TECH SAKSHAM

CASE STUDY REPORT

Data Analytics with Power BI

“Analysis of commercial Electricity Consumption in Indian State”

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Nm id	Name
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Trainer

UMA MAHESHWARI

ABSTRACT

This study investigates the patterns and trends of commercial electricity consumption in an Indian state, aiming to provide insights into energy usage dynamics and inform policy decisions. The analysis utilizes a comprehensive dataset encompassing electricity consumption data from commercial establishments over a specified period. Through advanced statistical techniques and data visualization methods, the study examines the temporal variations, seasonal effects, and sector-wise distribution of electricity consumption. Furthermore, factors influencing commercial electricity demand, such as economic indicators, urbanization trends, and regulatory frameworks, are analyzed to discern their impact on consumption patterns. The findings of this research contribute to a deeper understanding of commercial electricity usage behavior, offering valuable information for policymakers, utility providers, and stakeholders in the energy sector to formulate strategies for energy efficiency, demand management, and sustainable development.

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INTRODUCTION

1. PROBLEM STATEMENT:

The rapid growth of commercial activities in [Indian State] has led to a significant increase in electricity consumption, posing challenges for sustainable energy management and resource allocation. However, there remains a lack of comprehensive understanding regarding the specific patterns and drivers of commercial electricity consumption in the state. This study aims to address this gap by investigating the dynamics of commercial electricity usage, identifying key factors influencing consumption trends, and evaluating the effectiveness of existing policies and infrastructure in meeting the growing energy demands of commercial establishments. By providing a clear problem statement, this research seeks to facilitate informed decision-making and policy formulation to optimize energy usage, enhance efficiency, and promote sustainable development in [Indian State].

2. PROPOSED SOLUTION

To conduct a thorough analysis of commercial electricity consumption in an Indian state, a multifaceted approach is proposed. Firstly, obtaining a comprehensive dataset from electricity distribution companies or regulatory bodies would be crucial. This dataset should ideally cover a significant time span, with detailed information on electricity consumption by commercial establishments categorized by sector, size, and location.

3. ADVANTAGES:

Analyzing commercial electricity consumption in an Indian state offers several advantages. Firstly, it provides valuable insights into the economic activity and growth trends within the commercial sector. By examining electricity usage patterns, researchers and policymakers can gauge the health of various industries, identify emerging sectors, and anticipate future demand trends. Moreover, understanding the drivers of commercial electricity consumption, such as business expansion, technological advancements, and consumer behavior, enables stakeholders to tailor policies and incentives to promote sustainable energy practices and economic development.

Secondly, analyzing commercial electricity consumption facilitates the identification of energy efficiency opportunities. By scrutinizing consumption data at a granular level, inefficiencies and areas of high energy usage can be pinpointed. This allows businesses and policymakers to implement targeted measures such as energy audits, efficiency retrofits, and adoption of energy-efficient technologies to reduce electricity costs and carbon emissions. Additionally, benchmarking electricity consumption across different commercial sectors and establishments enables peer-to-peer learning and best practice sharing, fostering a culture of energy conservation and innovation.

Furthermore, examining commercial electricity consumption can inform infrastructure planning and investment decisions. By forecasting future demand trends and spatial distribution patterns, policymakers and utility providers can strategically allocate resources for electricity generation, transmission, and distribution

infrastructure. This ensures reliable and resilient energy supply to meet the needs of commercial establishments while minimizing investment risks and optimizing resource utilization. Additionally, analyzing consumption patterns helps identify opportunities for demand-side management initiatives such as time-of-use pricing, demand response programs, and incentivizing off-peak consumption to alleviate strain on the grid and enhance system efficiency.

In summary, analyzing commercial electricity consumption in an Indian state offers advantages such as insights into economic activity, identification of energy efficiency opportunities, and informed infrastructure planning. By leveraging consumption data and employing analytical tools, stakeholders can promote sustainable energy practices, drive economic growth, and ensure reliable energy supply for commercial establishments.

4. SCOPE:

The scope of analyzing commercial electricity consumption in an Indian state is vast and multifaceted, encompassing various dimensions that contribute to understanding and managing energy usage effectively. Firstly, the analysis will focus on gathering comprehensive data sets encompassing electricity consumption from a diverse range of commercial establishments across different sectors and geographical locations within the chosen Indian state. This includes but is not limited to retail stores, office buildings,

hotels, restaurants, manufacturing units, and educational institutions.

The analysis will delve into temporal variations, examining daily, monthly, and yearly consumption patterns to identify peak demand periods, seasonal fluctuations, and long-term trends. Moreover, sector-wise distribution analysis will be conducted to understand the relative contribution of different commercial sectors to overall electricity consumption. This will involve categorizing establishments based on their activities, size, and energy-intensive operations.

Furthermore, the scope extends to investigating the underlying factors influencing commercial electricity demand. Economic indicators such as GDP growth, industrial output, and business activities will be assessed for their correlation with electricity consumption. Urbanization trends, population density, and demographic changes will also be considered, as they impact the demand for commercial spaces and services. Additionally, regulatory frameworks, government policies, and incentives promoting energy efficiency and renewable energy adoption will be analyzed to evaluate their effectiveness in shaping consumption behavior.

SERVICES AND TOOLS REQUIRED

1. SERVICE 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. TOOLS AND SOFTWARE USED:

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.

Software Requirements:

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

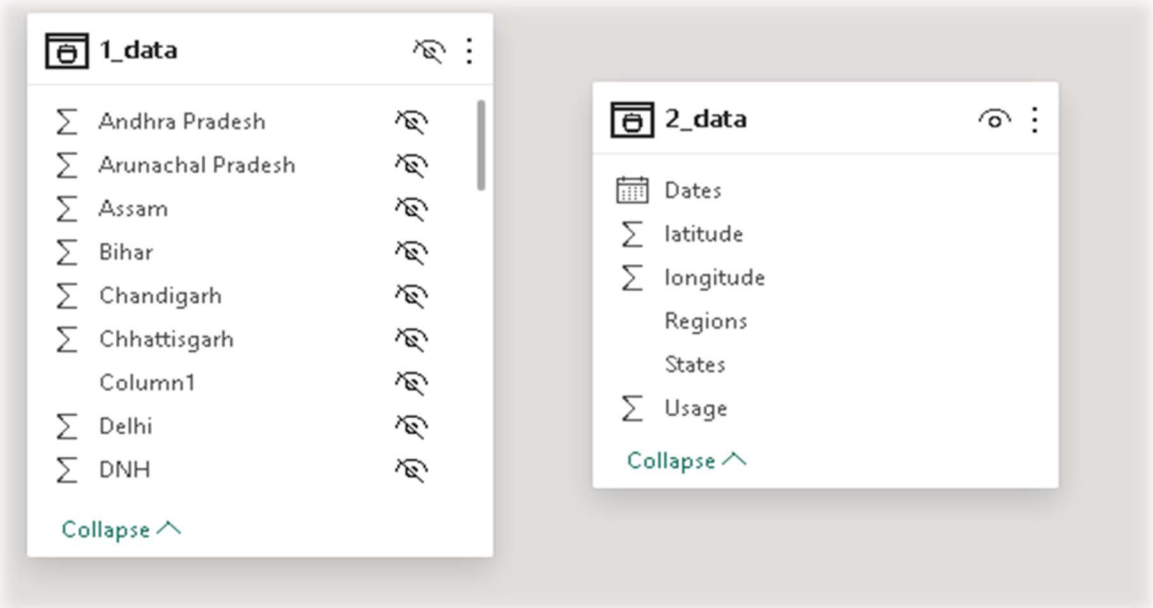
- PowerBI Service: This is an online SaaS (Software as a Service) service that you use to publish reports, create new dashboards, and share insights.

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

MODELING AND RESULT

Manage relationship

The “1_data” file will be used as the main connector as it contains most key identifier (column1) which can be use to relates the 4 data files together. The “long.data” file is use to link the client profile geographically with “dates



Manage relationships

Active	From: Table (Column)	To: Table (Column)
☑	1_data (Column1)	Sheet1 (Column1)
☑	long_data_ (Dates)	2_data (Dates)
☑	long_data_ (Regions)	Sheet1 (Column1)

New... Autodetect... Edit... Delete

Close

Edit relationship

Select tables and columns that are related.

1_data

Column1	Punjab	Haryana	Rajasthan	Delhi	UP	Uttarakhand	HP	J&K	Chandigarh
03-01-2019 00:00:00	121.9	133.5	240.2	85.5	311.8	39.3	30.1	54.1	4
04-01-2019 00:00:00	118.8	128.2	239.8	83.5	320.7	38.1	30.1	53.2	4
05-01-2019 00:00:00	121	127.5	239.1	79.2	299	39.2	30.2	51.5	4

Sheet1

Column1	Punjab	Haryana	Rajasthan	Delhi	UP	Uttarakhand	HP	J&K	Chandigarh
03-01-2019 00:00:00	121.9	133.5	240.2	85.5	311.8	39.3	30.1	54.1	4
04-01-2019 00:00:00	118.8	128.2	239.8	83.5	320.7	38.1	30.1	53.2	4
05-01-2019 00:00:00	121	127.5	239.1	79.2	299	39.2	30.2	51.5	4

Cardinality: Many to many (*:*)

Cross filter direction: Both

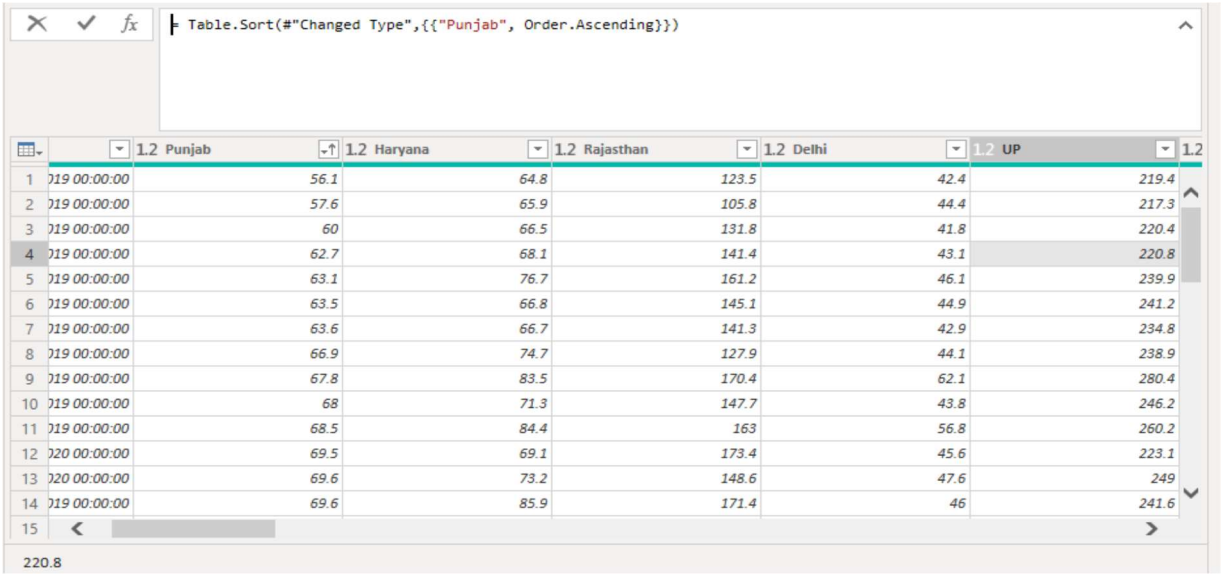
☑ Make this relationship active

☐ Apply security filter in both directions

☐ Assume referential integrity

Modelling for data and consumption data

Notice that the Dates and usage of the consumption of electricity are there in the datasets by not sorted, so by using the ascending command, it is been sorted in ascending order.

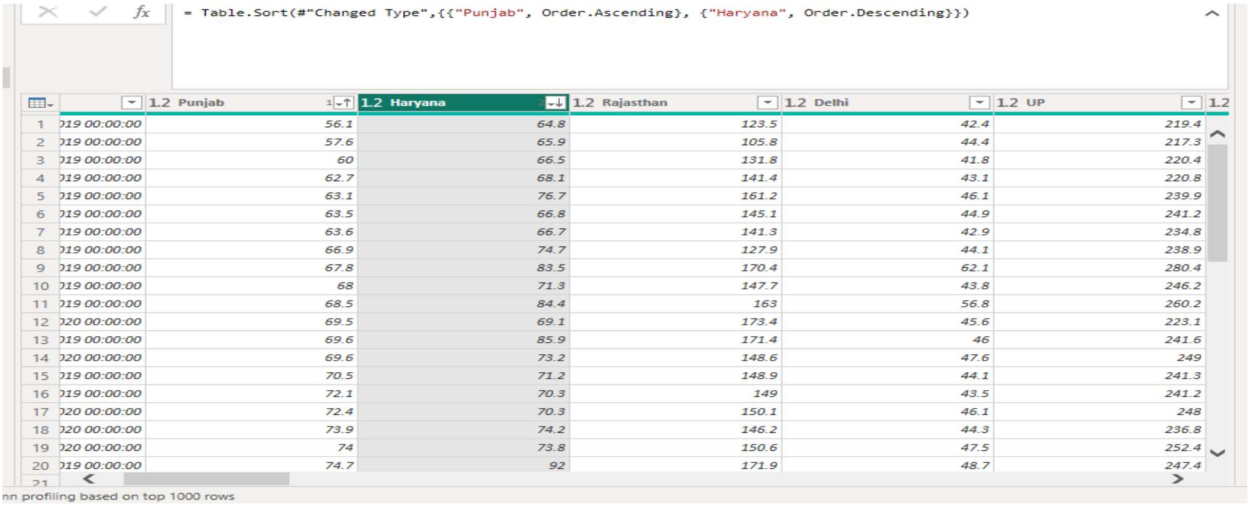


```
= Table.Sort(#"Changed Type",{{"Punjab", Order.Ascending}})
```

		1.2 Punjab	1.2 Haryana	1.2 Rajasthan	1.2 Delhi	1.2 UP	1.2
1	019 00:00:00	56.1	64.8	123.5	42.4	219.4	
2	019 00:00:00	57.6	65.9	105.8	44.4	217.3	
3	019 00:00:00	60	66.5	131.8	41.8	220.4	
4	019 00:00:00	62.7	68.1	141.4	43.1	220.8	
5	019 00:00:00	63.1	76.7	161.2	46.1	239.9	
6	019 00:00:00	63.5	66.8	145.1	44.9	241.2	
7	019 00:00:00	63.6	66.7	141.3	42.9	234.8	
8	019 00:00:00	66.9	74.7	127.9	44.1	238.9	
9	019 00:00:00	67.8	83.5	170.4	62.1	280.4	
10	019 00:00:00	68	71.3	147.7	43.8	246.2	
11	019 00:00:00	68.5	84.4	163	56.8	260.2	
12	020 00:00:00	69.5	69.1	173.4	45.6	223.1	
13	020 00:00:00	69.6	73.2	148.6	47.6	249	
14	019 00:00:00	69.6	85.9	171.4	46	241.6	
15							

220.8

The Haryana values are sorted in descending order

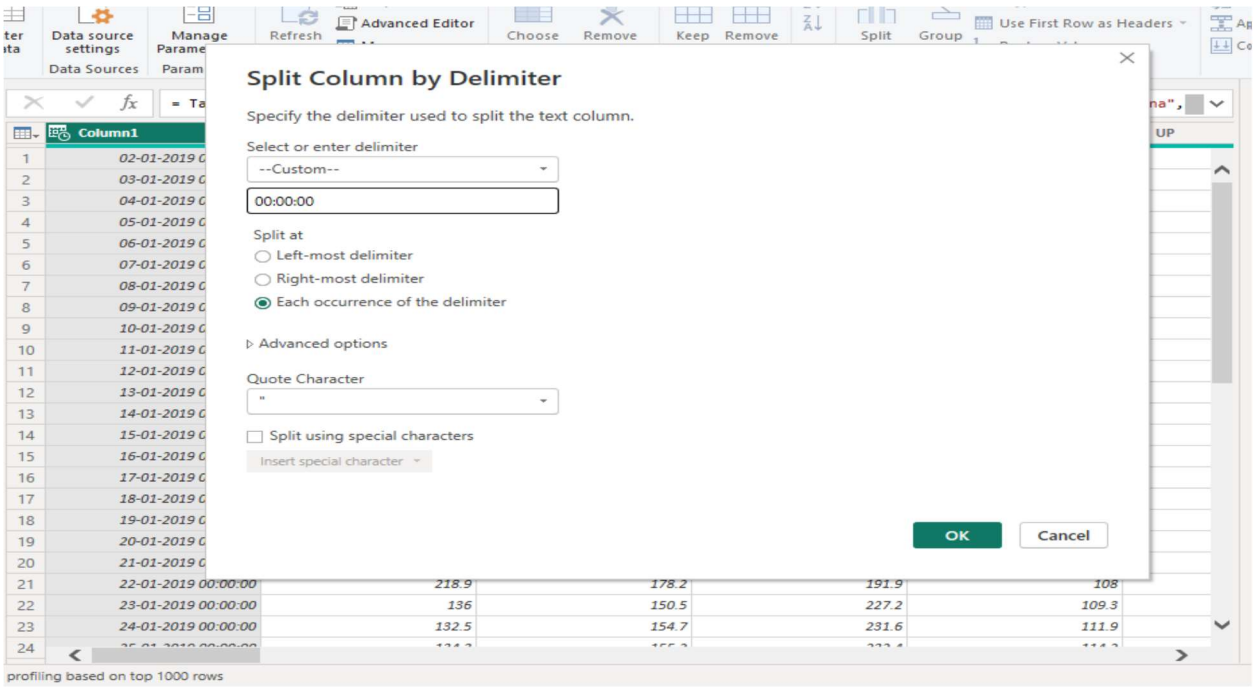


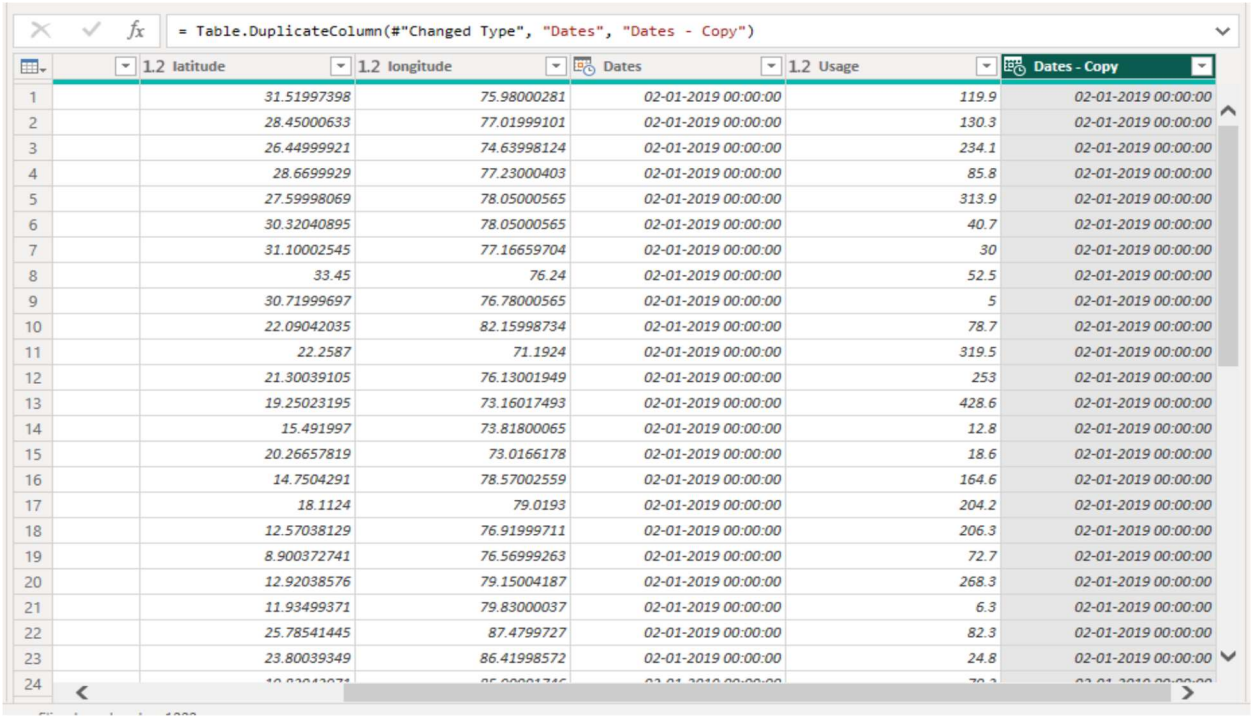
```
= Table.Sort(#"Changed Type",{{"Punjab", Order.Ascending}, {"Haryana", Order.Descending}})
```

		1.2 Punjab	1.2 Haryana	1.2 Rajasthan	1.2 Delhi	1.2 UP	1.2
1	019 00:00:00	56.1	64.8	123.5	42.4	219.4	
2	019 00:00:00	57.6	65.9	105.8	44.4	217.3	
3	019 00:00:00	60	66.5	131.8	41.8	220.4	
4	019 00:00:00	62.7	68.1	141.4	43.1	220.8	
5	019 00:00:00	63.1	76.7	161.2	46.1	239.9	
6	019 00:00:00	63.5	66.8	145.1	44.9	241.2	
7	019 00:00:00	63.6	66.7	141.3	42.9	234.8	
8	019 00:00:00	66.9	74.7	127.9	44.1	238.9	
9	019 00:00:00	67.8	83.5	170.4	62.1	280.4	
10	019 00:00:00	68	71.3	147.7	43.8	246.2	
11	019 00:00:00	68.5	84.4	163	56.8	260.2	
12	020 00:00:00	69.5	69.1	173.4	45.6	223.1	
13	019 00:00:00	69.6	85.9	171.4	46	241.6	
14	020 00:00:00	69.6	73.2	148.6	47.6	249	
15	019 00:00:00	70.5	71.2	148.9	44.1	241.3	
16	019 00:00:00	72.1	70.3	149	43.5	241.2	
17	020 00:00:00	72.4	70.3	150.1	46.1	248	
18	020 00:00:00	73.9	74.2	146.2	44.3	236.8	
19	020 00:00:00	74	73.8	150.6	47.5	252.4	
20	019 00:00:00	74.7	92	171.9	48.7	247.4	
21							

nn profiling based on top 1000 rows

Changing the order of dates of power query
Duplicate the “dates” then split column using space as delimiter.

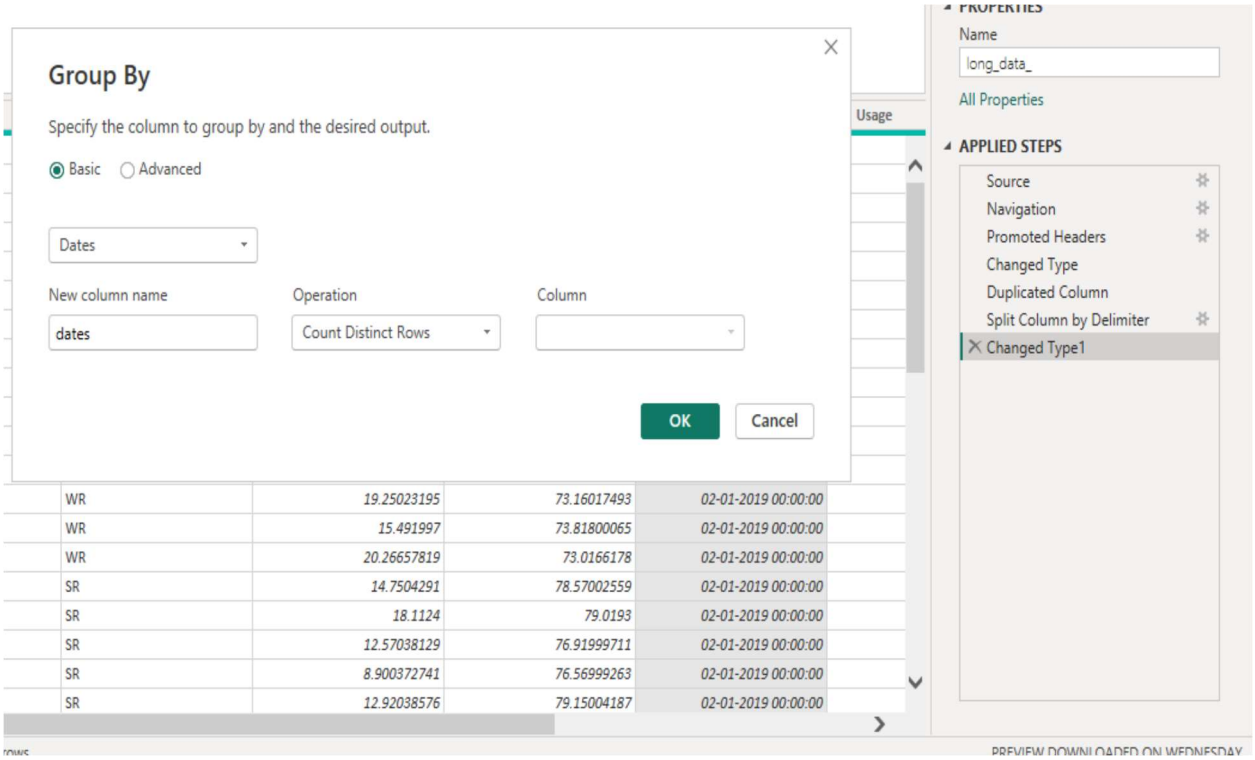




	latitude	longitude	Dates	Usage	Dates - Copy
1	31.51997398	75.98000281	02-01-2019 00:00:00	119.9	02-01-2019 00:00:00
2	28.45000633	77.01999101	02-01-2019 00:00:00	130.3	02-01-2019 00:00:00
3	26.44999921	74.63998124	02-01-2019 00:00:00	234.1	02-01-2019 00:00:00
4	28.6699929	77.23000403	02-01-2019 00:00:00	85.8	02-01-2019 00:00:00
5	27.59998069	78.05000565	02-01-2019 00:00:00	313.9	02-01-2019 00:00:00
6	30.32040895	78.05000565	02-01-2019 00:00:00	40.7	02-01-2019 00:00:00
7	31.10002545	77.16659704	02-01-2019 00:00:00	30	02-01-2019 00:00:00
8	33.45	76.24	02-01-2019 00:00:00	52.5	02-01-2019 00:00:00
9	30.71999697	76.78000565	02-01-2019 00:00:00	5	02-01-2019 00:00:00
10	22.09042035	82.15998734	02-01-2019 00:00:00	78.7	02-01-2019 00:00:00
11	22.2587	71.1924	02-01-2019 00:00:00	319.5	02-01-2019 00:00:00
12	21.30039105	76.13001949	02-01-2019 00:00:00	253	02-01-2019 00:00:00
13	19.25023195	73.16017493	02-01-2019 00:00:00	428.6	02-01-2019 00:00:00
14	15.491997	73.81800065	02-01-2019 00:00:00	12.8	02-01-2019 00:00:00
15	20.26657819	73.0166178	02-01-2019 00:00:00	18.6	02-01-2019 00:00:00
16	14.7504291	78.57002559	02-01-2019 00:00:00	164.6	02-01-2019 00:00:00
17	18.1124	79.0193	02-01-2019 00:00:00	204.2	02-01-2019 00:00:00
18	12.57038129	76.91999711	02-01-2019 00:00:00	206.3	02-01-2019 00:00:00
19	8.900372741	76.56999263	02-01-2019 00:00:00	72.7	02-01-2019 00:00:00
20	12.92038576	79.15004187	02-01-2019 00:00:00	268.3	02-01-2019 00:00:00
21	11.93499371	79.83000037	02-01-2019 00:00:00	6.3	02-01-2019 00:00:00
22	25.78541445	87.4799727	02-01-2019 00:00:00	82.3	02-01-2019 00:00:00
23	23.80039349	86.41998572	02-01-2019 00:00:00	24.8	02-01-2019 00:00:00
24					

Grouping of age by ranges

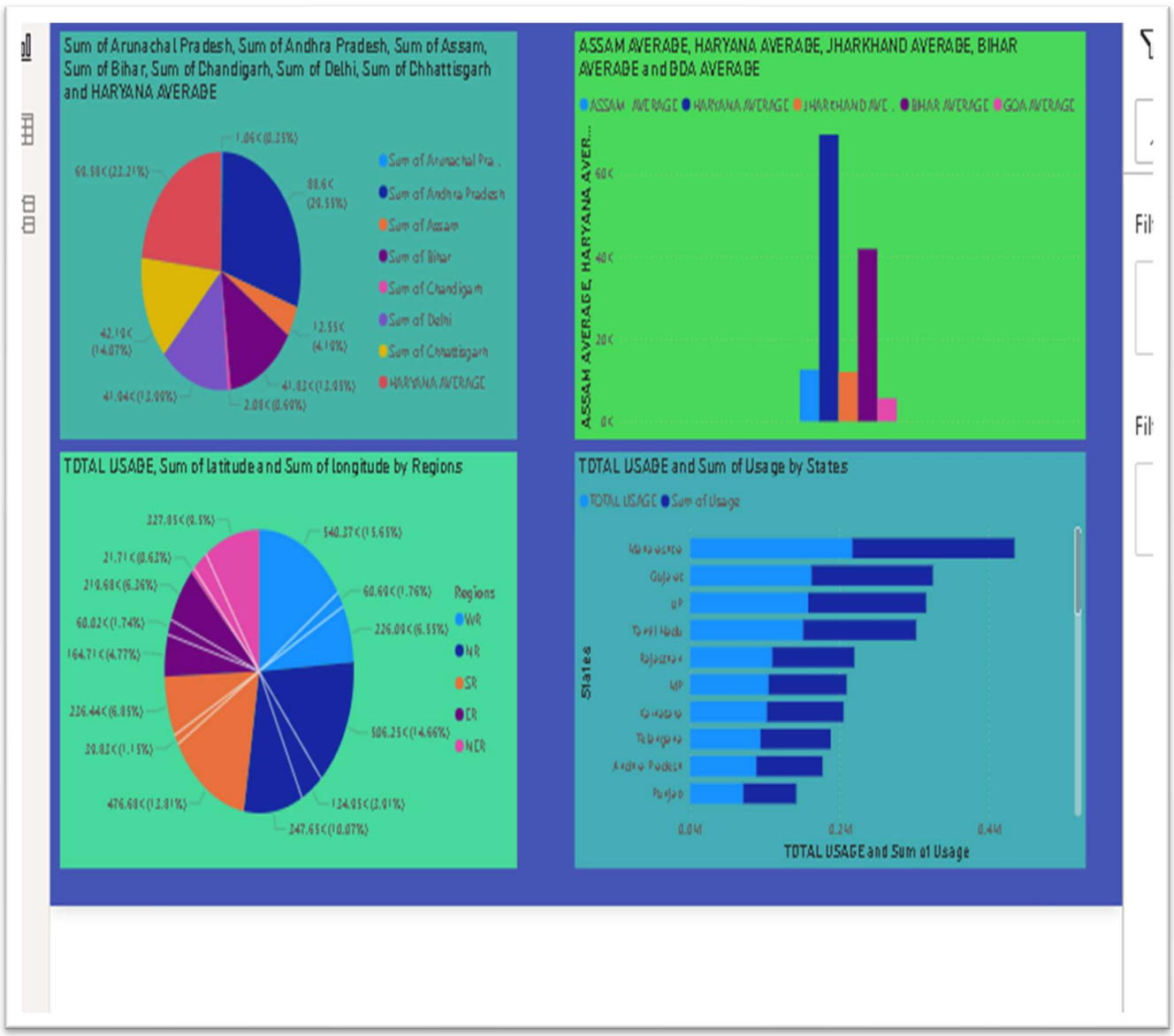
As the states ranges from 0 to 29, we shall group them into different state range for easier profiting, we will group the states with the value of median



lues of such as “account Id” have also been set as Text.

And District name have been categorized as place to be use for the map to show the sum of the inhabitants in each region.

Dashboard


Sum of Arunachal Pradesh, Sum of Andhra Pradesh, Sum of Assam, Sum of Bihar, Sum of Chandigarh, Sum of Delhi, Sum of Chhattisgarh and HARYANA AVERAGE
1.06K (0.25%)
88.6K (20.55%)
12.55K (4.10%)
41.83K (13.05%)
2.08K (0.69%)
41.84K (13.90%)
42.10K (14.07%)
60.58K (22.21%)
Sum of Arunachal Pra..
Sum of Andhra Pradesh
Sum of Assam
Sum of Bihar
Sum of Chandigarh
Sum of Delhi
Sum of Chhattisgarh
HARYANA AVERAGE
ASSAM AVERABE, HARYANA AVERABE, JHARKHAND AVERABE, BIHAR AVERABE and BDA AVERABE
ASSAM AVERAGE
HARYANA AVERAGE
JHARKHAND AVE..
BIHAR AVERAGE
GOA AVERAGE
ASSAM AVERAGE, HARYANA AVER...
60K
40K
20K
0K
TOTAL USABE, Sum of latitude and Sum of longitude by Regions
327.85K (0.5%)
540.27K (15.65%)
21.71K (0.62%)
210.68K (6.36%)
60.69K (1.76%)
60.02K (1.74%)
226.08K (6.55%)
164.71K (4.77%)
236.44K (6.85%)
506.25K (14.66%)
39.82K (1.15%)
476.68K (12.81%)
134.95K (3.91%)
347.65K (10.07%)
Regions
WR
NR
SR
ER
NER
TOTAL USABE and Sum of Usage by States
TOTAL USAGE
Sum of Usage
States
Gujarat
UP
Tamil Nadu
Rajasthan
MP
Karnataka
Telangana
Andhra Pradesh
Punjab
0.0M
0.2M
0.4M
TOTAL USAGE and Sum of Usage

CONCLUSION

The analysis of commercial electricity consumption in Indian staes reveals a complex and dynamic landscape shaped by various socio-economic, technological, and policy factors. Through comprehensive examples of historical trends, spatial variations, sectoral dynamics, and environmental implications, this study provides valuable insights into the patterns, drivers, and challenges of energy usage in the commercial sector. Key findings from this analysis underscore the significant growth in commercial electricity consumption driven by economic expansion, urbanization, and industrial activities across Indian states. While certain regions exhibit higher consumption levels due to concentrated economic activities and urban centers, disparities persist among states, highlighting the need for targeted interventions to address regional imbalances and enhance energy access and affordability.

FUTURE SCOPE

Future scenarios of sectoral value added and overall and per capita GDP, are used to determine service demands in certain sectors, that in turn determine the employment of various appliances and equipment to convert electricity into end use services. The government over successive years has prioritized the manufacturing sector to draw surplus labor from primary activities and enhance growth, productivity, and meaningful employment. This has reflected in the national manufacturing policy as well as the more recently launched make in India campaign.

REFERENCES

https://medium.com/p/4fffb6219f6c

LINK

https://app.powerbi.com/view?r=eyJrIjoiY2ZmNzc2YjctZjU0ZS00ZjdkLWFkZjUtZTE0ZDkyMDZhNjMyIiwidCI6ImZiZjI2ODdmLTUxYjctNDA0MC1iNmYzLTczYzVjMDllN2JlZCJ9