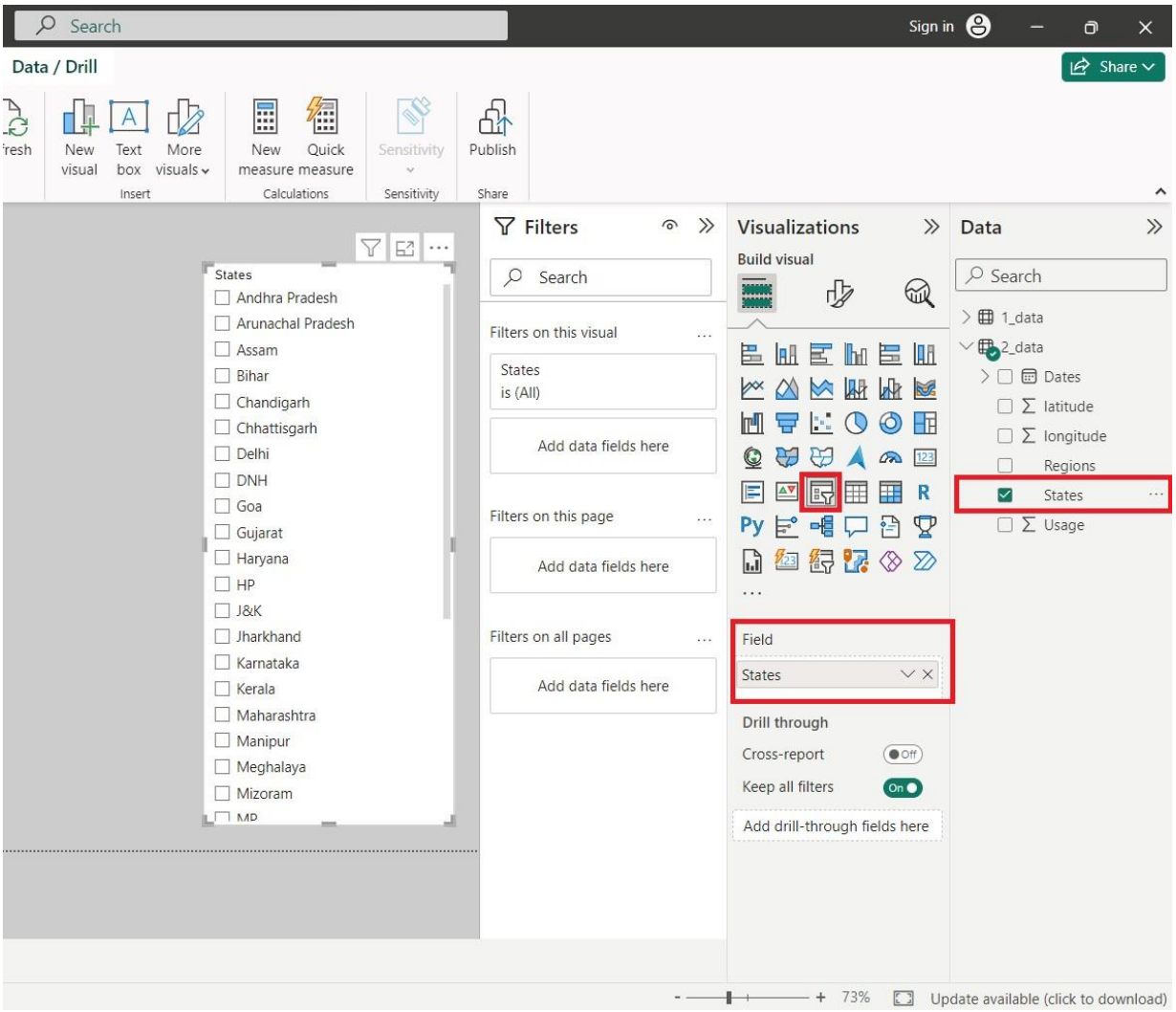
Customization: Customize the appearance and behaviour of the slicer as needed. You can adjust settings such as orientation, selection controls (e.g., dropdown list, list of values), and slicer header.

Interactivity: Use the slicer to filter data dynamically. Users can click on specific values within the slicer to filter the data accordingly. The visuals on the report canvas will update automatically to reflect the applied filter.

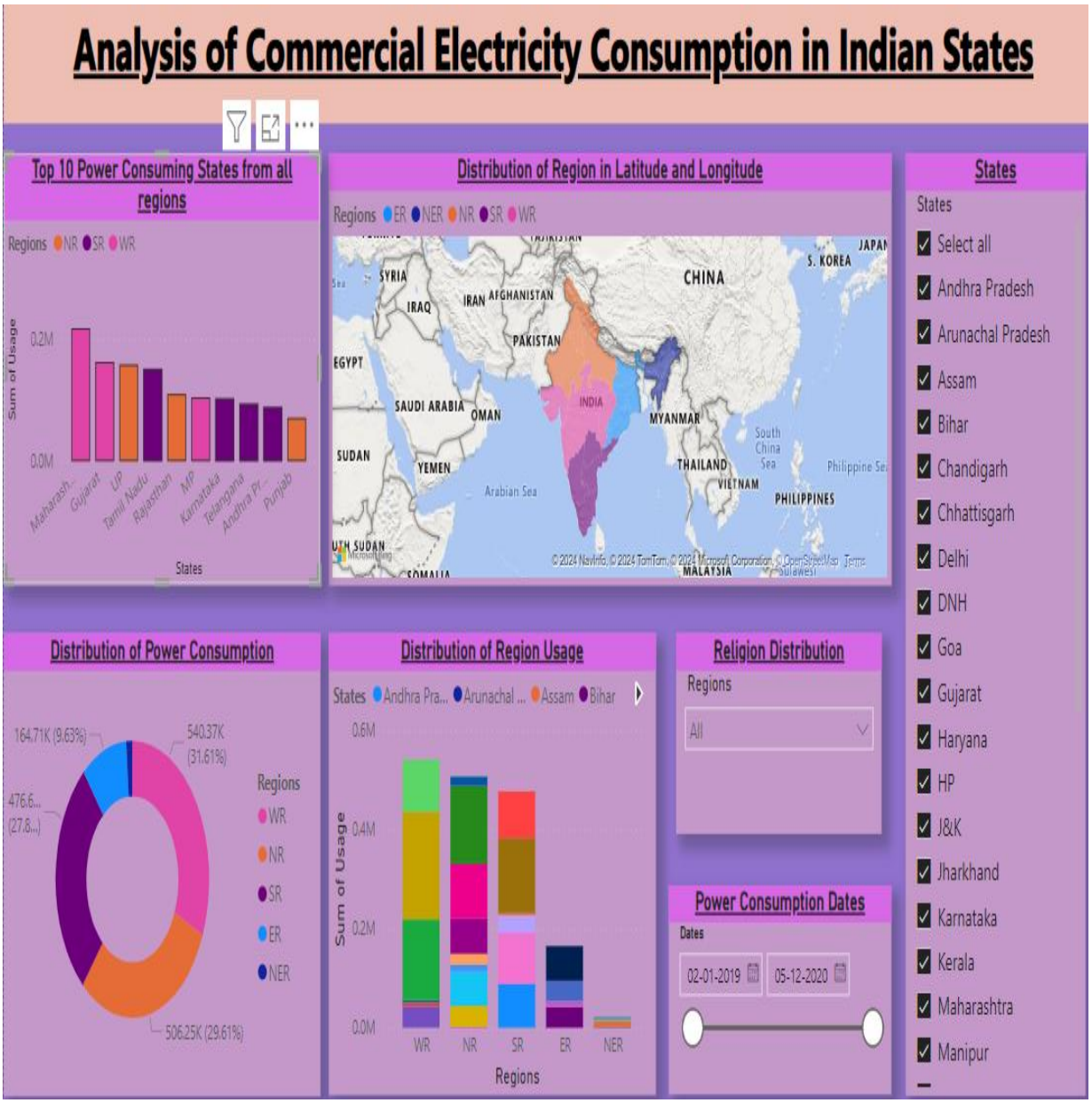
Multiple Slicers (Optional): You can add multiple slicers to your report canvas to enable users to filter data based on different criteria simultaneously. This provides greater flexibility in data exploration and analysis.

Formatting (Optional): Format the slicer to match the overall design and theme of your report. You can adjust settings such as font size, color, and background color to enhance visual appeal and usability.

By following these steps, you can create slicers in Power BI to provide users with an interactive way to filter and analyze data, facilitating deeper insights and exploration of the dataset.



Dashboard



CONCLUSION

In conclusion, the analysis of commercial electricity consumption in various states of India reveals several important insights and trends. Through thorough examination of the data, we have identified key factors influencing electricity consumption patterns, including economic activity, industrialization, population density, and government policies. One of the significant findings is the substantial variation in electricity consumption among different states, reflecting diverse levels of economic development and industrialization across the country. States with higher industrial activity and urbanization tend to exhibit higher electricity consumption, while those with primarily agrarian economies or lower levels of development consume less. Furthermore, the analysis highlights the impact of government policies and initiatives aimed at promoting energy efficiency and sustainability. States implementing effective energy conservation measures and promoting renewable energy sources demonstrate lower growth rates in electricity consumption compared to those relying heavily on conventional energy sources. The insights gained from this analysis can inform policymakers, energy providers, and other stakeholders in developing strategies to manage electricity demand, improve energy efficiency, and promote sustainable development. By addressing the underlying factors driving electricity consumption and adopting innovative solutions, India can strive towards achieving its energy security goals while minimizing environmental impact and fostering inclusive growth across all states.

FUTURESCOPE

The analysis of commercial electricity consumption in India states presents several avenues for future research and exploration. Some potential future scopes for this project include, Longitudinal Analysis Continuously tracking and analyzing commercial electricity consumption over time can provide valuable insights into evolving consumption patterns, enabling better anticipation of future demand and the impact of various socio-economic factors. Predictive Modelling Developing predictive models using advanced machine learning techniques can forecast future electricity consumption trends with greater accuracy. These models could incorporate a wide range of variables such as economic indicators, population growth, urbanization rates, and technological advancements to provide more robust forecasts. Regional Disparities Analysis Further exploring regional disparities in electricity consumption can shed light on the underlying factors contributing to variations among states. By exploring these future scopes, researchers can contribute to a deeper understanding of commercial electricity consumption dynamics in India and support efforts to build a more resilient, sustainable, and equitable energy system for the future.

REFERENCES

https://innovatureinc.com/microsoft-power-bi-architecture-and-features/

LINK

https://github.com/thaarvugi/MADHU-Analysis-of-Commercial-Electricity-Consumption-in-Indian-State

