**Plugging into the Future: An Exploration Of Electricity Consumption Patterns Using Tableau**

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**Introduction**

**Management of energy consumption in domestic environment is very important due to high electrical energy prices and impact of electricity production on the environment. Current records of power consumption reporting in Sri Lanka [1] only provides an overall idea about the power consumption of electrical devices. A detailed survey and analysis of power consumption of households in Sri Lanka haven't being conducted yet. The customers don't get a clear idea on how the power consumption was carried out by each device and how each device contributes to the overall power consumption. And also there are no data analysis methods to provide customers a forecasting [9][10] of power consumption using history of power consumption of a consumer.**

**Define problem / problem understanding**

**Defining complex problems: break it down**

**Verifying your understanding of the problems**

**Prioritize the problems: consider "important" and "urgent" problems.Understand your role in the problem: very stressed out, very guilty about your role in the problem.Problem Statement: The end result of problem identification Brief, clear, to-the-point identification of the specific problem to be addressed, including the key rationale for why it should be solved.**

**The first stage of problem solving is to understand the problem.Understanding a problem means turning an ill defined problem into a well defined problem, without any ambiguity.To solve the problem you must have knowledge of the problem domain.**

**Businessn Requirement**

**Business Research Problems When analyzing business problems, three things must be considered:Managers and decision-makers have total certainty about the underlying problem situation (rare in practice)Managers and decision-makers have little or no information about the problem situation on which to proceed on and the objectives and alternatives are either not, or are very vaguely defined (extreme cases)Managers and decision-makers grasp the general nature of the objectives they desire to realize, but lack sufficient information on the nature of the underlying business problem situation.**

**Specify The Business Problem**

**One of the more difficult tasks is identifying the business problem that needs to be solved. Very often, other aspects of the**[**BI**](https://www.sciencedirect.com/topics/computer-science/business-intelligence)**program can feed into this process. If you recall our “analysis spectrum” from Chapter 1, the first step is awareness of an issue (what happened), which is then followed by understanding the root causes (why it happened).**

**For example, an**[**OLAP**](https://www.sciencedirect.com/topics/computer-science/online-analytical-processing)**report may indicate that sales of one class of product in the Northeast region may lag behind sales in other regions or that the average wait time at the inbound call centers peaks at certain times of the day. After being alerted to this situation, it would be useful to understand why this sales lag exists, and this type of question provides a starting point for formulating the business problem to be examined.**

**Other kinds of business problems are actually part of the general business cycle. For example, planning a new marketing campaign and understanding customer attrition are frequent business problems that can be attacked through data mining. Once the problem has been identified and a goal set (e.g., lower the attrition rate by 50% or relieve the issues that are causing sales to lag in particular areas), you must assemble the right data needed for analysis and then move on to the next stage.**

**Literature Survey**

[**View chapter**](https://www.sciencedirect.com/science/article/pii/B978012385889400017X)

* **Contextualize the research problem:**

**It helps researchers understand the current state of knowledge in a field, identify key concepts, and situate their own work within the existing scholarly conversation.**

* **Identify research gaps:**

**By analyzing previous studies, researchers can pinpoint areas where further investigation is needed, justifying the novelty and significance of their own work.**

* **Inform research design:**

**A literature survey can reveal effective methodologies, potential challenges, and relevant theoretical frameworks that can guide the design of a new study.**

* **Establish credibility:**

**Demonstrating familiarity with the existing literature enhances the researcher's credibility and expertise in the field.**

* **Develop a theoretical framework:**

**It helps researchers understand the theoretical underpinnings of their topic and build a solid foundation for their own research.**

* **Evaluate existing research:**

**By critically analyzing previous studies, researchers can identify strengths, weaknesses, and contradictions in the literature.**

**Social Or Business Impact**

**"Business social impact" encompasses a company's far-reaching influence on social and environmental issues, highlighting its pivotal role in driving meaningful and constructive changes beyond mere financial gains. It signifies a company's commitment to making a positive difference in the world by addressing societal concerns and taking proactive measures to protect the environment. By prioritizing social and environmental responsibility alongside economic success, businesses can harness their power and resources to create a sustainable and inclusive future for all. Through collaborative efforts and innovative initiatives, companies can leverage their influence to drive positive change, leaving a lasting**[**impac**](https://www.sopact.com/guides/impact-measurement)**t far beyond their bottom line.**

**Project Description:  
Plugging into the Future: An Exploration of Electricity Consumption Patterns using Tableau" is a project that leverages Tableau's data visualization capabilities to analyze and understand electricity consumption patterns across various regions and sectors. By examining data such as time-of-day usage, peak demand periods, seasonal variations, and consumption by sector (residential, commercial, industrial), the project aims to provide valuable insights for utility companies, policymakers, and consumers. These insights can help optimize electricity usage, improve grid management, and promote sustainable energy practices.**

**Scenario 1: Time-of-Day Usage Patterns**

**The visualization tool allows users to explore electricity consumption trends throughout the day, across different regions and sectors. By identifying peak usage times and low-demand periods, utility companies can better manage electricity supply and demand, and design incentives for off-peak usage.**

**Scenario 2: Seasonal Variations and Forecasting**

**The project uses Tableau to analyze seasonal variations in electricity consumption patterns. Understanding how usage fluctuates throughout the year can help stakeholders plan for seasonal peaks and troughs, ensuring reliable power supply and optimizing energy production from renewable sources.**

**Scenario 3: Sector-Specific Consumption Insights**

**Through data visualization, the project explores electricity consumption by different sectors such as residential, commercial, and industrial. This analysis can reveal which sectors are the largest consumers of electricity and how their usage patterns differ. Utility companies can use this information to tailor conservation programs and energy efficiency initiatives to specific sectors for more effective energy management.**

**Project Flow**

**To accomplish this, we have to complete all the activities listed below,**

* **Define Problem / Problem Understanding**
  + **Specify the business problem**
  + **Business requirements**
  + **Literature Survey**
  + **Social or Business Impact.**
* **Data Collection & Extraction from Database**
  + **Collect the dataset,**
  + **Storing Data in DB**
  + **Perform SQL Operations**
  + **Connect DB with Tableau**
* **Data Preparation**
* **Prepare the Data for Visualization**
* **Data Visualizations**
  + **No of Unique Visualizations**
* **Dashboard**
  + **Responsive and Design of Dashboard**
* **Story**
  + **No of Scenes of Story**
* **Performance Testing**
  + **Amount of Data Rendered to DB ‘**
  + **Utilization of Data Filters**
  + **No of Calculation Fields**
  + **No of Visualizations/ Graphs**
* **Web Integration**
  + **Dashboard and Story embed with UI With Flask**
* **Project Demonstration & Documentation**
  + **Record explanation Video for project end to end solution**
  + **Project Documentation-Step by step project development procedure**

**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.**

**Collect the dataset**

**Please use the link to download the dataset:**[**https://drive.google.com/file/d/1JxIkHNwXxjFztKq7ad0\_KtkukCqTckNy/view?usp=sharing**](https://drive.google.com/file/d/1JxIkHNwXxjFztKq7ad0_KtkukCqTckNy/view?usp=sharing) **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)**

**Storing Data in DB & Perform SQL Operations**

**Explanation video link:**

[**https://drive.google.com/file/d/1FvnGQo9cNBfAjyRSiKC\_6DG9\_6x5ohuG/view?usp=sharing**](https://drive.google.com/file/d/1FvnGQo9cNBfAjyRSiKC_6DG9_6x5ohuG/view?usp=sharing)

**Consumption.csv - Google Drive..**

**No description..**

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**Storing Data in DB & Perform SQL Operations**

**Explanation video link:**

[**https://drive.google.com/file/d/1FvnGQo9cNBfAjyRSiKC\_6DG9\_6x5ohuG/view?usp=sharing**](https://drive.google.com/file/d/1FvnGQo9cNBfAjyRSiKC_6DG9_6x5ohuG/view?usp=sharing)

**Electricity Sql.mp4 - Google Drive..**

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**Connect DB with Tableau**

**Explanation video link:**

[**https://drive.google.com/file/d/1ssm30WD0EXOVwXPwMCWqrEbBieZlV3t6/view?usp=sharing**](https://drive.google.com/file/d/1ssm30WD0EXOVwXPwMCWqrEbBieZlV3t6/view?usp=sharing)

**Database Integration.webm - Google Drive..**

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**Data Preparation**

**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.**

**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.**

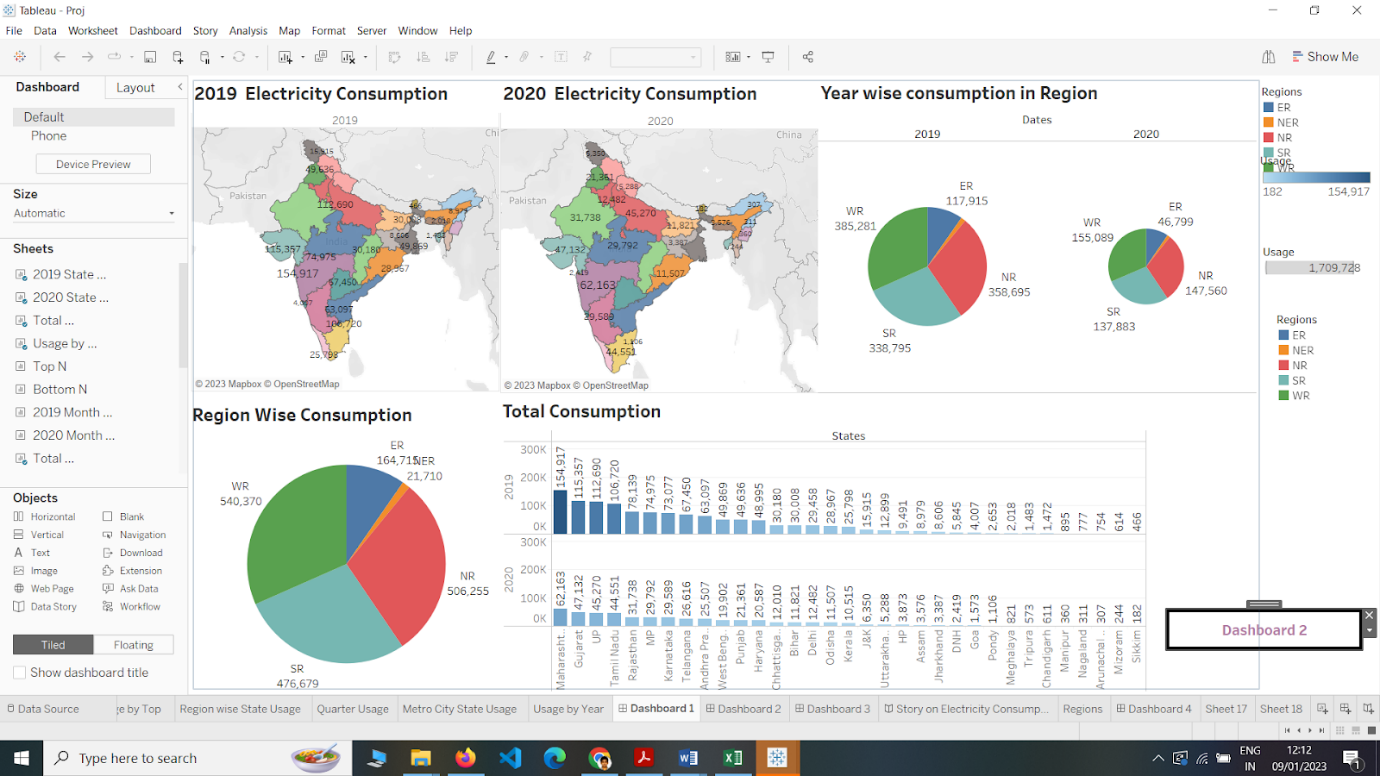
**No of Unique Visualizations**

**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  
Explanation video link:**[**https://drive.google.com/file/d/1pVHAOm5Z\_5mJlEeVTH232l\_dXE38W0eB/view?usp=sharing**](https://drive.google.com/file/d/1pVHAOm5Z_5mJlEeVTH232l_dXE38W0eB/view?usp=sharing) **Activity 1.2: To Understand-2019 and 2020 Month wise Consumption, Total Consumption by region, Usage Before and After Lockdown  
Explanation video link:**[**https://drive.google.com/file/d/1MEthsJ89teEYR6k688W-7i5Bk0dEBIo2/view?usp=sharing**](https://drive.google.com/file/d/1MEthsJ89teEYR6k688W-7i5Bk0dEBIo2/view?usp=sharing) **Activity 1.3:  To understand  Region wise State Usage Quarter Usage and Usage by Year  
Explanation video link:**[**https://drive.google.com/file/d/1utqB\_EInIi2AFb4tT7Nr2RSsznRVe5Ty/view?usp=sharing**](https://drive.google.com/file/d/1utqB_EInIi2AFb4tT7Nr2RSsznRVe5Ty/view?usp=sharing)

**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.**

**No of Unique Visualizations**

**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.  
  
Explanation video link:**[**https://drive.google.com/file/d/1xBAJZD7TGEMzssDpHlrjmTS6GiaNzPHE/view?usp=sharing**](https://drive.google.com/file/d/1xBAJZD7TGEMzssDpHlrjmTS6GiaNzPHE/view?usp=sharing) ****

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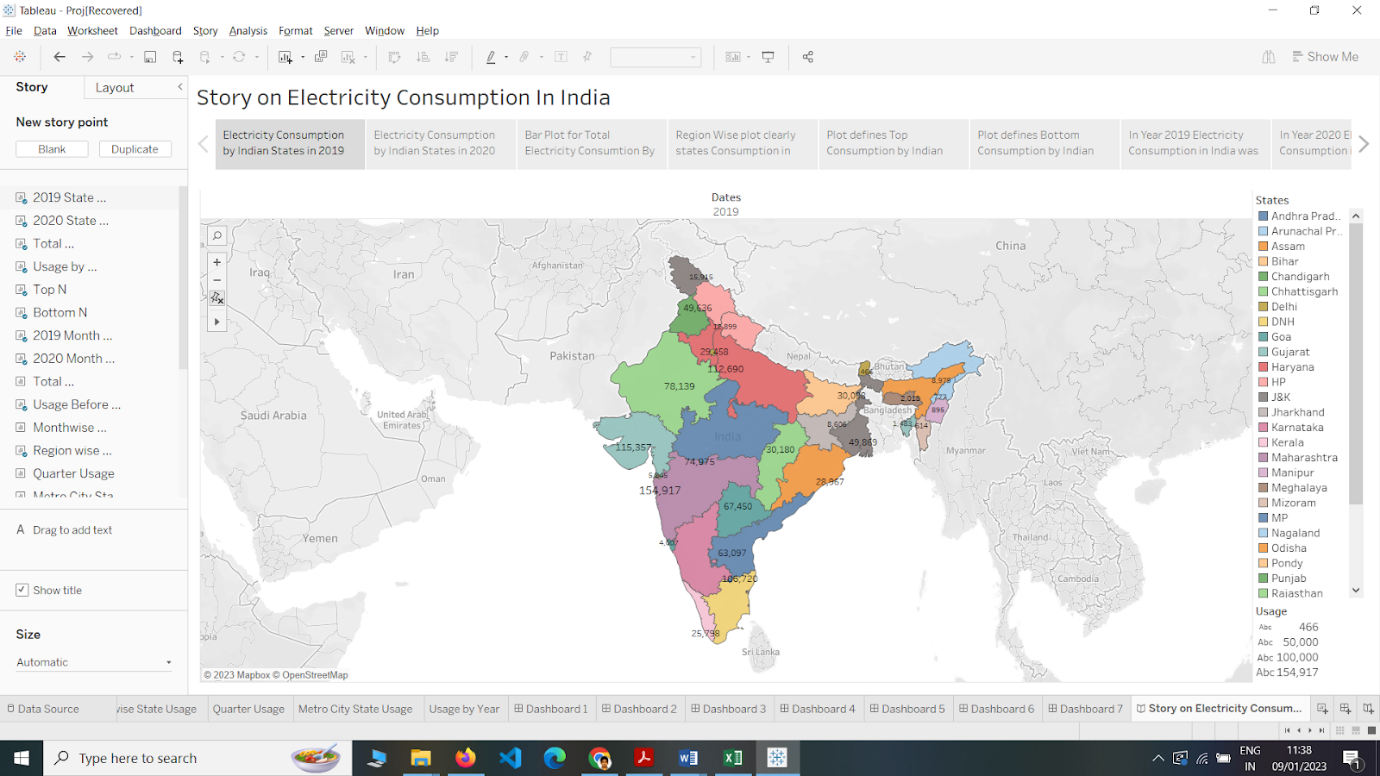
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**Story**

**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.**

**Responsive and Design of Dashboard**

**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.  
Explanation video link:**[**https://drive.google.com/file/d/1qxEL-SCEc\_yoM9wDOJXj9hIHxgoG25gO/view?usp=sharing**](https://drive.google.com/file/d/1qxEL-SCEc_yoM9wDOJXj9hIHxgoG25gO/view?usp=sharing) ****

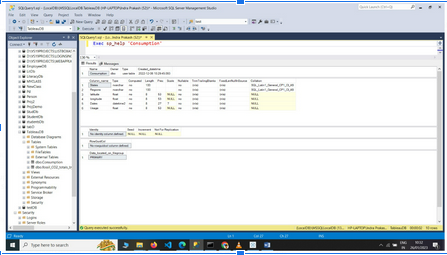
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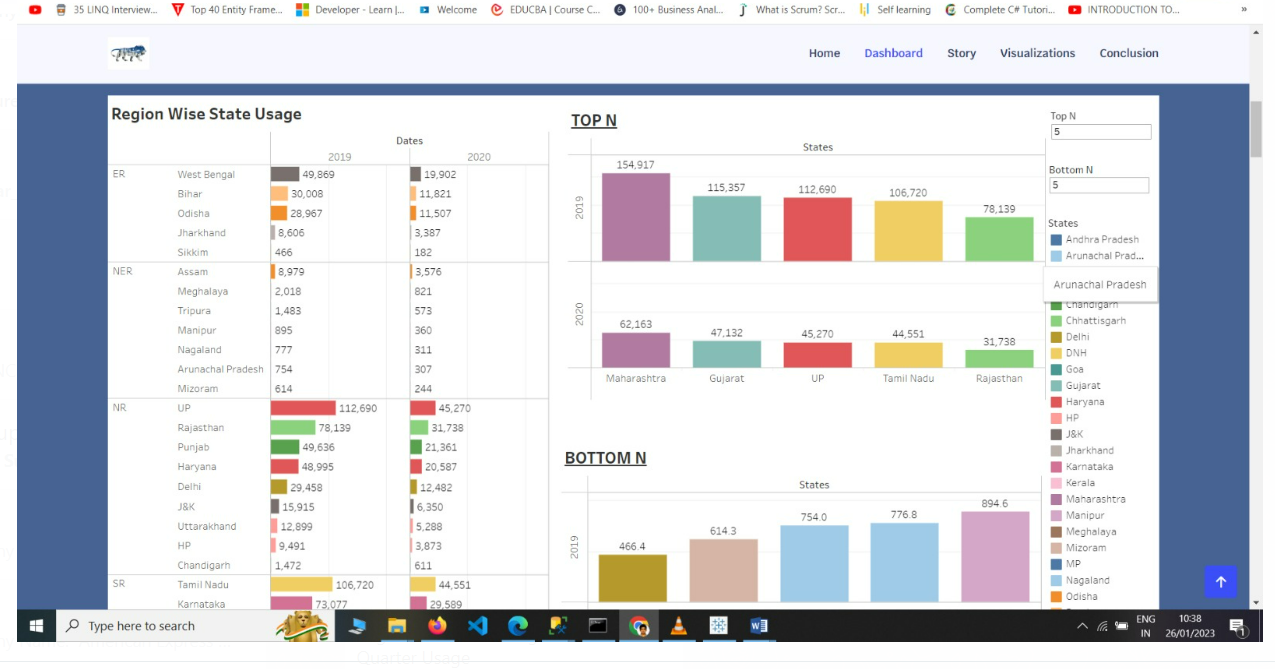
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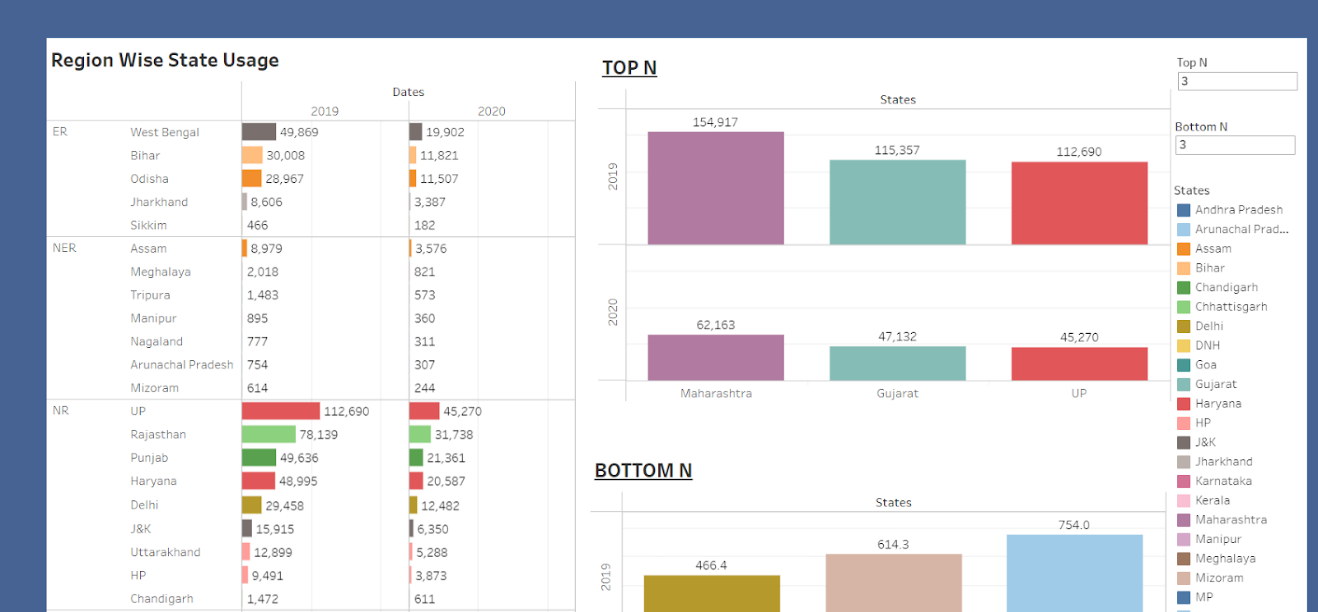
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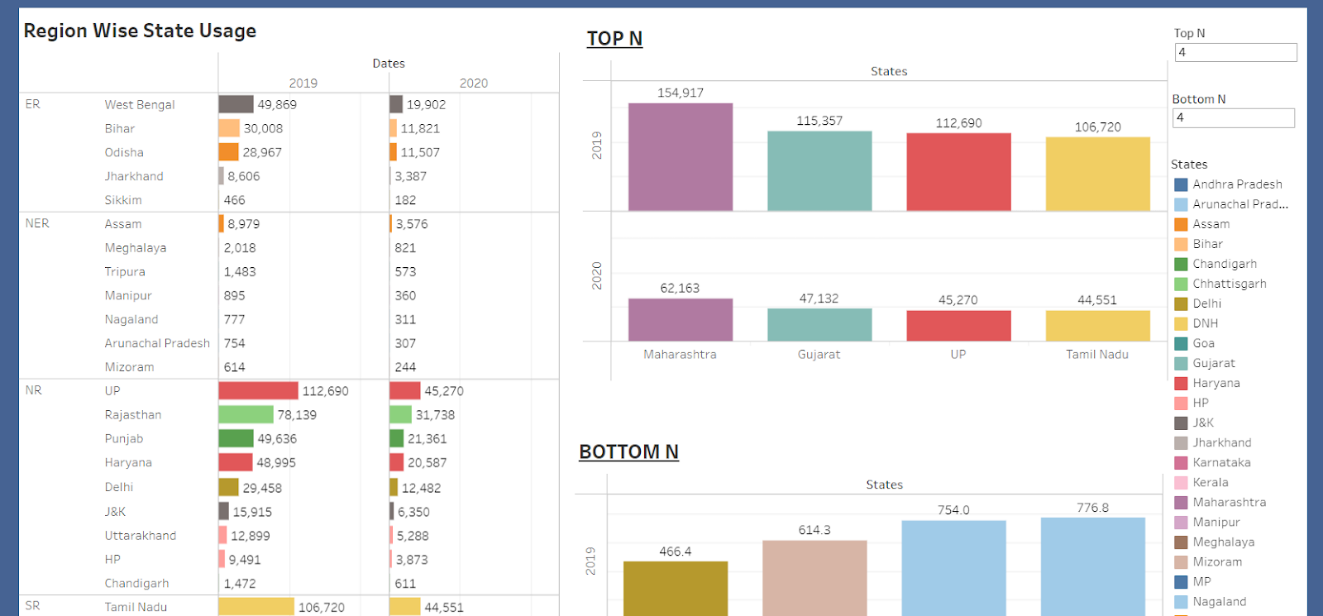
**Amount of Data Rendered to DB**

**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.  
  
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**Utilization of Data Filters**

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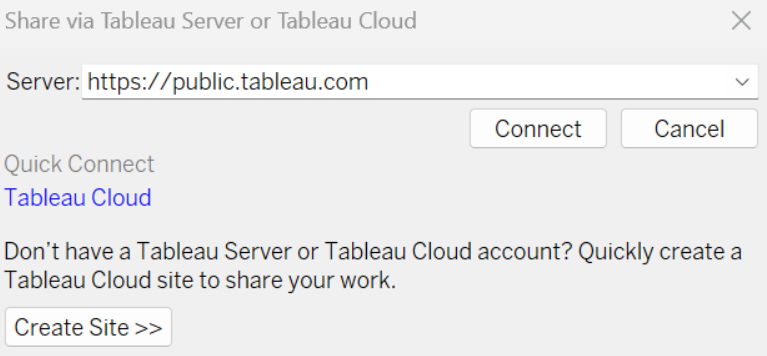
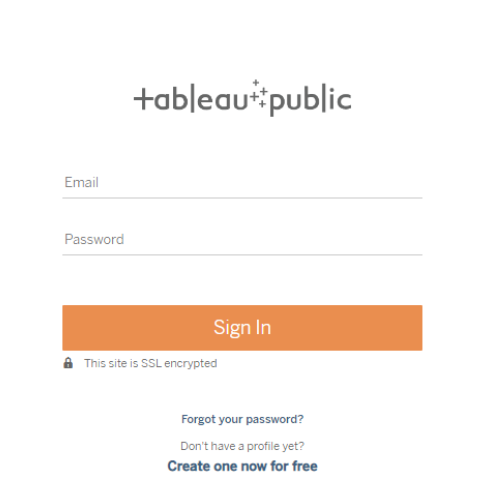
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**No of Visualizations/ Graphs**

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**

**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  
  
Once you login into your tableau public using the credentials, the particular visualization will be published into tableau public  
Note: While publishing the visualization to the public, the respective sheet will get published when you click on share option.**

**Dashboard and Story embed with UI With Flask**

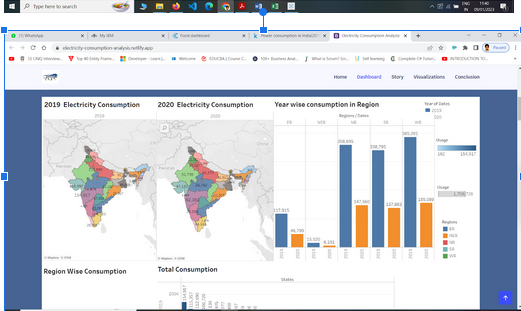
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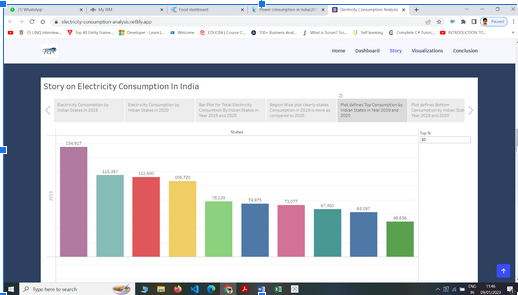
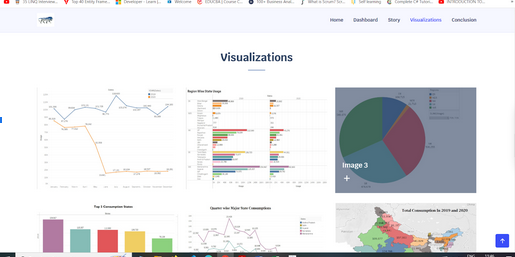
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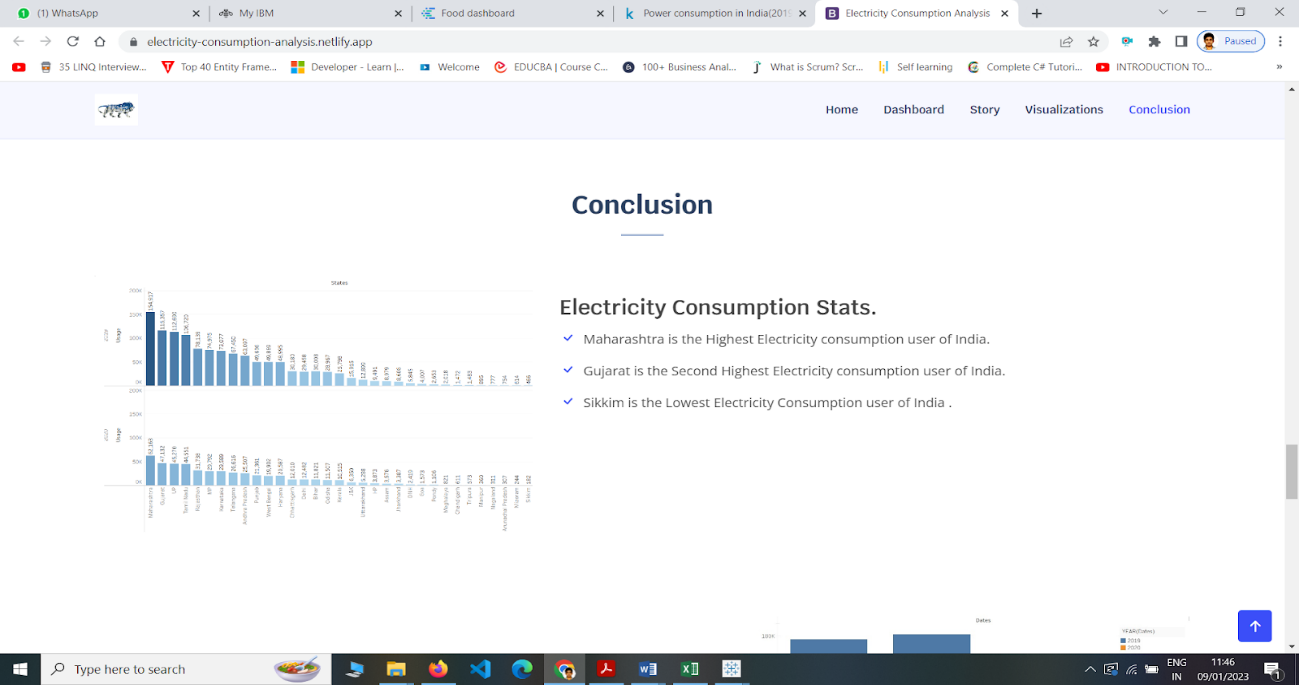
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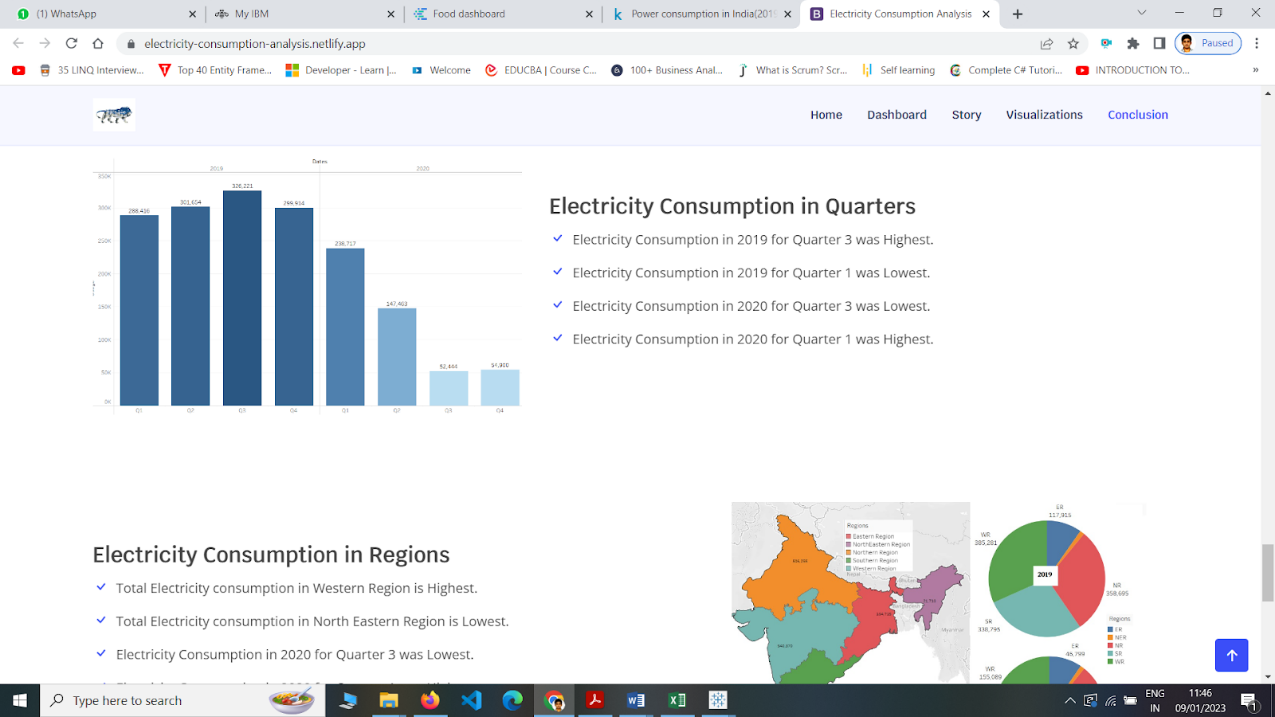
**Using Flask :**[**https://drive.google.com/file/d/1SFf8HNGkrEjFNbmtOmMPLsShTpy8hI\_7/view?usp=sharing**](https://drive.google.com/file/d/1SFf8HNGkrEjFNbmtOmMPLsShTpy8hI_7/view?usp=sharing)

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**Publishing.mp4 - Google Drive..**

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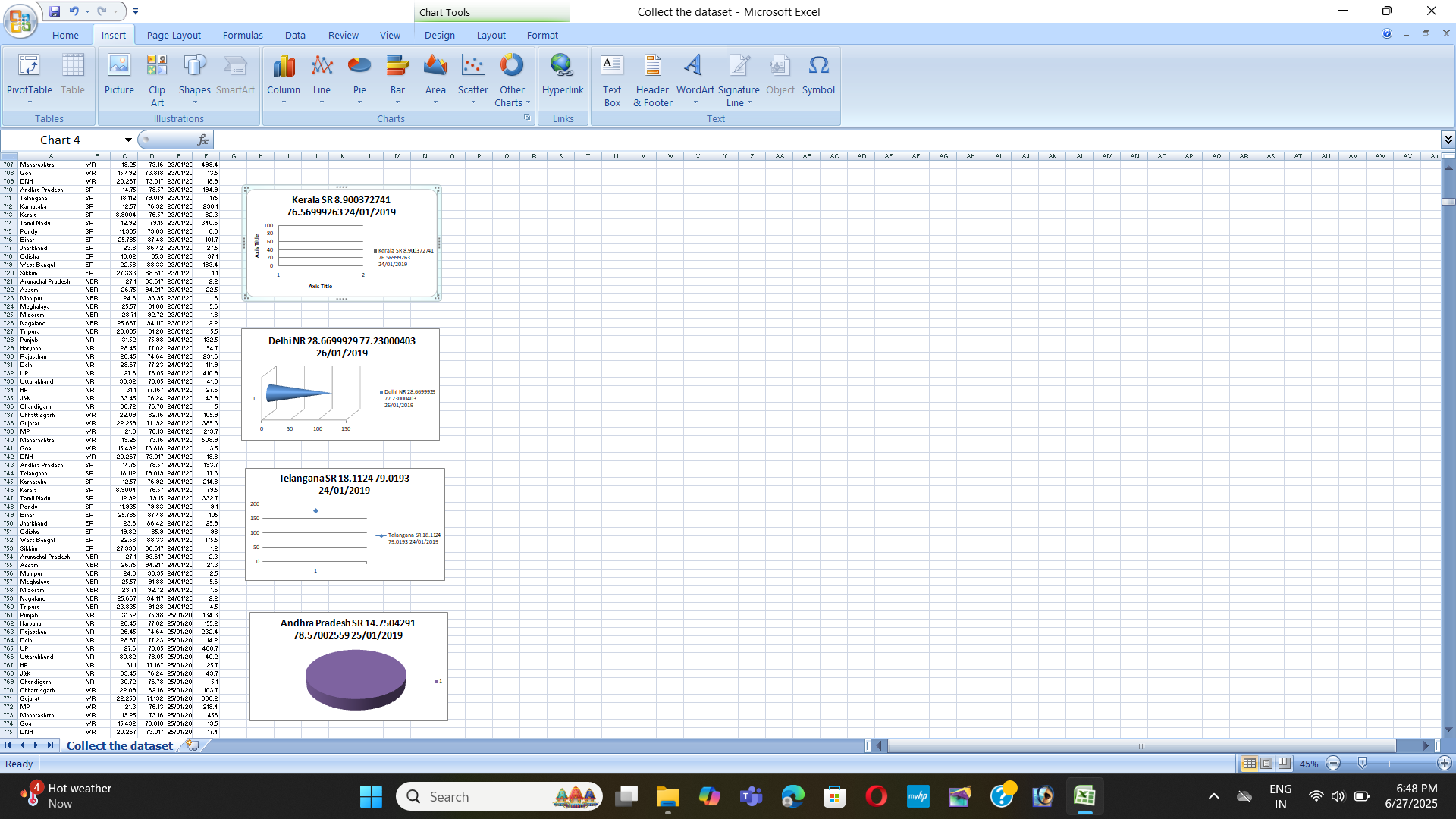
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**Project Demonstration & Documentation**

**Below mentioned deliverables to be submitted along with other deliverables  
Activity 1:- Record explanation Video for project end to end solution  
Activity 2:- Project Documentation-Step by step project development procedure  
  
Create document as per the template provided**

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