Plugging into the Future: An Exploration of Electricity Consumption Patterns

Milestone 1: Define Problem / Problem Understanding

Activity 1: Specify the business problem

India is the world's third-largest producer and third-largest consumer of electricity. The national electric grid in India has an installed capacity of 370.106 GW as of 31 March 2020. Renewable power plants, which also include large hydroelectric plants, constitute 35.86% of India's total installed capacity. During the fiscal year (FY) 2019–20, the total electricity generation in the country was 1,598 TWh, of which 1,383.5 TWh generated by utilities. The gross electricity consumption per capita in FY2019 was 1,208 kWh.

In 2015-16, electric energy consumption in agriculture was recorded as being the highest (17.89%) worldwide. The per capita electricity consumption is low compared to most other countries despite India having a low electricity tariff.

In light of the recent COVID-19 situation, when everyone has been under lockdown for the months of March to June the impacts of the lockdown on economic activities have been faced by every sector in a positive or a negative way.

The dataset is exhaustive in its demonstration of energy consumption state wise.

Analysing Electricity Consumption in India from Jan 2019 till 5th December 2020. This dataset contains a record of Electricity consumption in each states of India here we are going to analyse State wise , Region wise and Overall Electricity consumption in India.

Activity 2: Business requirements

The business requirements for analyzing analysis on electricity consumption in IndiaIdentify the current patterns of electricity consumption in different regions and sectors of India. This information can be used to identify areas where consumption is high and areas where it is low. Identify opportunities for improving energy efficiency and reducing consumption in different sectors and regions. This information can be used to develop policies and programs to promote energy efficiency. This information can be used by government agencies, electricity providers, and investors to develop policies and make investment decisions that promote sustainable energy development and consumption in India.

Activity 3: Literature Survey (Student Will Write)

A literature survey is a method of researching existing literature and studies related to a specific topic.The topic of electricity consumption in India is a well-researched area, with many studies having been conducted to understand consumption patterns and trends, as well as the impact of government policies and investment opportunities.A study by (Kumar et al., 2020) analyzed the electricity consumption patterns in India and identified the major contributors to the consumption. The study found that the residential sector was the largest consumer of electricity, followed by the commercial and industrial sectors.Another study by (Jain and Rathi, 2019) analyzed the impact of government policies on electricity consumption in India. The study found that policies promoting energy efficiency and renewable energy development have had a positive impact on reducing electricity consumption in India.

Activity 4: Social or Business Impact.

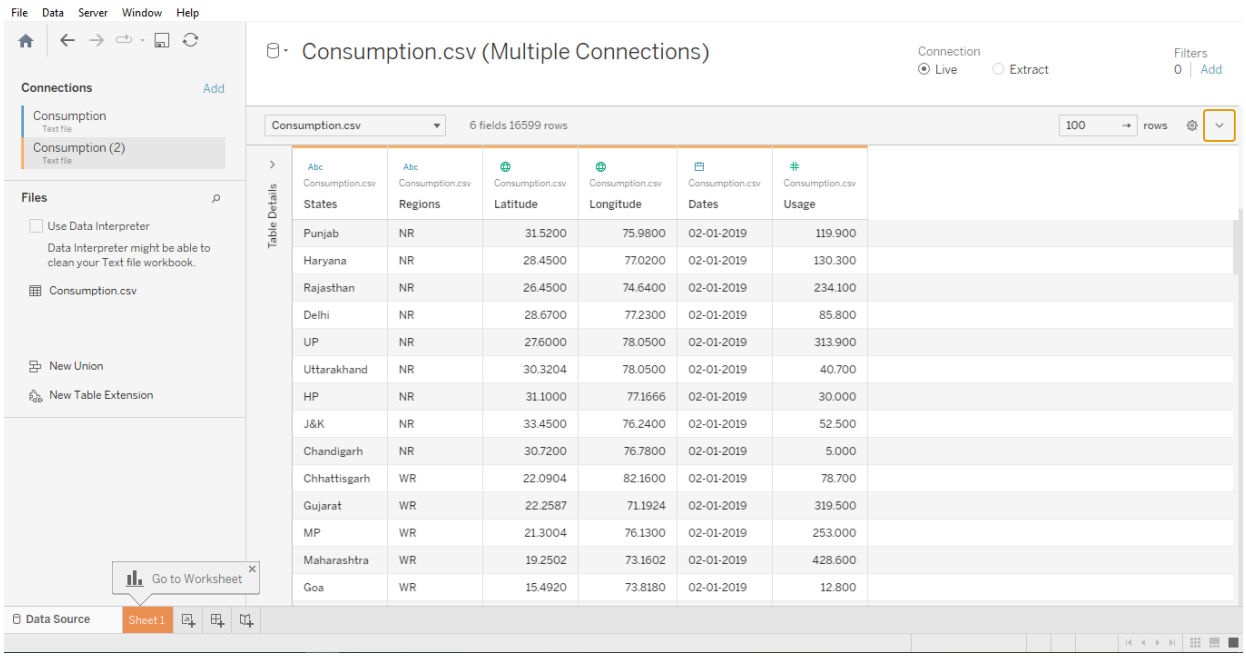
Social Impact: By providing access to electricity, the analysis can help to improve the quality of life for people living in areas without access to electricity, including providing access to lighting, heating, and cooling, and powering essential services such as hospitals and schools..

Business Model/Impact: By understanding consumption patterns and trends, the analysis can help businesses identify market opportunities and develop strategies to meet the growing demand for electricity in India.

Milestone 2: Data Collection & Extraction from Database

Data collection is the process of gathering and measuring information on variables of interest, in an established systematic fashion that enables one to answer stated research questions, test hypotheses, and evaluate outcomes and generate insights from the data.

Activity 1: Collect the dataset



States	Regions	Latitude	Longitude	Dates	Usage
Punjab	NR	31.5200	75.9800	02-01-2019	119.900
Haryana	NR	28.4500	77.0200	02-01-2019	130.300
Rajasthan	NR	26.4500	74.6400	02-01-2019	234.100
Delhi	NR	28.6700	77.2300	02-01-2019	85.800
UP	NR	27.6000	78.0500	02-01-2019	313.900
Uttarakhand	NR	30.3204	78.0500	02-01-2019	40.700
HP	NR	31.1000	77.1666	02-01-2019	30.000
J&K	NR	33.4500	76.2400	02-01-2019	52.500
Chandigarh	NR	30.7200	76.7800	02-01-2019	5.000
Chhattisgarh	WR	22.0904	82.1600	02-01-2019	78.700
Gujarat	WR	22.2587	71.1924	02-01-2019	319.500
MP	WR	21.3004	76.1300	02-01-2019	253.000
Maharashtra	WR	19.2502	73.1602	02-01-2019	428.600
Goa	WR	15.4920	73.8180	02-01-2019	12.800

Activity 1.1: Understand the data

In Dataset Consumption.csv data is in the form of a time series for a period of 24 months beginning from 2nd Jan 2019 till 5th December 2020. Columns

contains States, Regions, Latitude, Longitude, Dates andUsage. The dataset has been scraped from the weekly energy reports of POSOC.

Fields Include

States - Indian States

Regions- States in Regions on Indian Map

Latitude - States in Regions on Indian Map

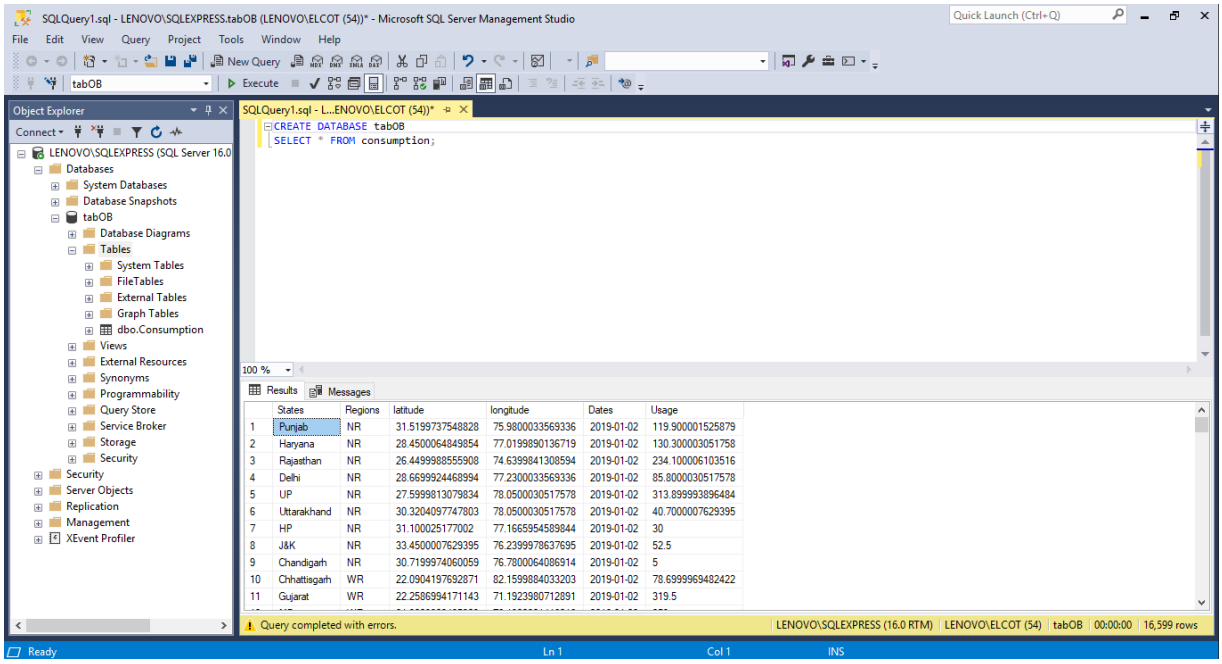
Longitude - Geographical Coordinates of States

Dates - Dates of Usage

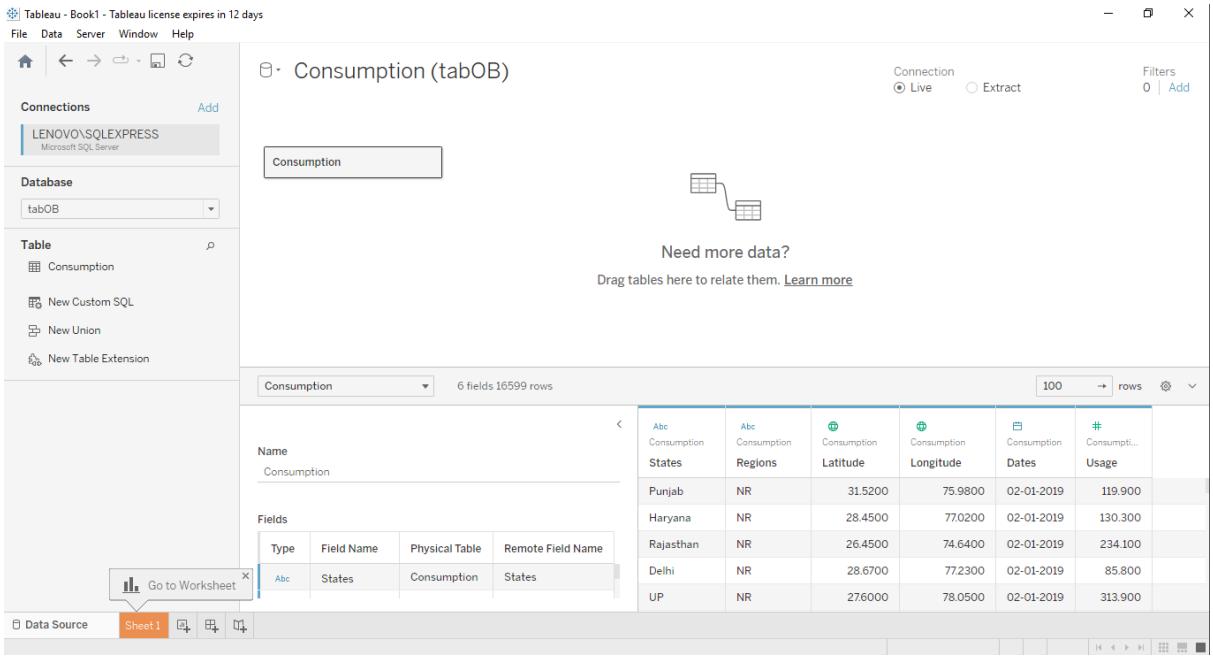
Usage - Power consumed in Mega Units(MU)

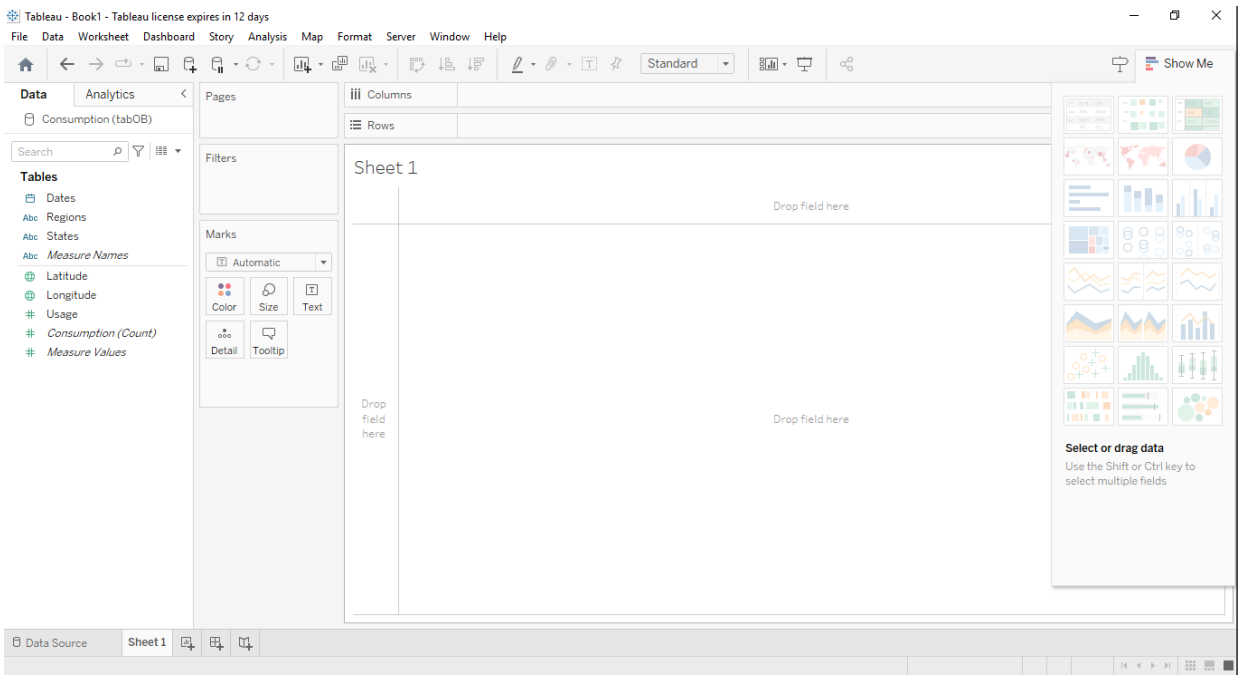
Activity 2: Storing Data in DB & Connect DB with Tableau

Storing Data in DB



Connect DB with Tableau





Milestone 3: Data Preparation

Activity 1: Prepare the Data for Visualization

Preparing the data for visualization involves cleaning the data to remove irrelevant or missing data, transforming the data into a format that can be easily visualized, exploring the data to identify patterns and trends, filtering the data to focus on specific subsets of data, preparing the data for visualization software, and ensuring the data is accurate and complete. This process helps to make the data easily understandable and ready for creating visualizations to gain insights into the performance and efficiency.

This data is preprocessed initially. Lets proceed for visualization.

Milestone 4: Data Visualization

Data visualization is the process of creating graphical representations of data in order to help people understand and explore the information. The goal of data visualization is to make complex data sets more accessible, intuitive, and easier to interpret. By using visual elements such as charts, graphs, and maps, data visualizations can help people quickly identify patterns, trends, and outliers in the data.

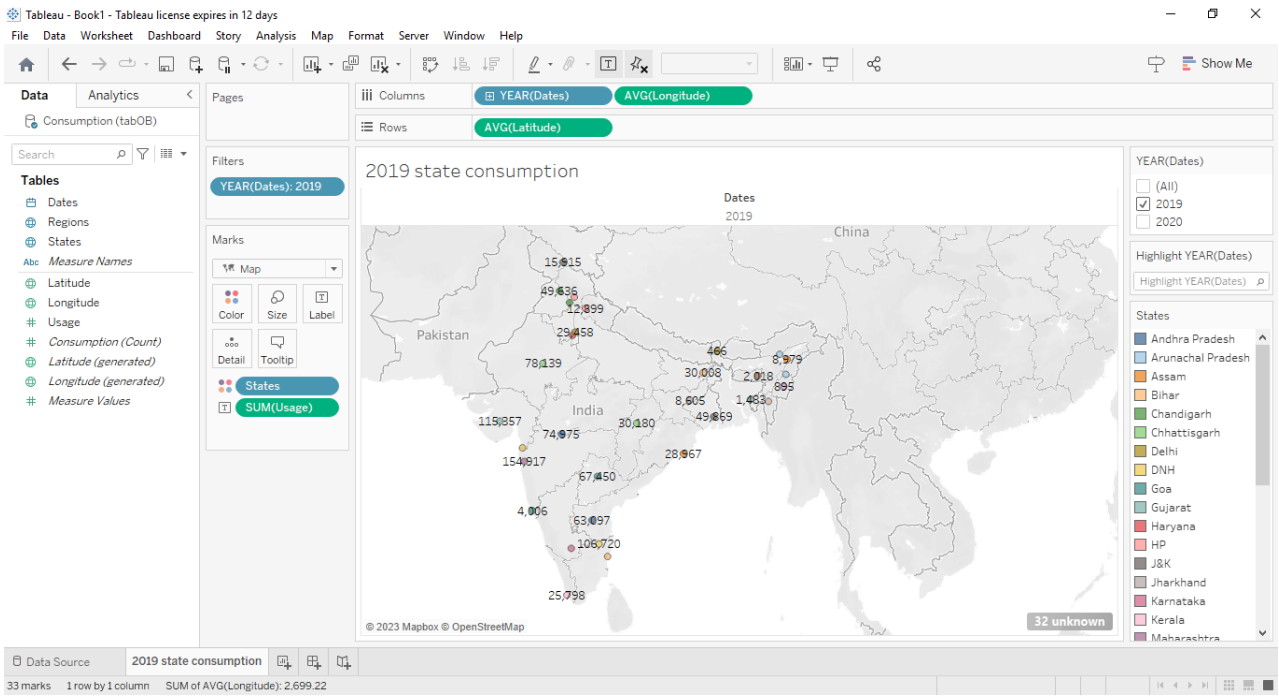
Activity 1: No of Unique Visualizations

The number of unique visualizations that can be created with a given dataset. Some common types of visualizations that can be used to analyze the performance and efficiency of Radisson Hotels include bar charts, line charts, heat maps, scatter plots, pie charts,Maps etc. These visualizations can be used

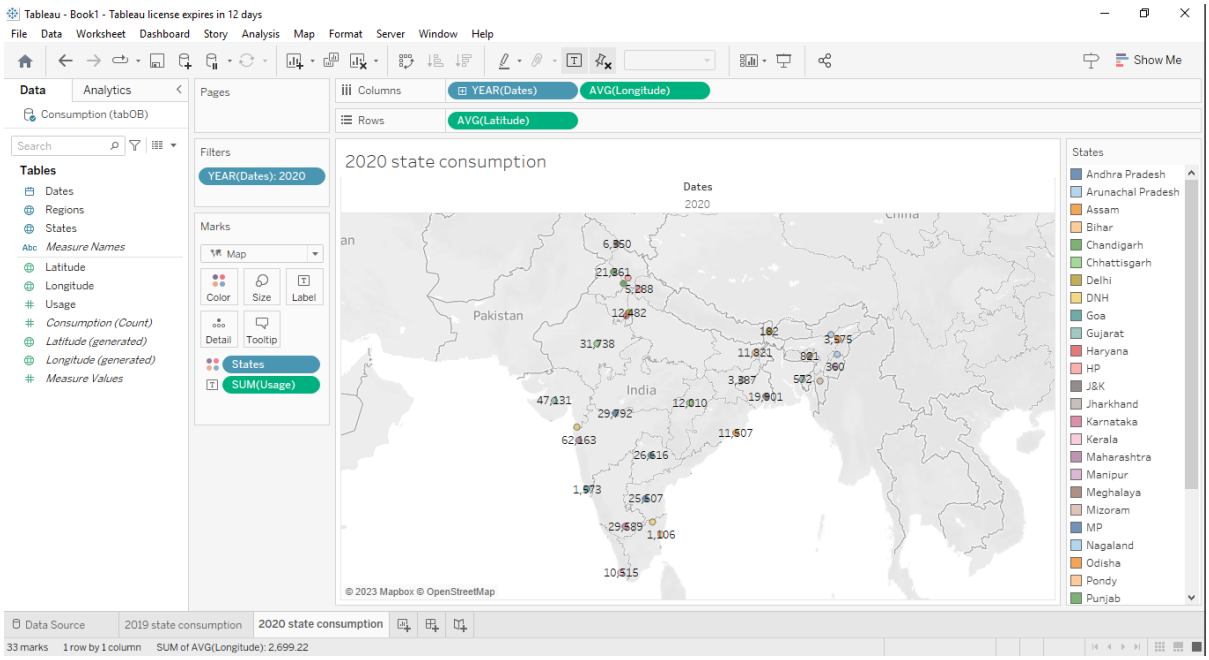
to compare performance, track changes over time, show distribution, and relationships between variables, breakdown of revenue and customer demographics, workload, resource allocation and location of hotels.

Activity 1.1: To Understand-2019 and 2020 Consumption, Total Consumption, Usage by Region, Top N and Bottom N States

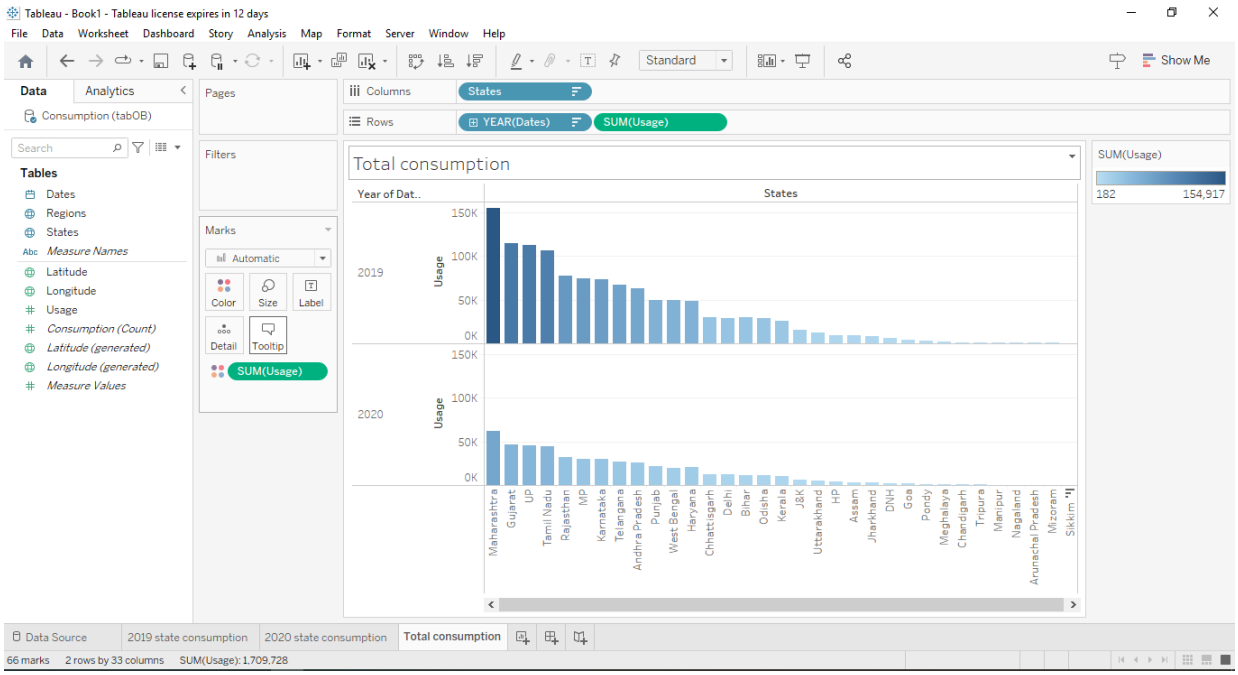
2019 state consumption



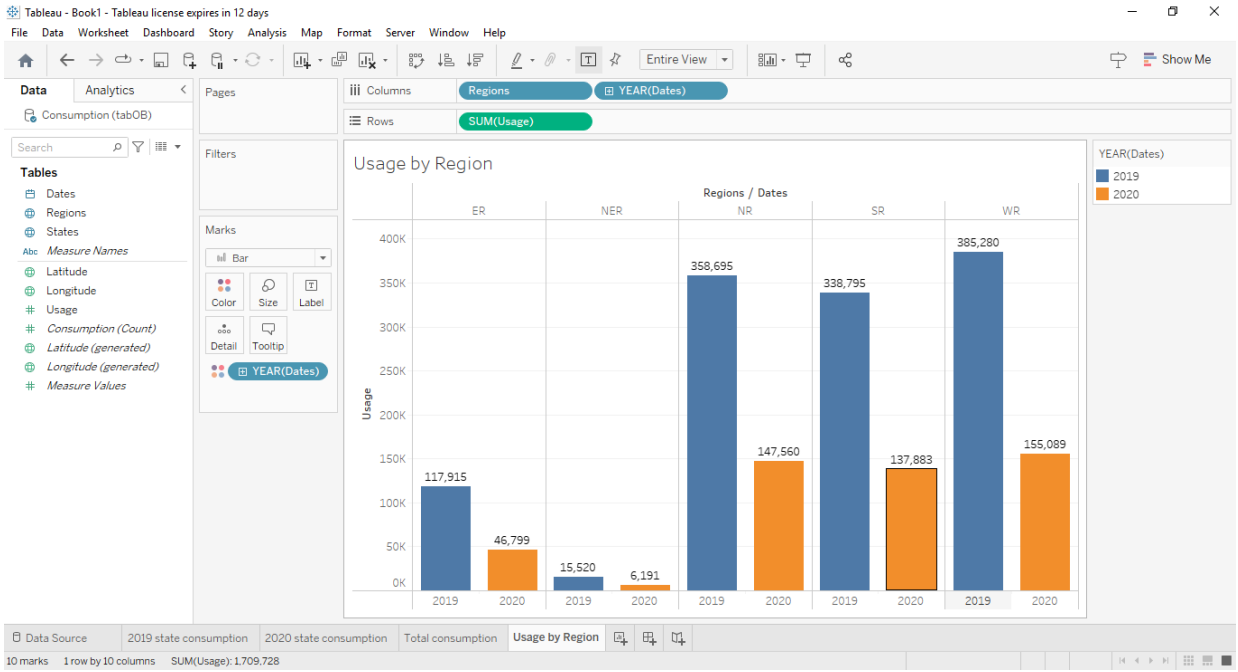
2020 state consumption



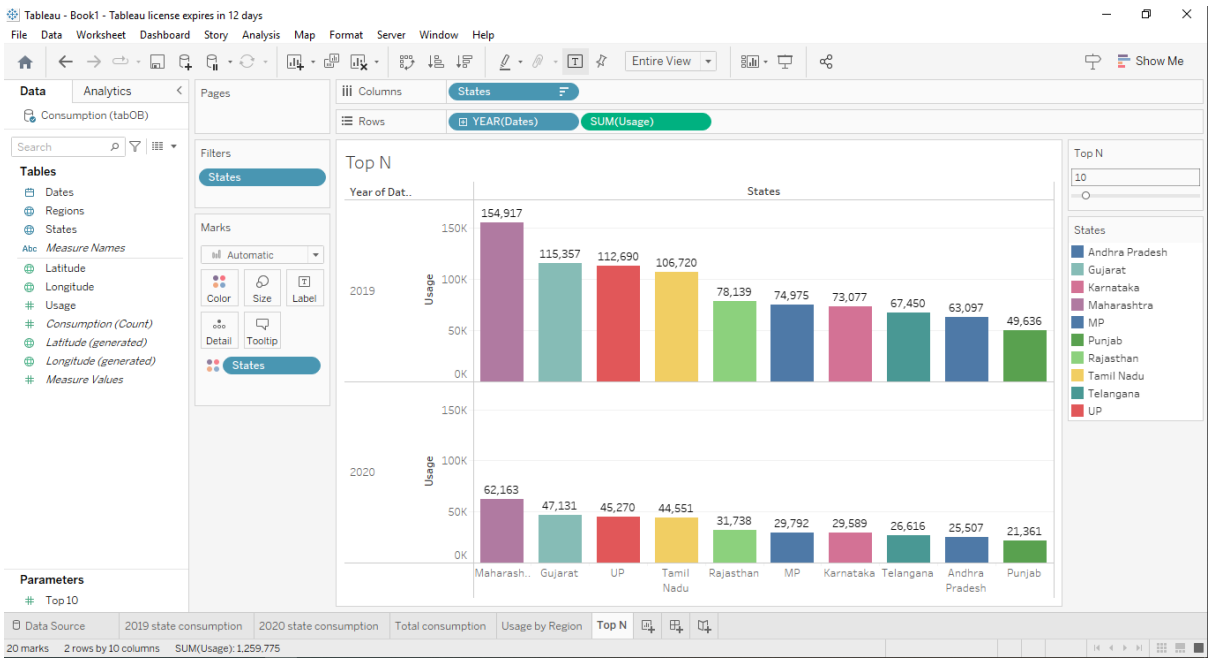
Total consumption



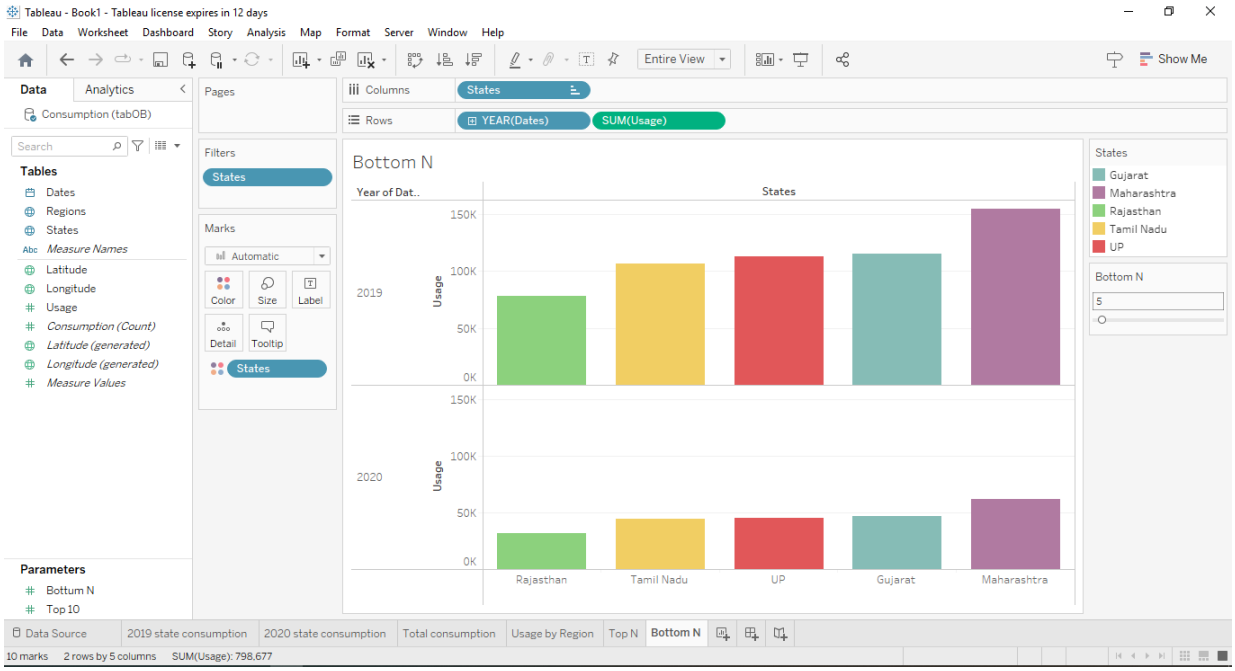
Usage by Region



Top N States

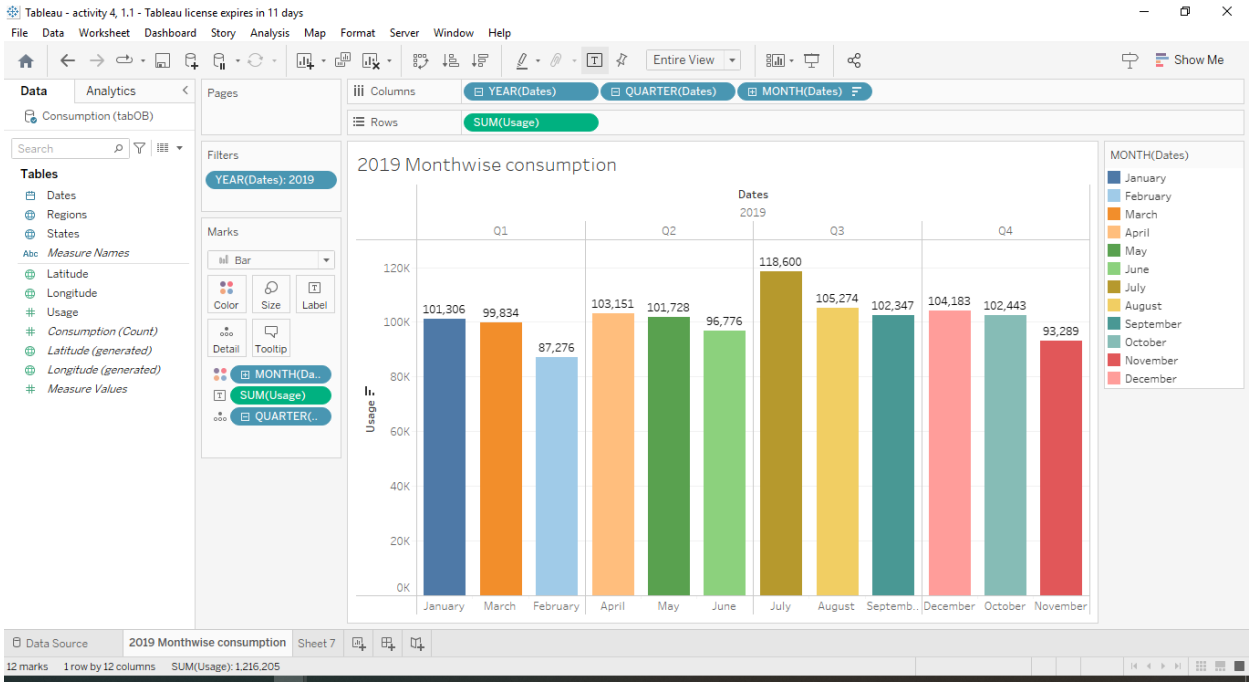


Bottom N States

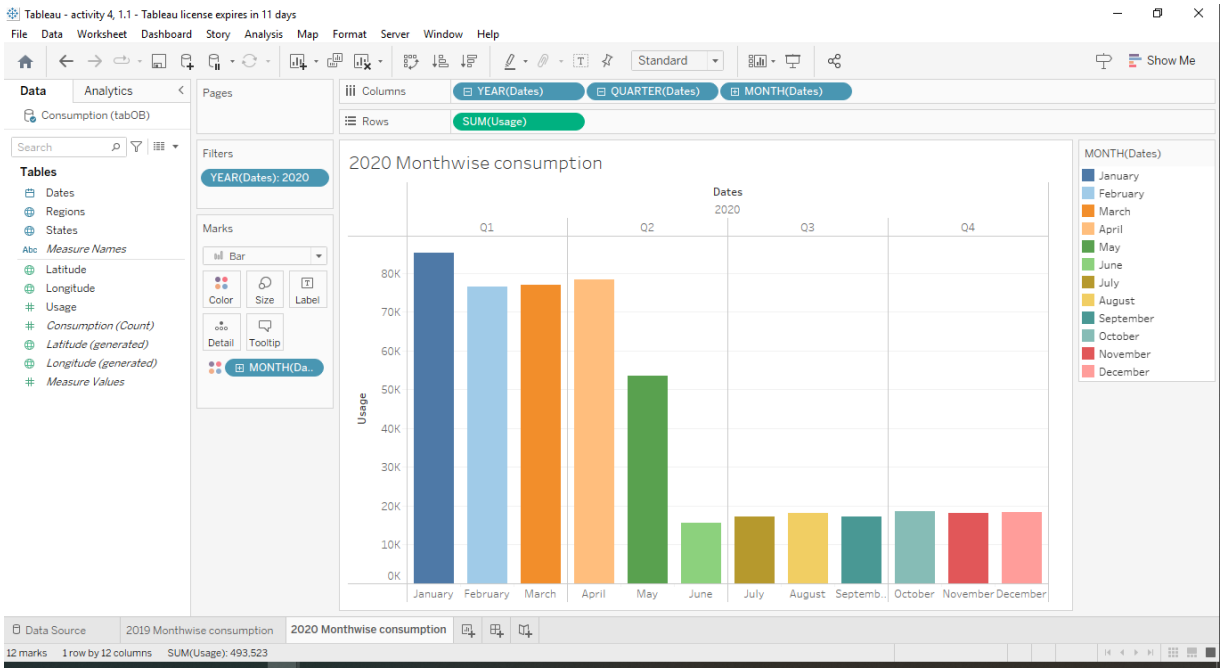


Activity 1.2: To Understand-2019 and 2020 Month wise Consumption, Total Consumption by region, Usage Before and After Lockdown

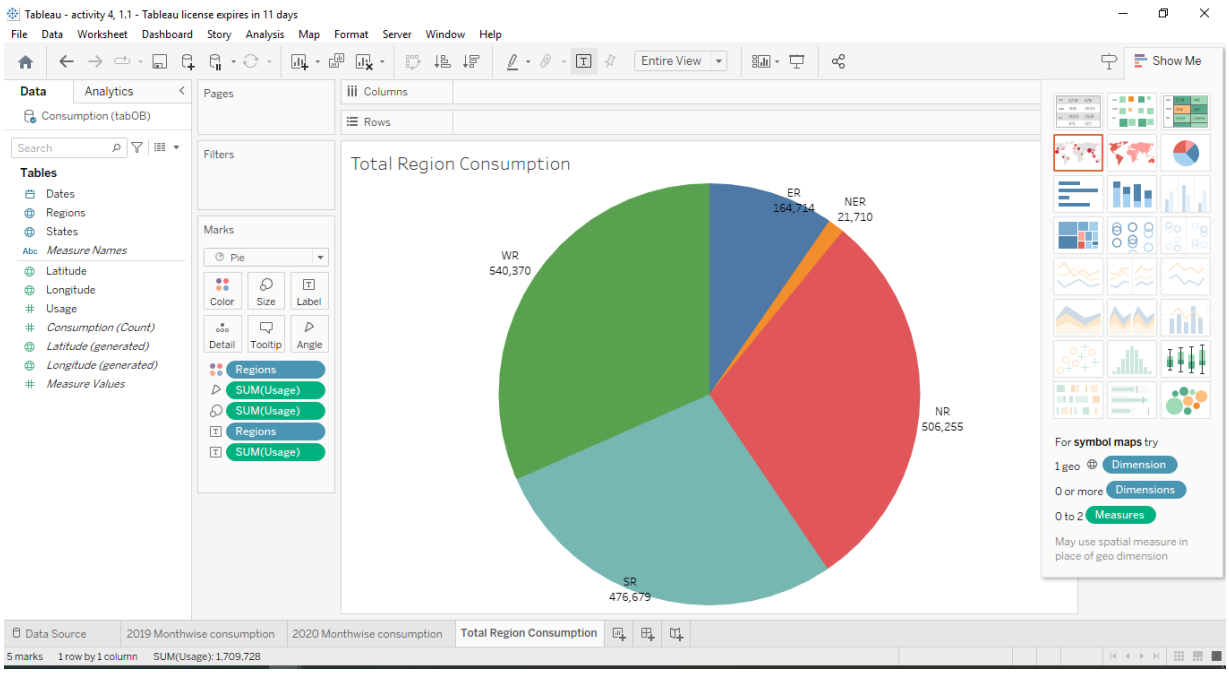
2019 Monthwise Consumption



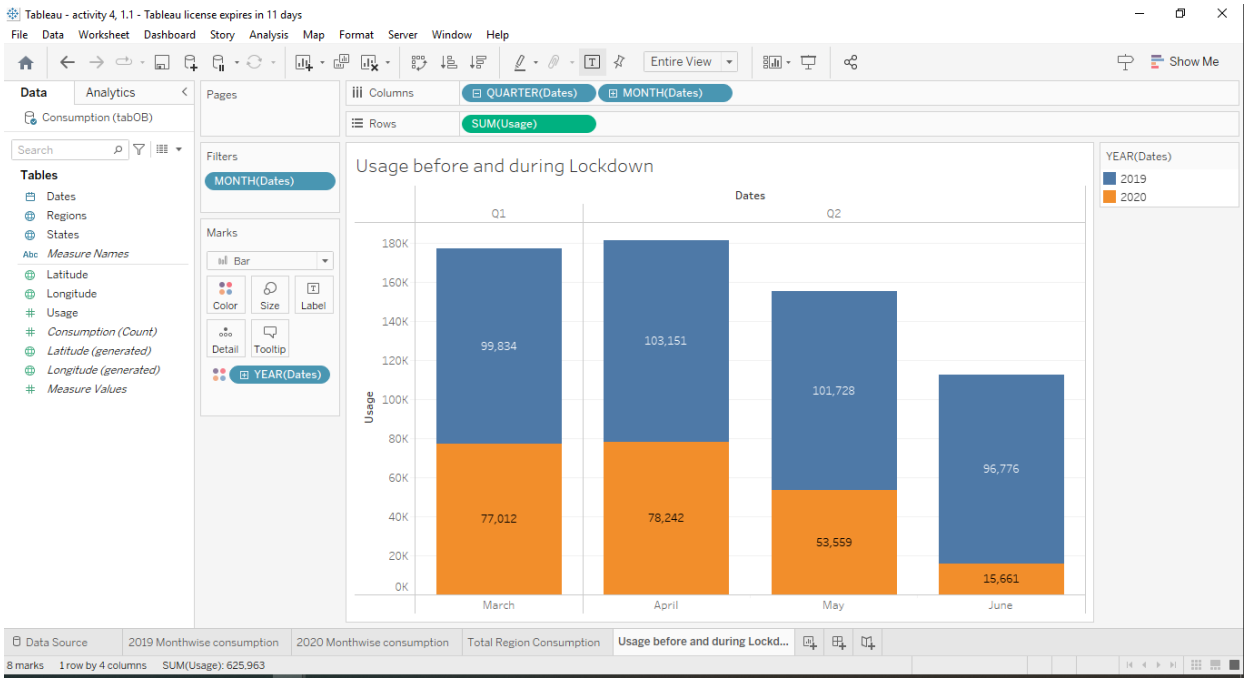
2020 Monthwise Consumption



Total Region Consumption

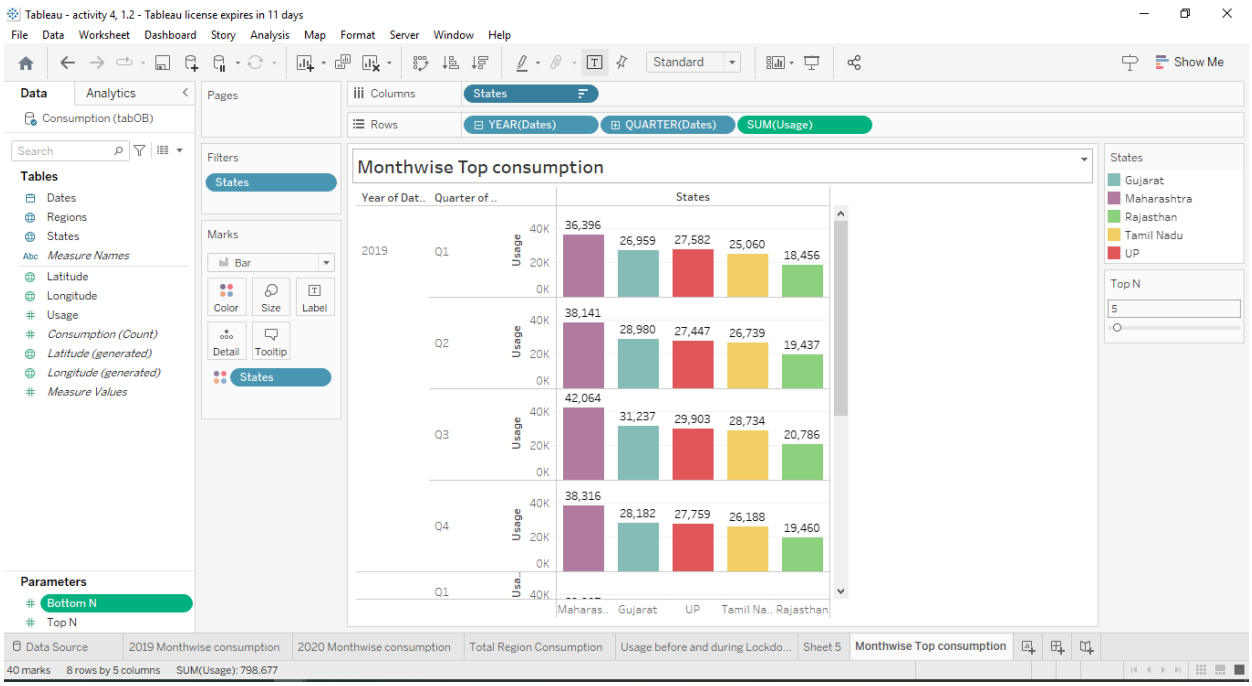


Usage Before and After Lockdown

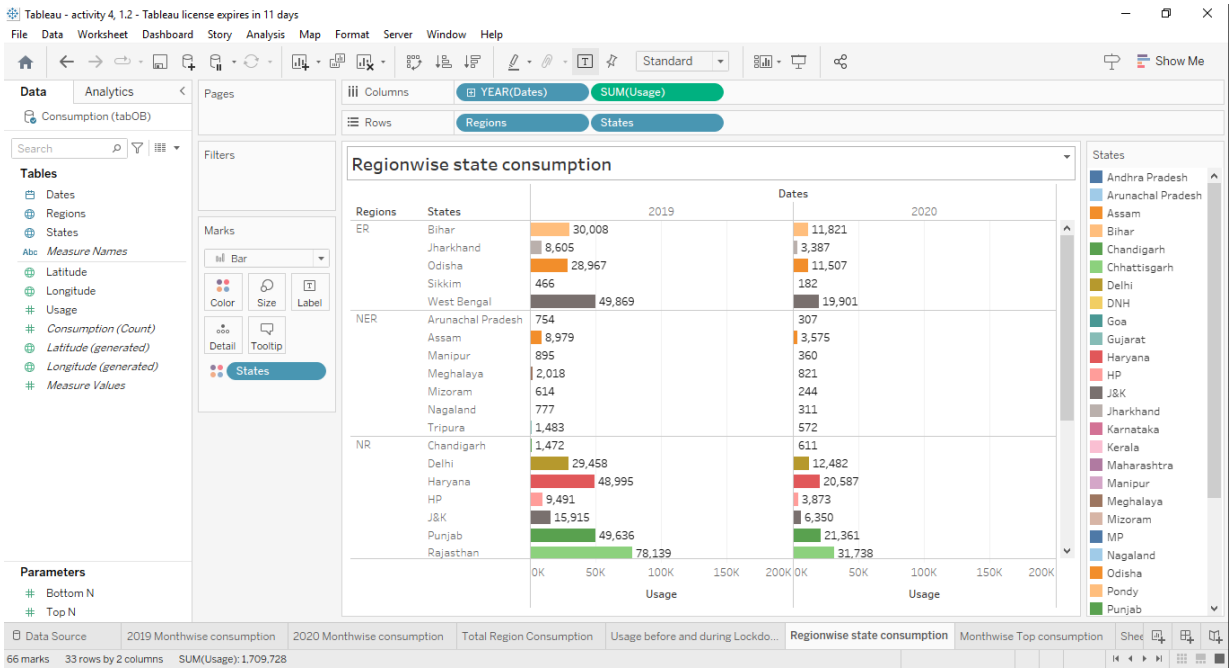


Activity 1.3: To understand Region wise State Usage Quarter Usage and Usage by Year

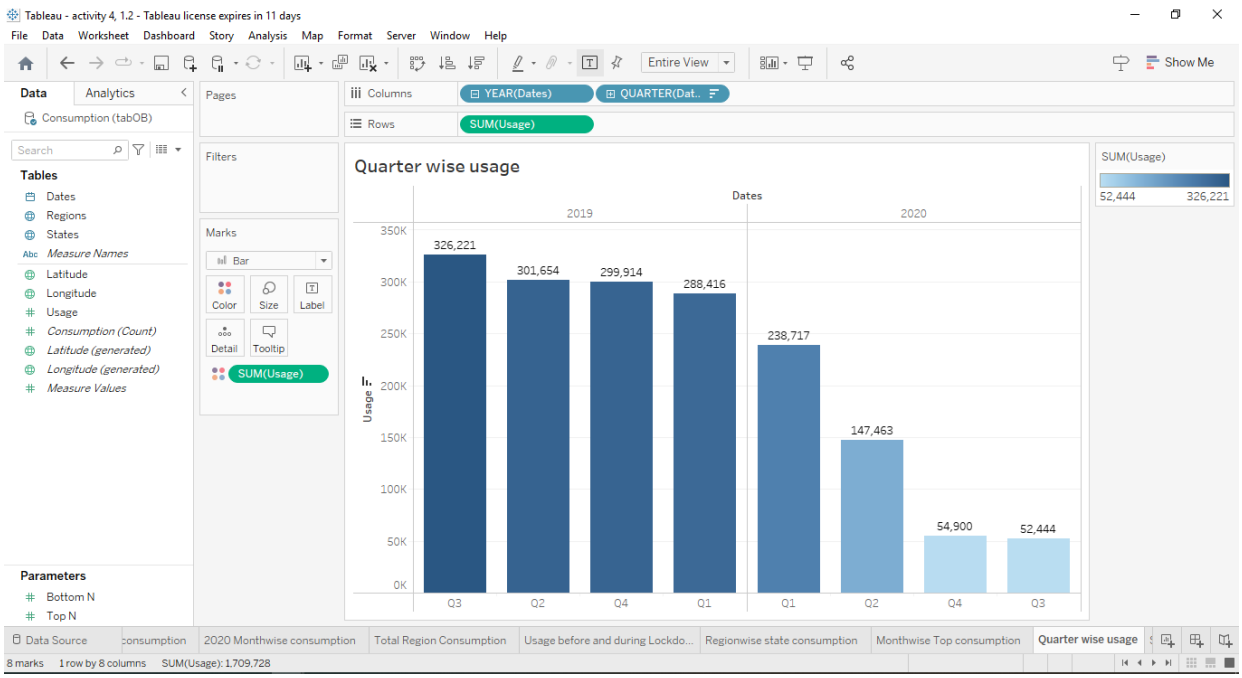
Monthwise Top Consumption



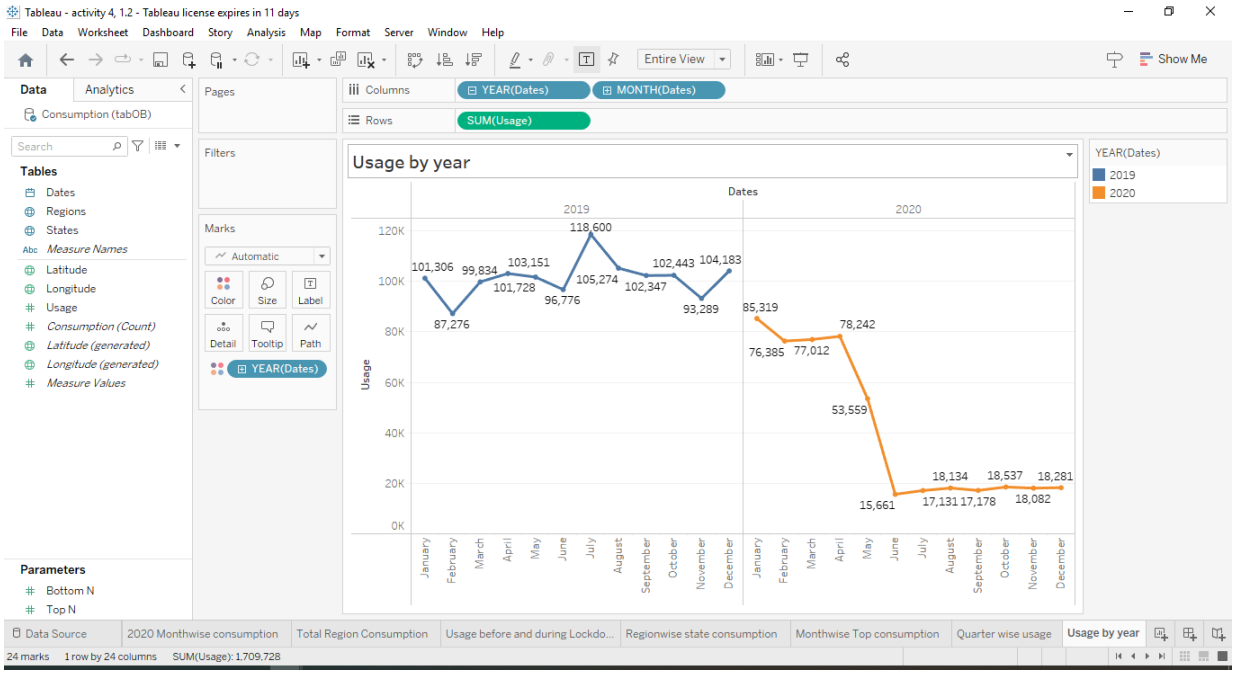
Regionwise State Consumption



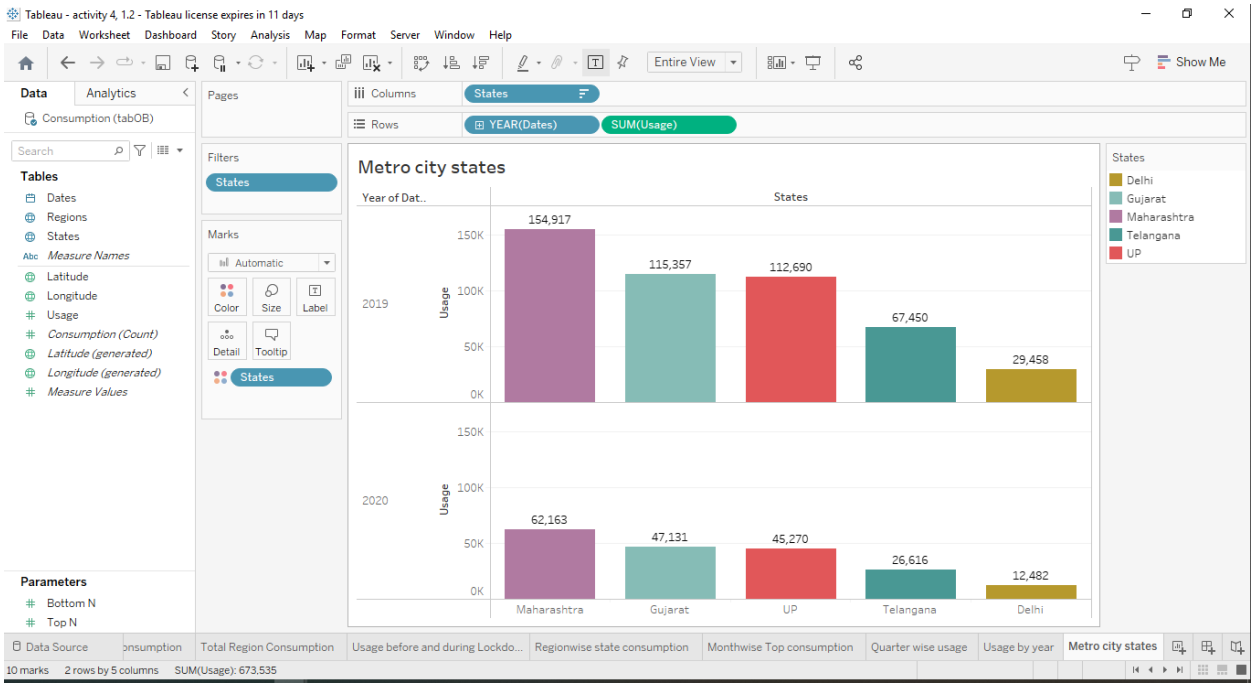
Quarter wise Usage



Usage By Year



Metro City States



Milestone 5: Dashboard

A dashboard is a graphical user interface (GUI) that displays information and data in an organized, easy-to-read format. Dashboards are often used to provide real-time monitoring and analysis of data, and are typically designed for a specific purpose or use case. Dashboards can be used in a variety of settings, such as business, finance, manufacturing, healthcare, and many other industries. They can be used to track key performance indicators (KPIs), monitor performance metrics, and display data in the form of charts, graphs, and tables.

Activity :1- Responsive and Design of Dashboard

The responsiveness and design of a dashboard for analyzing the performance and efficiency of Radisson Hotels is crucial to ensure that the information is easily understandable and actionable. Key considerations for designing a responsive and effective dashboard include user-centered design, clear and concise information, interactivity, data-driven approach, accessibility, customization, and security. The goal is to create a dashboard that is user-friendly, interactive, and data-driven, providing actionable insights to improve the performance and efficiency of Radisson Hotels.

Once you have created views on different sheets in Tableau, you can pull them into a dashboard.

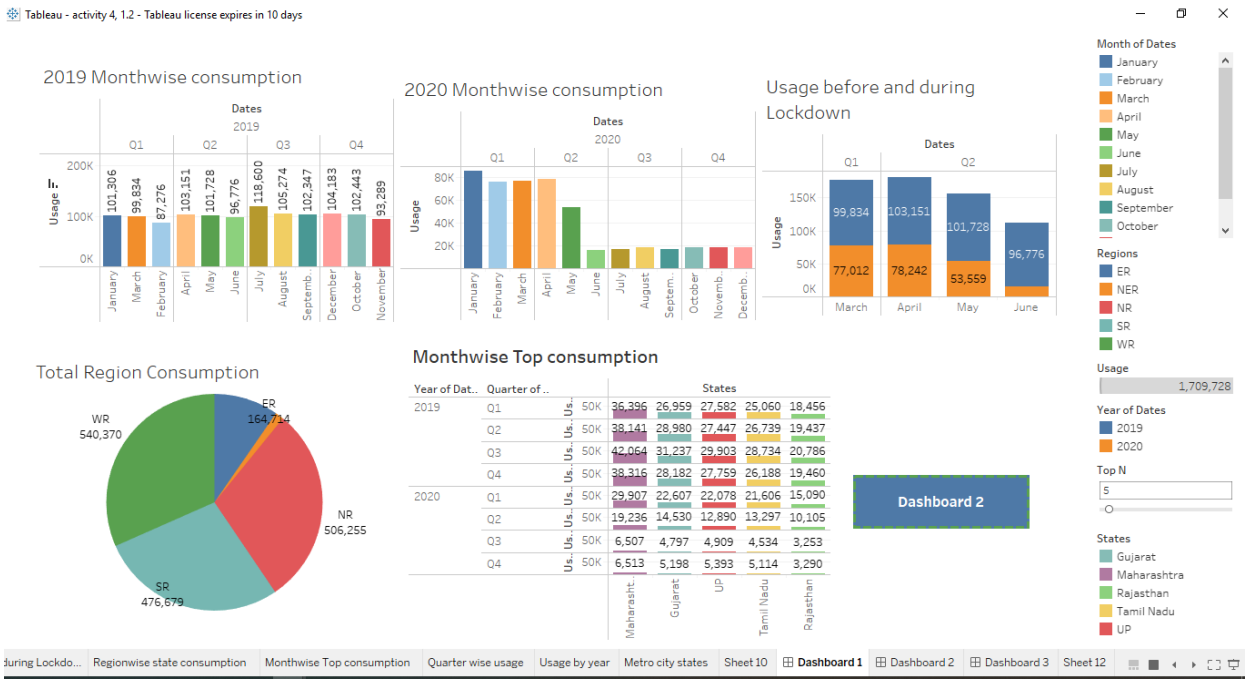


Tableau - activity 4, 1.2 - Tableau license expires in 10 days
2019 Monthwise consumption
2020 Monthwise consumption
Usage before and during Lockdown
Total Region Consumption
Monthwise Top consumption
Dashboard 2
Month of Dates
Regions
Usage
Year of Dates
Top N
States
during Lockdo...
Regionwise state consumption
Monthwise Top consumption
Quarter wise usage
Usage by year
Metro city states
Sheet 10
Dashboard 1
Dashboard 2
Dashboard 3
Sheet 12

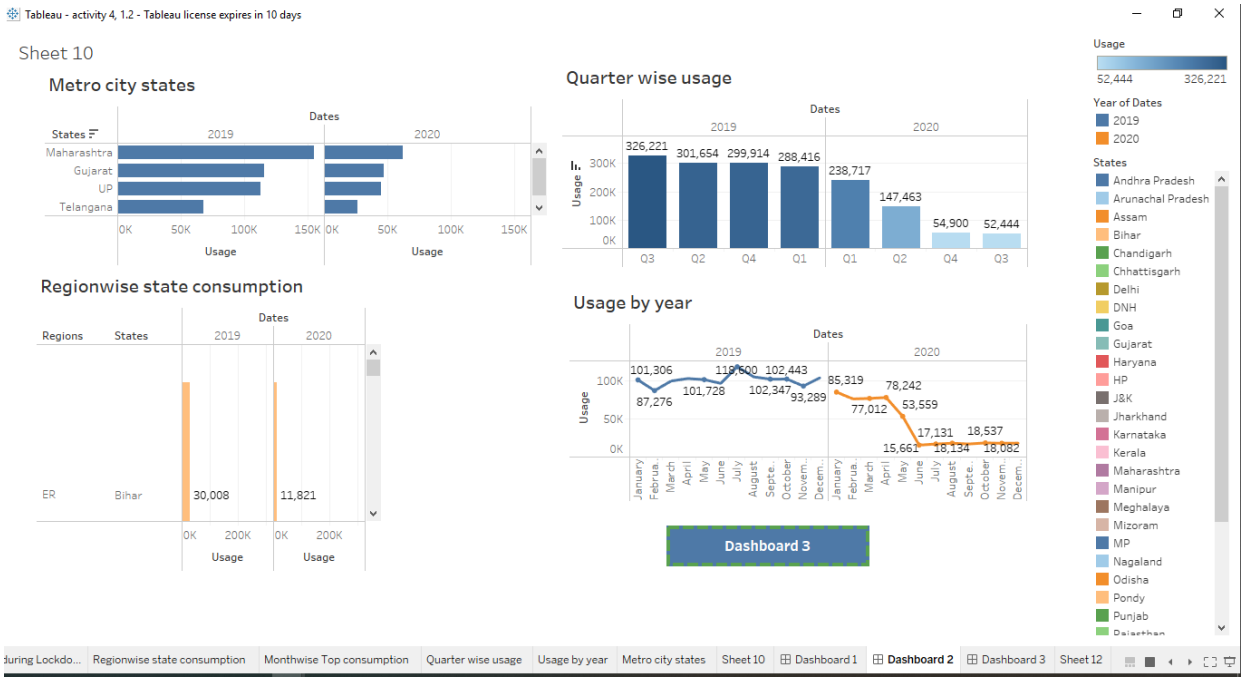


Tableau - activity 4, 1.2 - Tableau license expires in 10 days
Sheet 10
Metro city states
Quarter wise usage
Regionwise state consumption
Usage by year
Dashboard 3
Usage
Year of Dates
States
during Lockdo...
Regionwise state consumption
Monthwise Top consumption
Quarter wise usage
Usage by year
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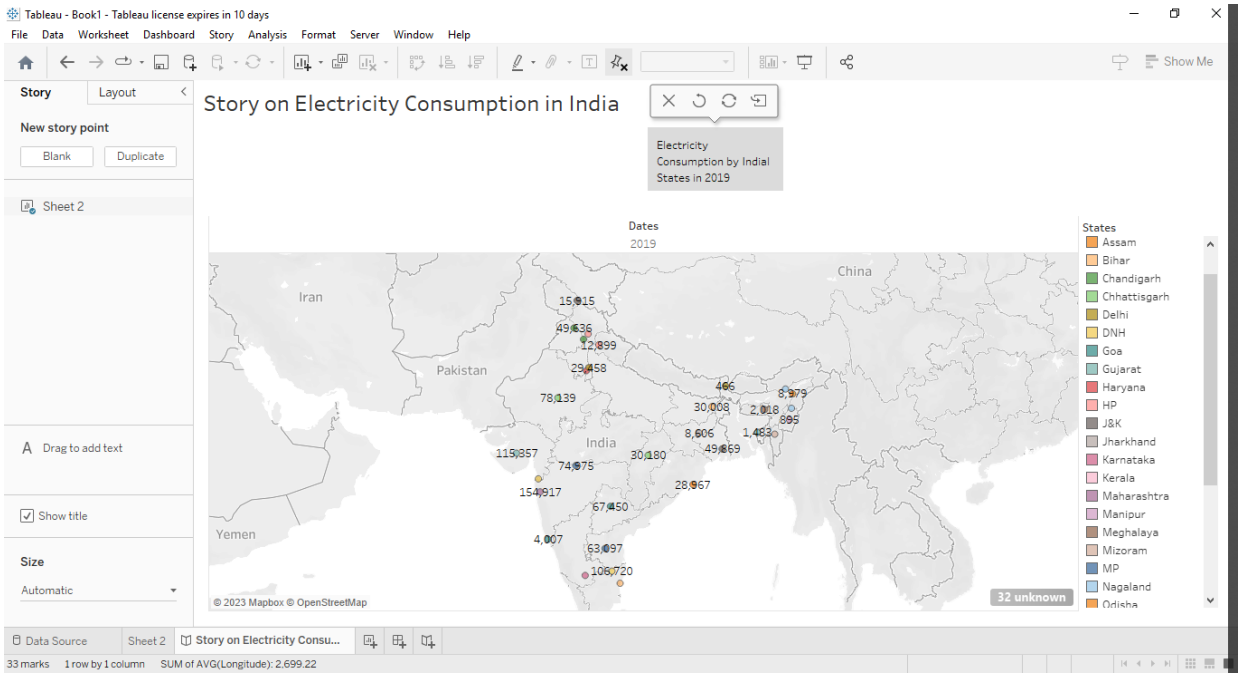
Sheet 10
Dashboard 1
Dashboard 2
Dashboard 3
Sheet 12

Milestone 6: Story

A data story is a way of presenting data and analysis in a narrative format, with the goal of making the information more engaging and easier to understand. A data story typically includes a clear introduction that sets the stage and explains the context for the data, a body that presents the data and analysis in a logical and systematic way, and a conclusion that summarizes the key findings and highlights their implications. Data stories can be told using a variety of mediums, such as reports, presentations, interactive visualizations, and videos.

Activity:1- No of Scenes of Story

The number of scenes in a storyboard for a data visualization analysis of the electricity consumption in india will depend on the complexity of the analysis and the specific insights that are trying to be conveyed. A storyboard is a visual representation of the data analysis process and it breaks down the analysis into a series of steps or scenes.

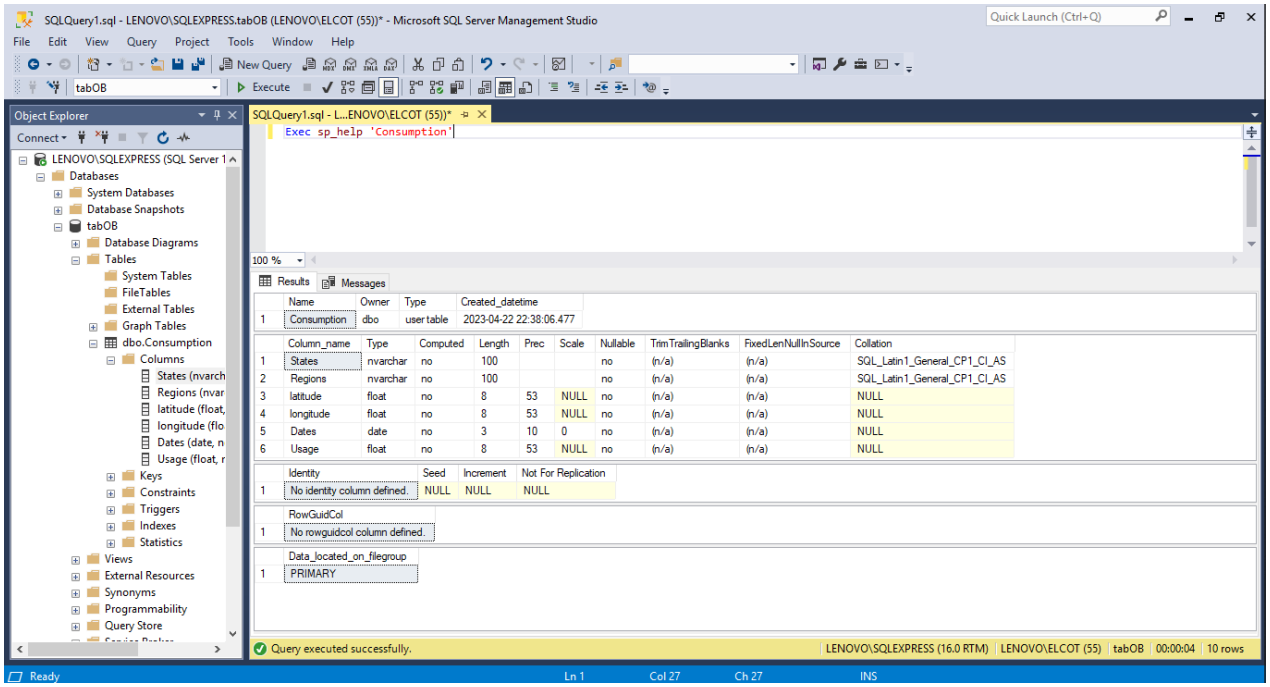


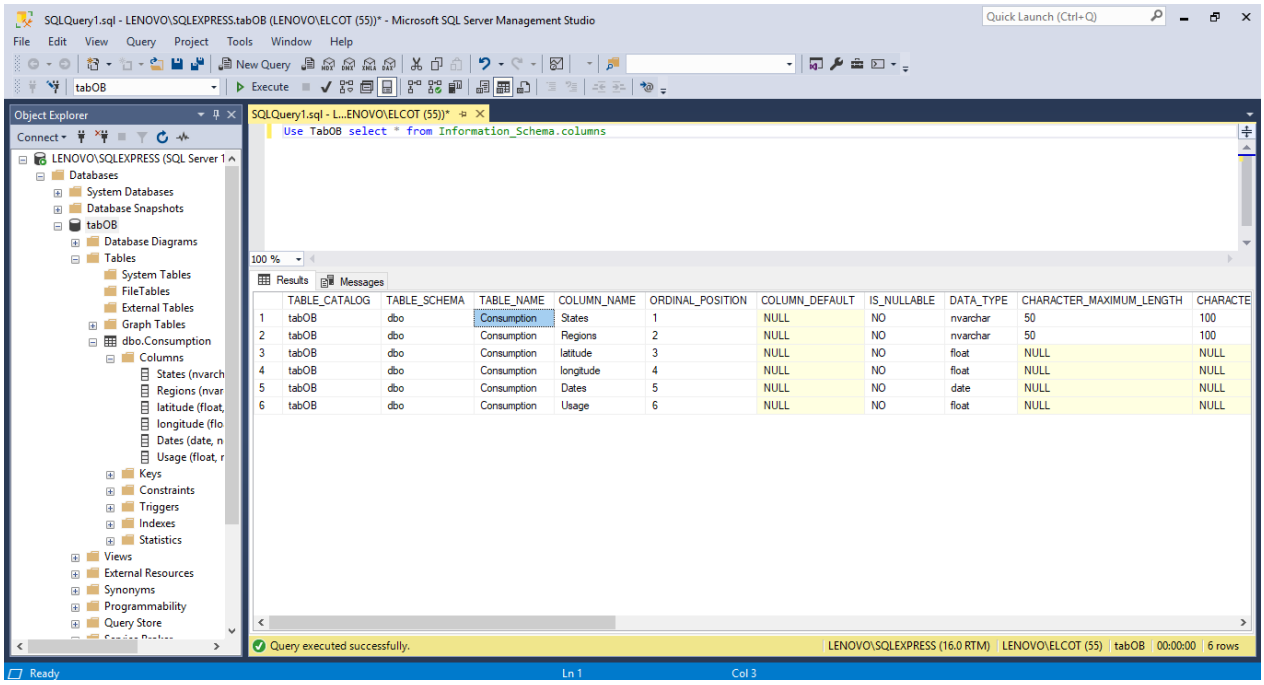
Milestone 7: Performance Testing

Activity 1: Amount of Data Rendered to DB

● The amount of data that is rendered to a database depends on the size of the dataset and the capacity of the database to store and retrieve data.

● Open the MySQL Workbench, go to the database then click to expand the tables,select the table and click on (i) button to get the information related to table such as column count,table rows etc.





Activity 2: Utilization of Data Filters

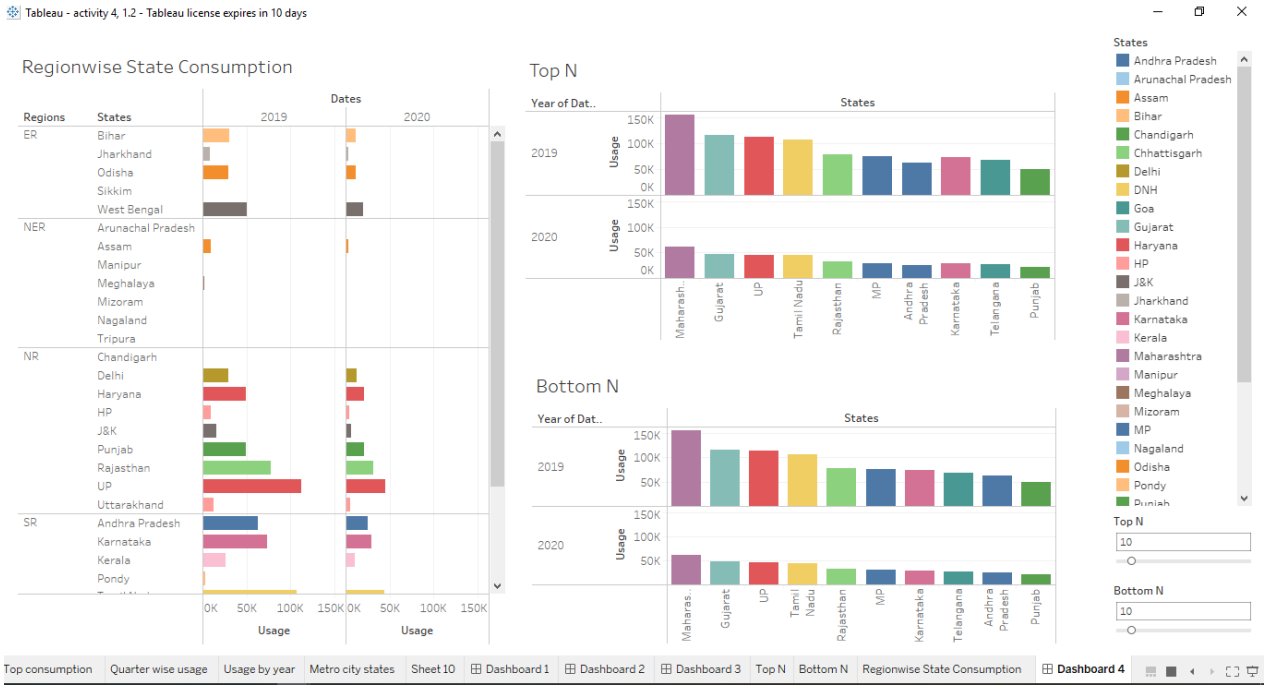


Tableau - activity 4, 1.2 - Tableau license expires in 10 days
Regionwise State Consumption
Regions
States
Dates
2019
2020
ER
Bihar
Jharkhand
Odisha
Sikkim
West Bengal
NER
Arunachal Pradesh
Assam
Manipur
Meghalaya
Mizoram
Nagaland
Tripura
NR
Chandigarh
Delhi
Haryana
HP
J&K
Punjab
Rajasthan
UP
Uttarakhand
SR
Andhra Pradesh
Karnataka
Kerala
Pondy
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States
Usage
Maharash..
Gujarat
UP
Tamil Nadu
Rajasthan
MP
Andhra Pradesh
Karnataka
Telangana
Punjab
Bottom N
Maharas..
Andhra Pradesh
States
Andhra Pradesh
Arunachal Pradesh
Assam
Bihar
Chandigarh
Chhattisgarh
Delhi
DNH
Goa
Gujarat
Haryana
HP
J&K
Jharkhand
Karnataka
Kerala
Maharashtra
Manipur
Meghalaya
Mizoram
MP
Nagaland
Odisha
Pondy
Top N
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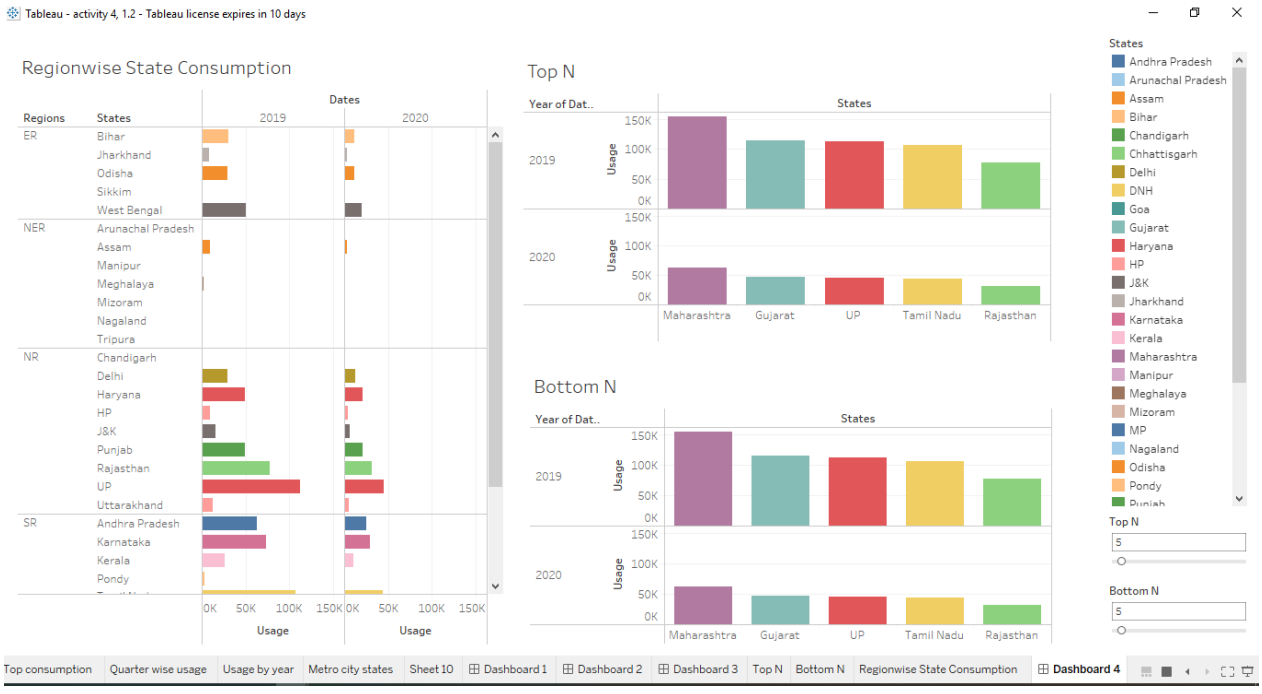
Bottom N
10
Top consumption
Quarter wise usage
Usage by year
Metro city states
Sheet 10
Dashboard 1
Dashboard 2
Dashboard 3
Top N
Bottom N
Regionwise State Consumption
Dashboard 4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Regionwise State Consumption
Regions
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2019
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ER
Bihar
Jharkhand
Odisha
Sikkim
West Bengal
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Arunachal Pradesh
Assam
Manipur
Meghalaya
Mizoram
Nagaland
Tripura
NR
Chandigarh
Delhi
Haryana
HP
J&K
Punjab
Rajasthan
UP
Uttarakhand
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Andhra Pradesh
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Usage
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States
Usage
Maharashtra
Gujarat
UP
Tamil Nadu
Rajasthan
Bottom N
States
Andhra Pradesh
Arunachal Pradesh
Assam
Bihar
Chandigarh
Chhattisgarh
Delhi
DNH
Goa
Gujarat
Haryana
HP
J&K
Jharkhand
Karnataka
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Manipur
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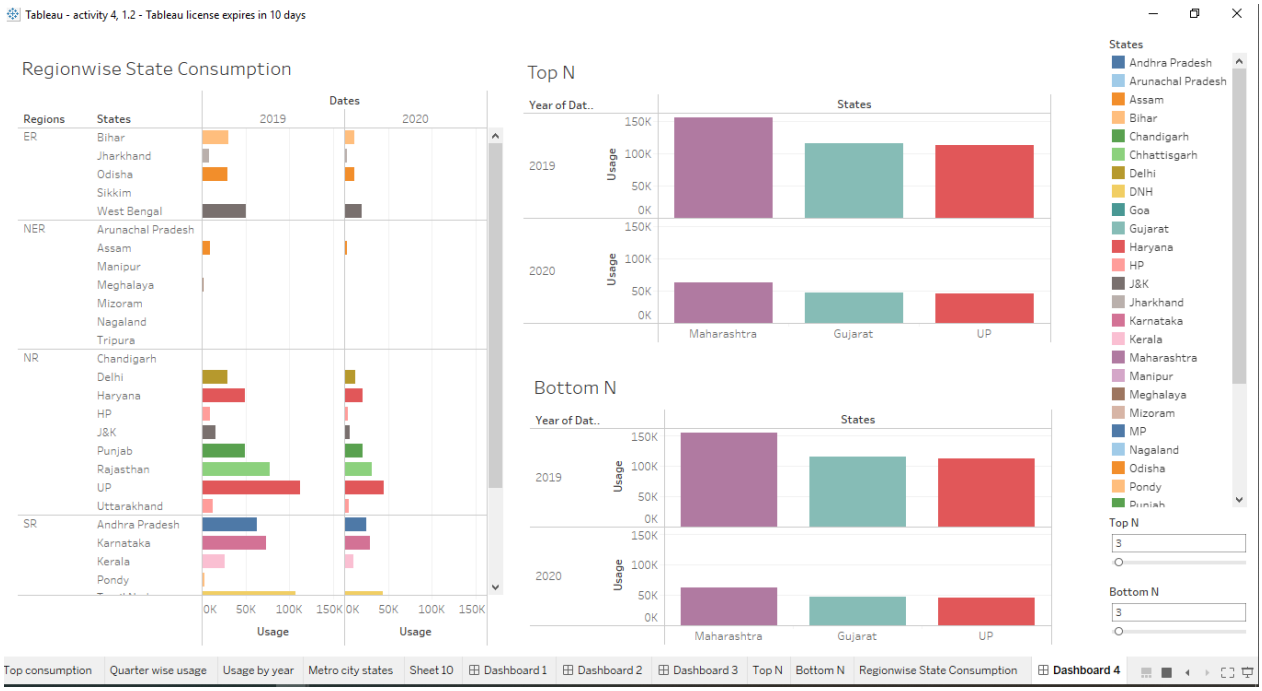
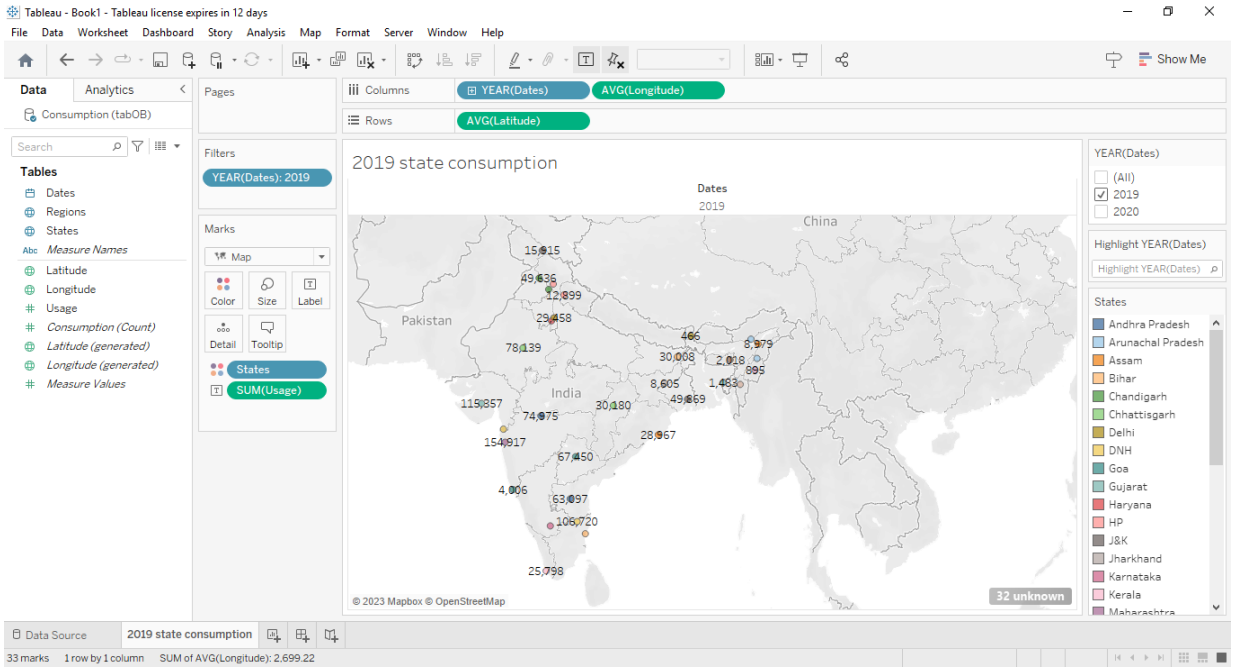
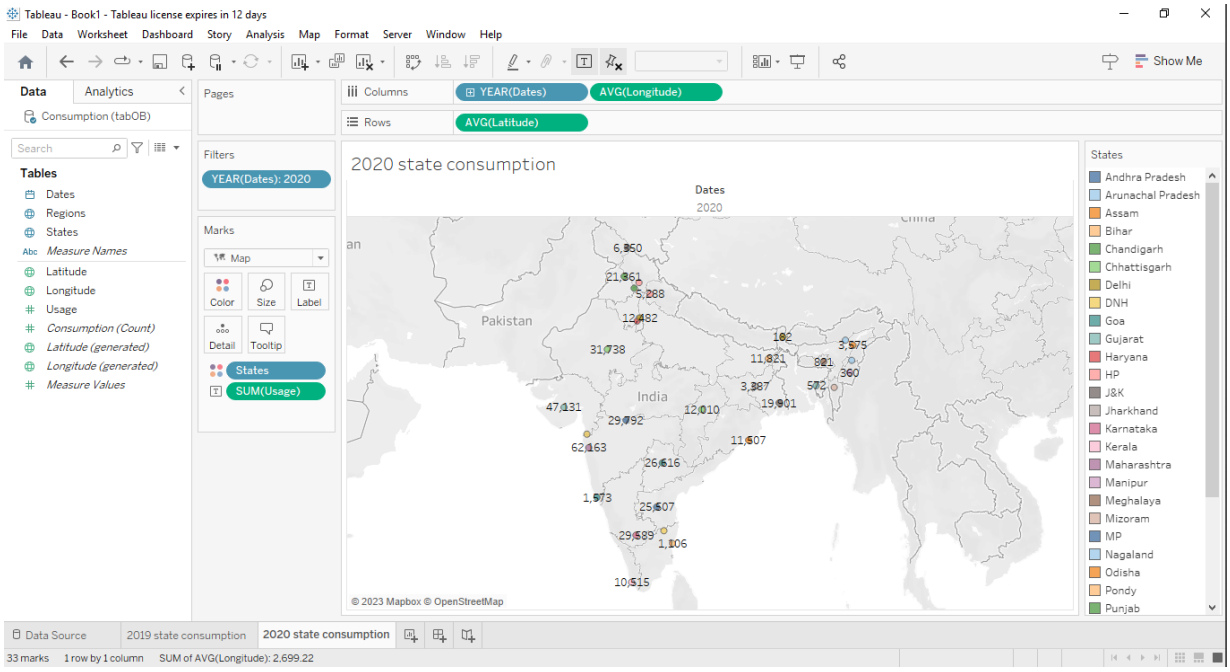


Activity 4: No of Visualization/ Graphs

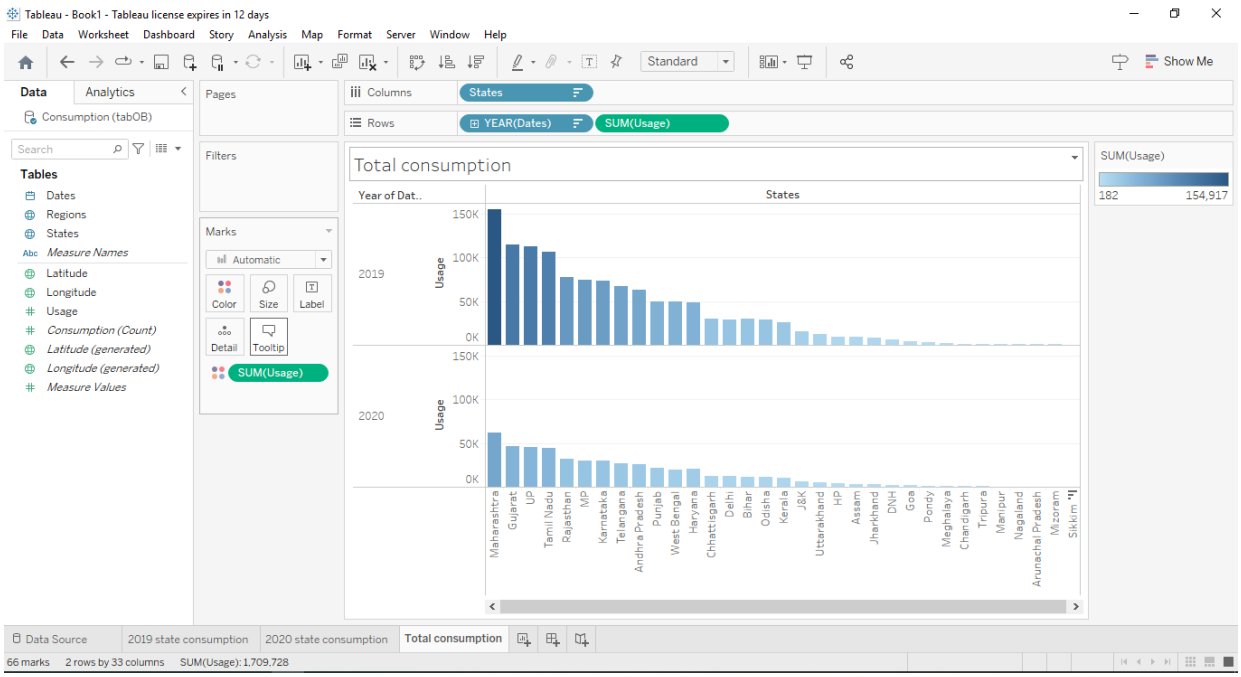
1) 2019 State Consumption



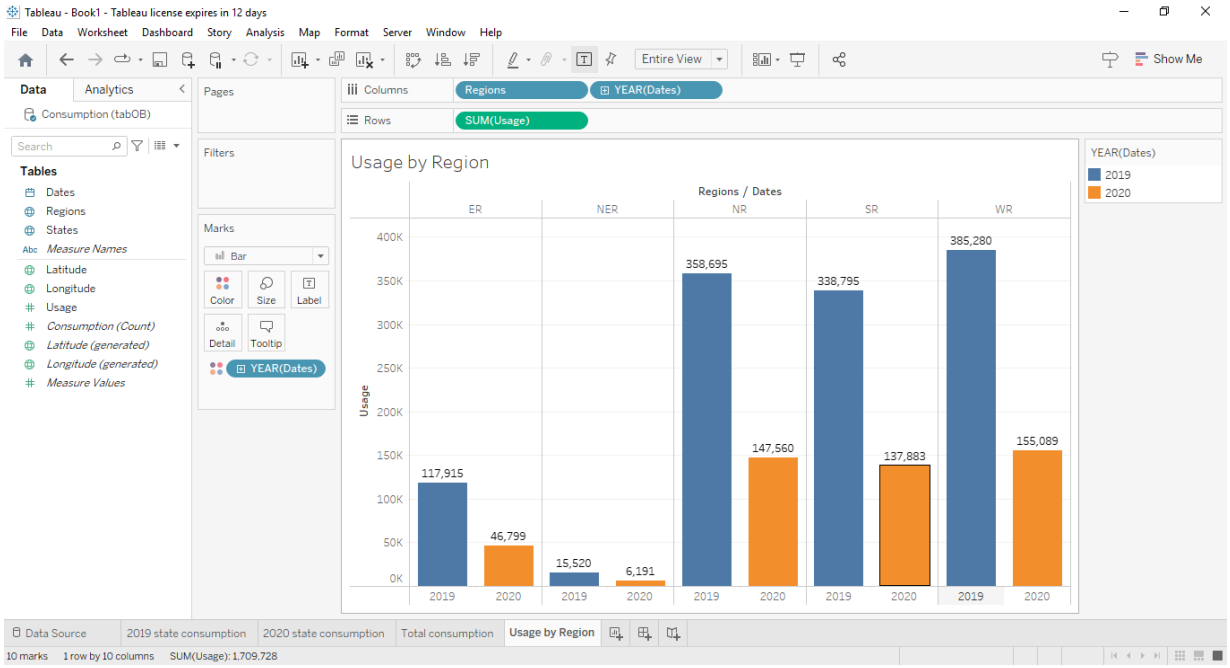
2) 2020 State Consumption



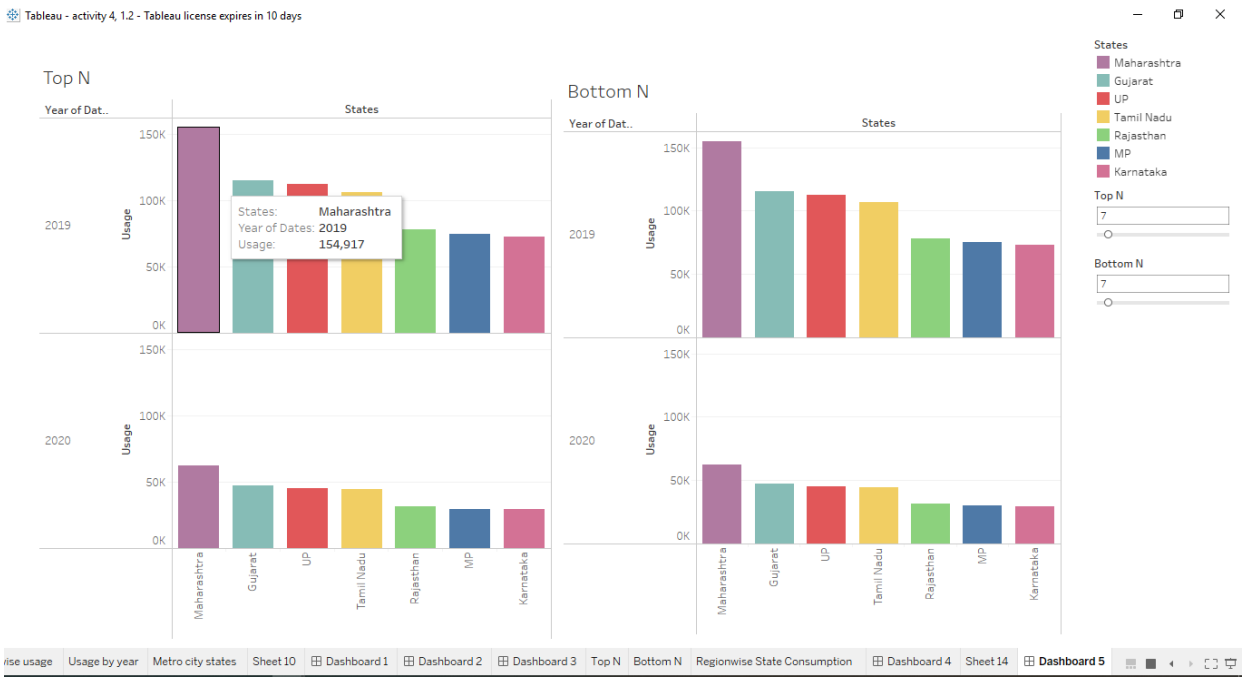
3) Total Consumption



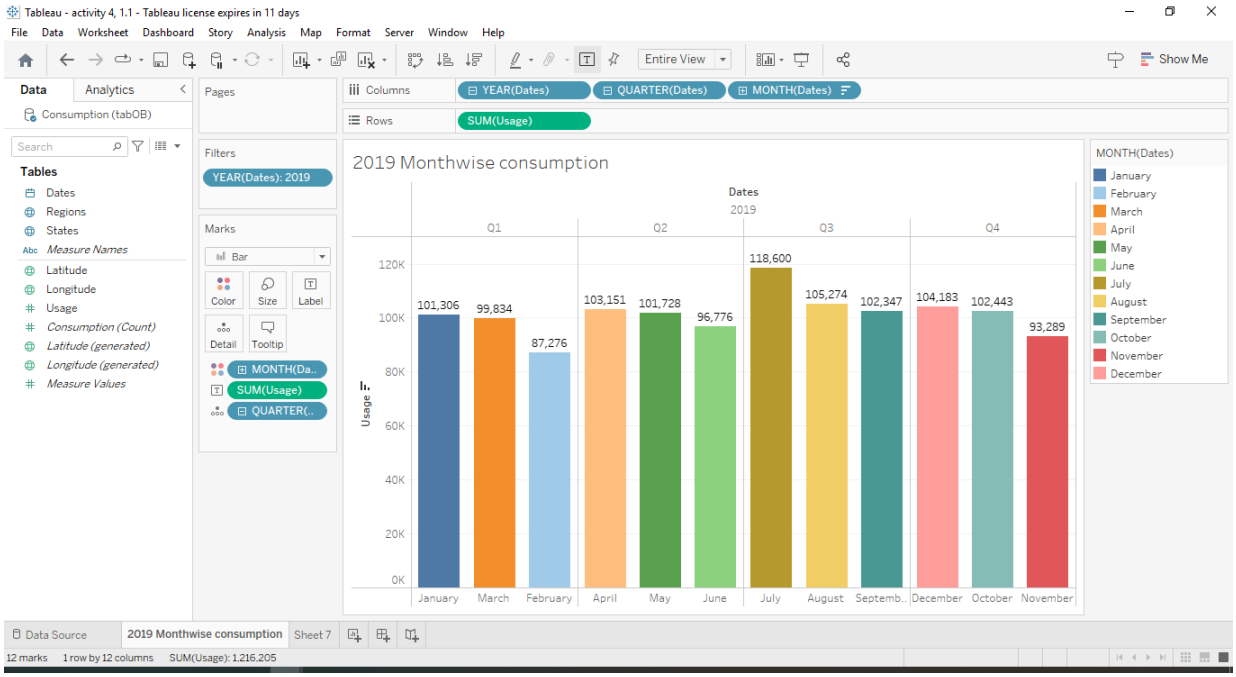
4) Usage By Region

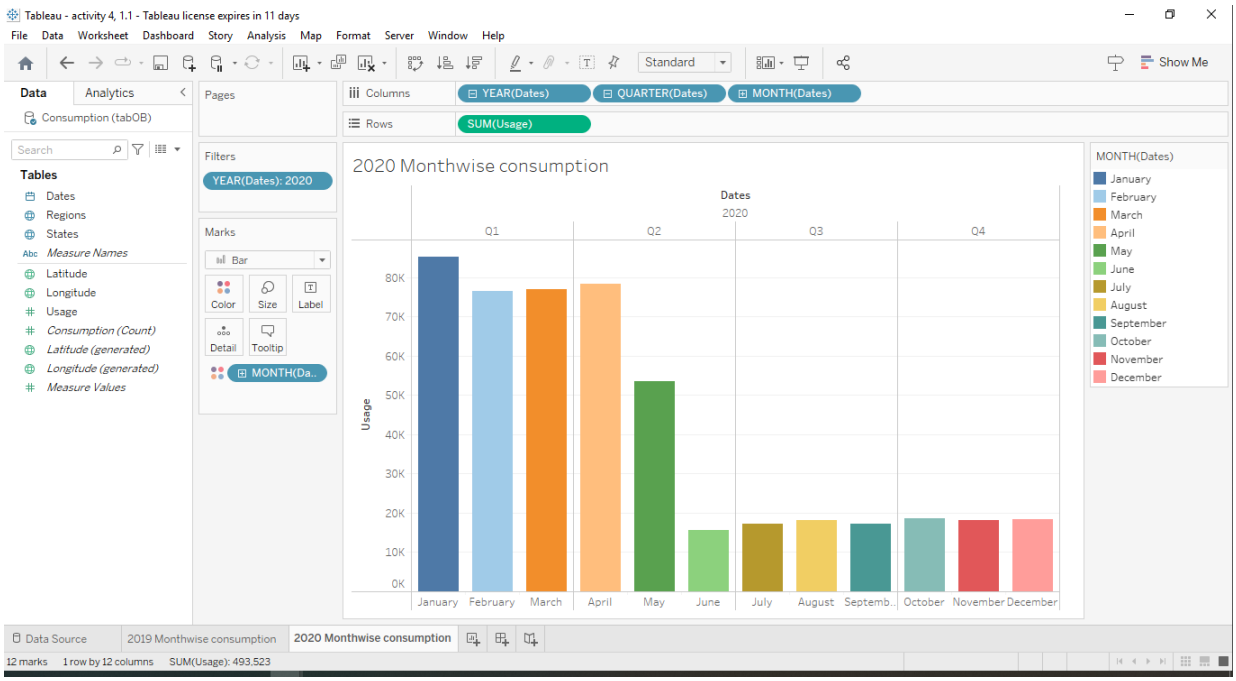


5) Top N and Bottom N

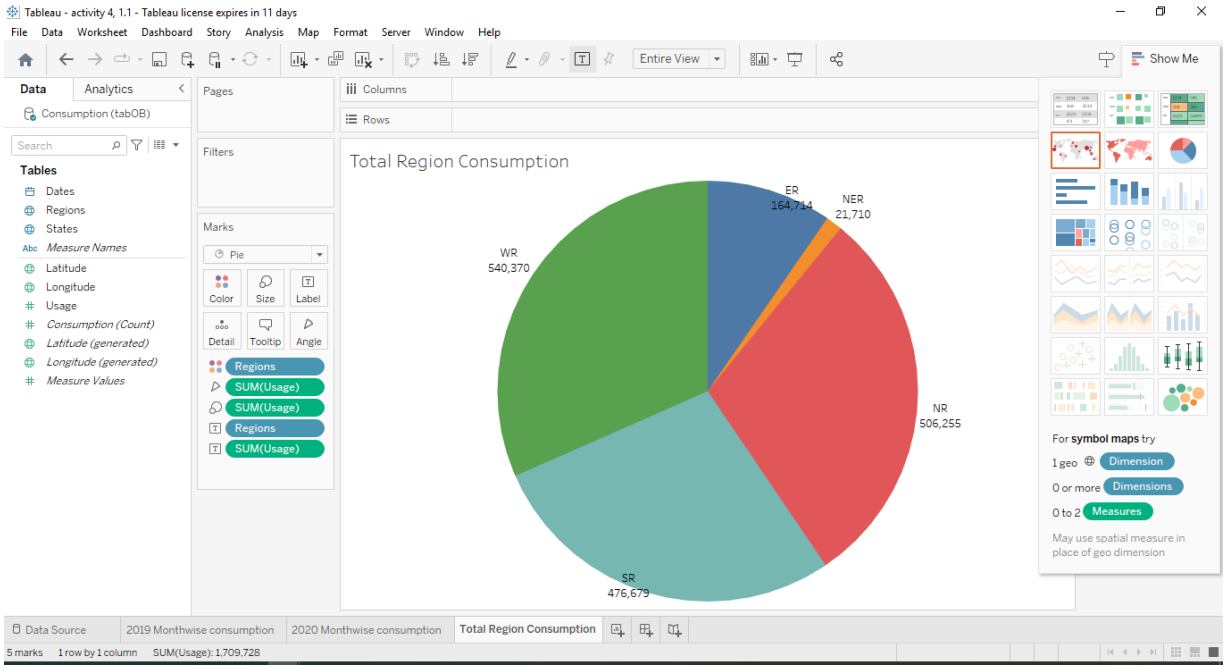


6) 2019 and 2020 Monthwise Consumption

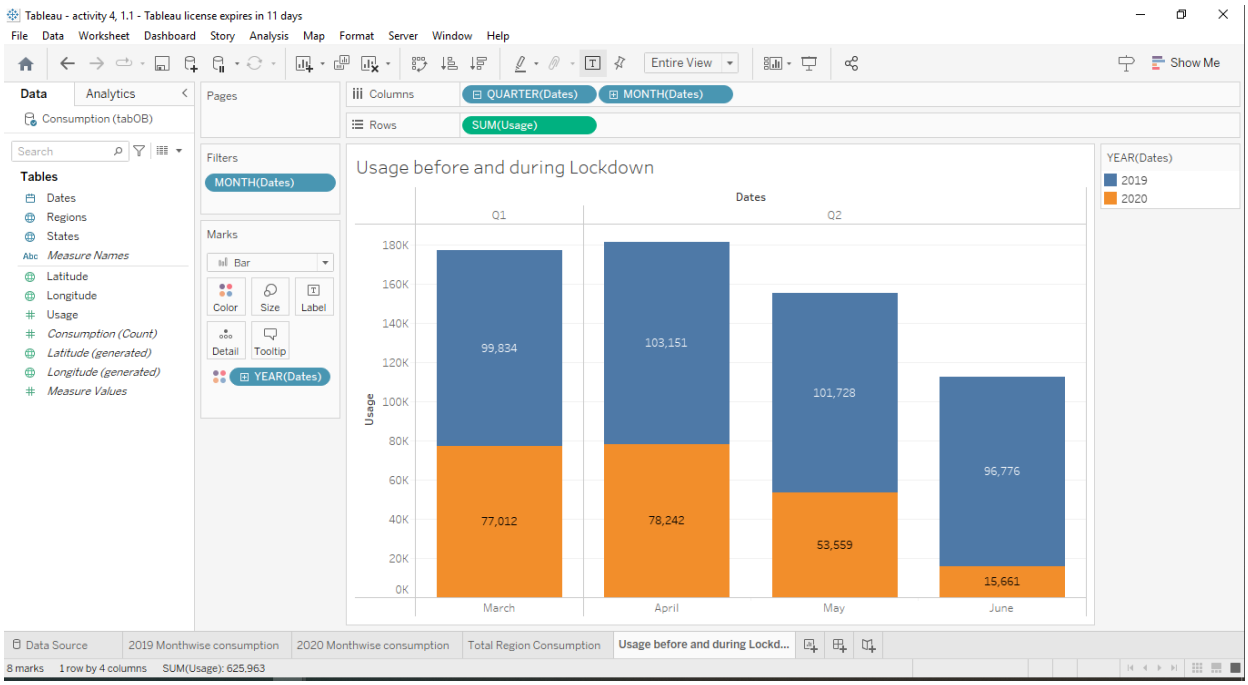




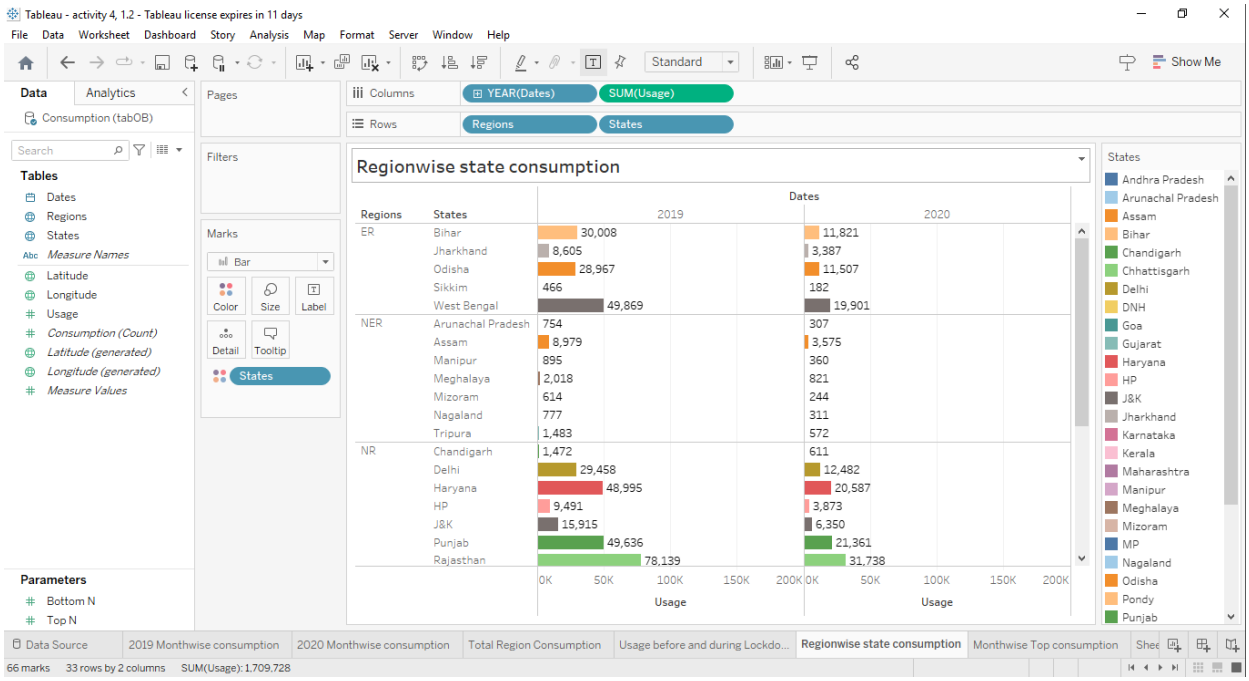
7) Total Consumption Region Wise



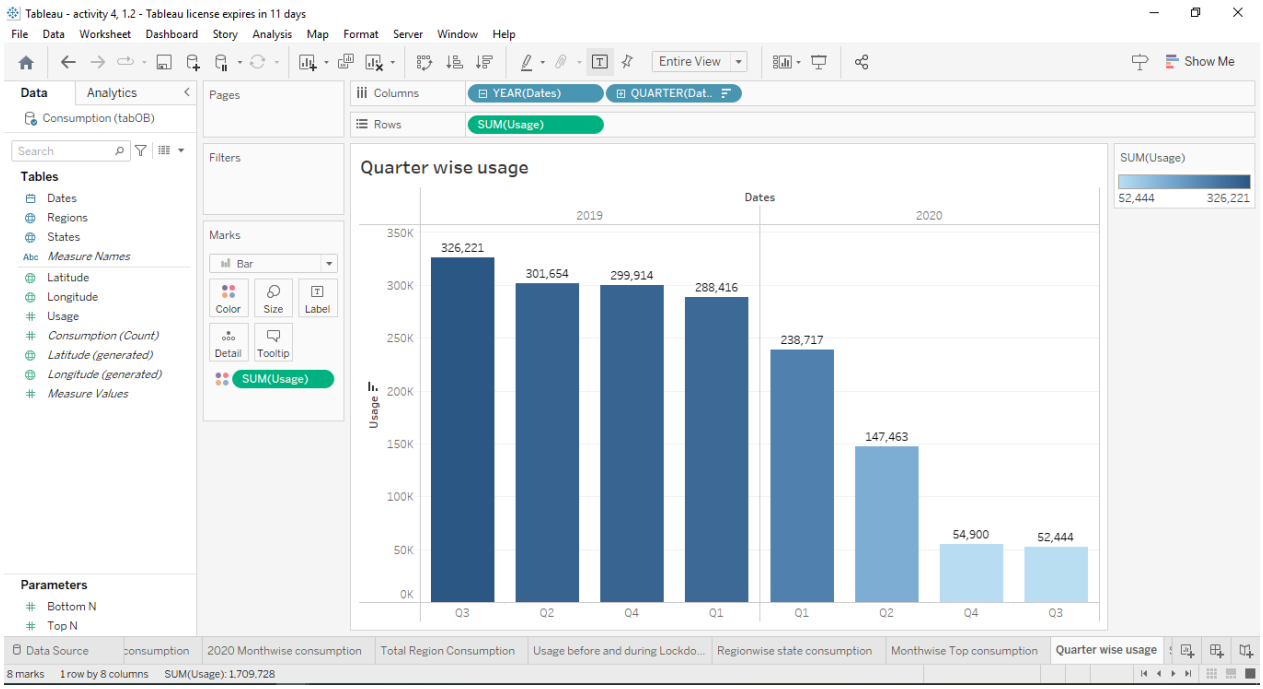
8) Usage Before and After Lockdown



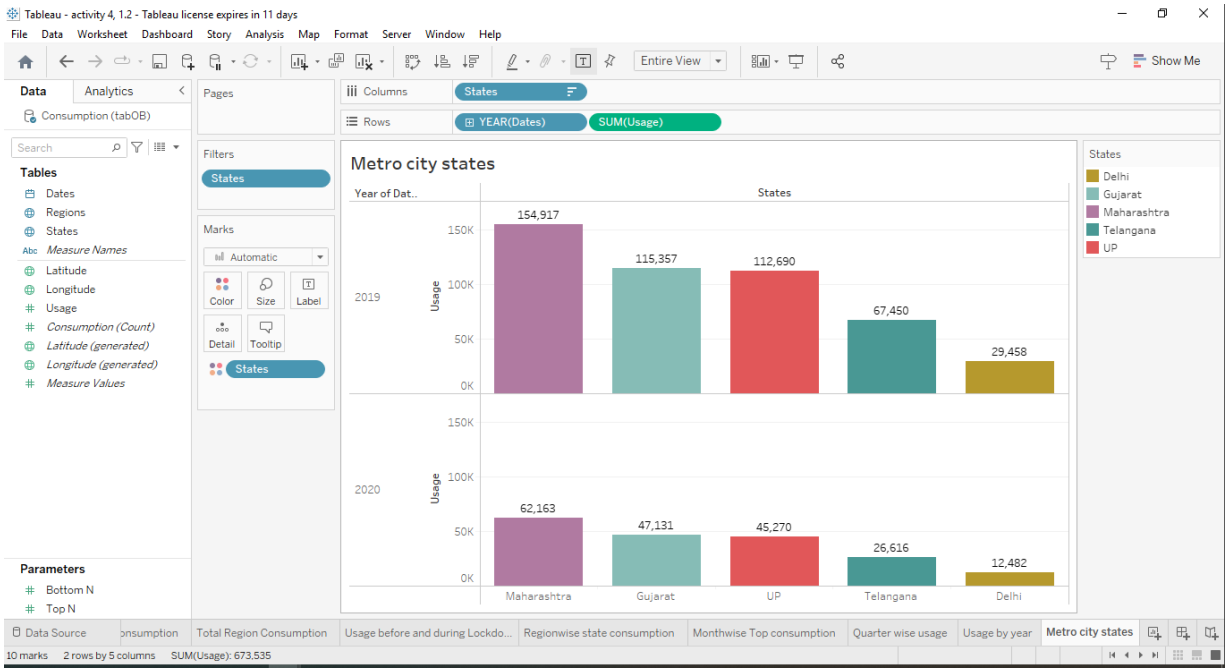
9) Region wise State Usage



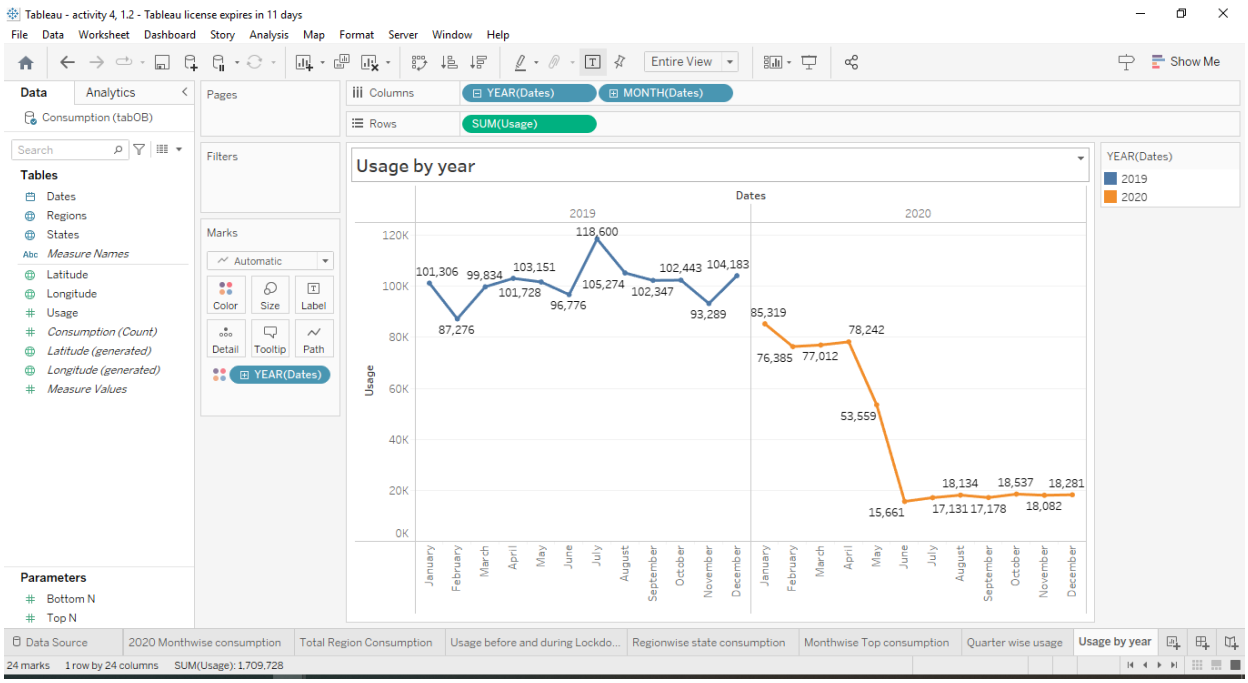
10) Quarter Usage



11) Metro city State usage



12) Usage by year

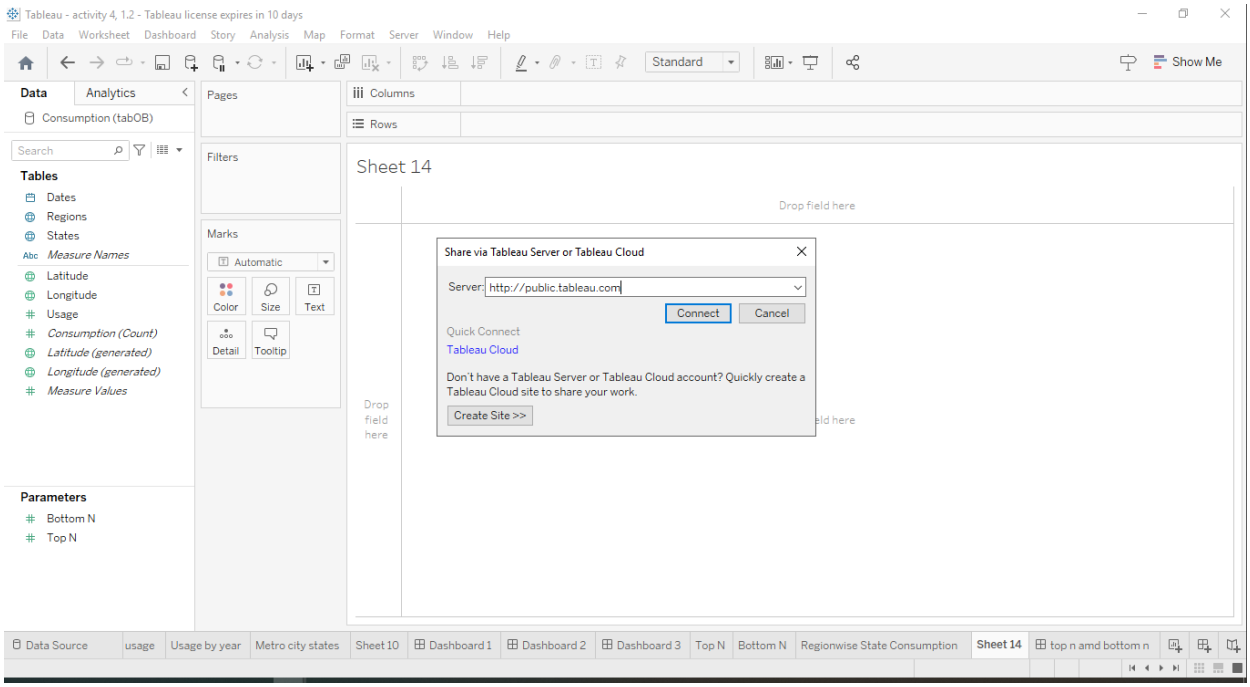


Milestone 8: Web integration

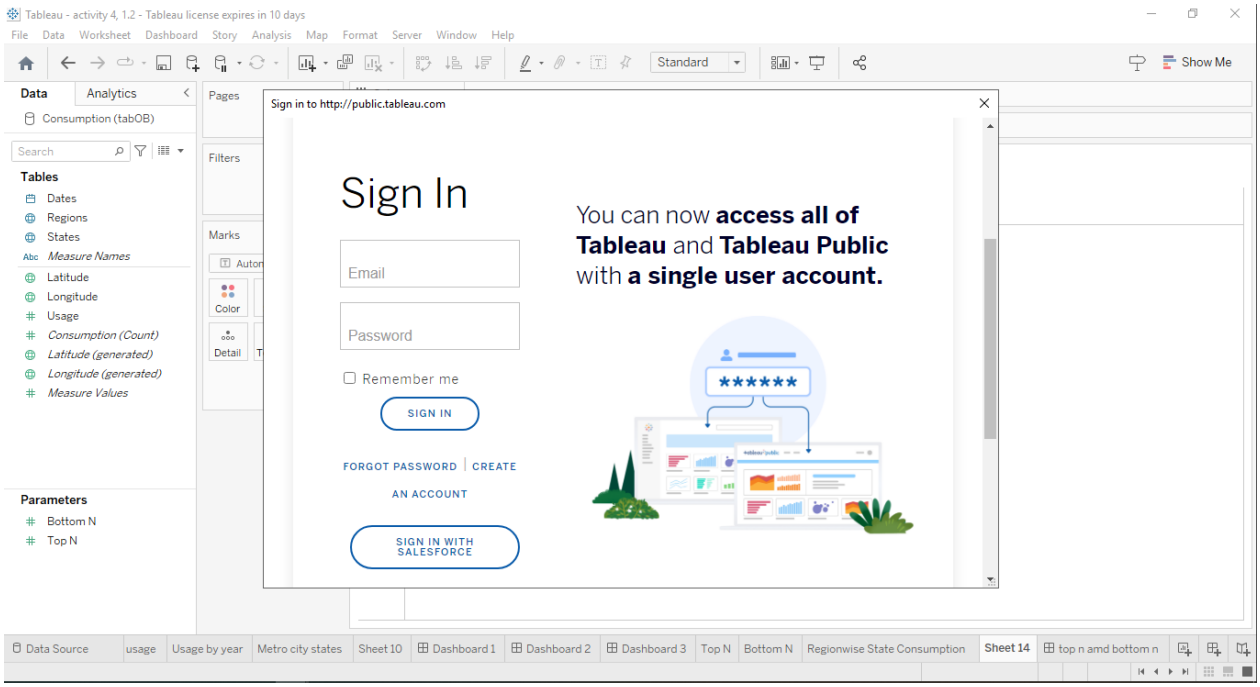
Publishing helps us to track and monitor key performance metrics, to communicate results and progress. help a publisher stay informed, make better decisions, and communicate their performance to others.

Publishing dashboard and reports to tableau public

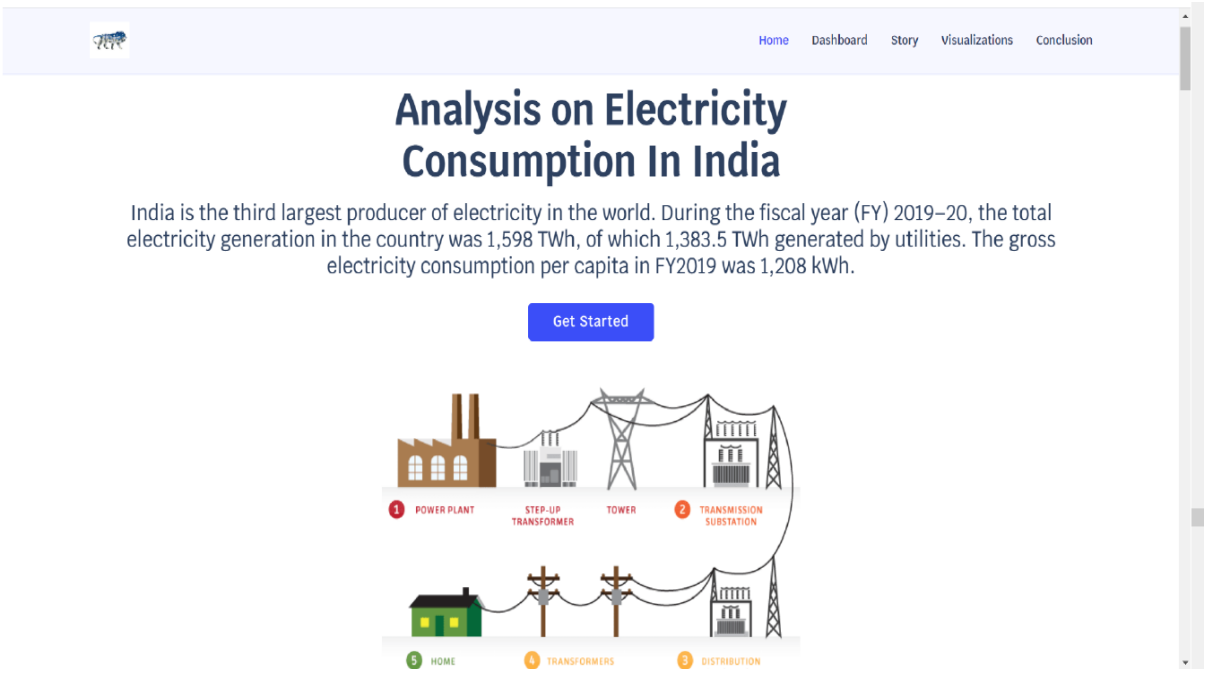
Step 1: Go to Dashboard/story, click on share button on the top ribbon

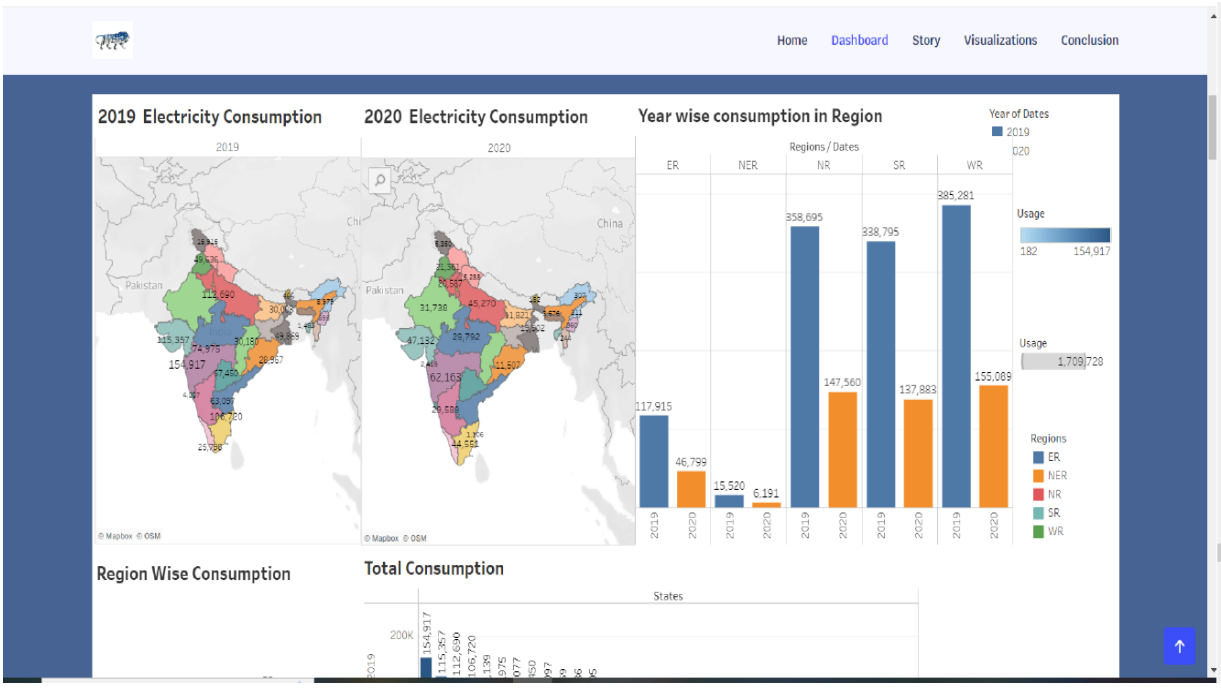


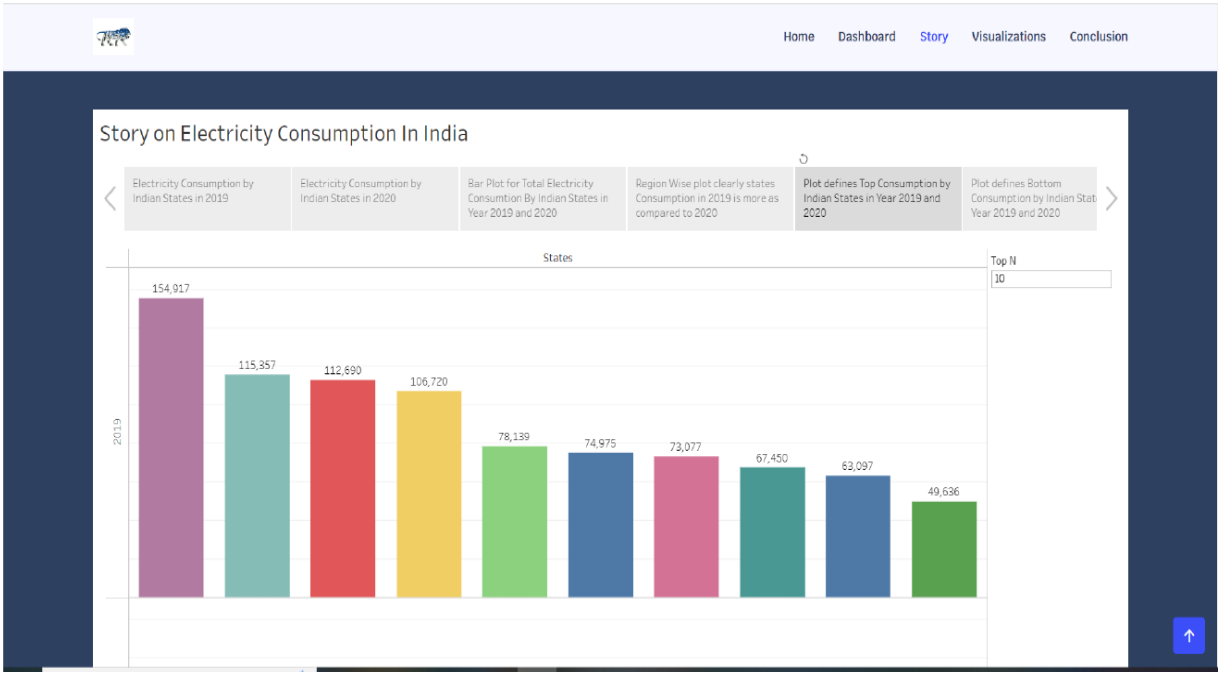
Step 2: Once you click on connect it will ask you for tableau public user name and password



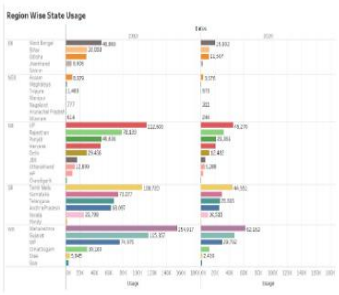
Activity 1: Dashboard and Story embed with UI With Flask

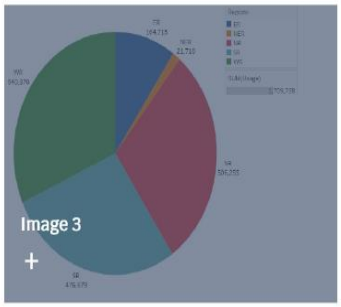


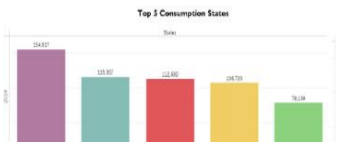

Home
Dashboard
Story
Visualizations
Conclusion
2019 Electricity Consumption
2020 Electricity Consumption
Year wise consumption in Region
Year of Dates
2019
2020
Regions / Dates
ER
NER
NR
SR
WR
Usage
182
154,917
1,709,728
117,915
46,799
15,520
6,191
358,695
147,560
338,795
137,883
385,281
155,089
Regions
ER
NER
NR
SR
WR
Region Wise Consumption
Total Consumption
States
200K
154,917
115,357
112,690
106,720

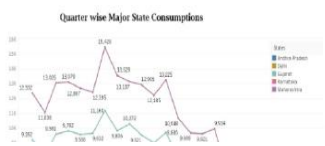

Home
Dashboard
Story
Visualizations
Conclusion
Story on Electricity Consumption In India
Electricity Consumption by Indian States in 2019
Electricity Consumption by Indian States in 2020
Bar Plot for Total Electricity Consumtion By Indian States in Year 2019 and 2020
Region Wise plot clearly states Consumption in 2019 is more as compared to 2020
Plot defines Top Consumption by Indian States in Year 2019 and 2020
Plot defines Bottom Consumption by Indian Stat Year 2019 and 2020
States
Top N
10
2019
154,917
115,357
112,690
106,720
78,139
74,975
73,077
67,450
63,097
49,636

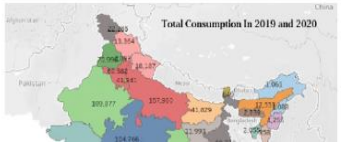
Visualizations



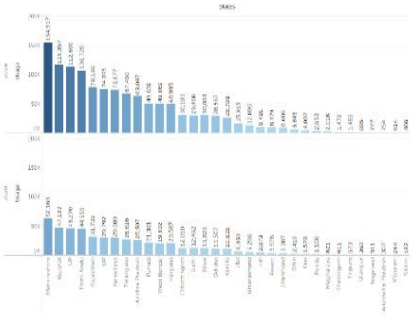






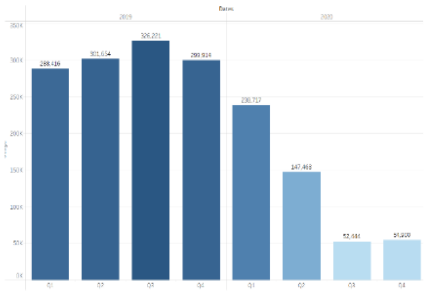


Conclusion



Electricity Consumption Stats.

- Maharashtra is the Highest Electricity consumption user of India.
- Gujarat is the Second Highest Electricity consumption user of India.
- Sikkim is the Lowest Electricity Consumption user of India .



Electricity Consumption in Quarters

- Electricity Consumption in 2019 for Quarter 3 was Highest.
- Electricity Consumption in 2019 for Quarter 1 was Lowest.
- Electricity Consumption in 2020 for Quarter 3 was Lowest.
- Electricity Consumption in 2020 for Quarter 1 was Highest.

Electricity Consumption in Regions

- Total Electricity consumption in Western Region is Highest.
- Total Electricity consumption in North Eastern Region is Lowest.
- Electricity Consumption in 2020 for Quarter 3 was Lowest.