CONTENTS

1. INTRODUCTION

1.1 PROJECT OVERVIEW

Electricity is one of the most fundamental resources driving the progress of modern civilization. It fuels every sector of society, from industries and transportation to residential homes and educational institutions. With increasing urbanization and digital dependency, the demand for electricity continues to rise significantly. Monitoring and understanding how electricity is consumed are crucial for ensuring sustainable energy development, efficient resource management, and robust infrastructure planning.

This project is centred on the theme "Plugging into the Future: An Exploration of Electricity Consumption Patterns Using Tableau." The objective is to create a comprehensive and interactive data visualization model that highlights patterns in electricity consumption using Tableau. The visualizations aim to make the data understandable, insightful, and accessible to a wide range of stakeholders, including policymakers, utility companies, analysts, and the general public.

The project utilizes real-world electricity consumption datasets and transforms them into visual dashboards. Through these dashboards, users can observe trends over time, make regional comparisons, and analyze sector-wise electricity usage. Special attention is given to identifying peak usage periods, seasonal variations, and patterns that could inform future planning and optimization strategies. Tableau's intuitive interface and powerful features make it the ideal platform for delivering this analytical capability.

In essence, the project not only provides a tool for better comprehension of electricity usage but also promotes data-driven decision-making and encourages proactive engagement in energy efficiency and sustainability efforts.

1.2 PURPOSE

The purpose of this project is to address the growing need for clear, actionable insights into electricity consumption data. In a rapidly digitizing and energy-dependent world, raw data alone is insufficient for informed decision-making. There is a crucial need to convert this data into meaningful visualizations that can be easily interpreted by a wide audience, ranging from government agencies to private sector analysts and ordinary citizens.

By leveraging Tableau, the project aims to bridge the gap between complex electricity usage data and accessible insights. Tableau's capacity for creating interactive dashboards enables users to explore data dynamically, apply filters, and uncover trends that might otherwise remain hidden in spreadsheets or static charts. This not only helps in understanding past and present consumption patterns but also plays a role in forecasting future needs and supporting proactive planning.

Another key purpose is to enhance public and institutional awareness about energy efficiency. Visualization fosters transparency and understanding, empowering users to identify inefficiencies, peak usage periods, and region-specific issues. The project ultimately promotes data-driven governance and encourages collaborative efforts in energy conservation and sustainable development.

Key Points – Purpose of the Project:

- To convert complex electricity consumption data into clear, interactive visualizations.
- To support decision-makers in identifying trends, inefficiencies, and forecasting energy demand.
- To enhance accessibility and understanding of energy data for a wide range of stakeholders.
- To promote data-driven governance and sustainable energy planning.
- To raise awareness about energy efficiency through engaging visual tools.

2. IDEATION PHASE

2.1 PROBLEM STATEMENT

Customer Problem Statement Template:

Create a problem statement to understand your customer's point of view. The Customer Problem Statement template helps you focus on what matters to create experiences people will love.

A well-articulated customer problem statement allows you and your team to find the ideal solution for the challenges your customers face. Throughout the process, you'll also be able to empathize with your customers, which helps you better understand how they perceive your product or service.

I am	Describe customer with 3-4 key characteristics - *who are they?*	Describe the customer and their attributes here
I'm trying to	*List their outcome or "job" the care about - what are they trying to achieve?*	List the thing they are trying to achieve here
but	Describe what problems or barriers stand in the way – *what bothers them most?*	Describe the problems or barriers that get in the way here
because	Enter the "root cause" of why the problem or barrier exists – *what needs to be solved?*	Describe the reason the problems or barriers exist
which makes me feel	Describe the emotions from the customer's point of view – *how does it impact them emotionally?*	Describe the emotions the result from experiencing the problems or barriers

Example:

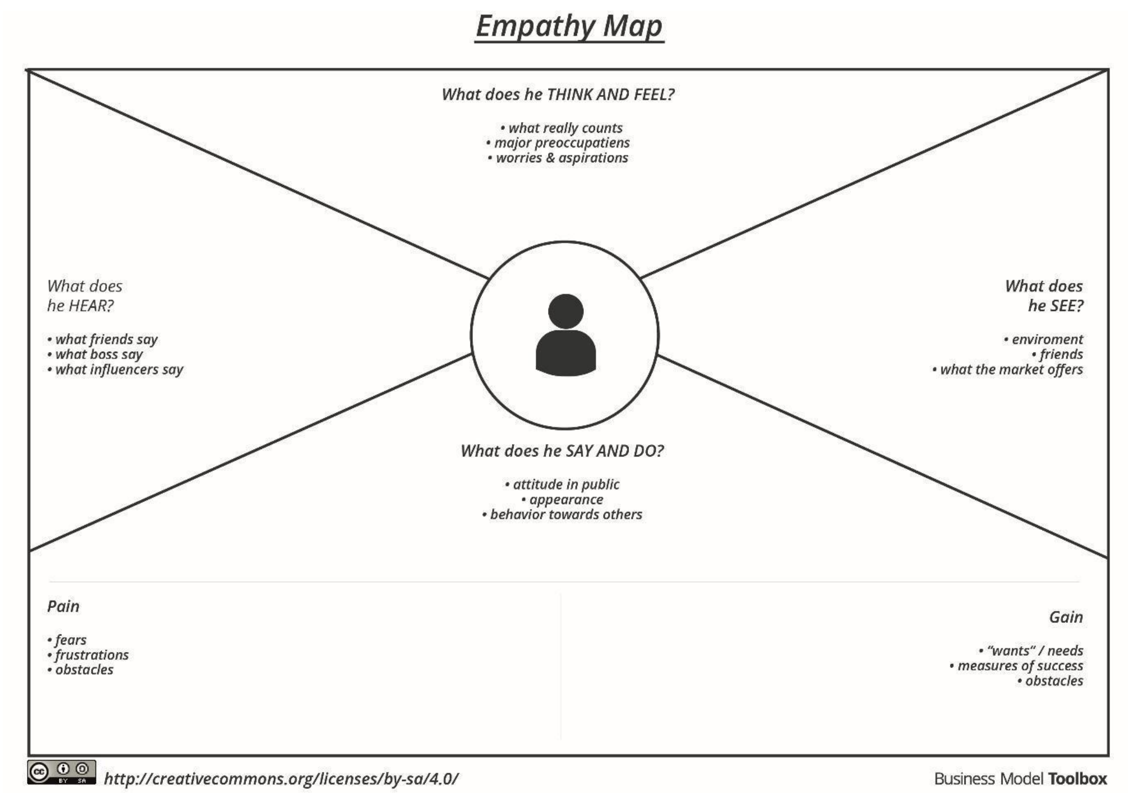
2.2 EMPATHY MAP CANVAS

Empathy Map Canvas:

The Empathy Map Canvas is a valuable tool used in this project to better understand the experiences, thoughts, and behaviours of the primary users engaging with electricity consumption data. This mapping helps identify user-centric needs and frustrations and guides the creation of meaningful, intuitive solutions in the visualization process.

It is a useful tool to helps teams better understand their users. Creating an effective solution requires understanding the true problem and the person who is experiencing it. The exercise of creating the map helps participants consider things from the user's perspective along with his or her goals and challenges.

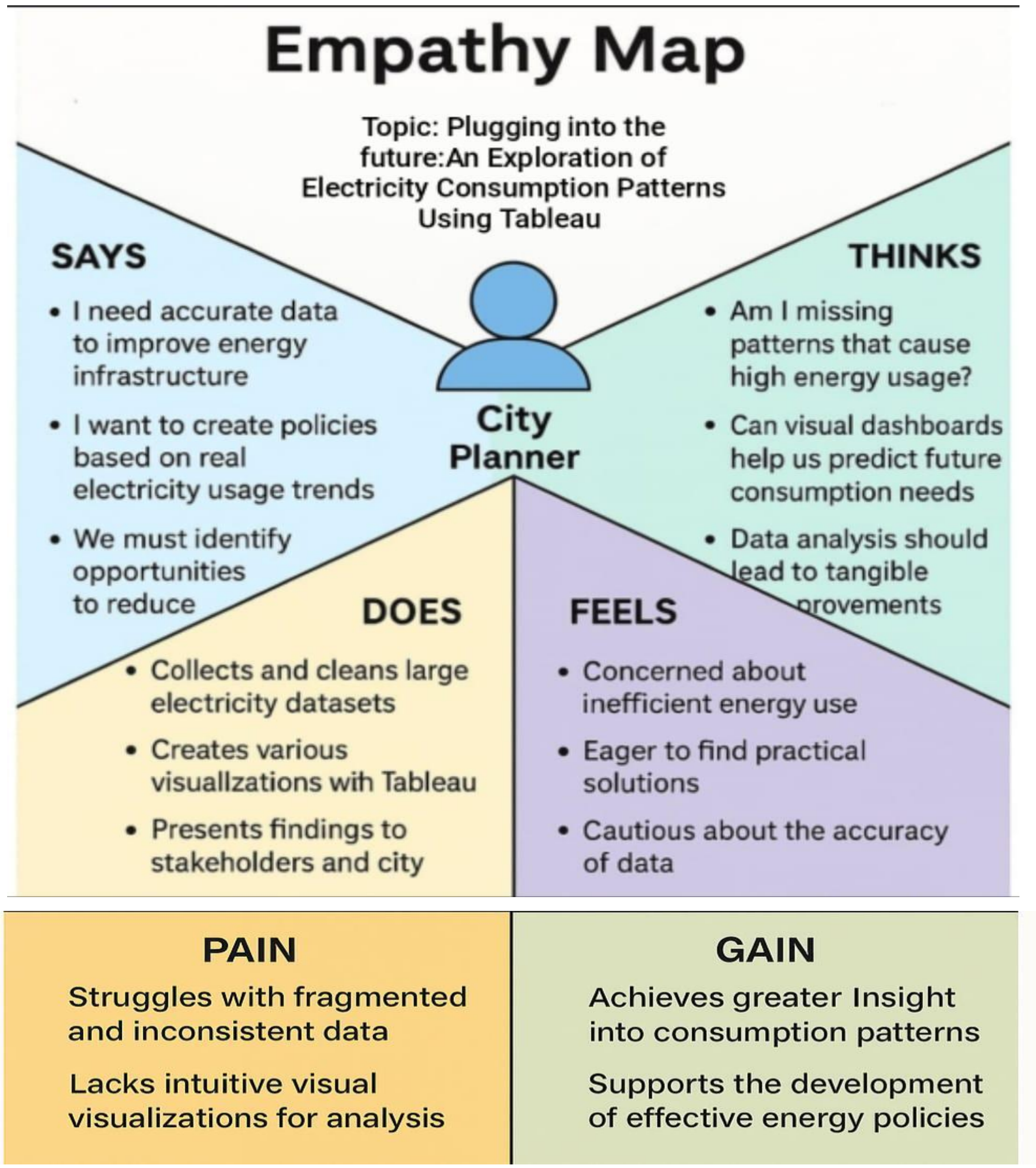
Example:



Example: Consider a **city planner** who manages urban electricity infrastructure. They often say, "I need to know which neighbourhoods are seeing the highest power demand."

They think about seasonal spikes and whether the data can help with future planning. They may feel overwhelmed by raw spreadsheets and often rely on outdated tools. What they truly need is a visual, interactive dashboard to monitor usage trends efficiently.

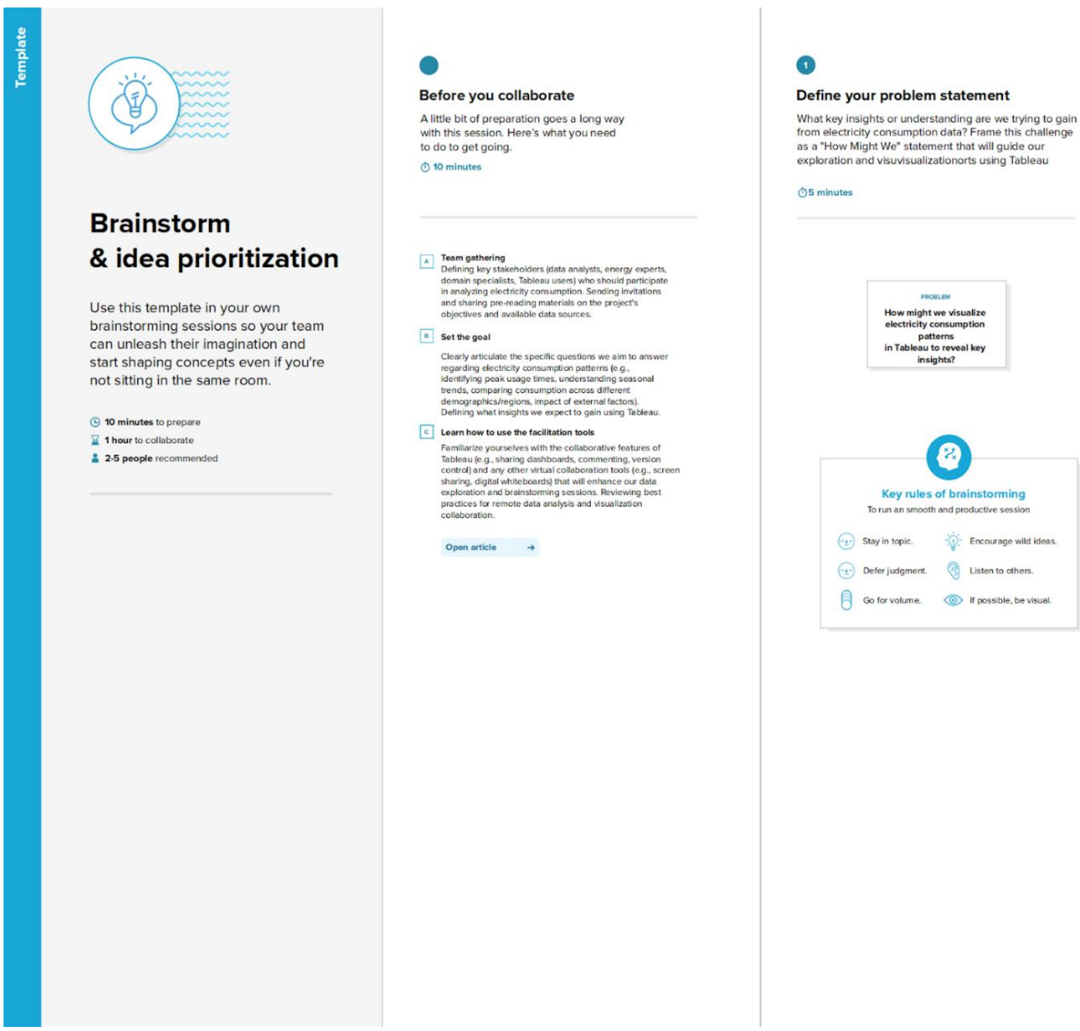
By addressing these practical needs and emotional responses, the project ensures its solutions are aligned with real-world user contexts and behaviours. An intuitive platform to visualize electricity usage clearly.



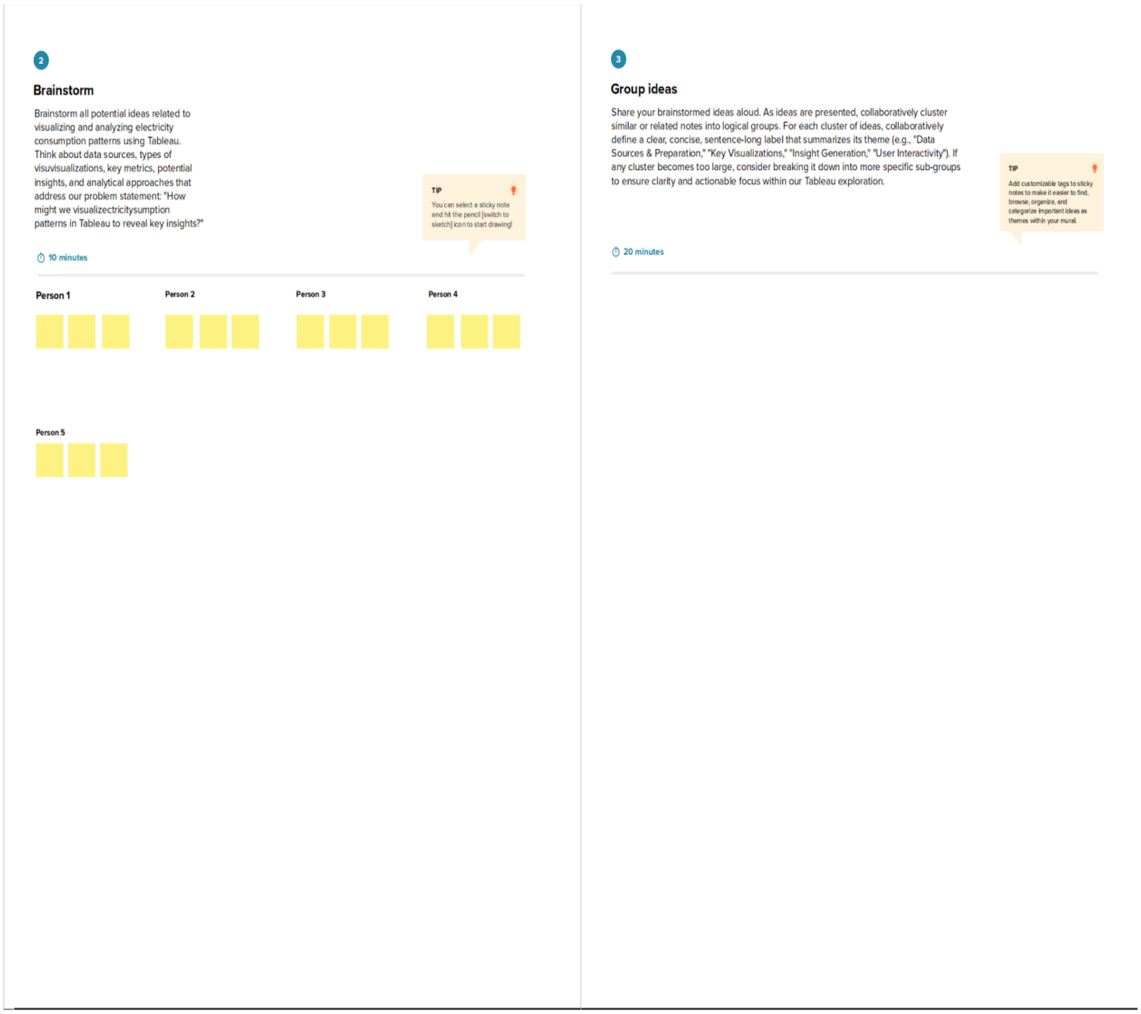
2.3 BRAINSTORMING

Brainstorming provides a free and open environment that encourages everyone within a team to participate in the creative thinking process that leads to problem solving. Prioritizing volume over value, out-of-the-box ideas are welcome and built upon, and all participants are encouraged to collaborate, helping each other develop a rich number of creative solutions.

Use this template in your own brainstorming sessions so your team can unleash their imagination and start shaping concepts even if you're not sitting in the same room.



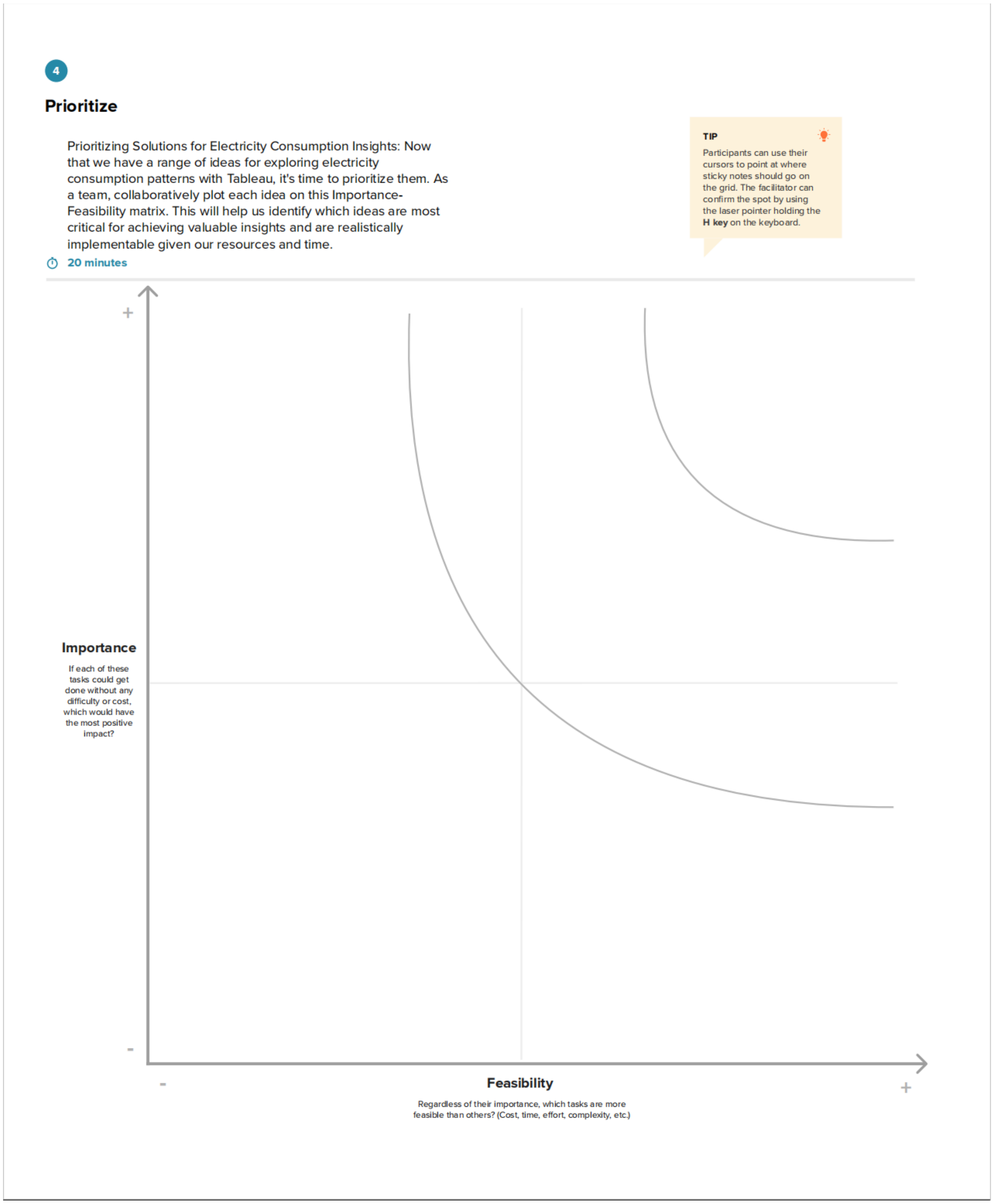
Step-2: Brainstorm, Idea Listing and Grouping



Ideas generated during the ideation phase included:

- Heatmaps for region-wise electricity usage
- Line charts for monthly/annual usage trends
- Sectoral comparison (residential, industrial, commercial)
- Interactive filters to analyze data by region, time, and sector
- Integration of weather or demographic data to explain usage patterns

Step-3: Idea Prioritization



3. REQUIREMENT ANALAYSIS

3.1 CUSTOMER JOURNEY MAP

The Customer Journey Map is a strategic visualization that outlines the steps users take when interacting with electricity consumption data. In this project, the journey highlights how users transition from being unaware of data visualization tools to fully utilizing Tableau dashboards for informed decision-making. Mapping this journey helps ensure that user needs are met at each stage and identifies opportunities to improve the user experience.

In the context of this project, the journey typically begins when users become aware of the need to analyze electricity usage. This awareness may arise from challenges such as rising energy costs, operational inefficiencies, or regulatory reporting requirements. At this stage, users often feel confused or overwhelmed due to the complexity and volume of raw data available.

During the consideration phase, users begin exploring possible solutions. They may compare traditional spreadsheets, static reports, and modern visualization tools. As users are introduced to Tableau dashboards, they become more interested due to the tool's interactive features, visual clarity, and ease of use. Users start to see the value of visualizing electricity consumption trends and begin to trust the platform as a reliable resource.

The decision phase is where users adopt Tableau dashboards as their primary tool for analysis. At this point, they feel more confident and empowered. They engage with interactive filters, regional comparisons, and sector-based charts to extract meaningful insights.

Finally, in the action phase, users apply the insights to make impactful decisions—such as infrastructure upgrades, conservation strategies, or reporting improvements. This phase also includes sharing dashboards with teams, stakeholders, or the public, enhancing collaboration and transparency.

The Customer Journey Map helps align the project's features with user expectations and reveals areas for enhancement, such as better onboarding materials, responsive support, and advanced filtering capabilities.

3.2 SOLUTION REQUIREMENTS

Functional Requirements:

Following are the functional requirements of the proposed solution.

FR No.	Functional Requirement (Epic)	Sub Requirement (Story / Sub-Task)
FR-1	Data Ingestion	Upload consumption data (CSV/API), Connect smart meter data
FR-2	Data Preprocessing	Handle missing values, normalize formats, timestamp conversion
FR-3	Dashboard Visualization	Line/bar graphs, pie charts, interactive filters (region, device, time)
FR-4	Alerts & Insights	Trigger overconsumption alerts, generate daily/weekly insights

Non-functional Requirements:

Following are the non-functional requirements of the proposed solution.

FR No.	Non-Functional Requirement	Description
NFR-1	Usability	Dashboards should be interactive and easy to interpret for all user levels
NFR-2	Security	Data access must be restricted to authenticated users
NFR-3	Reliability	System must consistently process and display accurate consumption data
NFR-4	Performance	Dashboards should load and respond within 2 seconds
NFR-5	Availability	Dashboards should load and respond within 2 seconds
NFR-6	Scalability	Should handle large datasets and multiple user sessions simultaneously

3.3 DATA FLOW DESIGN

A Data Flow Diagram (DFD) is a traditional visual representation of the information flows within a system. A neat and clear DFD can depict the right amount of the system requirement graphically. It shows how data enters and leaves the system, what changes the information, and where data is stored.

The Data Flow Diagram (DFD) plays a crucial role in visualizing how electricity consumption data is processed within the project. It serves as a blueprint that maps the flow of data from its initial source to its final presentation in the form of interactive dashboards. This helps stakeholders understand the architecture behind the scenes and how each component contributes to delivering insights.

At the initial stage, raw electricity consumption data is collected from reliable sources such as government databases or utility providers. This raw data often exists in CSV or Excel format and typically contains details like state-wise electricity usage, sectoral consumption, and monthly or annual breakdowns.

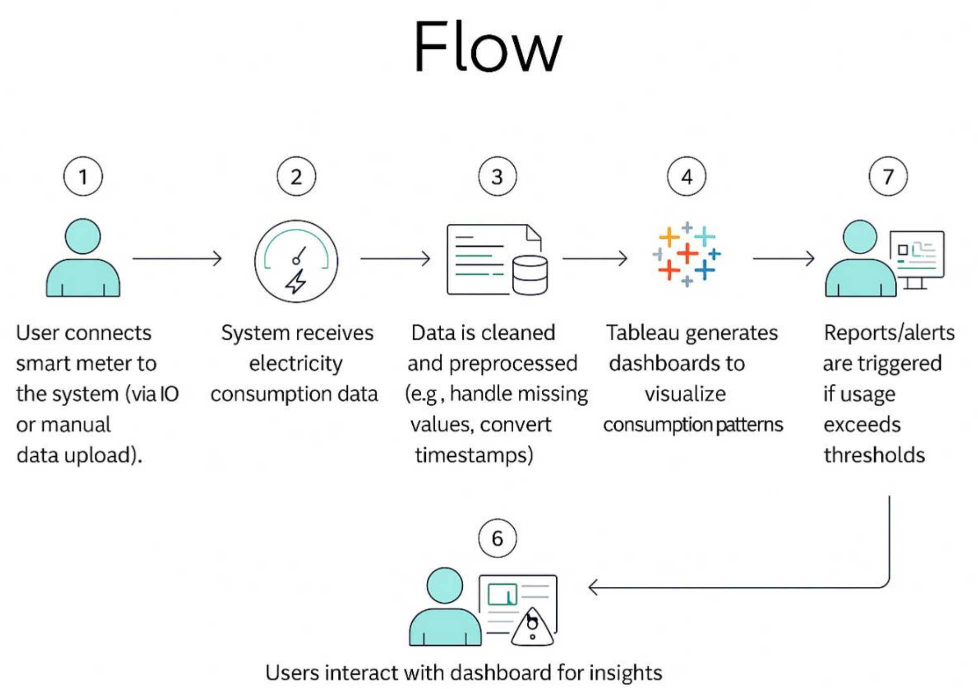
The next step involves preprocessing the data using tools like Microsoft Excel or Python. During this stage, the data is cleaned, formatted, and standardized to ensure consistency and usability. This may include handling missing values, normalizing units, and filtering out irrelevant or duplicate records.

Once cleaned, the processed dataset is imported into Tableau. Here, the data is structured into worksheets and dashboards that support interactive filtering, comparison, and visualization. Tableau allows for creating bar charts, line graphs, maps, and other visual formats that transform raw data into meaningful insights.

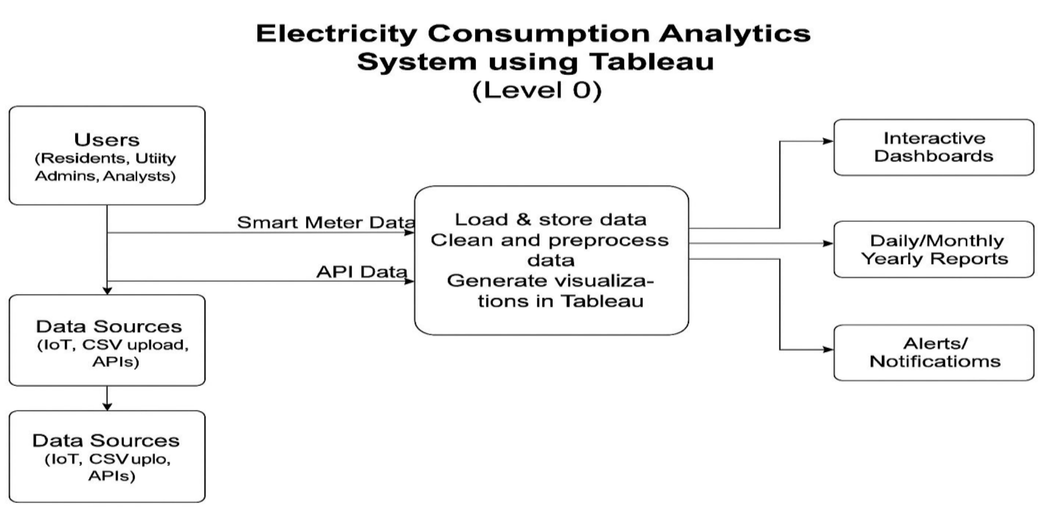
Users interact with the final Tableau dashboard, applying filters such as region, year, or sector to explore specific patterns. This dynamic interface enables stakeholders to extract custom insights based on their needs.

The DFD not only clarifies the data journey but also highlights opportunities for optimization, such as automating the preprocessing step or integrating real-time data feeds in the future.

Example:



Example : DFD (LEVEL 0)



User Stories

Use the below template to list all the user stories for the product.

User Type	Functional Requirement (Epic)	User Story Number	User Story / Task	Acceptance criteria	Priority	Release
Resident	Data Monitoring	USN-1	As a user, I want to track my daily electricity usage through a dashboard.	Usage data visible and updated on a daily basis	High	Sprint-1
Analyst	Regional Comparison	USN-2	As a data analyst, I want to compare electricity usage across cities or zones.	Comparison chart available using filters	High	Sprint-2
Utility Admin	Alerts & Notifications	USN-3	As an admin, I want to get alerts when a user's consumption exceeds average usage.	Email or dashboard alert generated for threshold breach	Medium	Sprint-2
Resident	Insights	USN-4	As a user, I want to know which appliances consume the most electricity.	Appliance-level usage shown via visual (if data supports it)	Medium	Sprint-3
Stakeholder	Dashboard Access & Reporting	USN-5	As a stakeholder, I want downloadable reports from Tableau dashboards for review and meetings.	PDF/CSV report generation enabled	High	Sprint-3

3.4 TECHNOLOGY STACK

Technical Architecture:

The technology stack selected for this project ensures efficient data handling, seamless visualization, and an intuitive user experience. It comprises a combination of tools and platforms chosen to support every phase of the data visualization lifecycle—from preprocessing to presentation.

Microsoft Excel is used in the early stages for data cleaning and formatting. It allows for quick inspection, identification of missing or erroneous values, and basic structuring of datasets before they are fed into the visualization tool. For users less familiar with coding, Excel serves as a user-friendly environment to perform essential data preparation tasks.

Tableau Public is the core visualization tool in this project. Known for its drag-and-drop functionality and ability to connect to a wide variety of data sources, Tableau makes it easy to create interactive and informative dashboards. Users can apply filters, drill down into specific dimensions, and export insights visually without writing any code. Tableau Public also allows sharing dashboards online, increasing accessibility.

CSV/Excel Files serve as the data storage format throughout the process. These formats ensure compatibility across platforms and make it simple to import data into Tableau or other tools.

The Deliverable shall include the architectural diagram as below and the information as per the table1 & table 2

Example: Order processing during pandemics for offline mode

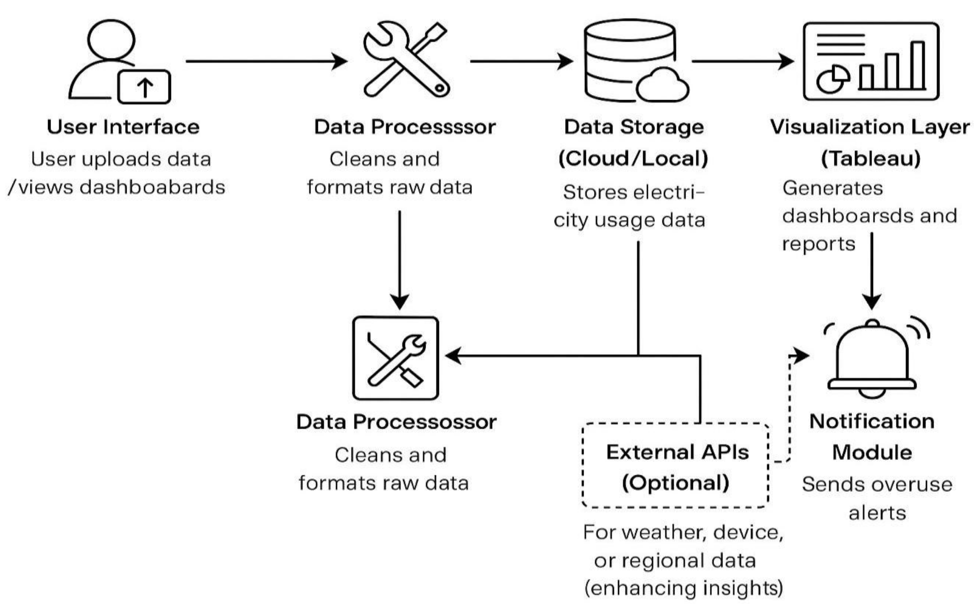


Table-1 : Components & Technologies:

S.No	Component	Description	Technology
1.	User Interface	Upload files, interact with dashboard	Tableau Public, HTML/CSS (embedded)
2.	Application Logic-1	Data Cleaning & Preprocessing	Python (Pandas, NumPy)
3.	Application Logic-2	Load data to Tableau	Tableau Extract API, CSV Connector
4.	Database	Data Storage	PostgreSQL / Google Sheets / AWS RDS
5.	Cloud Database	File and dashboard hosting	Google Drive / AWS S3 / Azure Storage
6.	External API(optional)	Weather or smart grid data	OpenWeather API / Smart Meter APIs
7.	Notification Service	Alert generation for abnormal usage	Python Script + SMTP / Twilio API

Table-2: Application Characteristics:

S.No	Characteristics	Description	Technology
1.	Open-Source Frameworks	Based on open-source platforms for flexibility	Python, Tableau Public
2.	Security Implementations	Secure data access with user-level permissions	Encrypted Upload, OAuth (if any)
3.	Scalable Architecture	Can handle large data uploads and dashboard scaling	Tableau Server / Cloud Infra
4.	Availability	Dashboard accessible 24/7 via embedded or hosted service	Tableau Public, Cloud Hosting
5.	Performance	Fast loading dashboards and real-time filters	Optimized extracts in Tableau

4. PROJECT DESIGN

4.1 Problem – Solution Fit Template:

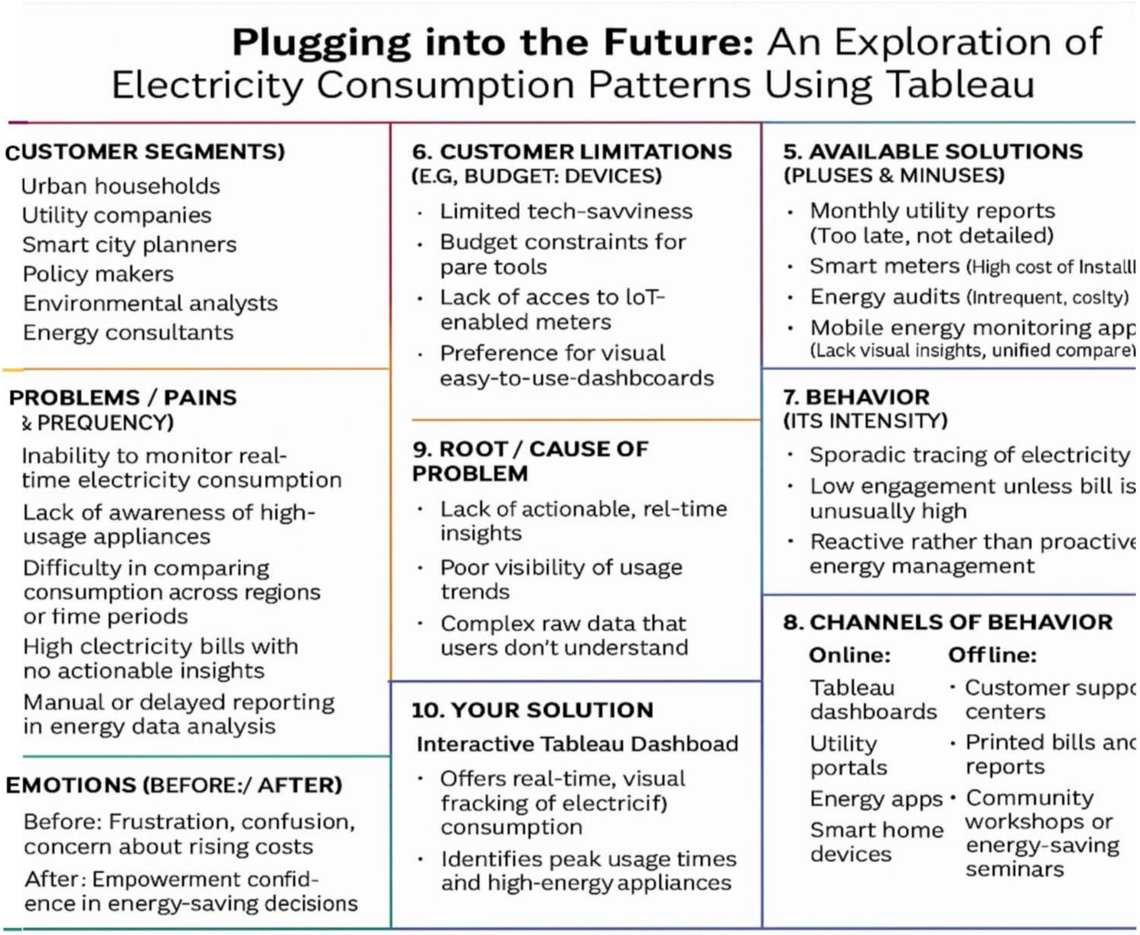
The Problem-Solution Fit simply means that you have found a problem with your customer and that the solution you have realized for it actually solves the customer's problem. It helps entrepreneurs, marketers and corporate innovators identify behavioural patterns and recognize what would work and why .

Purpose:

- ❑ Solve complex problems in a way that fits the state of your customers.
- ❑ Succeed faster and increase your solution adoption by tapping into existing mediums and channels of behaviour.
- ❑ Sharpen your communication and marketing strategy with the right triggers and messaging.
- ❑ Increase touch-points with your company by finding the right problem-behaviour fit and building trust by solving frequent annoyances, or urgent or costly problems.
- ❑ Understand the existing situation in order to improve it for your target group.

Despite the availability of extensive electricity usage data, stakeholders often lack the tools or expertise to interpret and use this data effectively. This leads to inefficient energy planning, wastage, and missed opportunities for optimization.

Problem Statement: How can electricity consumption data be visualized effectively to reveal usage patterns, identify inefficiencies, and support data-driven energy management decisions?



4.2 PROPOSED SOLUTION

The proposed solution centres on the development of a user-friendly and interactive Tableau dashboard to visualize electricity consumption data. This dashboard includes a variety of visual formats such as time-series charts, sector-wise bar graphs, and geo-based heatmaps to help identify consumption patterns, trends, and anomalies. The system is designed to integrate data from diverse sources and deliver actionable insights.

It stands out for its tailored functionality—supporting specific user needs and behaviours—and is capable of adapting to smart grid data, weather impacts, and other dynamic metrics. Socially, the dashboard encourages sustainable energy use, supports policymaking, and raises awareness among the public. It also enhances customer satisfaction by offering clear, real-time insights for energy cost savings and operational efficiency.

From a business perspective, the solution allows for scalable implementation via SaaS models, customized dashboard consulting, and premium analytics services. Its scalability is underpinned by Tableau's architecture, which can manage large volumes of data and integrate with a wide range of future data inputs.

S.No.	Parameter	Description
1.	Problem Statement (Problem to be solved)	Current electricity data analysis is complex and lacks clear visualizations, hindering efficient energy management, forecasting, and waste reduction. There's a need for an intuitive tool to reveal consumption insights.
2.	Idea / Solution description	Develop an interactive Tableau dashboard to visualize and analyze electricity consumption patterns. This includes data preparation and creating various charts (time-series, heatmaps filters to identify trends and anomalies.
3.	Novelty / Uniqueness	Tailored, user-friendly Tableau dashboard for electricity data, integrating diverse sources. It provides specific, actionable insights into consumption behaviour, going beyond generic visualizations and easy user interpretation.
4.	Social Impact / Customer Satisfaction	Social Impact: Promotes energy conservation, aids policy-making, and optimizes grid management for stable supply. Increases public awareness of sustainable energy. Customer Satisfaction: Provides immediate visual insights for cost savings and improved efficiency for energy managers and businesses.
5.	Business Model (Revenue Model)	Potential models include SaaS subscriptions for organizations, custom dashboard development, consulting on energy data analysis, and premium access to aggregated consumption analytics.
6.	Scalability of the Solution	Highly scalable with Tableau's robust architecture, handling large data volumes. Easily adaptable to include more data sources (e.g., smart meters, weather) and features. Can monitor consumption across regions or buildings.

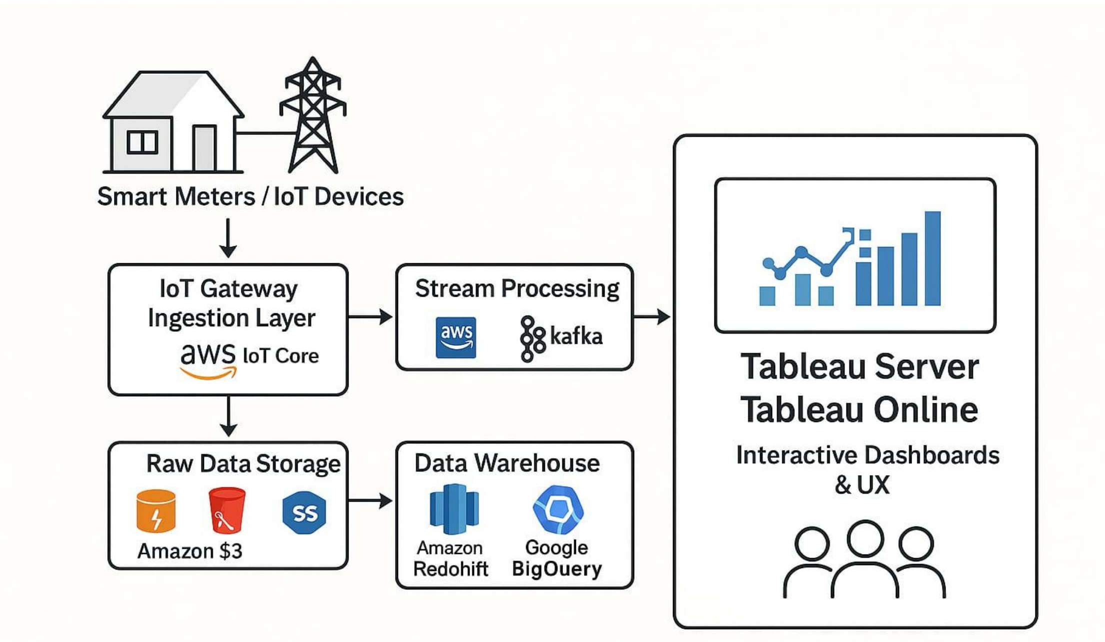
4.3 SOLUTION ARCHITECTURE

Solution architecture is a complex process – with many sub-processes – that bridges the gap between business problems and technology solutions. The solution architecture for this project is designed to ensure smooth integration, scalability, and efficient data processing for visualizing electricity consumption patterns. It follows a modular structure that facilitates data collection, transformation, visualization, and interaction through well-defined stages.

Its goals are to:

- Find the best tech solution to solve existing business problems.
- Describe the structure, characteristics, behaviour, and other aspects of the software to project stakeholders.
- Define features, development phases, and solution requirements.
- Provide specifications according to which the solution is defined, managed, and delivered.

Example - Solution Architecture Diagram:



Solution Architecture Diagram

6. FUNCTIONAL AND PERFORMNACE TESTING

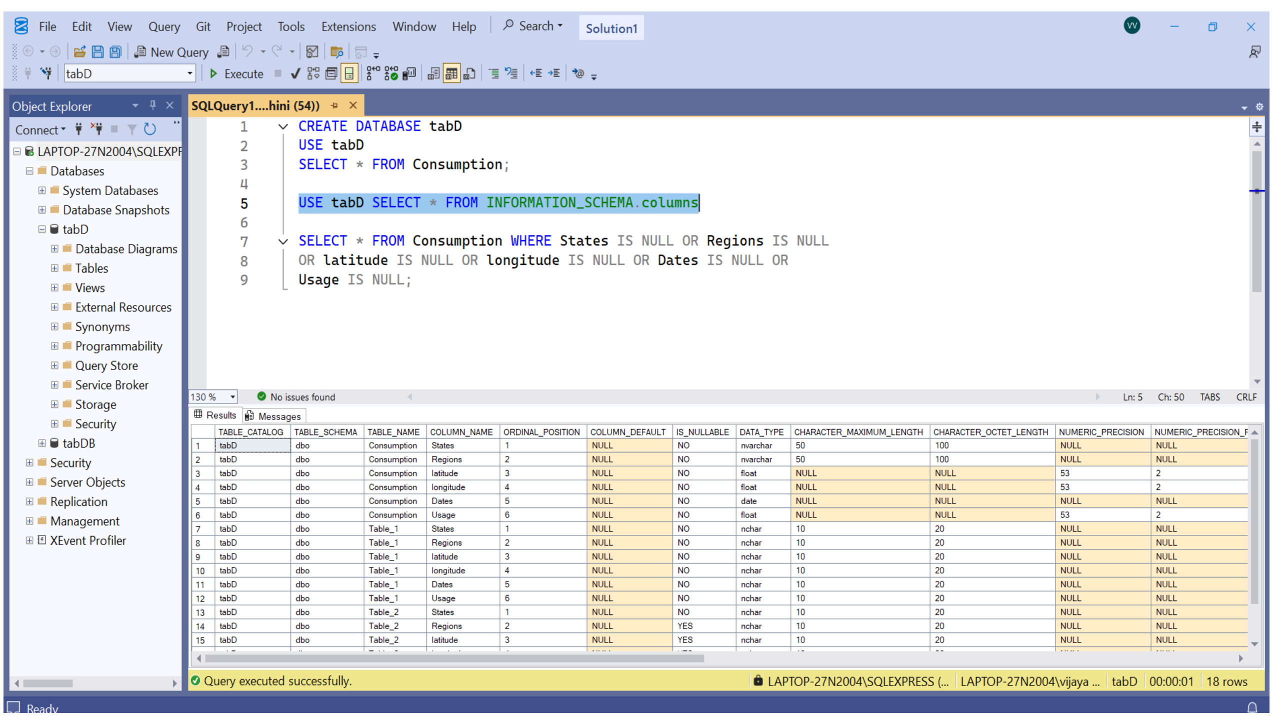
6.1 PERFORMANCE TESTING

Performance testing is a critical part of this project to ensure that the Tableau dashboards operate efficiently, particularly when handling large datasets or serving multiple users. The goal of performance testing is to validate that the visualizations are fast, responsive, and stable under different conditions of data volume and user interaction.

Performance Testing in a database context usually refers to testing:

- How fast queries run.
- How efficient the schema and indexing are.
- How the system handles large volumes of data or complex queries

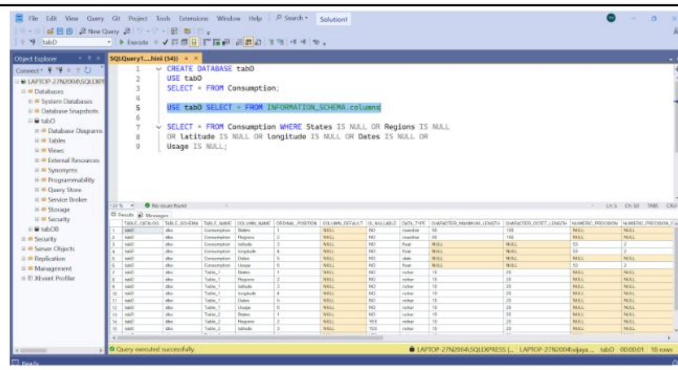
It includes Data Quality Checks i.e.., Querying for NULL values helps identify incomplete data, which can affect performance .Ensures cleaner data before testing system performance.



Then it performs Schema Design Review which will extract Appropriate data types, Nullability, Column lengths and Bad schema design which can slow down performance. It also performs measuring execution time, analyzing query plans, adding indexes if needed, testing with larger data volumes.

Overall, the performance testing phase confirmed that the solution is robust, scalable, and ready for deployment, offering smooth and reliable user experiences.

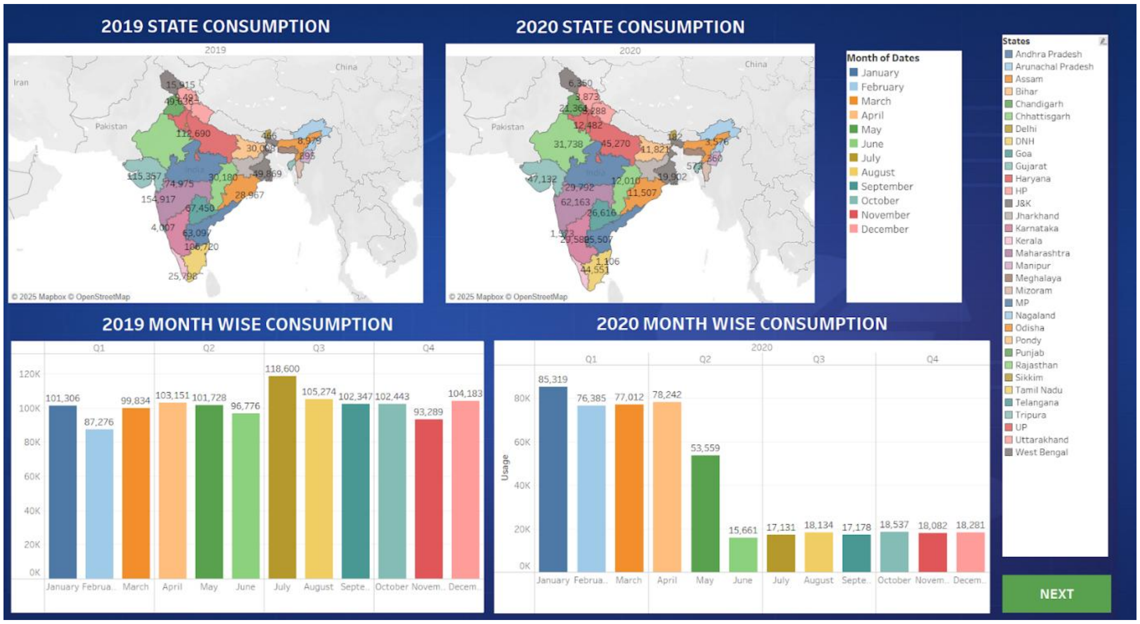
Model Performance Testing:

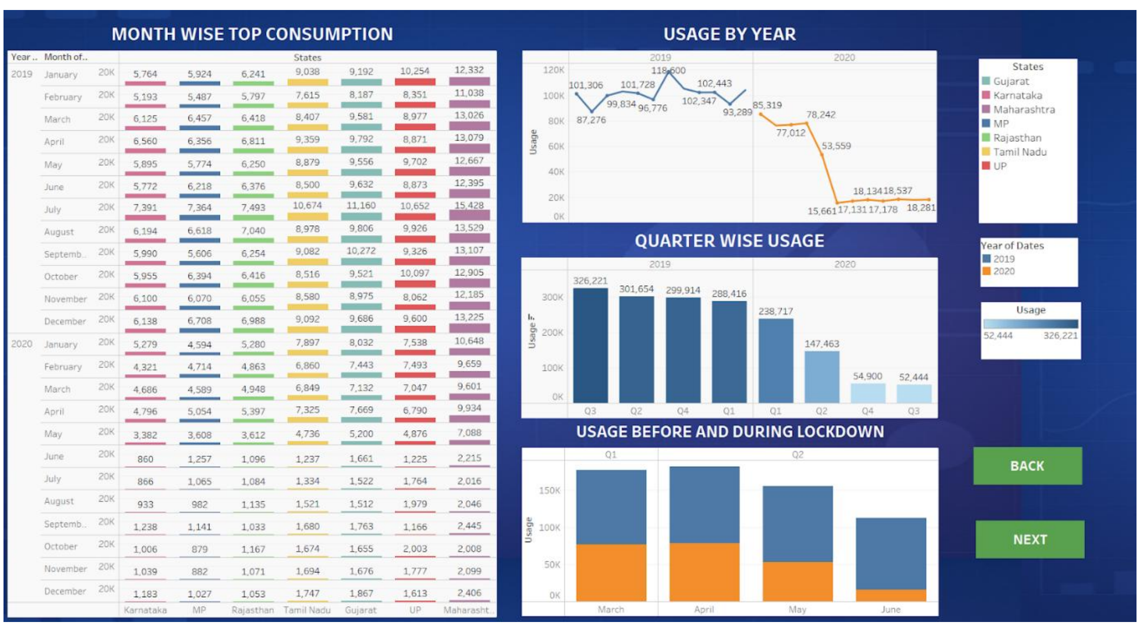
S.No.	Parameter	Screenshot / Values
1.	Data Rendered	
2.	Data Preprocessing	The data is pre-processed initially.
3.	Utilization of Filters	Filters such as States, Year (dates):2020, Year (dates):2019, Month (dates).
4.	Calculation fields Used	No calculation fields are used.
5.	Dashboard design	No of Visualizations / Graphs - 15
6	Story Design	No of Visualizations / Graphs - 15

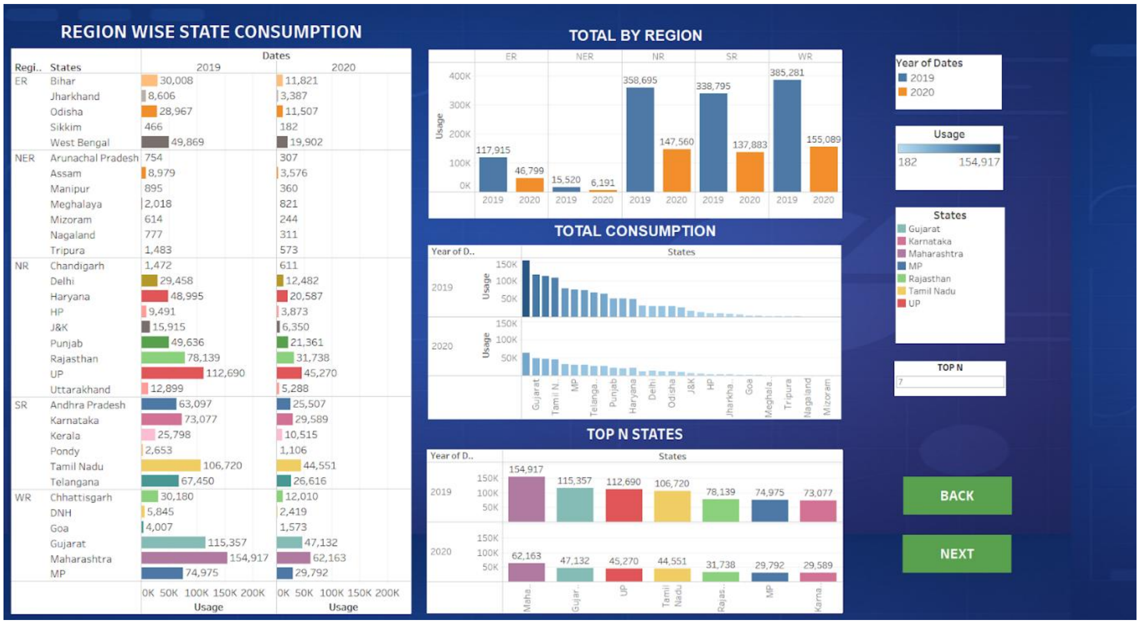
7. RESULTS

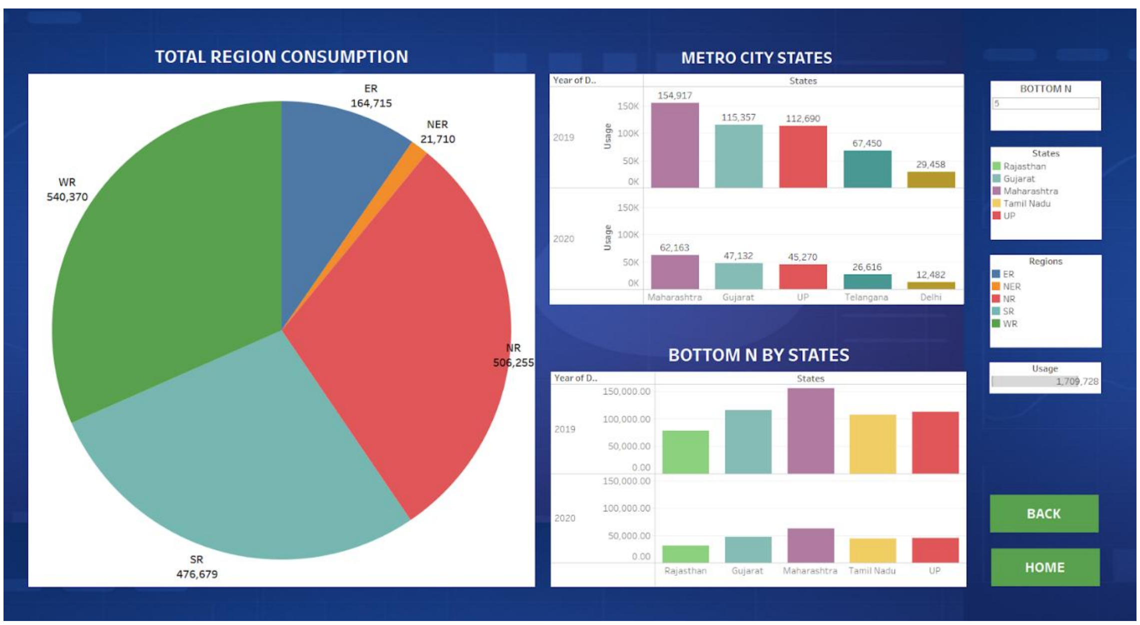
7.1 OUTPUT SCREENSHOTS

DASHBOARDS






REGION WISE STATE CONSUMPTION
Dates
Regi.. States 2019 2020
ER Bihar 30,008 11,821
Jharkhand 8,606 3,387
Odisha 28,967 11,507
Sikkim 466 182
West Bengal 49,869 19,902
NER Arunachal Pradesh 754 307
Assam 8,979 3,576
Manipur 895 360
Meghalaya 2,018 821
Mizoram 614 244
Nagaland 777 311
Tripura 1,483 573
NR Chandigarh 1,472 611
Delhi 29,458 12,482
Haryana 48,995 20,587
HP 9,491 3,873
J&K 15,915 6,350
Punjab 49,636 21,361
Rajasthan 78,139 31,738
UP 112,690 45,270
Uttarakhand 12,899 5,288
SR Andhra Pradesh 63,097 25,507
Karnataka 73,077 29,589
Kerala 25,798 10,515
Pondy 2,653 1,106
Tamil Nadu 106,720 44,551
Telangana 67,450 26,616
WR Chhattisgarh 30,180 12,010
DNH 5,845 2,419
Goa 4,007 1,573
Gujarat 115,357 47,132
Maharashtra 154,917 62,163
MP 74,975 29,792
0K 50K 100K 150K 200K
Usage
TOTAL BY REGION
ER NER NR SR WR
117,915 46,799 15,520 6,191 358,695 147,560 338,795 137,883 385,281 155,089
2019 2020 2019 2020 2019 2020 2019 2020 2019 2020
Usage
Year of Dates
2019
2020
Usage
182 154,917
TOTAL CONSUMPTION
Year of D.. States
2019
2020
Gujarat Tamil N.. MP Telanga.. Punjab Haryana Delhi Odisha J&K HP Jharkha.. Goa Meghala.. Tripura Nagaland Mizoram
States
Gujarat
Karnataka
Maharashtra
MP
Rajasthan
Tamil Nadu
UP
TOP N
TOP N STATES
Year of D.. States
2019 154,917 115,357 112,690 106,720 78,139 74,975 73,077
2020 62,163 47,132 45,270 44,551 31,738 29,792 29,589
Maha.. Gujar.. UP Tamil Nadu Rajas.. MP Karna..
BACK
NEXT


TOTAL REGION CONSUMPTION
ER
164,715
NER
21,710
WR
540,370
NR
506,255
SR
476,679
METRO CITY STATES
Year of D.. States
2019 154,917 115,357 112,690 67,450 29,458
2020 62,163 47,132 45,270 26,616 12,482
Maharashtra Gujarat UP Telangana Delhi
BOTTOM N
States
Rajasthan
Gujarat
Maharashtra
Tamil Nadu
UP
Regions
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NER
NR
SR
WR
Usage
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2019
2020
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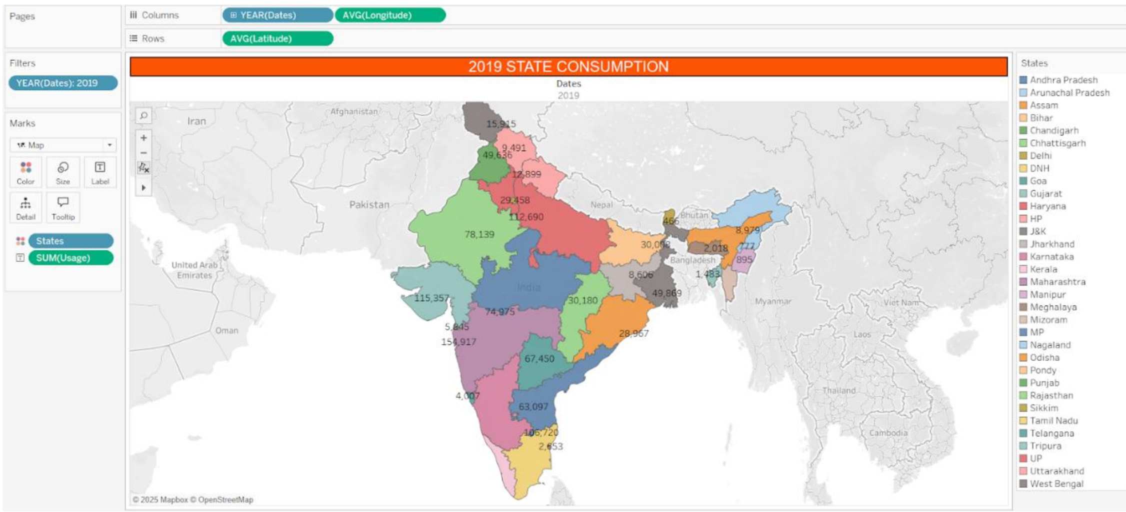
50,000.00
0.00
Rajasthan Gujarat Maharashtra Tamil Nadu UP
BACK
HOME

STORY


Pages
Columns
YEAR(Dates)
AVG(Longitude)
Rows
AVG(Latitude)
Filters
YEAR(Dates): 2019
Marks
States
SUM(Usage)
2019 STATE CONSUMPTION
Dates
2019
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
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Tripura
UP
Uttarakhand
West Bengal
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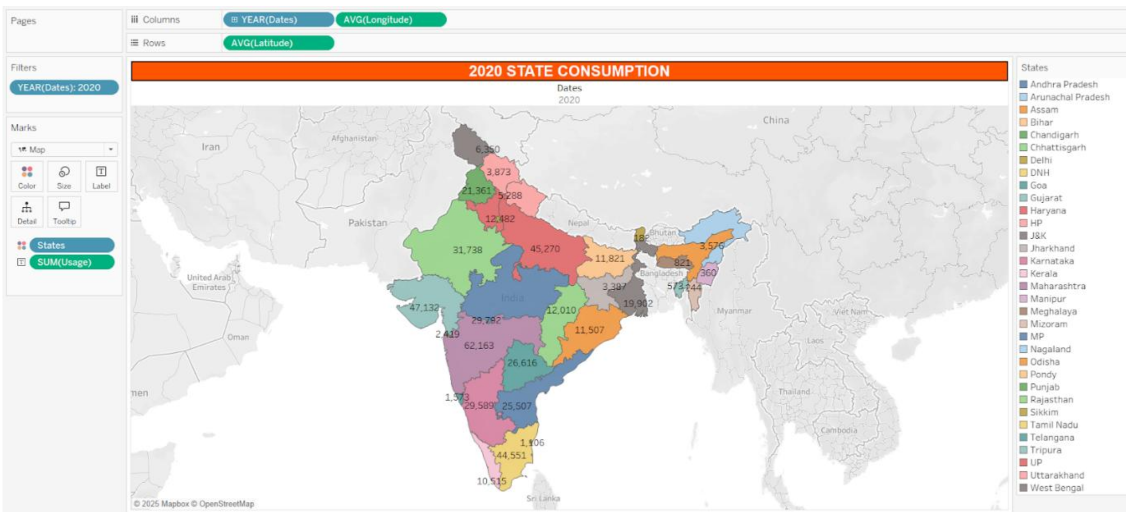
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2020 STATE CONSUMPTION
Dates
2020
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Andhra Pradesh
Arunachal Pradesh
Assam
Bihar
Chandigarh
Chhattisgarh
Delhi
DNH
Goa
Gujarat
Haryana
HP
J&K
Jharkhand
Karnataka
Kerala
Maharashtra
Manipur
Meghalaya
Mizoram
MP
Nagaland
Odisha
Pondy
Punjab
Rajasthan
Sikkim
Tamil Nadu
Telangana
Tripura
UP
Uttarakhand
West Bengal
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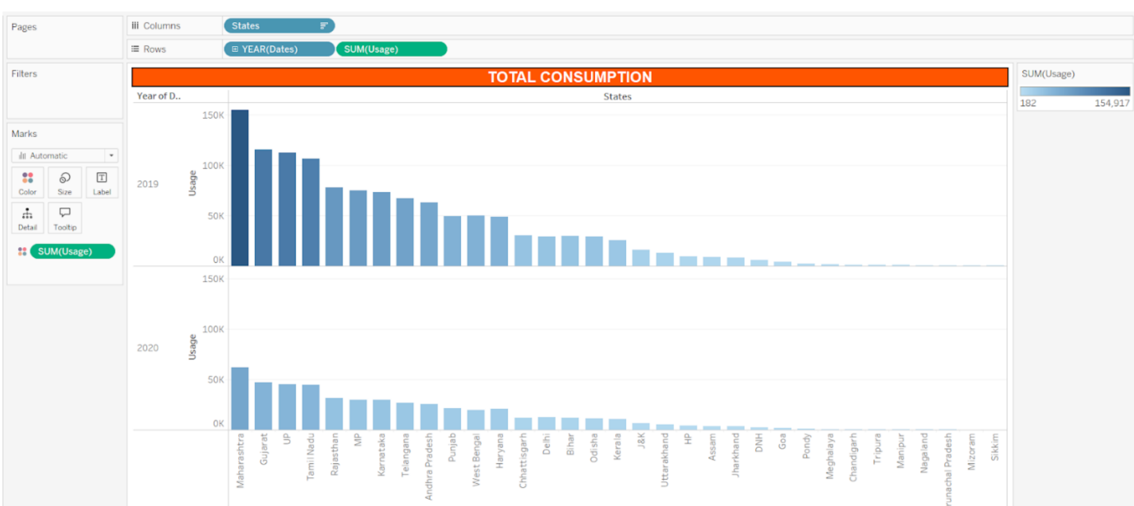
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Filters
Marks
Automatic
SUM(Usage)
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SUM(Usage)
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154,917
Year of D..
States
2019
2020
Usage
150K
100K
50K
0K
Maharashtra
Gujarat
UP
Tamil Nadu
Rajasthan
MP
Karnataka
Telangana
Andhra Pradesh
Punjab
West Bengal
Haryana
Chhattisgarh
Delhi
Bihar
Odisha
Kerala
J&K
Uttarakhand
HP
Assam
Jharkhand
DNH
Goa
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Nagaland
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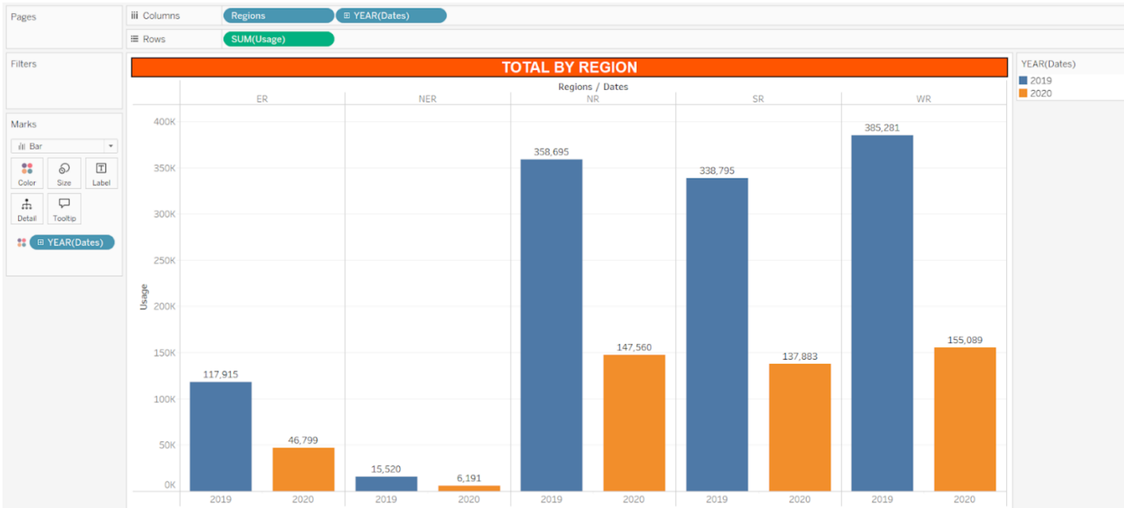
Mizoram
Sikkim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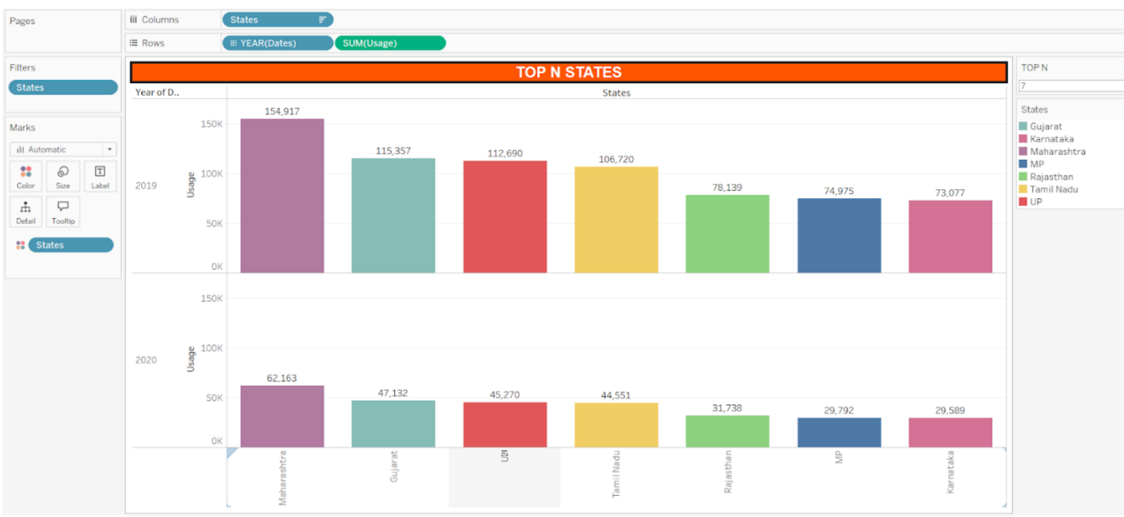
Bar
Color
Size
Label
Detail
Tooltip
YEAR(Dates)
TOTAL BY REGION
Regions / Dates
ER
NER
NR
SR
WR
Usage
400K
350K
300K
250K
200K
150K
100K
50K
0K
117,915
46,799
15,520
6,191
358,695
147,560
338,795
137,883
385,281
155,089
2019
2020
YEAR(Dates)
2019
2020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SUM(Usage)
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Automatic
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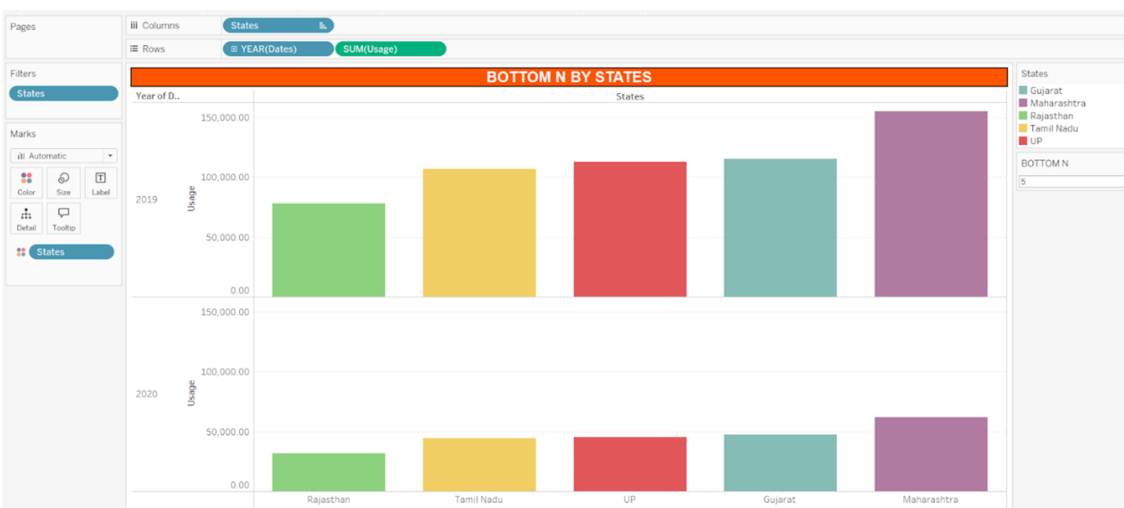
Size
Label
Detail
Tooltip
States
TOP N STATES
Year of D..
States
2019
2020
Usage
150K
100K
50K
0K
154,917
115,357
112,690
106,720
78,139
74,975
73,077
62,163
47,132
45,270
44,551
31,738
29,792
29,589
Maharashtra
Gujarat
UP
Tamil Nadu
Rajasthan
MP
Karnataka
TOP N
7
States
Gujarat
Karnataka
Maharashtra
MP
Rajasthan
Tamil Nadu
UP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SUM(Usage)
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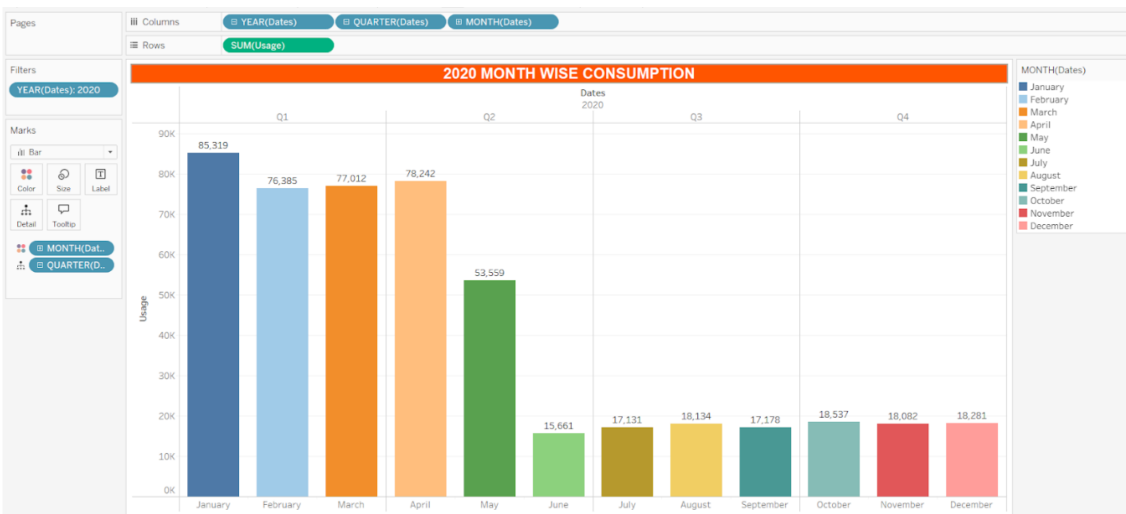
Marks
Automatic
Color
Size
Label
Detail
Tooltip
States
BOTTOM N BY STATES
Year of D..
States
2019
2020
Usage
150,000.00
100,000.00
50,000.00
0.00
Rajasthan
Tamil Nadu
UP
Gujarat
Maharashtra
States
Gujarat
Maharashtra
Rajasthan
Tamil Nadu
UP
BOTTOM N
5

Pages
Columns
YEAR(Dates)
QUARTER(Dates)
MONTH(Dates)
Rows
SUM(Usage)
Filters
YEAR(Dates): 2019
Marks
Bar
Color
Size
Label
Detail
Tooltip
2019 MONTH WISE CONSUMPTION
Dates
2019
Q1
Q2
Q3
Q4
Usage
120K
110K
100K
90K
80K
70K
60K
50K
40K
30K
20K
10K
0K
101,306
87,276
99,834
103,151
101,728
96,776
118,600
105,274
102,347
102,443
93,289
104,183
January
February
March
April
May
June
July
August
September
October
November
December
MONTH(Dates)



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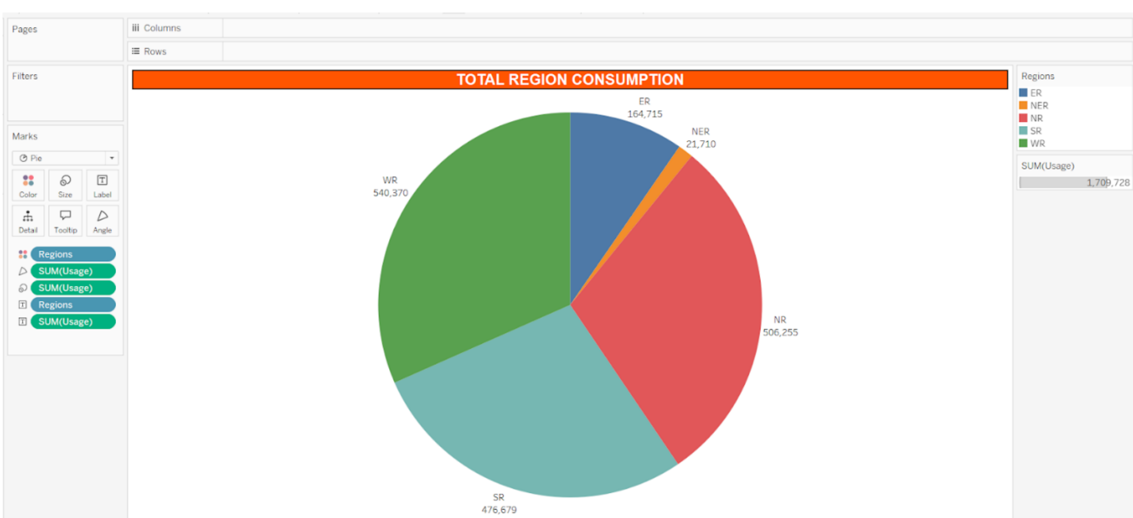
QUARTER(Dates)
MONTH(Dates)
Rows
SUM(Usage)
Filters
YEAR(Dates): 2020
Marks
Bar
Color
Size
Label
Detail
Tooltip
2020 MONTH WISE CONSUMPTION
Dates
2020
Q1
Q2
Q3
Q4
Usage
90K
80K
70K
60K
50K
40K
30K
20K
10K
0K
85,319
76,385
77,012
78,242
53,559
15,661
17,131
18,134
17,178
18,537
18,082
18,281
January
February
March
April
May
June
July
August
September
October
November
December
MONTH(Dates)



Pages
Columns
Rows
Filters
Marks
Pie
Color
Size
Label
Detail
Tooltip
Angle
Regions
SUM(Usage)
TOTAL REGION CONSUMPTION
ER
164,715
NER
21,710
NR
506,255
SR
476,679
WR
540,370
Regions
ER
NER
NR
SR
WR
SUM(Usage)
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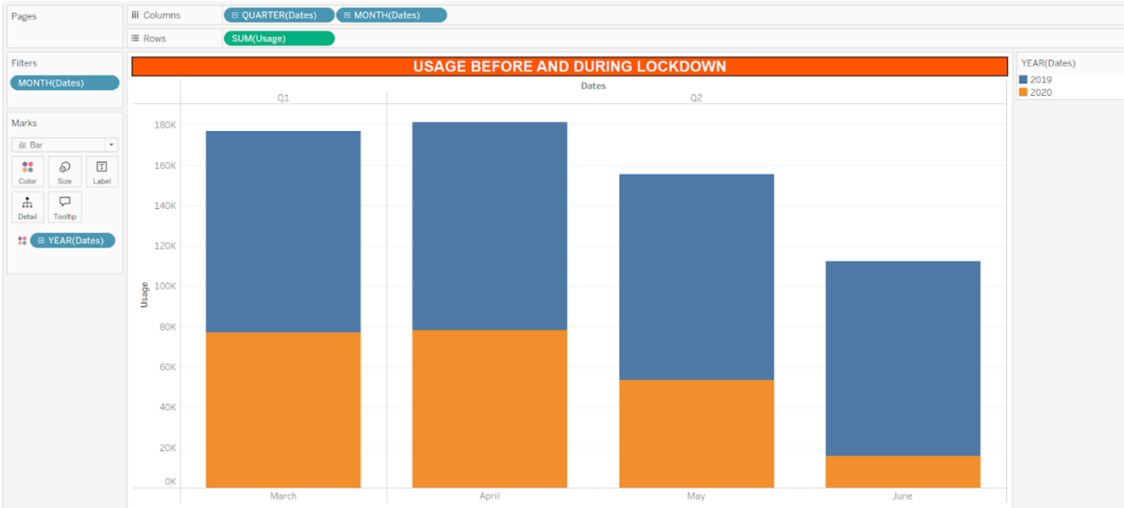
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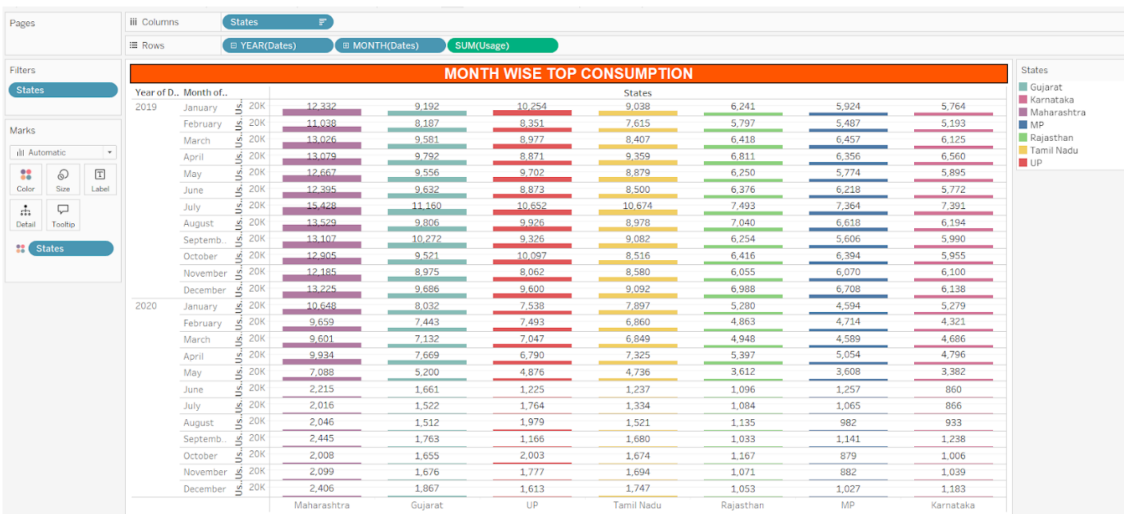
MONTH(Dates)
Rows
SUM(Usage)
Filters
MONTH(Dates)
Marks
Bar
YEAR(Dates)
USAGE BEFORE AND DURING LOCKDOWN
Dates
Q1
Q2
Usage
March
April
May
June
YEAR(Dates)
2019
2020


Pages
Columns
States
Rows
YEAR(Dates)
MONTH(Dates)
SUM(Usage)
Filters
States
Marks
Automatic
MONTH WISE TOP CONSUMPTION
Year of D..
Month of..
States
2019
2020
Maharashtra
Gujarat
UP
Tamil Nadu
Rajasthan
MP
Karnataka
States
Gujarat
Karnataka
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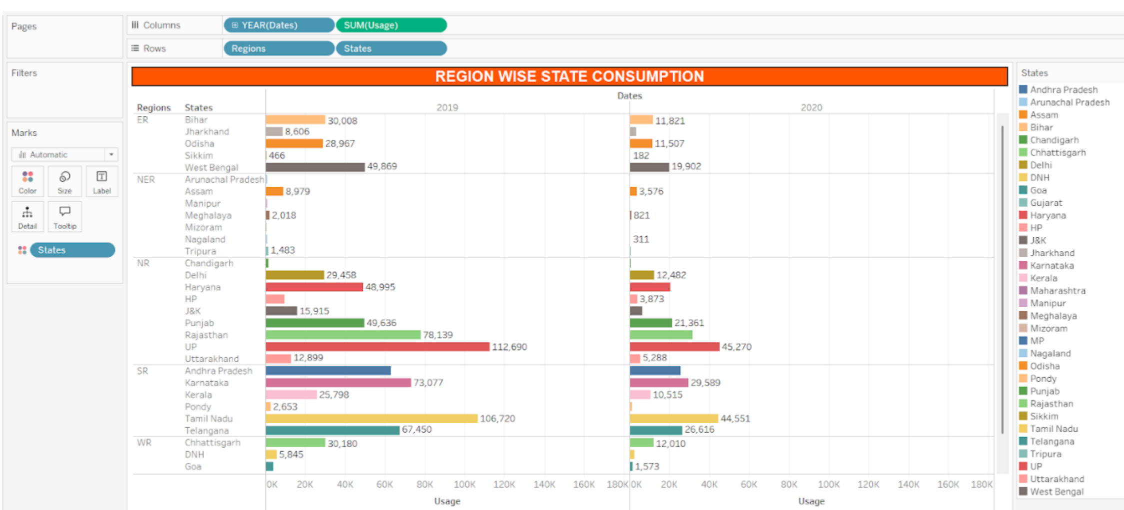
MP
Rajasthan
Tamil Nadu
UP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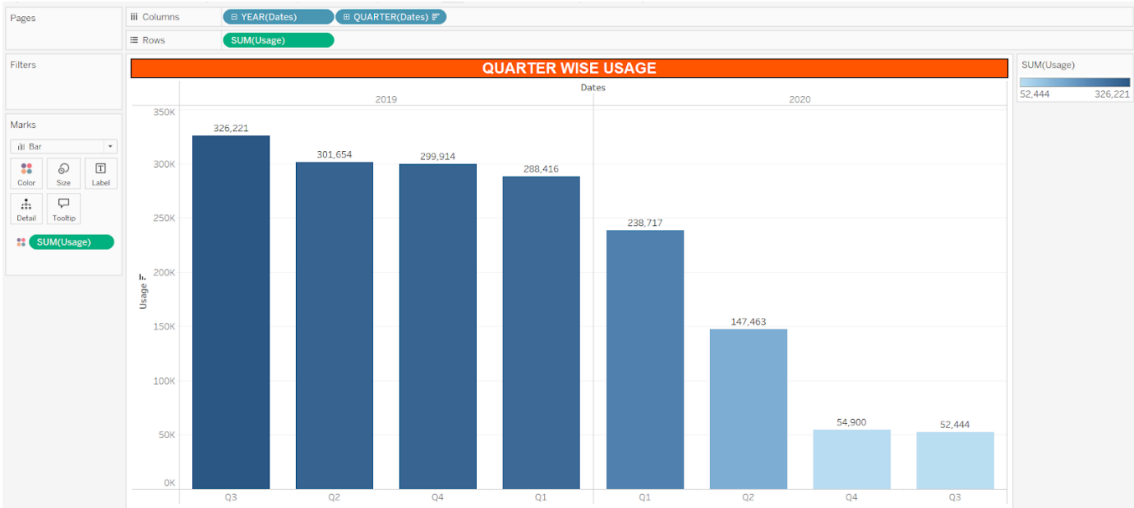
YEAR(Dates)
SUM(Usage)
Rows
Regions
States
Filters
Marks
Automatic
REGION WISE STATE CONSUMPTION
Dates
Regions
States
2019
2020
ER
NER
NR
SR
WR
Usage



QUARTER WISE USAGE
Dates
2019
2020
Usage
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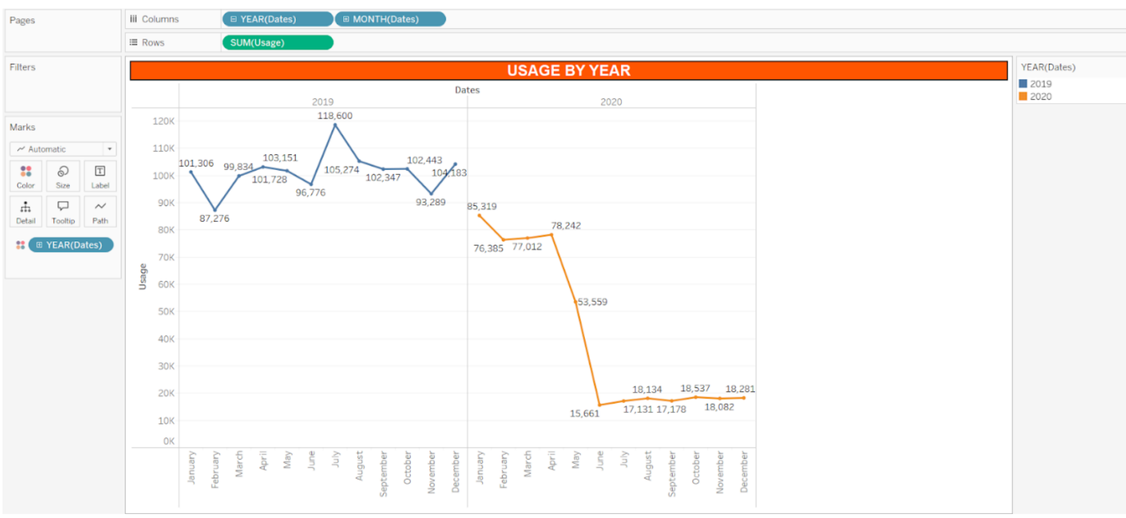
301,654
299,914
288,416
238,717
147,463
54,900
52,444
Q3
Q2
Q4
Q1
Q1
Q2
Q4
Q3
SUM(Usage)



USAGE BY YEAR
Dates
2019
2020
Usage
YEAR(Dates)
101,306
87,276
99,834
101,728
103,151
96,776
118,600
105,274
102,347
102,443
93,289
104,183
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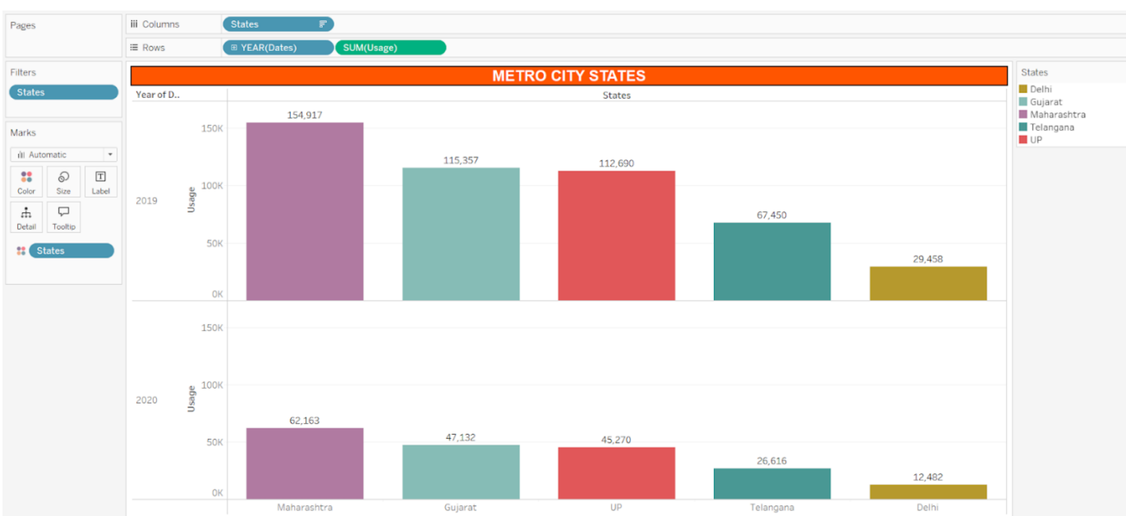
18,537
18,082
18,281



METRO CITY STATES
States
Year of D..
2019
2020
Usage
154,917
115,357
112,690
67,450
29,458
62,163
47,132
45,270
26,616
12,482
Maharashtra
Gujarat
UP
Telangana
Delhi

8. ADVANTAGES AND DISADVANTAGES

ADVANTAGES

- Enables real-time data exploration.
- Presents data in an easy-to-understand visual format.
- Identifies peak and idle usage hours effectively.
- Encourages sustainable and conscious energy practices.
- Offers a user-friendly interface suitable for all users.
- Helps detect anomalies and reduce energy wastage.
- Enhances data transparency and facilitates informed policy decisions.
- Can be integrated with cloud platforms for scalability.

DISADVANTAGES

- Heavily dependent on the quality and freshness of the data.
- Static insights if the dataset is not frequently updated.
- May require initial training to navigate advanced dashboards.
- Tableau Public has limited real-time capabilities and lower data security.
- Requires stable internet connectivity for Tableau Public visualizations.
- May face limitations with very large datasets unless optimized.
- Not all users may have access to Tableau-compatible devices.
- Limited custom scripting capabilities compared to full programming platforms.
- Integration with complex APIs can be restricted without paid Tableau version.
- Exporting and automating dashboards may require third-party tools.

9. CONCLUSION

Through this project, we have demonstrated the power and potential of data-driven tools like Tableau to drive informed energy management. The project titled *"Plugging into the Future"* not only refers to electricity as a central theme but also symbolizes a progressive leap toward smarter, more sustainable decision-making based on data.

By collecting, preprocessing, and visualizing real-world electricity consumption data, we were able to uncover patterns and insights that offer valuable guidance for policymakers, businesses, and consumers alike. These insights include identifying consumption peaks, regional disparities, seasonal behaviours, and usage anomalies. Such information is essential for making energy systems more efficient, cost-effective, and resilient.

The interactive Tableau dashboards developed during this project serve as accessible tools for visual storytelling, transforming raw datasets into digestible and actionable visual narratives. Users can engage with the data dynamically—applying filters, zooming into specific sectors, and uncovering trends that would otherwise remain hidden in spreadsheets.

This initiative also reinforces the broader significance of data literacy and visual analytics in public planning and sustainable energy development. The ability to turn large-scale datasets into strategic insights empowers not only energy managers but also urban planners, researchers, and local governments to take proactive measures.

In essence, this project proves that each meaningful insight—no matter how small—can contribute to a larger vision of energy efficiency and sustainability. *Plugging into the future* thus becomes more than a metaphor; it becomes a mission to use data and technology as levers for building a better, more informed tomorrow.

10. FUTURE SCOPE

The success of this project opens several promising pathways for future enhancement and expansion. While the current implementation effectively visualizes electricity consumption data, there are multiple ways in which the system can be scaled and refined to offer even greater value.

One of the most impactful directions is the **integration of real-time data streams**. By connecting to APIs or smart meter feeds, the dashboards can transition from historical analysis to real-time monitoring. This would provide stakeholders with up-to-the-minute insights into energy usage, allowing for faster responses to anomalies and more proactive energy management.

Another area for development lies in **predictive analytics**. By incorporating machine learning algorithms, the system could forecast electricity demand based on historical trends, weather patterns, and demographic data. Such forecasting would be particularly valuable for energy providers and urban planners in managing load distribution and anticipating infrastructure needs.

Mobile optimization and multilingual support could further increase the accessibility of the dashboard, ensuring it is usable across diverse populations and on various platforms, from smartphones to tablets.

Lastly, there is potential to develop this as a **commercial or public platform**, offering subscription-based access or open-source collaboration for educational institutions, energy research centres, and government bodies.

In summary, the foundation laid by this project provides a versatile base upon which numerous advanced features and applications can be built—transforming a static dashboard into a dynamic, intelligent energy management tool.