INTERNSHIP PROJECT DOCUMENT

1. INTRODUCTION

1.1 Project Overview:

This project focuses on analyzing electricity consumption patterns across Indian states and regions using an interactive Tableau dashboard. The system processes historical consumption data, visualizes state-wise and region-wise usage, and compares trends across years, quarters, and pre- and post-lockdown periods. Through maps, bar charts, and trend analysis, the dashboard enables users to identify high-consumption regions, observe seasonal and yearly variations, and understand the impact of major events like COVID-19 lockdown. The goal of the project is to transform raw consumption data into meaningful insights that support data-driven decision making and policy analysis.

1.2 Purpose:

The purpose of this project is to convert raw electricity consumption data into clear, actionable insights through interactive visualizations. It aims to help analysts, policymakers, and decision-makers understand regional consumption patterns, yearly and quarterly trends, and the impact of events such as lockdowns. By providing an intuitive dashboard with filtering and comparison features, the project supports informed planning, resource allocation, and strategic decision-making based on data rather than assumptions.

2. IDEATION PHASE

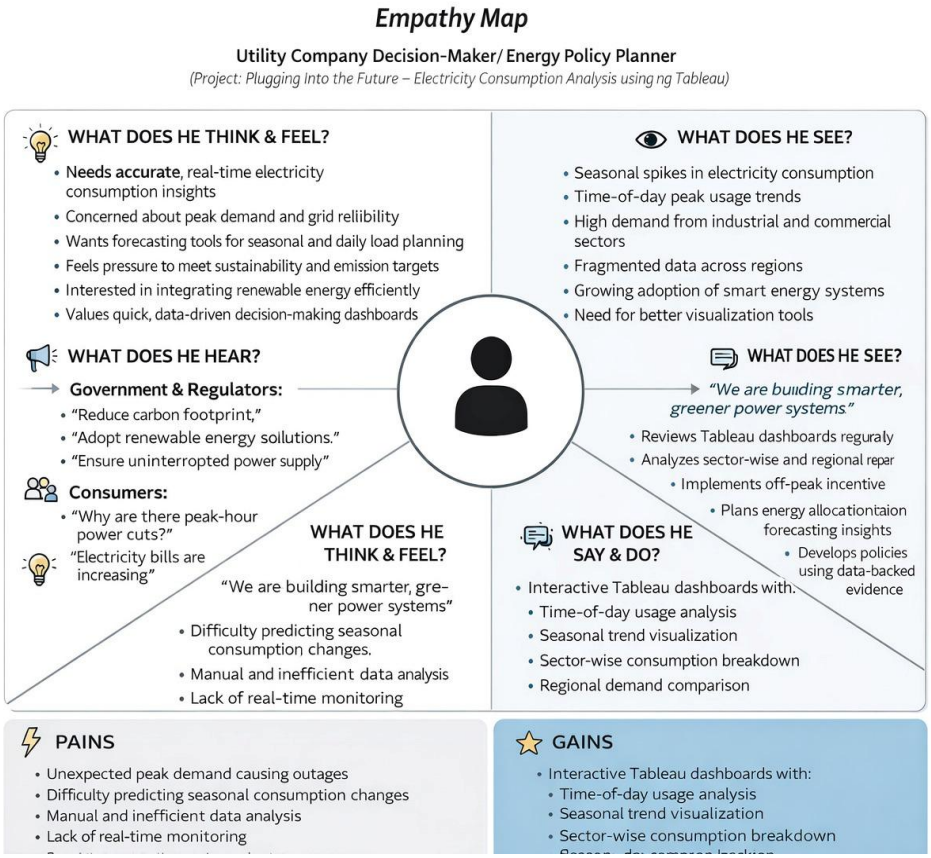
2.1 Problem Statement:

Electricity consumption data across different states and regions is often available in raw, unstructured formats, making it difficult to analyze trends, compare regions, or measure the impact of major events such as the COVID-19 lockdown. Decision-makers struggle to quickly identify high-consumption areas, seasonal variations, and year-over-year changes due to the lack of clear visualization and centralized analysis. Therefore, there is a need for an interactive and structured dashboard that transforms complex consumption data into meaningful insights to support effective planning and policy decisions.

Problem Statement (	I am (Custome	I'm trying to	But	Because	Which makes me feel
PS-1	Utility compani policymaker s, a consumers	Enable efficie energy usage, improve grid management promote sustainable	We lack c interactive insights in electricity consumpti patterns ac	Currentdata analysi methods don't effectively reveal ti of -day usage, peak demand, seasonal variations, or sector	Frustrated by inefficie resource allocation an inability to form effect energy policies.

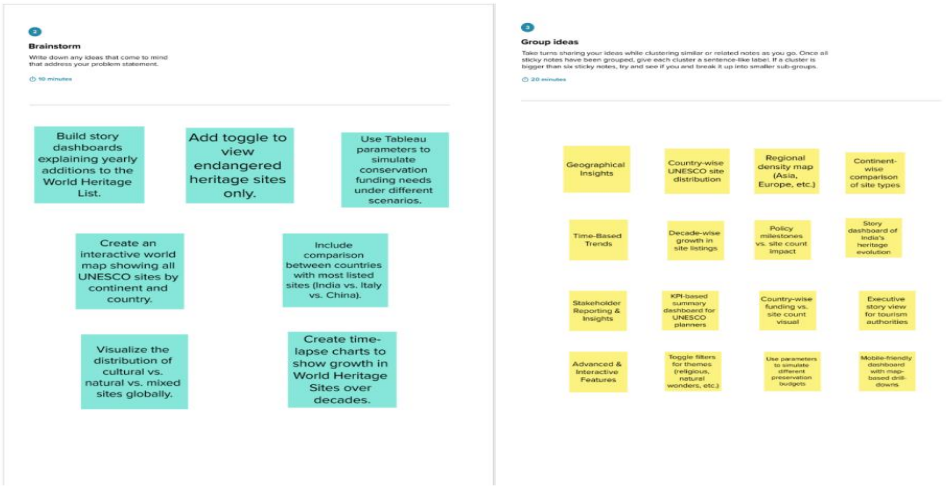
		practices [cite]	Indian reg and sector	wise consumptio n trends 2 .	
PS-2	Stakeholder s in energy sector	Optimize electricity sup and reduce co by understand consumption trends [cite:5,	It's difficu pinpoint w sectors an regions consume t most ener and when	The raw electricity usage data is compl and not easily diges for quick decision - making	Concerned about poter energy waste and miss opportuniti es for cost savings.

2.2 Empathy Map Canvas:



2.3 Brain Stroming:

Step-2: Brainstorm, Idea Listing and Grouping



3. REQUIREMENT ANALYSIS:

3.1 Customer Journey Map:

3.2 Solution Requirement:

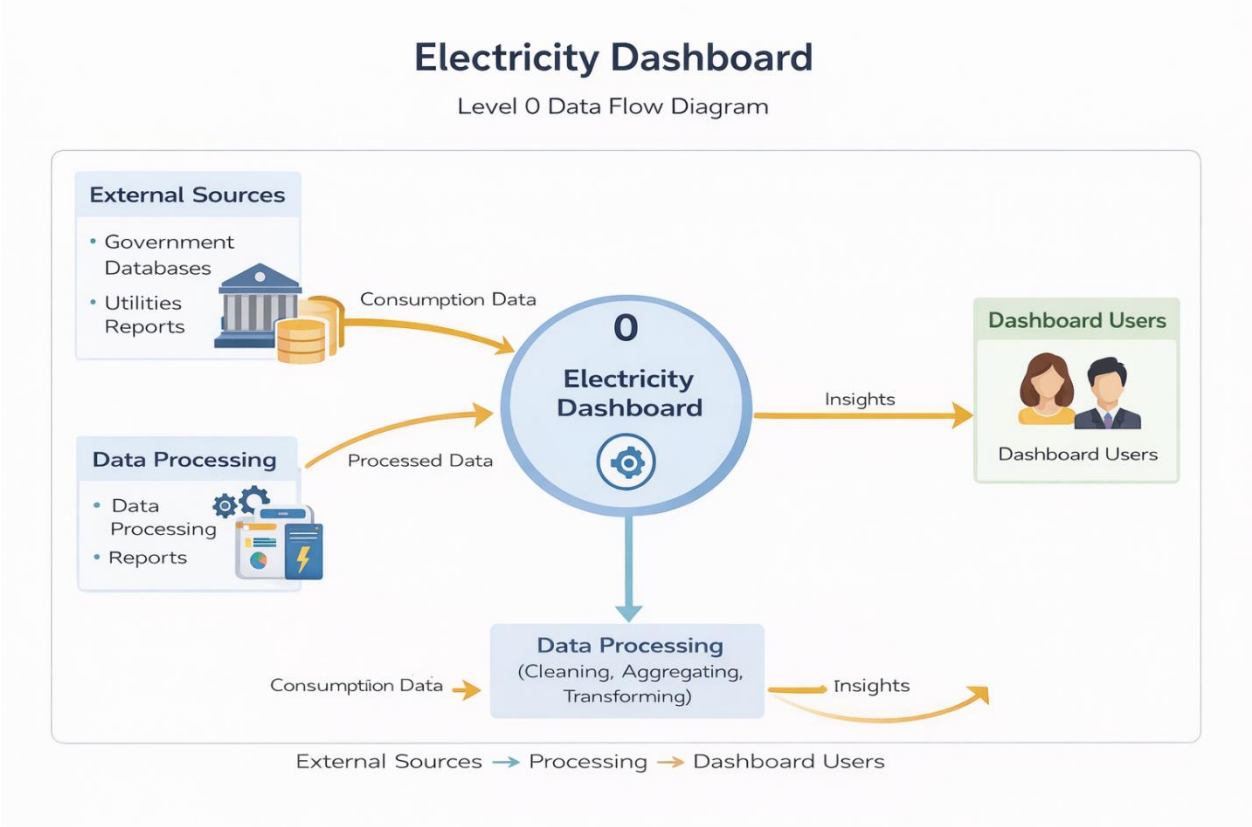
Functional Requirements:

FR No.	Functional Requirement (Epic)	Sub Requirement (Story / Sub-Task)
FR-1	Data Collection	Upload public electricity datasets Import Excel/CSV files
FR-2	Data Preprocessing	Clean and handle missing data Format for Tableau use
FR-3	Visualization Design	Design dashboard layout Create charts for sectors/regions Enable filtering options
FR-4	Insight Generation	Generate summaries Highlight usage trends
FR-5	Publishing	Export dashboard to Tableau Public Enable sharing via link

Non-functional Requirements:

FR No.	Non-Functional Requirement	Description
NFR-1	Usability	The Tableau dashboard should be intuitive and user friendly for technical and non-technical users.
NFR-2	Security	Published dashboards should be accessible via secured links and hosted on secure platforms.
NFR-3	Reliability	The dashboard should consistently display updated and accurate data from source files.
NFR-4	Performance	Visualizations should load efficiently without noticeable delays.
NFR-5	Availability	The dashboard should be available online 24/7 through Tableau Public or embedded links.
NFR-6	Scalability	The solution should support larger datasets and expansion to include more regions/sectors.

3.3 Data Flow Daigram:

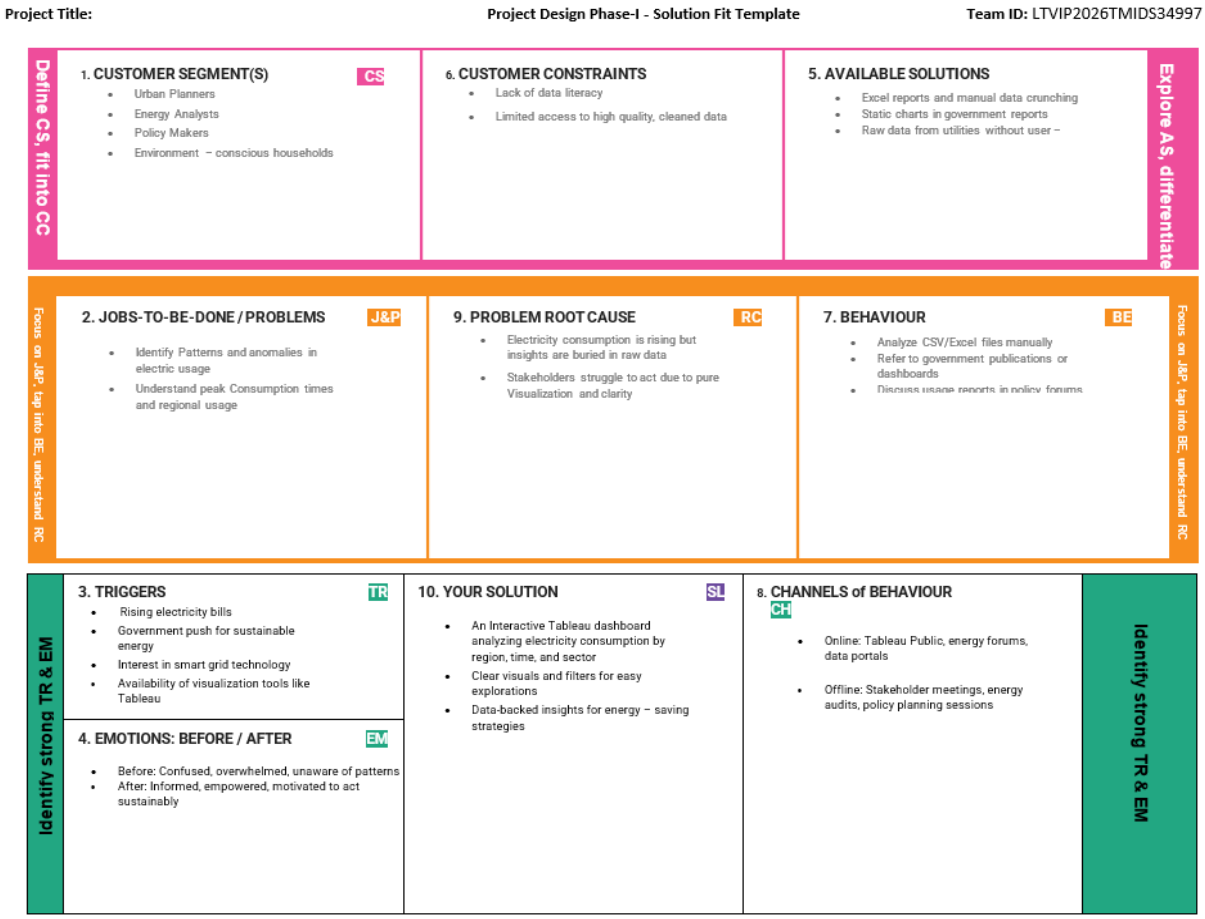


3.4 Technology Stack:

S.No	Component	Description	Technology
1.	User Interface	Dashboard interface for viewing electricity consumption trends	Tableau Public
2.	Application Logic-1	Script for data cleaning and formatting	Python (Pandas, NumPy)
3.	Application Logic-2	Data reshaping and exporting for Tableau	Python
4.	Database	Processed CSV/Excel files	Local Filesystem
5.	Cloud Database	N/A – Static files used in Tableau	N/A
6.	File Storage	Stores pre-processed datasets	Local Storage
7.	External API-1	Open energy datasets	data.gov.in, Kaggle
8.	External API-2	Weather correlation data (optional)	OpenWeather API
9.	Machine Learning Model	Optional forecasting model (future scope)	Prophet / Scikit-learn
10	Infrastructure (Server / Cloud)	Application setup and dashboard hosting	Local preprocessing + Tableau Cloud

4. PROJECT DESIGN:

4.1 Problem Solution Fit:

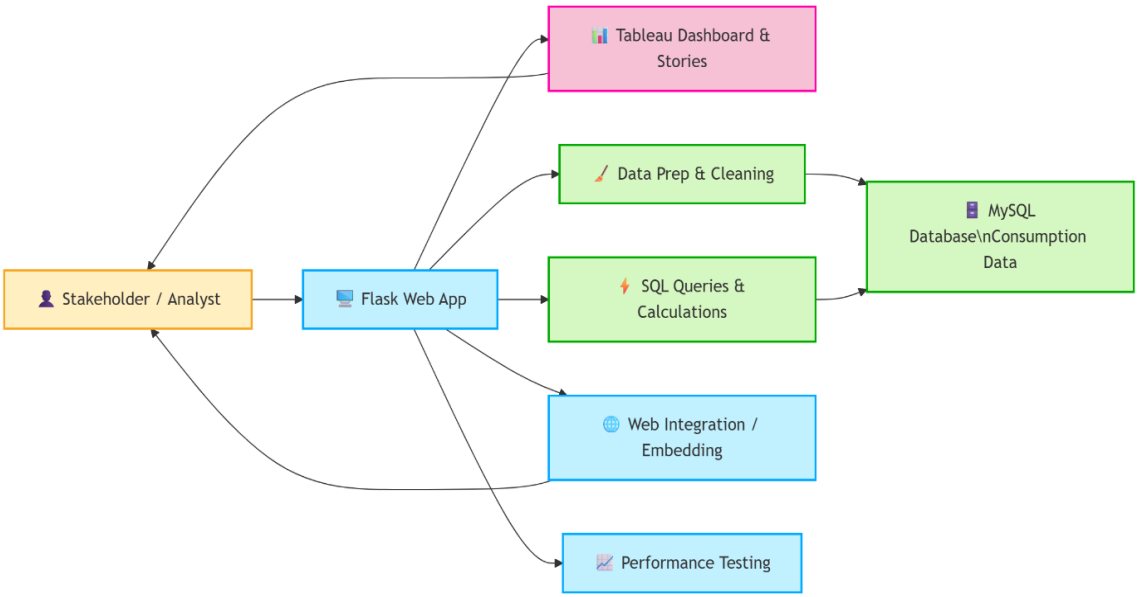


4.2 Proposed Solution:

S.No.	Parameter	Description
1.	Problem Statement (Problem to be solved)	Electricity consumption data is often underutilized due to its complexity, lack of visualization, and accessibility challenges. Stakeholders such as policymakers, analysts, and citizens lack clear insights to identify consumption trends or inefficiencies.
2.	Idea / Solution description	Develop an interactive Tableau dashboard that visualizes electricity consumption patterns across regions, sectors (residential, industrial, commercial), and time periods. The dashboard will enable stakeholders to

		explore, compare, and make informed energy decisions through clear, user-friendly visuals.
3.	Novelty / Uniqueness	While electricity data exists, our solution uniquely combines open data, advanced visualization, and interactivity in Tableau. It brings together seasonal patterns, sector-wise breakdowns, and geographic comparisons in one unified tool.
4.	Social Impact / Customer Satisfaction	The solution empowers government bodies and citizens to make energy-efficient decisions, supports environmental sustainability, and promotes awareness through intuitive visual storytelling. Households can see usage trends; planners can optimize policy.
5.	Business Model (Revenue Model)	The solution can be extended as a subscription- based analytics service to municipalities or utility companies. It could also be offered as a freemium public dashboard with advanced features for enterprise or government use.
6.	Scalability of the Solution	The dashboard can be scaled to incorporate national or international datasets, integrate predictive analytics, and include additional KPIs such as carbon emissions or cost forecasts. It can also be adapted for other utilities like water or gas.

4.3 Solution Architecture:



5. PROJECT PLANNING & SCHEDULING:

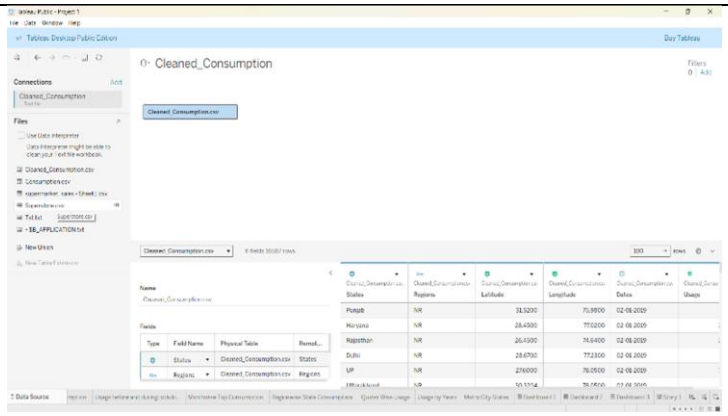
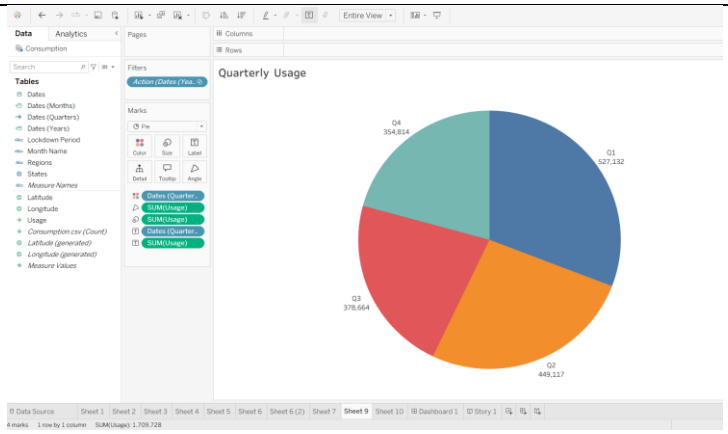
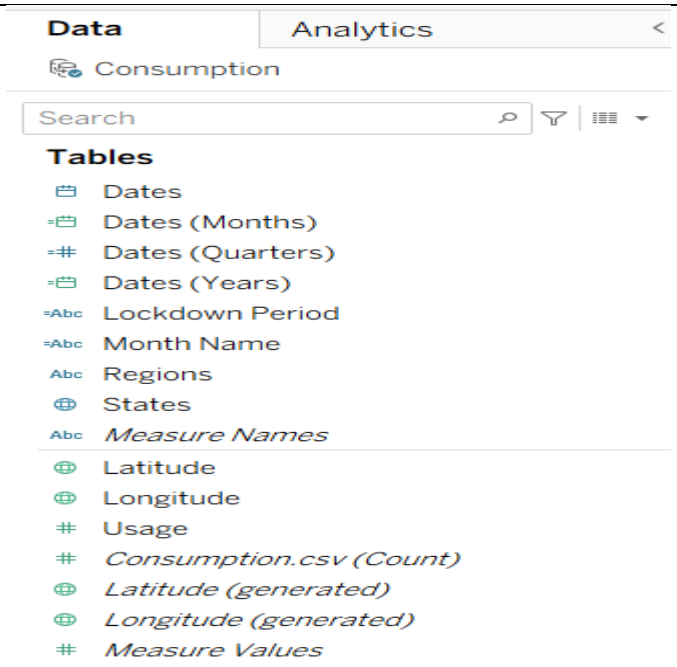
5.1 Project Planning:

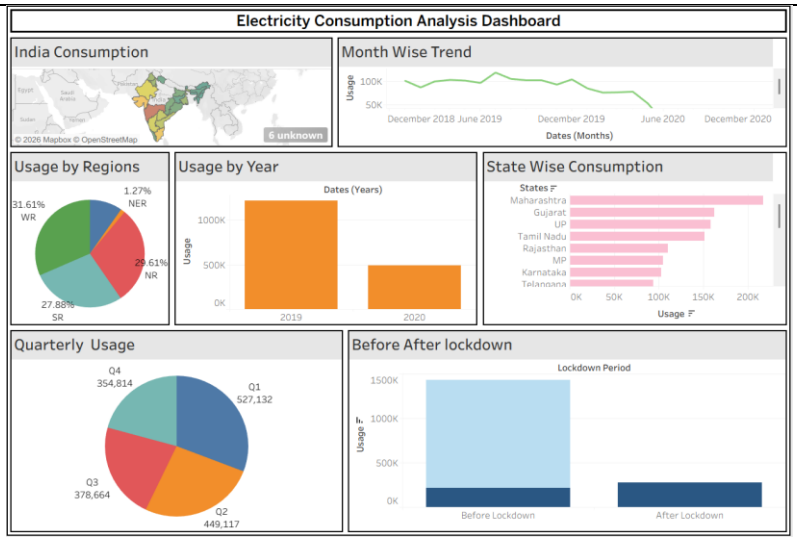
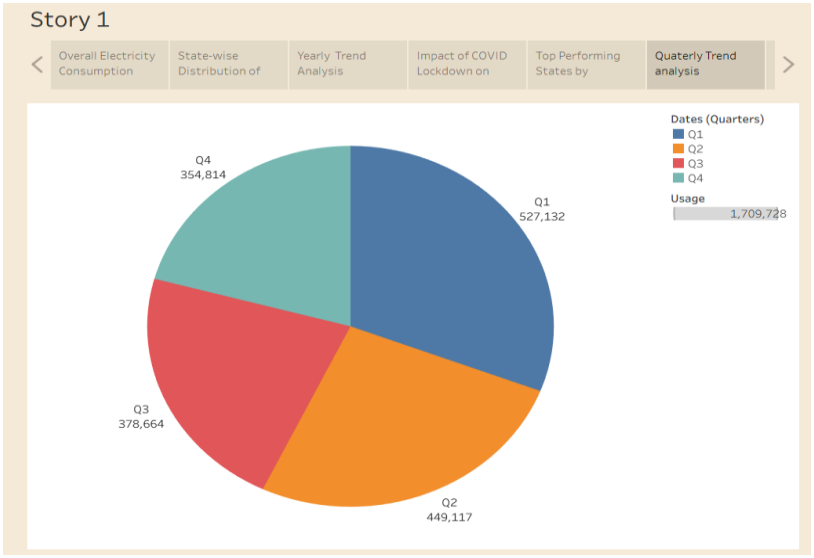
Sprint	Functional Requirement (Epic)	User Story Number	User Story / Task	Story Points	Priority	Team Members
Sprint-1	Data Collection	USN-1	As a data analyst, I want to collect electricity usage data from open sources	2	High	K. Bhavya
Sprint-1	Data Preprocessing	USN-2	As a data analyst, I want to clean and format the dataset for use in Tableau	3	High	A.Pujitha
Sprint-1	Data Preprocessing	USN-3	As a user, I want to ensure all missing and categorical data are handled properly	3	Low	P.Pranavi
Sprint-2	Dashboard Layout	USN-4	As a designer, I want to create a visual wireframe layout for the dashboard	2	Medium	S.Shamili
Sprint-2	Data Visualization	USN-5	As a user, I want to view region -wise electricity usage on a map in Tableau	3	High	P. Chaitrika
Sprint-2	Data Visualization	USN - 6	As a user, I want to compare sector -wise electricity consumption	3	High	A.Pujitha
Sprint-2	Trend Analysis	USN - 7	As an analyst, I want to analyze electricity usage trends over time	5	High	K. Bhavya
Sprint-3	Filtering & Interactivity	USN - 8	As a user, I want to filter data by sector and region in Tableau	2	High	P. Chaitrika
Sprint-3	Deployment	USN - 9	As a team member, I want to publish the final dashboard to Tableau Public	3	Medium	S.Shamili
Sprint-3	Insight Summary	USN -10	As an analyst, I want to prepare a summary of insights from the dashboard	5	High	P.Pranavi
Sprint - 3	Review	USN -11	As a team, we want to conduct a review and finalize the project	3	Medium	K. Bhavya

6. FUNCTIONAL AND PERFORMANCE TESTING:

6.1 Performance Testing:

S.No.	Parameter	Screenshot / Values
1.	Data Rendered	https://drive.google.com/file/d/1JxIkHNwXxjFztKq7ad0_KtkukCqTckNy/view

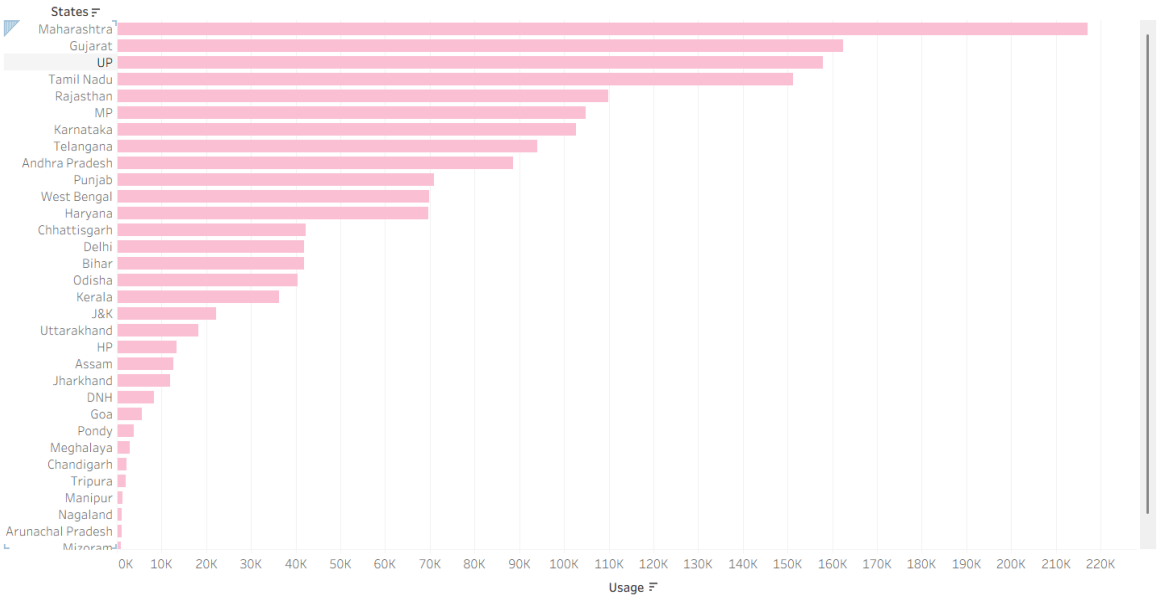
2.	Data Preprocessing	
3.	Utilization of Filters	
4.	Calculation fields Used	
5.	Dashboard design	No of Visualizations / Graphs – 9

		
6	Story Design	No of Visualizations / Graphs -6 

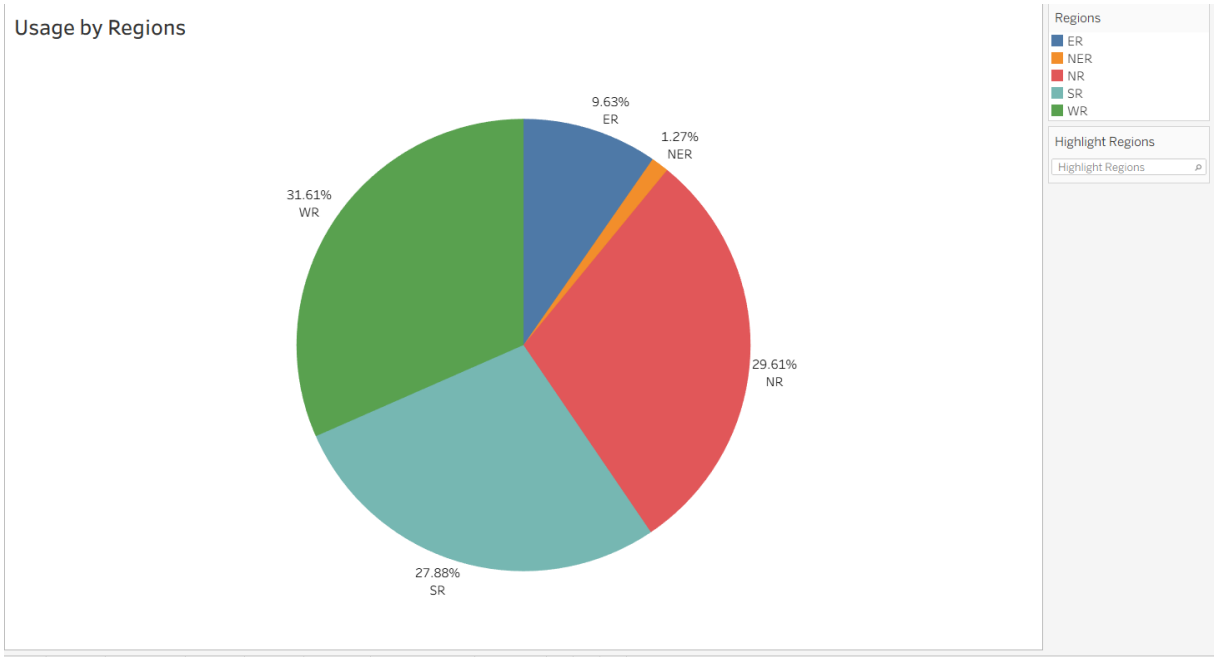
7. RESULTS:

7.1 Output Screenshots:

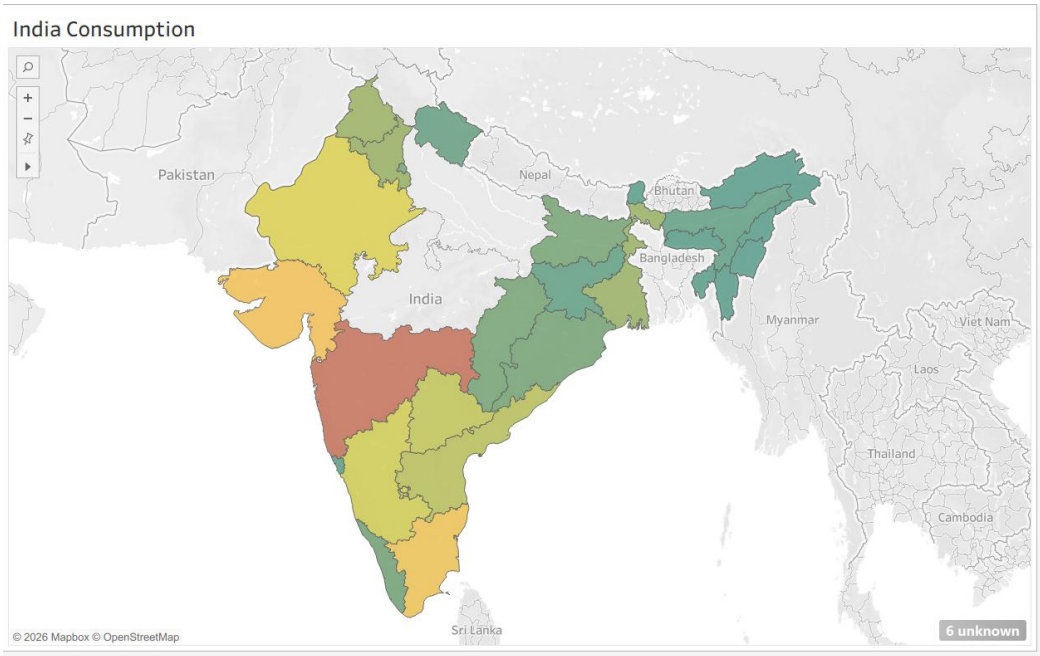
State Wise Consumption



Usage by Regions



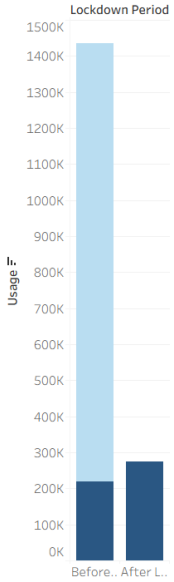
India Consumption



SUM(Usage)
649 217,080

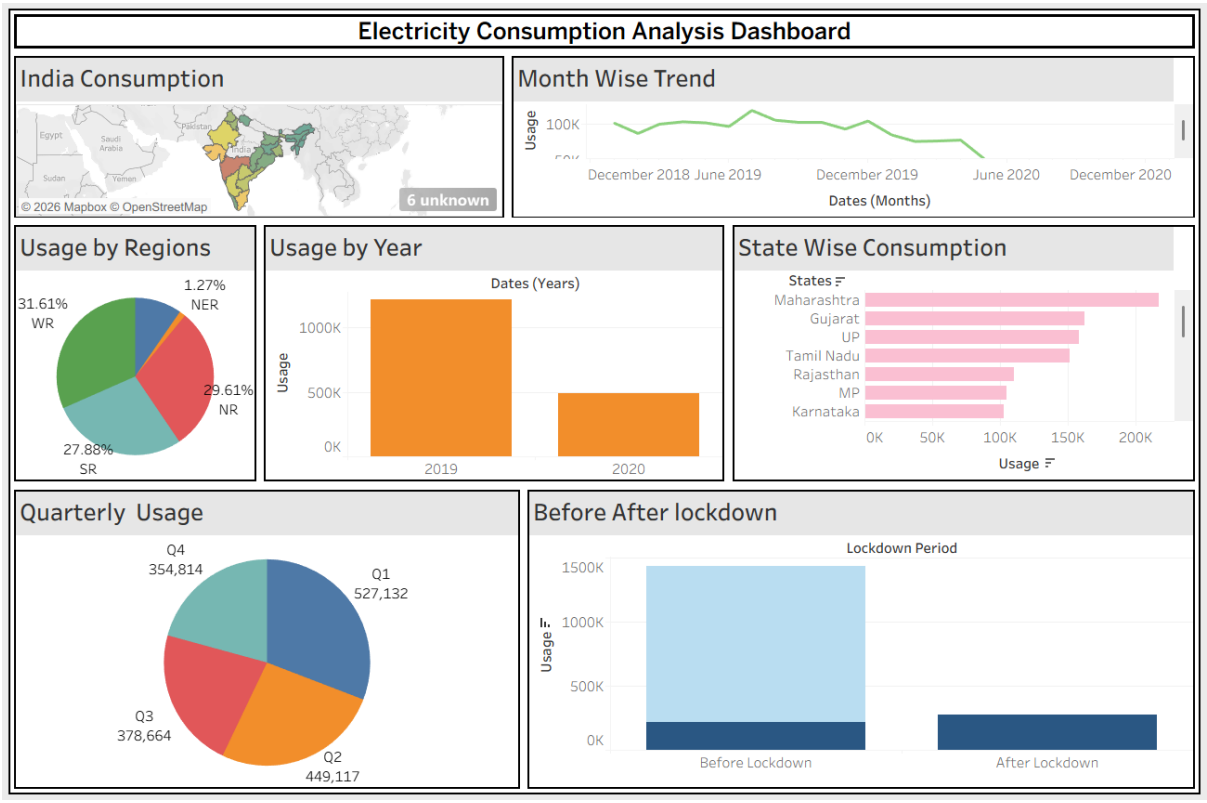
SUM(Usage)
649 217,080

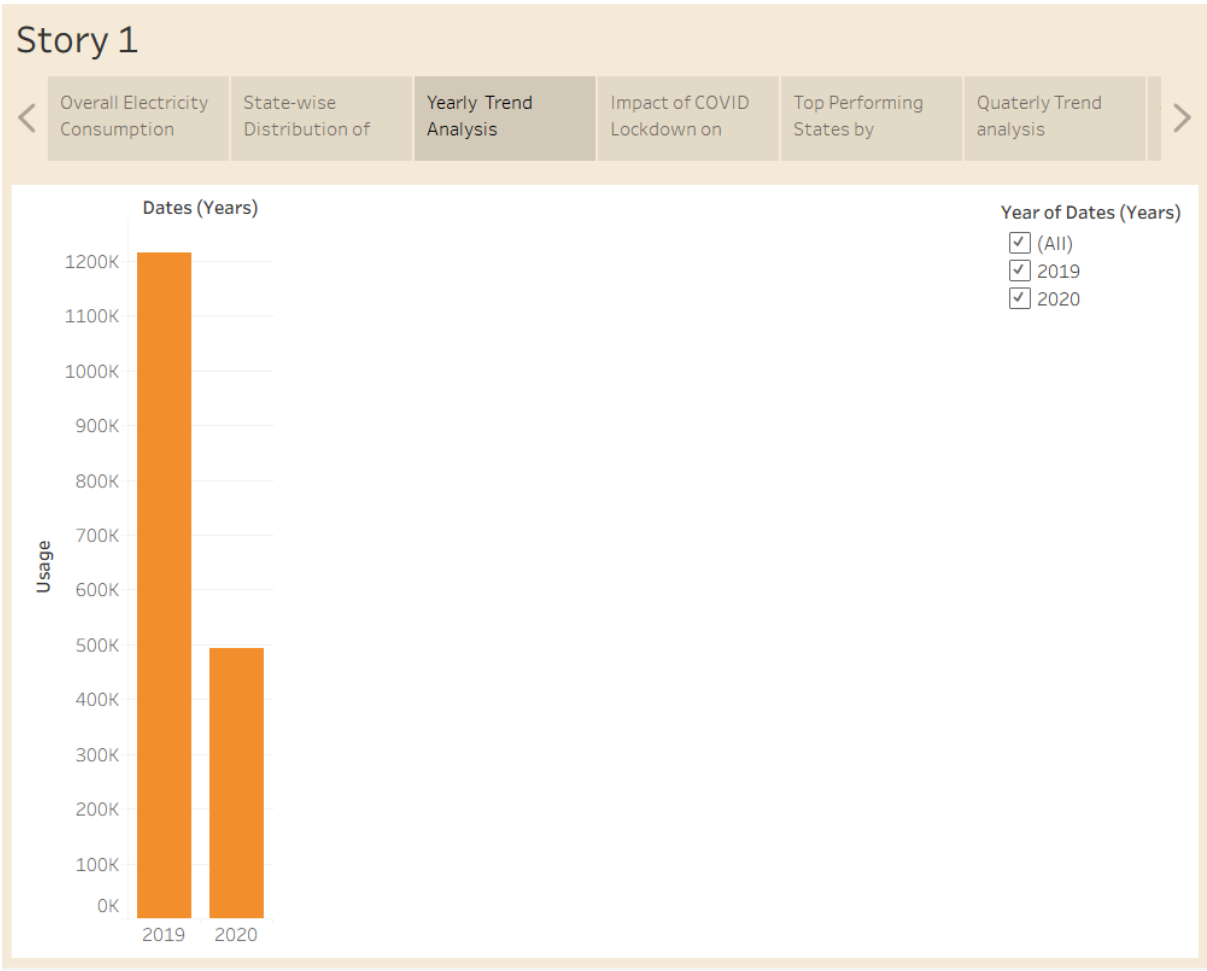
Before After lockdown



Dates (Years)
2019 2020

Dashboard and Stories:





8. ADVANTAGES & DISADVANTAGES:

8.1 Advantages:

- Provides clear visualization of complex electricity consumption data
- Enables easy comparison across states, regions, and years
- Interactive filters allow dynamic analysis (2019 vs 2020, pre/post lockdown)
- Identifies high-consumption and low-consumption regions quickly
- Supports data-driven decision-making for policy and planning
- Saves time compared to manual Excel analysis
- Helps detect trends, patterns, and seasonal variations

8.2 Disadvantages:

- Depends on accuracy and completeness of input data
- Limited to historical data (no real-time updates if not integrated)
- Overcrowded dashboards may confuse users if not designed properly
- Requires basic Tableau knowledge to modify or extend
- Does not automatically predict future consumption (unless predictive models are added)

9. CONCLUSION:

The Electricity Consumption Analysis project successfully transforms raw state-wise and regional power usage data into meaningful visual insights through an interactive Tableau dashboard. By analyzing yearly trends, regional distribution, quarterly usage, and the impact of lockdown, the system enables users to clearly understand consumption patterns and variations across India. The dashboard simplifies complex datasets into intuitive visual representations, making it easier for decision-makers to identify trends, compare performance, and draw informed conclusions for planning and policy development.

10. FUTURE ENHANCEMENT:

In the future, this project can be enhanced by integrating real-time electricity consumption data and incorporating predictive analytics to forecast future demand trends. Advanced features such as anomaly detection, automated insights generation, and AI-based consumption prediction models can be added to improve decision-making capabilities. Additionally, deploying the dashboard as a web-based interactive application with user access control and mobile responsiveness would increase accessibility and practical usability.

11. APPENDIX:

Dataset link:

https://drive.google.com/file/d/1JxIkHNwXxjFztKq7ad0_KtkukCqTckNy/view

Demo Video Link:

https://drive.google.com/file/d/18nS_UElMsO9j4ioiTwRSclh7H8SifDJu/view?usp=sharing