# 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 |
|---|---|
| 250F80F587387F94AA41D279F089B2E | M. NISHA |

Trainer: A. Uma Maheshwari

Master trainer: A. Uma Maheshwari

# ABSTRACT

The demand for energy has been increasing over the years in India,whichmaybethe resultofitsrapideconomicgrowthtrajectory.Inthiscontext,thisstudyexaminesthe direction of the Granger-causal relationship between electricity consumption and economic growth at the state and sectoral levels in India. In doing so, the panel cointegration tests with the structural break, the heterogeneous panelcausalitytest, and the panel VAR based impulse-response model are employed.

Further,theresultsprovideevidenceforthepresenceofunidirectional Granger-causalityflowinginthedirectionofoveralleconomicgrowthtoelectricity consumption at the aggregate state level.

# INDEX




# CHAPTER 1

# INTRODUCTION

- **ProblemStatement**

An important property of the electricity grid is that productionmust be carefully matched to consumption in order to keepvoltage and frequency stable and avoid damaging expensiveinfrastructure. On the other hand, customer activities, needs,and desires, as well as weather, shape the patterns of elec-tricity use, which vary seasonally and hourly. These patternstypically result in high concentrations of electricity use in“peak periods”. The larger the peak demand, the greater theamount of electrical resources (distribution, transmission, andgeneration assets) that are needed to meet it.

- **ProposedSolution**

The proposed solution involves leveraging data analytics techniques with data sourced from the cloud and web to conduct an in-depth analysis of commercial electricity consumption in an Indian state.As we know, developing country like India has been promoting itself by enhancing various initiatives on all sectors and regions to achieve economic targets and for prepare to meet global competition for proclaim efficient nation. Accumulation of changes in energy consumption especially commercialenergy pointedis indirectlyspurstheproblemsontheconsumptionofnon-commercial energy regularly consumes by ruralpeople.Though,initiationof various commercialenergy isalwayssupportstoeconomicgrowthanditneverever makeworsentothatyetlookingforanothertrendofconsumptioninnon-commercial type and its reflects amongtheruralhave toconsiderandnecessarystepsneed toexecuteforthesupportof primaryenergy consumers and to boost economy level.Visualizationtoolswillbeusedtopresentfindingscomprehensively,facilitating

informed decision-making, while continuous monitoring will ensure ongoing optimization of energy resources and efficiency initiatives.

- **Feature**

- **Utilisationpatterns:**Analyzepeakandoff-peakconsumptiontimestoidentify trends in commercial electricity usage, aiding in resource allocation and infrastructureplanning.

- **Sectoral Breakdown :** Segment consumption data by industry sectors to understandwhichsectorsarethelargestconsumers,enablingtargetedenergy efficiency initiatives and tariff structure.

- **SeasonalVariation:**Evaluateseasonalfluctuationsinelectricitydemandto anticipatefuturedemands,optimizesupplychainmanagement,andimplement demand-side management strategies.

- **Advantages**

- **EnchanceResourceManagement:**Electricitymanagementisavasttopicin environmentalsciencethatdealswiththecontrol,monitoring,andconservation of energy consumption. This not only includes efficiency in consumption but also the creation and distribution of electric power.

- **ProactiveDecision -Making:** Byleveragingcloud/web-baseddataanalytics, stakeholderscanproactivelyidentifyconsumptionpatterns,anticipatedemand fluctuations, and plan infrastructure upgrades or maintenance activities accordingly.Thisproactiveapproachenhancesgridstability,reduces downtime, and enhances overall operational efficiency.

- **Scope**

BasedonrecentdatafromtheCentralElectricityAuthority(CEA), the peak power demand is expected to reach 230 GW by 2035. Meetingthisdemandrequiresstrategiccapacityadditionandrobust infrastructure development.

Powering India: an analysis of commercial electricity consumption in an Indian state using data analytics sourced from cloud or web platforms would entail examining trends, patterns, and factors influencing electricity usage. This analysis could encompass identifying peak consumption periods, understanding the impact of economic activities and industrial sectors on electricity demand, detecting anomalies or inefficiencies in consumption patterns, and forecastingfutureconsumptiontrendstoaidinresourceallocationand infrastructure planning. Additionally, it could involve exploring correlations between electricity usage and external factors such as weather conditions, demographic shifts, or policy changes, providing valuableinsightsforpolicymakers,utilityproviders,andbusinessesto optimize energy management strategies and promote sustainable development.

# CHAPTER2

# SERVICESANDTOOLSREQUIRED

## 2.1 ServicesUsed

- **Datacollectionandintegration**
  Dependingonyourdatasourcesandneeds,youcanusedifferentmethodsto collectenergydata,suchasmanualreading,wiredorwirelesscommunication, or cloud-based services. Manual reading is the simplest but most time-consuminganderror-pronemethod..Thiscouldincludeindustries,offices, retail outlets, etc. Data integration techniques will be crucial to ensure uniformity and consistency in the dataset.
- **DescriptiveAnalytics:**Performdescriptiveanalyticstounderstandthecurrent patterns and trends in commercial electricity consumption. This involves summarizing the data through measures such as mean, median, mode, and standarddeviation,aswellasvisualizingthedatausingchartsandgraphsto identify any outliers or anomalies.
- **Predictive Modeling : Precise electricity forecasting is a pertinent challengeineffectivelycontrollingthesupplyanddemandofpower. This is due to the inherent volatility of electricity, which cannot be stored and must be utilised promptly.**

## 2.2 ToolsandSoftwareused

**Tools**:

PowerBI: The main tool for this project is PowerBI, 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 • PowerBI Desktop: This is a Windows application that you can use to create reports and publish them to PowerBI.

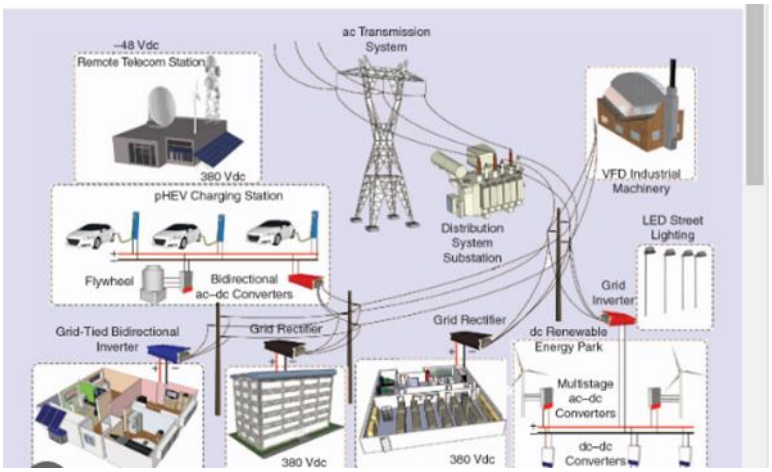
•PowerBI Service: This is an online SaaS (Software as a Service) service that you use to publish reports, create new dashboards, and share insights.

•PowerBI Mobile: This is a mobile application that you can use to access your reports and dashboards on the go.

# CHAPTER 3

# PROJECTARCHITECTURE

## 3.1 Architecture



**DataAnalyticsArchitectureforCommercialElectricityConsumptioninIndian State:**

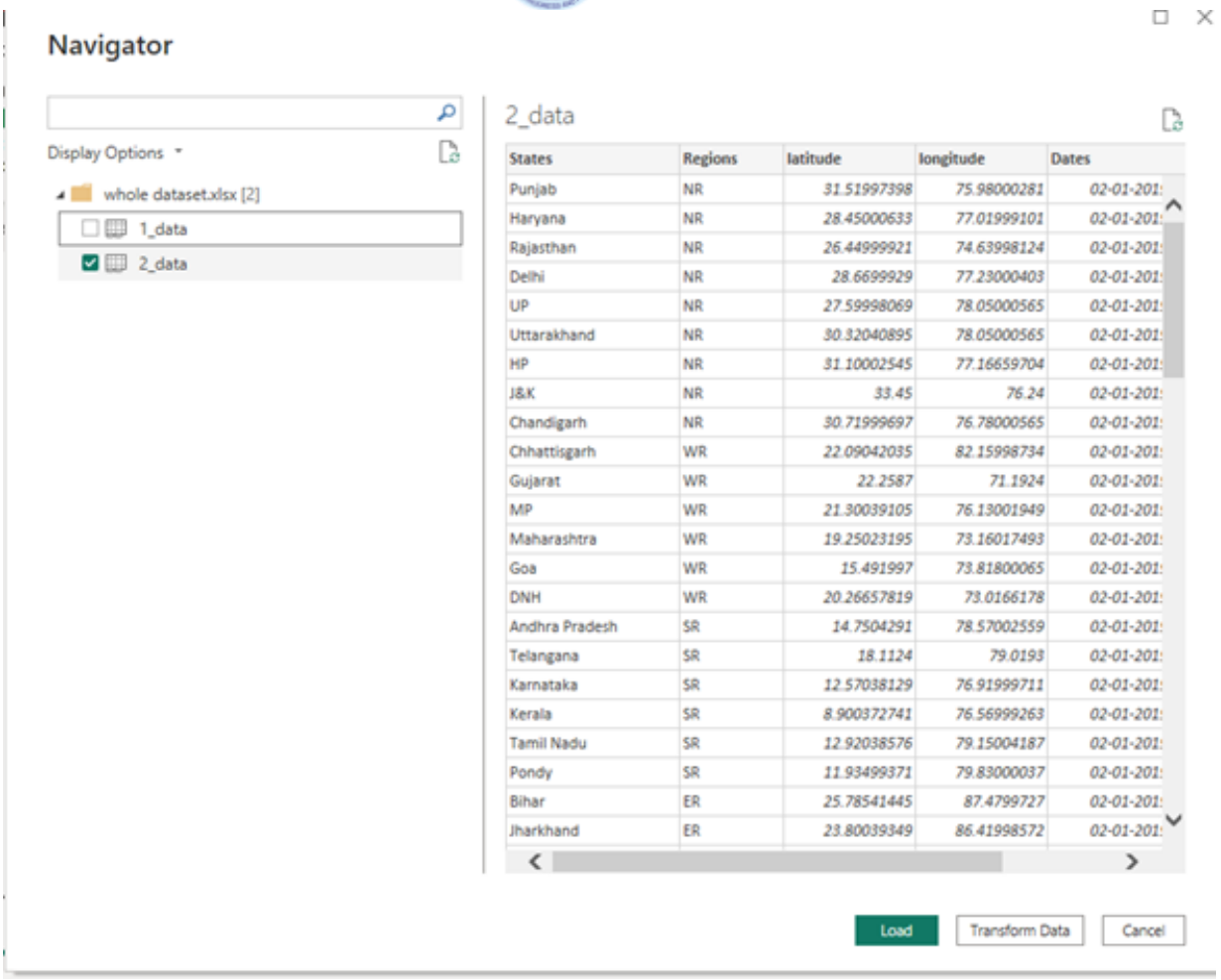
- **Datacollection:**Gatherdatafromcloud/websourcesincludinggovernment databases, utility companies, and IoT devices.
- **DataPreprocessing:**Cleanseandpreprocessthedatatohandlemissing values, outliers, and inconsistencies.
- **DataStorage:**Storetheprocesseddatainascalableandefficientdata storage system such as a data warehouse or data lake.
- **Dataintegration:**Integratedatafrommultiplesourcestocreatea comprehensive dataset for analysis.
- **AnalysisandModeling:**Utilizemachinelearningandstatisticaltechniquesto analyze the data and build predictive models.
- **Visualization:**Createvisualizationssuchascharts,graphs,andmapsto present insights and trends in electricity consumption.
- **Interpretation:**Interprettheresultsoftheanalysistounderstandpatterns, identify consumption drivers, and inform decision-making.
- **ReportingandDeployment:**Generatereportsanddeploytheanalytics solution for stakeholders to use in optimizing electricity consumption strategies.

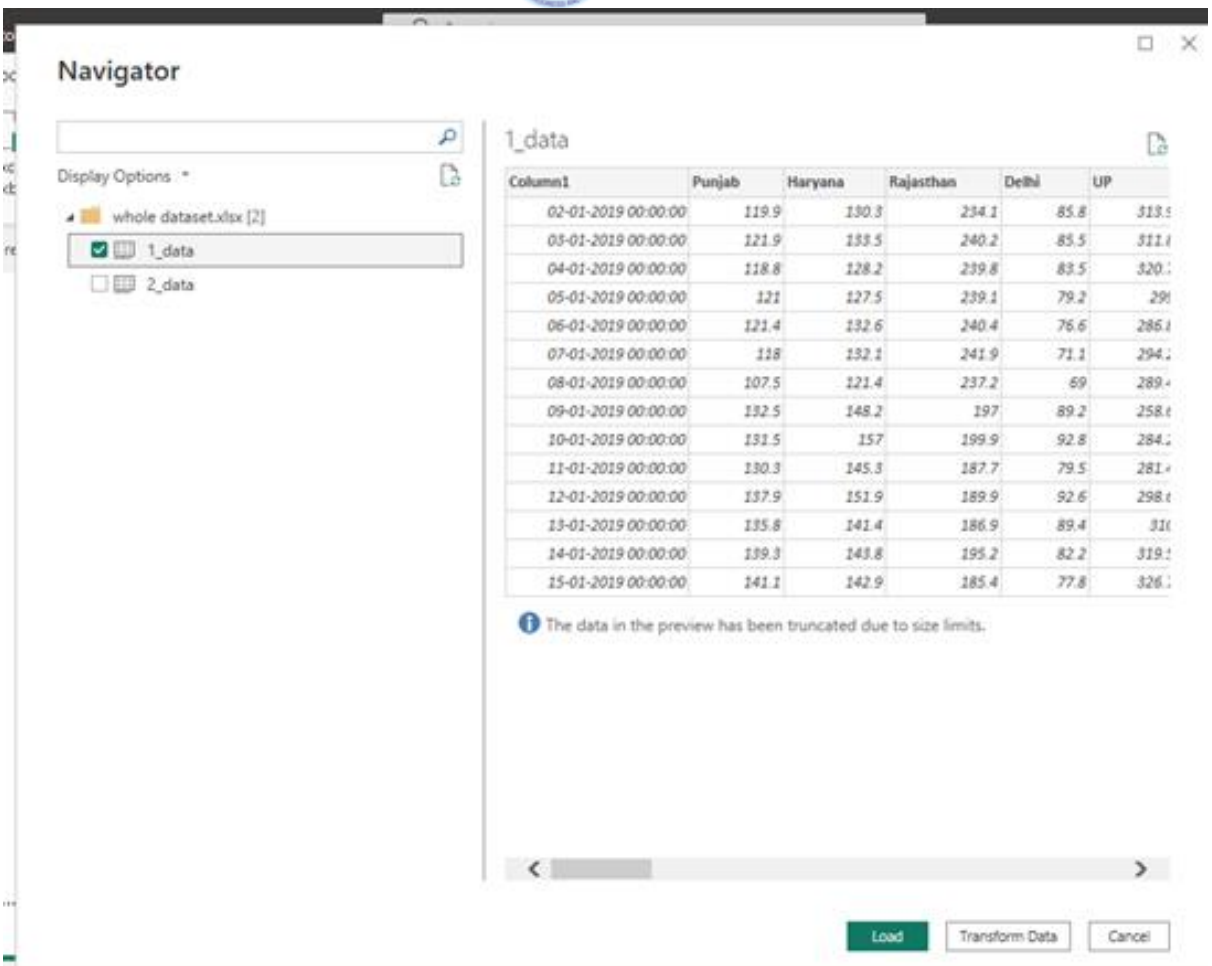
# CHAPTER 4

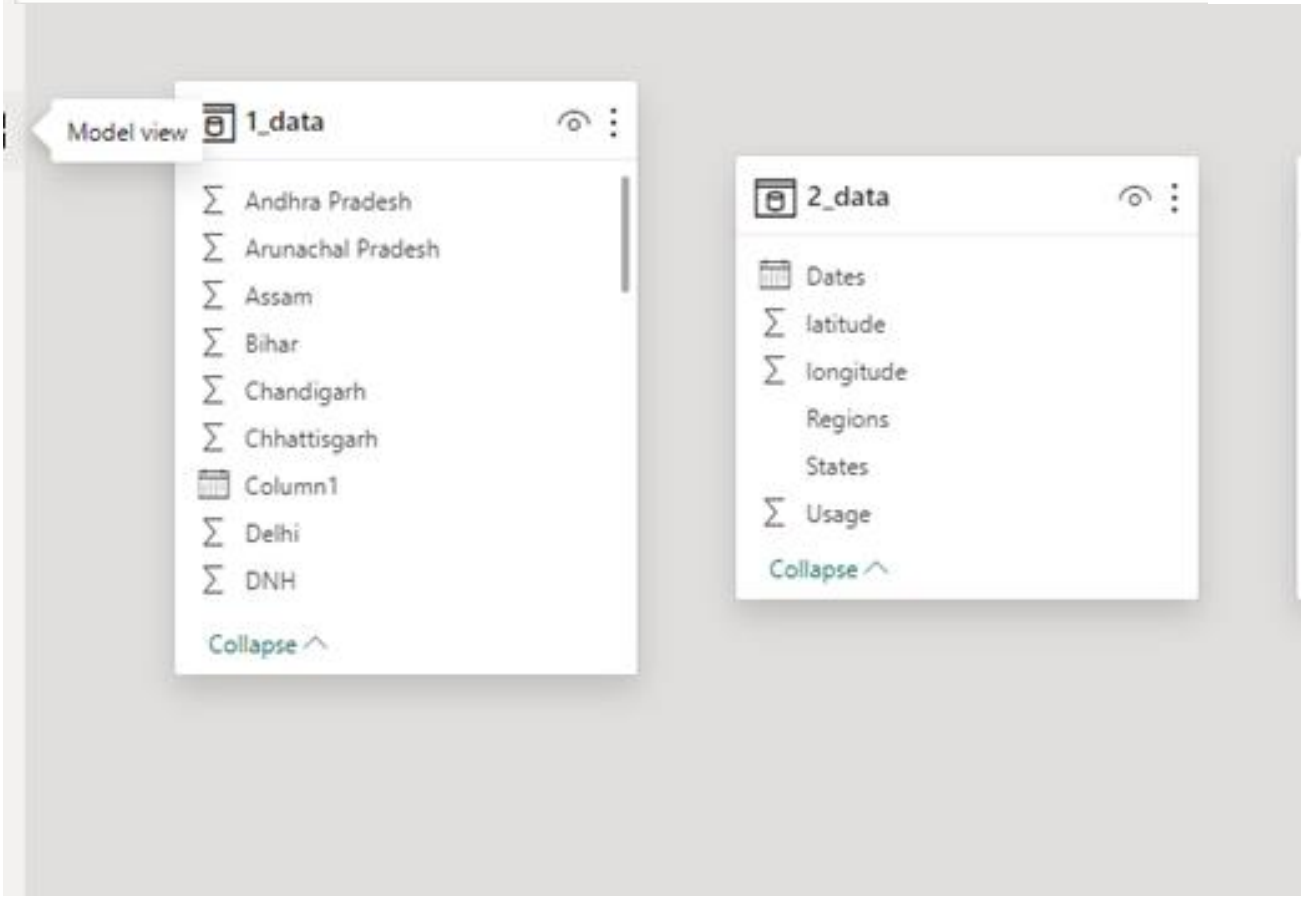
# MODELINGANDRESULT

## Managerelationship

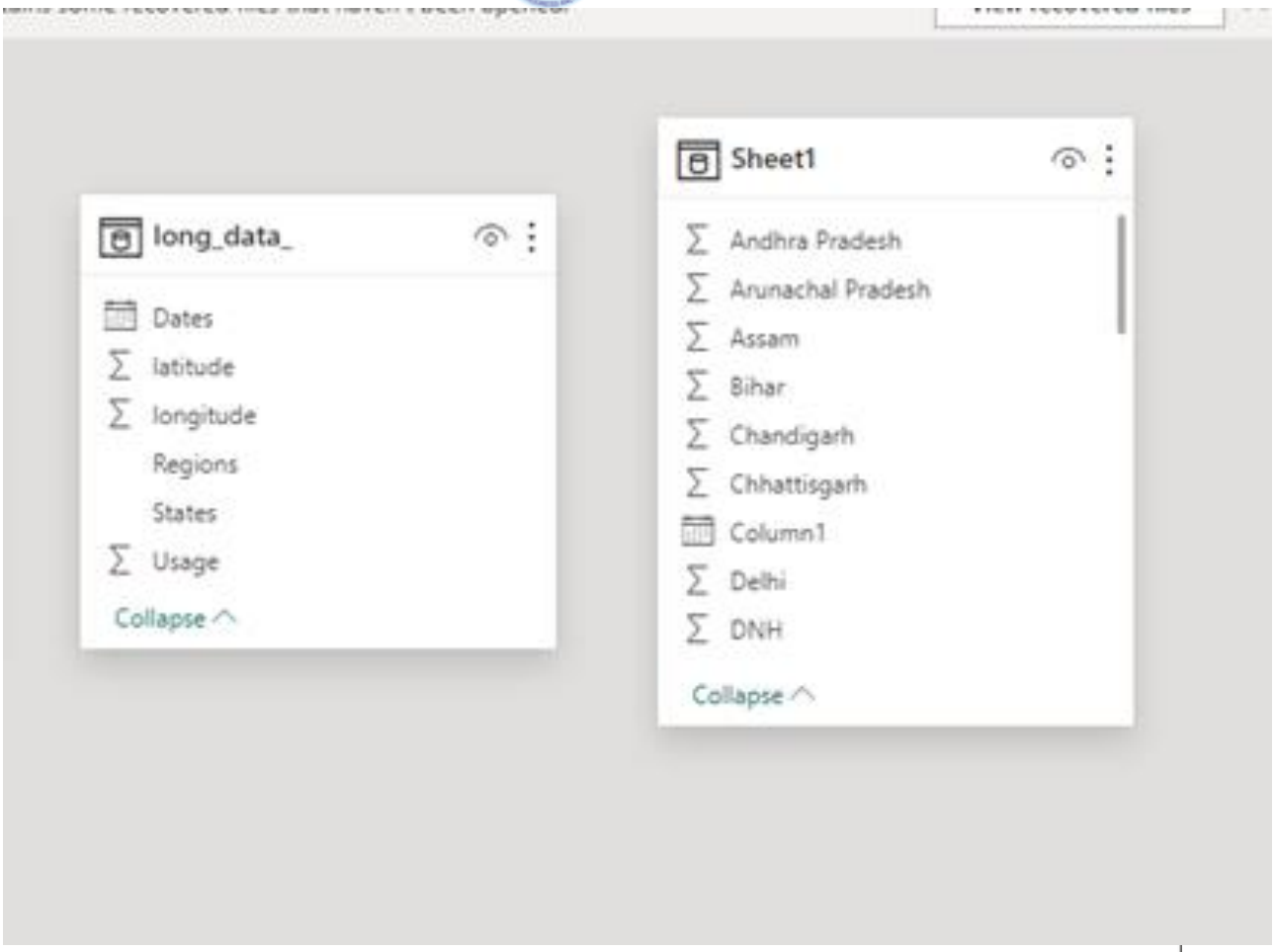
The demand for energy has been increasing over the years in India, which may be the result of its rapid economic growth trajectory. In this context, this study examines the direction of the Granger-causal relationship between electricity consumption and economic growth at the state and sectoral levels in India. In doing so, the panel cointegration tests with the structural break, the heterogeneous panel causality test, and the panel VAR based impulse-response model are employed.

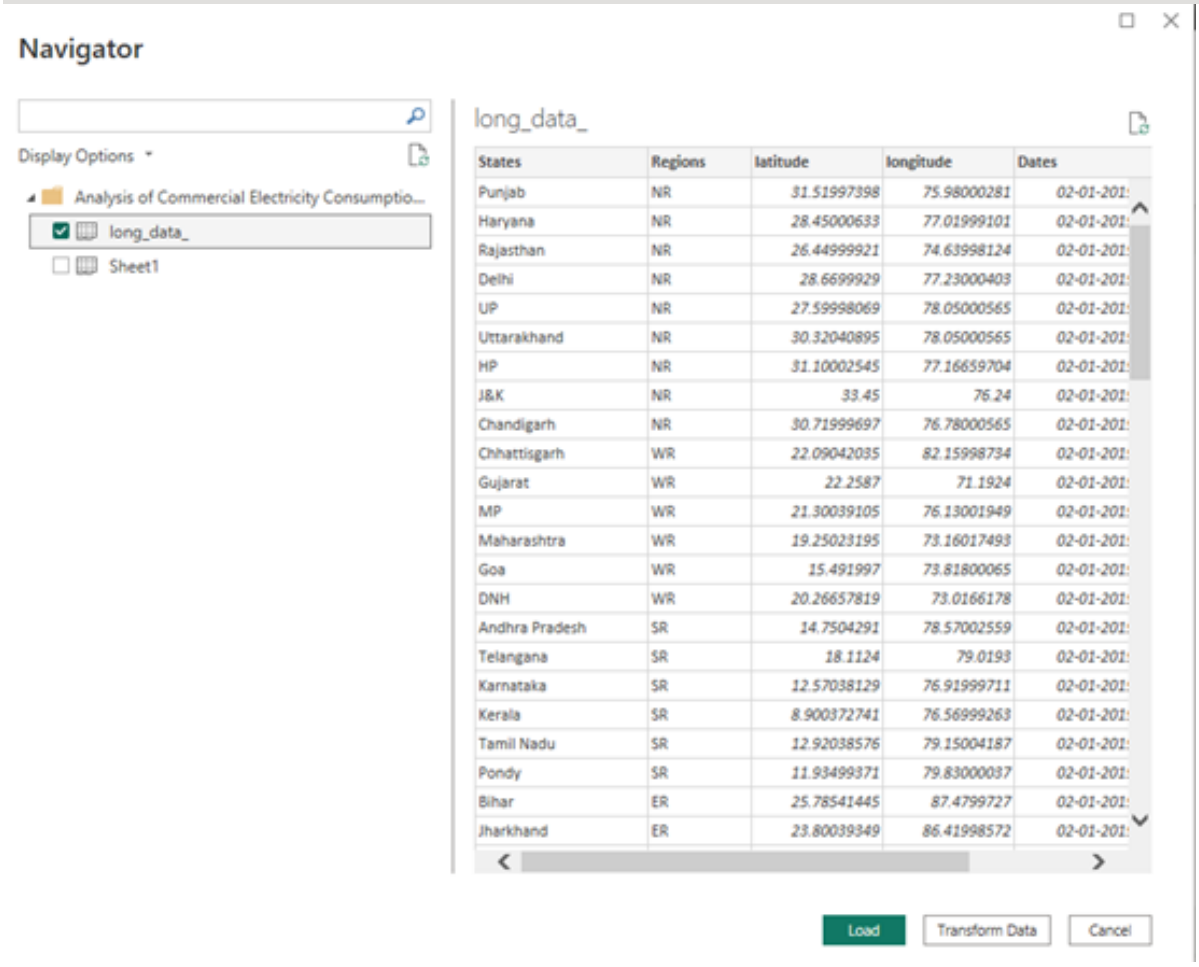




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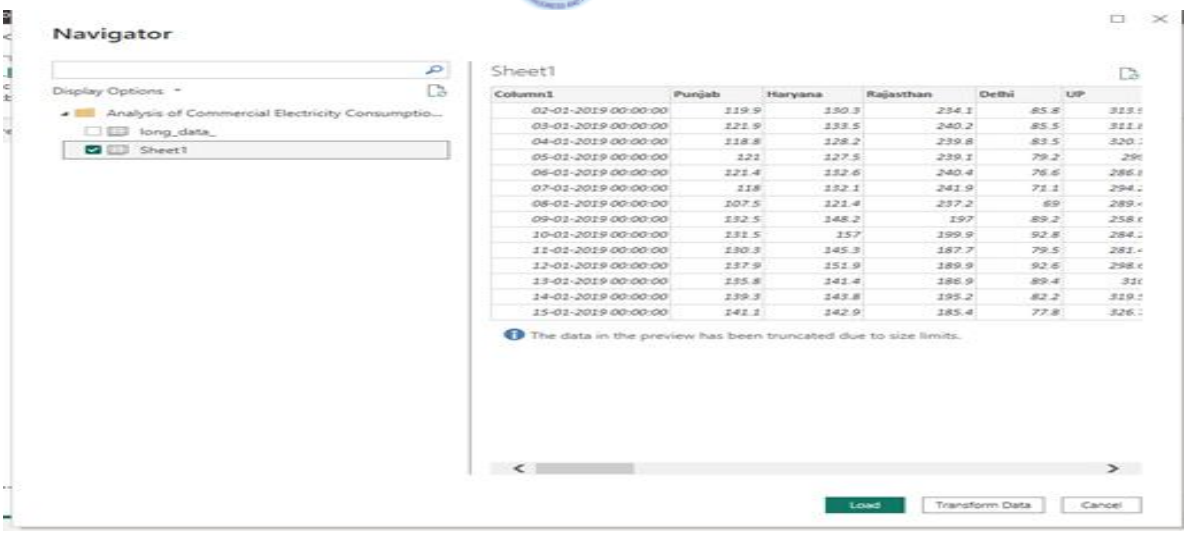
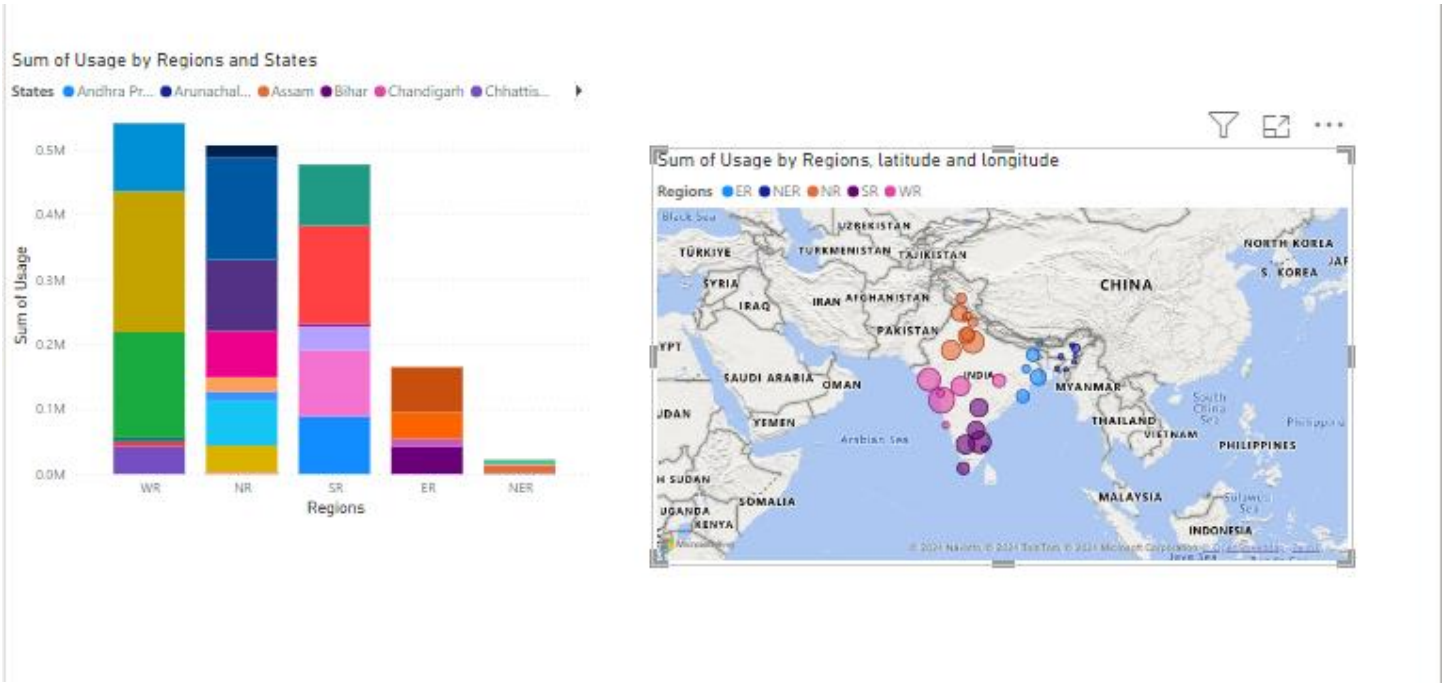
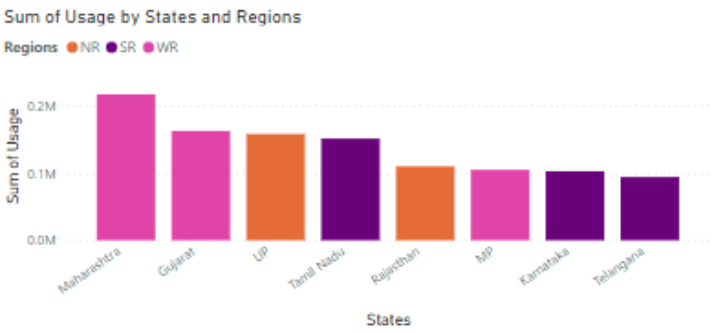
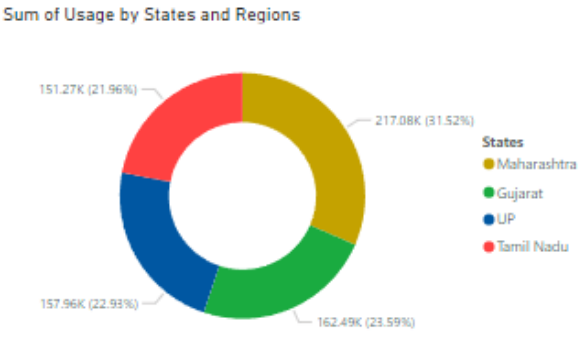


# Dashboard



## C0NCLUSION

**After conducting a comprehensive analysis of commercial electricity consumption in the selected Indian state using data analyticswithdatasourcedfromcloud/webplatforms,itisevident that several key patterns and trends emerge. The analysis reveals distinct seasonal variations in consumption, with notable peaks during periods of economic activity and industrial production.**

**Additionally, certain geographic regions within the state exhibit higher consumption rates, likely influenced by factors such as urbanization, industrial development, and infrastructure availability. Furthermore, the study highlights the importance of proactive energy management strategies, including demand-side management initiatives and investment in renewable energy infrastructure, to ensure sustainable electricity usage and mitigate potential supply constraints. Overall ,these insights under score the significance of leveraging data-driven approaches to optimize commercial electricity consumption and drive towards a more resilient and efficient energy ecosystem in the state.**

# FUTURESCOPE

Looking ahead, there are several promising avenues for further exploration and enhancement of the analysis of commercial electricity consumption in the Indian state leveraging data analytics and cloud/web-based data sources. Future research could delve deeper into granular sub-sector analysis to identify specific industries or business categories driving electricity demand and develop targetedenergyefficiencymeasurestailoredtotheiruniquerequirements. Additionally, integrating real-time data streams and advanced predictive analytics techniques can enable proactive demand forecasting and optimization, empowering stakeholders to anticipate and respond to fluctuations in electricity usage more effectively. Furthermore, exploring the intersection of emerging technologies such as Internet of Things devices and smart meters with data analytics holds immense potential for enabling finer-grained monitoring and control of electricity consumption at the commercial level,pavingthewayfor more agile and sustainable energy management practices in the state.

# REFERENCES

https://www.sciencedirect.com/science/article/abs/pii/S0140988320304047

**LINK**

https://github.com/githubtraining/hellogitworld.git