SMARTBRIDGE
Let's Bridge the Gap

Smart Internz

PLUGGING INTO THE FUTURE: AN EXPLORATION OF ELECTRICITY CONSUMPTION PATTERNS

Project Based Experiential Learning Program

Handbook

SmartBridge Educational Services Pvt. Ltd.

BY

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III B.Sc., MATHEMATICS

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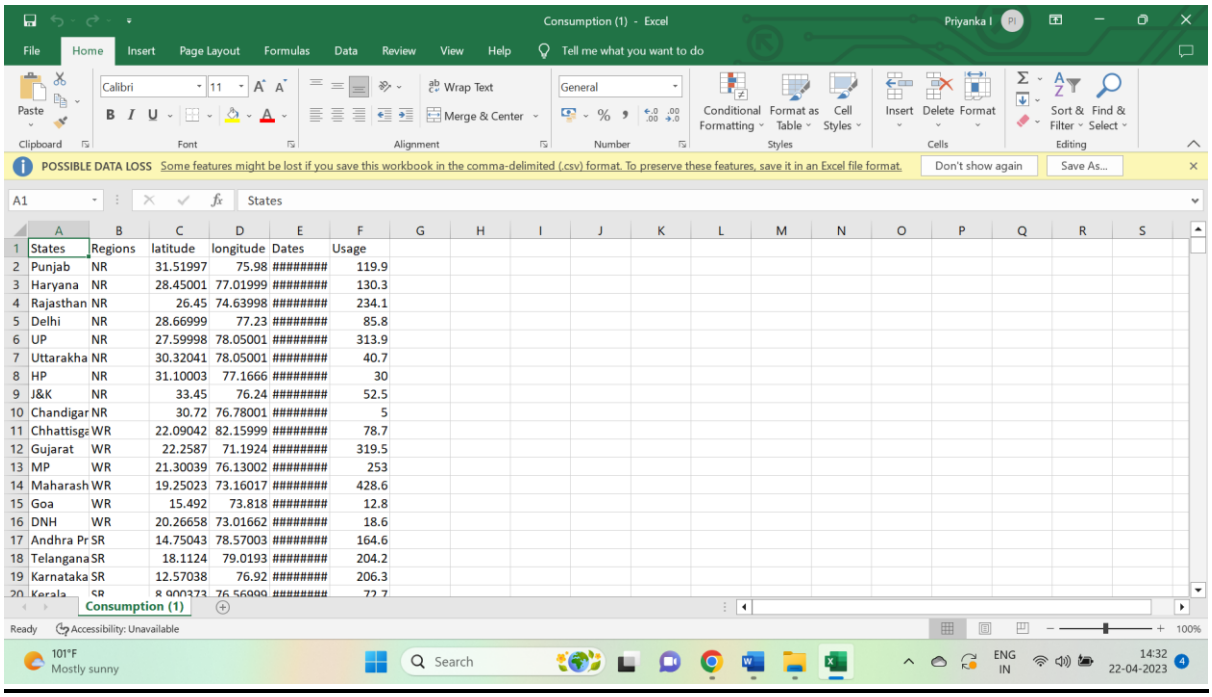
➢ INTRODUCTION

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 Terawatt-hour, of which 1,383.5 Terawatt-hour generated by utilities. The gross electricity consumption per capita in FY2019 was 1,208 kWh. In 2015-2016, 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 state of India, here we are going

to analyse State wise, Region wise and Overall Electricity consumption in India.

- **DATA EXTRACT AND COLLECTION**



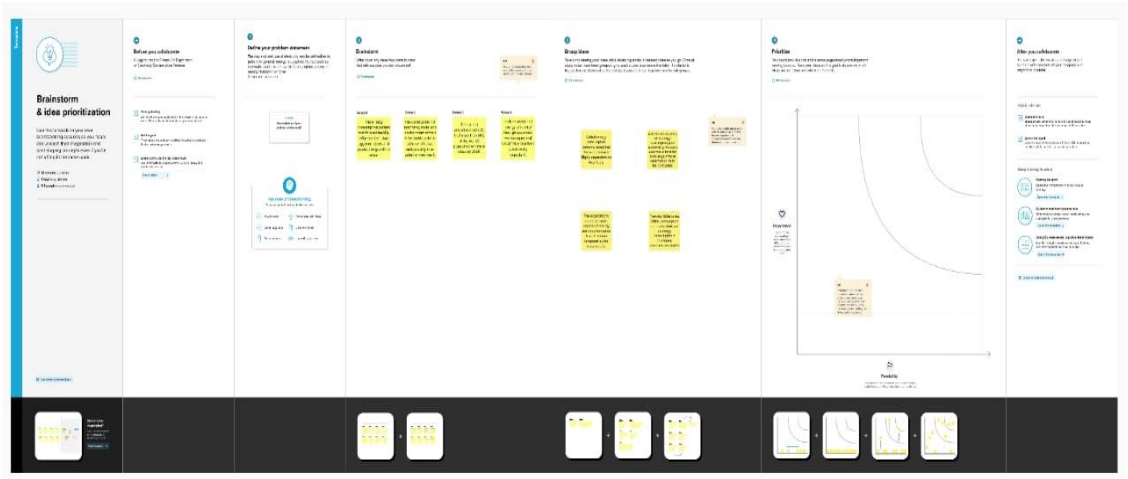
States	Regions	latitude	longitude	Dates	Usage
Punjab	NR	31.51997	75.98	########	119.9
Haryana	NR	28.45001	77.01999	########	130.3
Rajasthan	NR	26.45	74.63998	########	234.1
Delhi	NR	28.66999	77.23	########	85.8
UP	NR	27.59998	78.05001	########	313.9
Uttarakha	NR	30.32041	78.05001	########	40.7
HP	NR	31.10003	77.1666	########	30
J&K	NR	33.45	76.24	########	52.5
Chandigar	NR	30.72	76.78001	########	5
Chhattisga	WR	22.09042	82.15999	########	78.7
Gujarat	WR	22.2587	71.1924	########	319.5
MP	WR	21.30039	76.13002	########	253
Maharash	WR	19.25023	73.16017	########	428.6
Goa	WR	15.492	73.818	########	12.8
DNH	WR	20.26658	73.01662	########	18.6
Andhra Pr	SR	14.75043	78.57003	########	164.6
Telangana	SR	18.1124	79.0193	########	204.2
Karnataka	SR	12.57038	76.92	########	206.3

From the https://naanmudhalvan.smartinternz.com/ website, after signing in by using login credentials, you should follow the steps down below

- ✓ Projects
- ✓ Access Resources
- ✓ Guided Projects
- ✓ Go To Workspace

- ✓ Download Project Manual (to access the detailed steps to complete the project)
- ✓ Then, clicking “Data Collection & Extraction” From Database, you can download the csv file of data for your project from “Collect the Dataset” down below.

➢ BRAINSTROMING & IDEA PRIORITIZATION



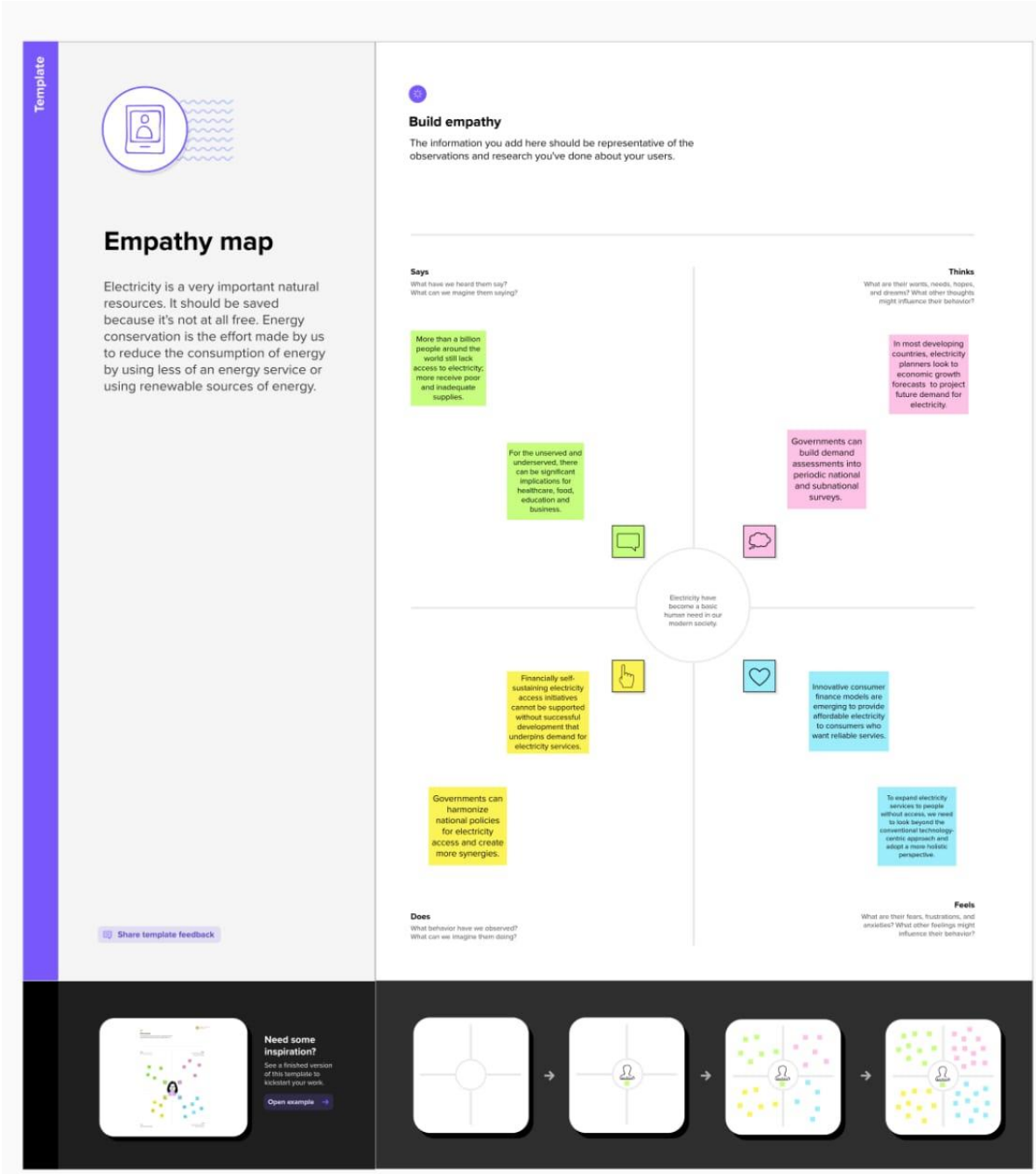
- ✓ By creating a new account in MURAL website https://app.mural.co/signin you can do the task of brainstorming and idea prioritization for the given project topic ‘Plugging into the Future: An Exploration of Electricity Consumption Patterns’. You can follow the guided steps below.

- Log into the MURAL website
- Search for ‘BRAINSTROMING AND IDEA PRIORITIZATION’ in the templates
- Once it pops up, after previewing, create a new mural template and start working on your topic.
- After completing the template, download it as a pdf file for future reference.

➢ EMPATHY MAP

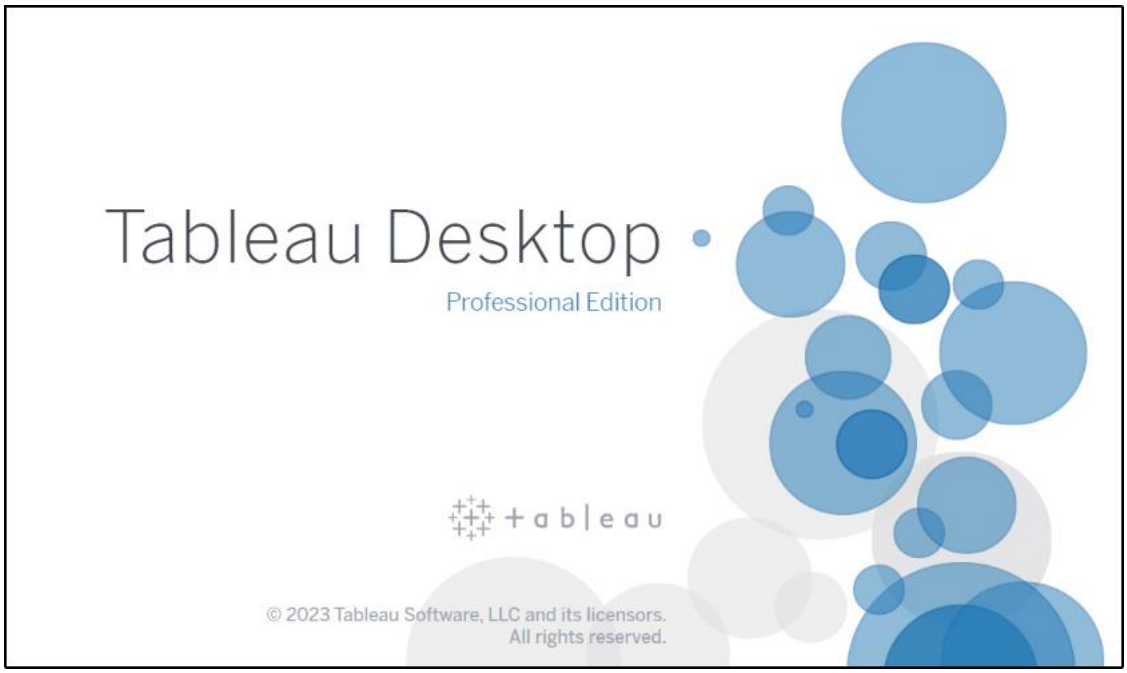
Empathy map can also be created for your topic same as the brainstroming by following the similar steps

- Search for ‘Empathy Map’ in the templates
- Create new mural template
- Do the empathy map task for your project topic
- Download it as pdf file once it’s completed


Template
Empathy map
Electricity is a very important natural resources. It should be saved because it's not at all free. Energy conservation is the effort made by us to reduce the consumption of energy by using less of an energy service or using renewable sources of energy.
Share template feedback
Build empathy
The information you add here should be representative of the observations and research you've done about your users.
Says
What have we heard them say?
What can we imagine them saying?
More than a billion people around the world still lack access to electricity; more receive poor and inadequate supplies.
For the unserved and underserved, there can be significant implications for healthcare, food, education and business.
Thinks
What are their wants, needs, hopes, and dreams? What other thoughts might influence their behavior?
In most developing countries, electricity planners look to economic growth forecasts to project future demand for electricity.
Governments can build demand assessments into periodic national and subnational surveys.
Electricity have become a basic human need in our modern society.
Financially self-sustaining electricity access initiatives cannot be supported without successful development that underpins demand for electricity services.
Innovative consumer finance models are emerging to provide affordable electricity to consumers who want reliable servies.
Governments can harmonize national policies for electricity access and create more synergies.
To expand electricity services to people without access, we need to look beyond the conventional technology-centric approach and adopt a more holistic perspective.
Does
What behavior have we observed?
What can we imagine them doing?
Feels
What are their fears, frustrations, and anxieties? What other feelings might influence their behavior?
Need some inspiration?
See a finished version of this template to kickstart your work.
Open example

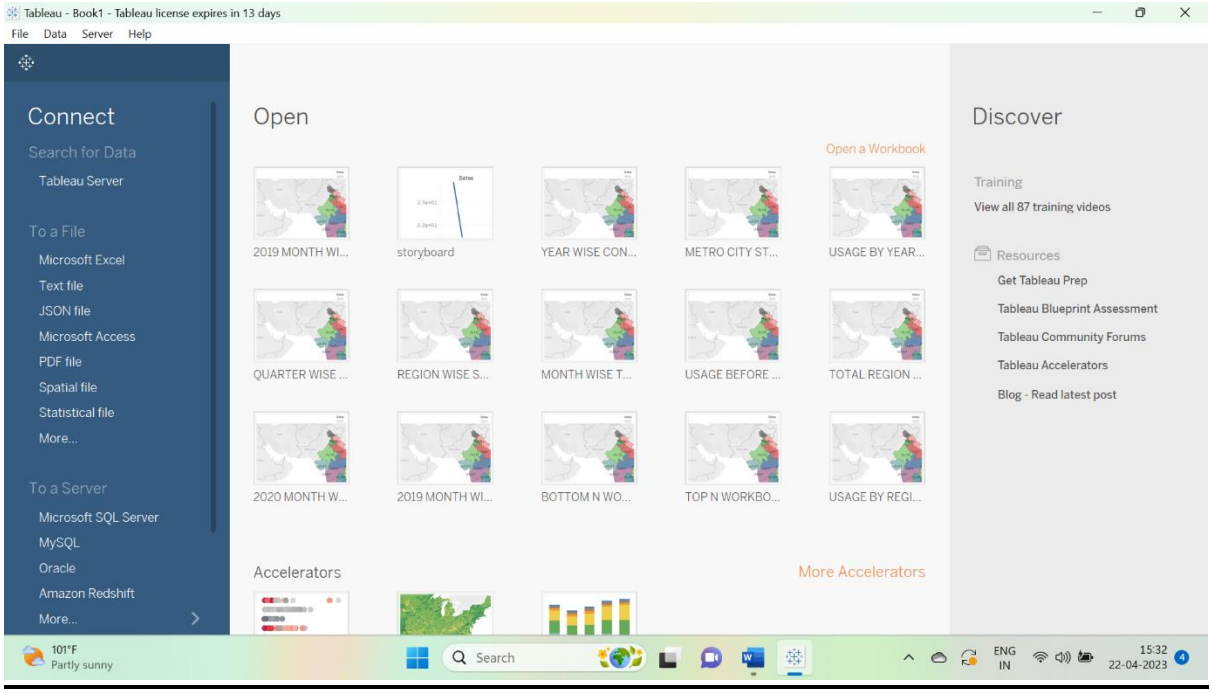
➢ **TABLEAU**

First of all, download the Tableau Desktop version on your PC. Then register by filling in the details required and start a free trail for 14 days or else you can use the product usage key if you had it.



- ✓ Then go to ‘Microsoft Excel’ to get started on the dashboard and story for your project.
- ✓ Once the data sheet, you can start creating sheets as per instructed on your project manual videos under the data visualization section.
- ✓ After completing the sheets, you can get started with your Dashboard by the instructions on the video in project manual

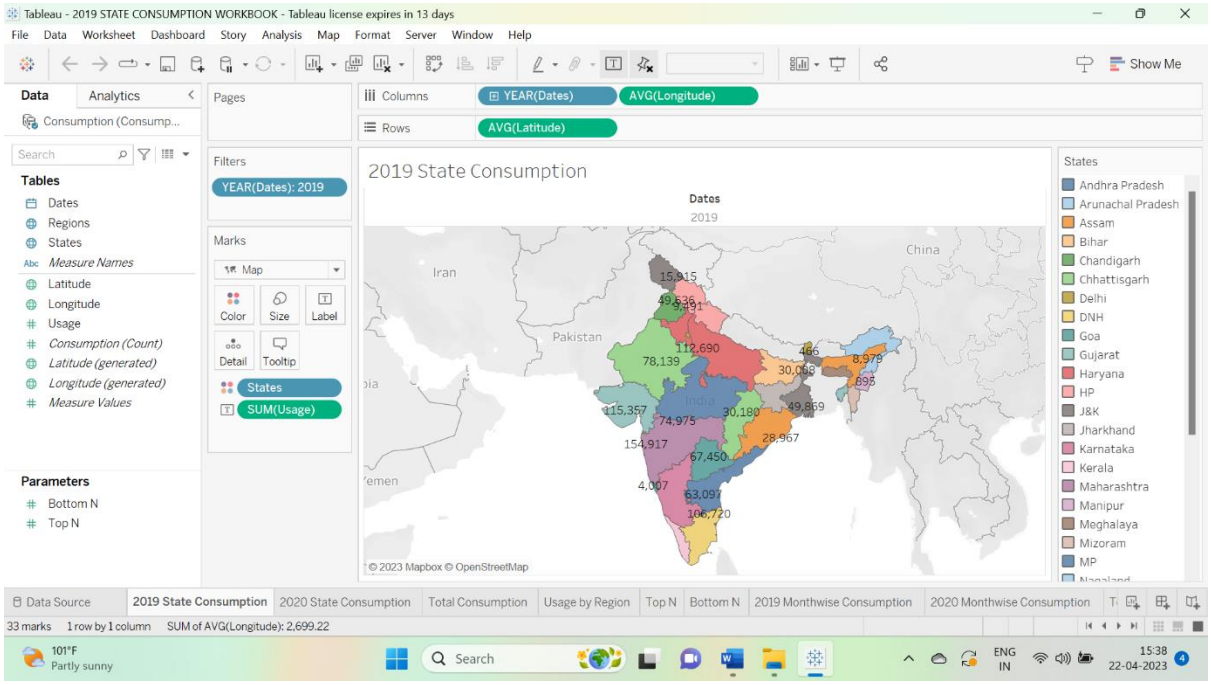
- ✓ Once you are done with the dashboard, you can start creating your story on the Tableau as per the instructions in the video
- ✓ Once you are done with data visualization, dashboard and story, you have to extract the data and save the workbook in Tableau and in the end, this is how your Tableau app will look like.

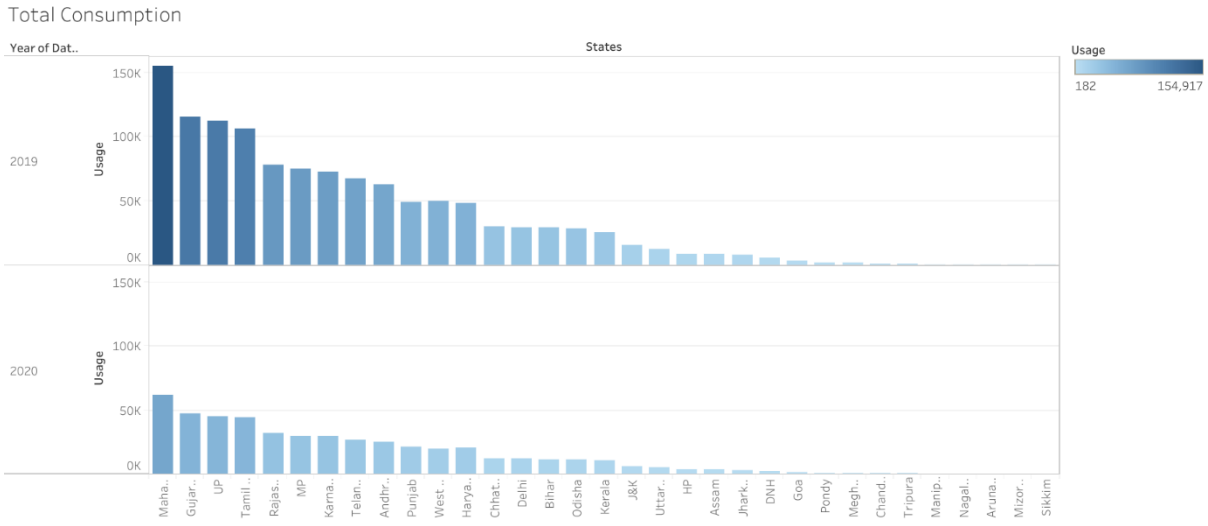


➢ WEB INTEGRATION

Now, you have to get started on publishing your data visualization, dashboards and story boards on https://public.tableau.com/

In this website, you have to create a new account and sign in using your email id and password created.





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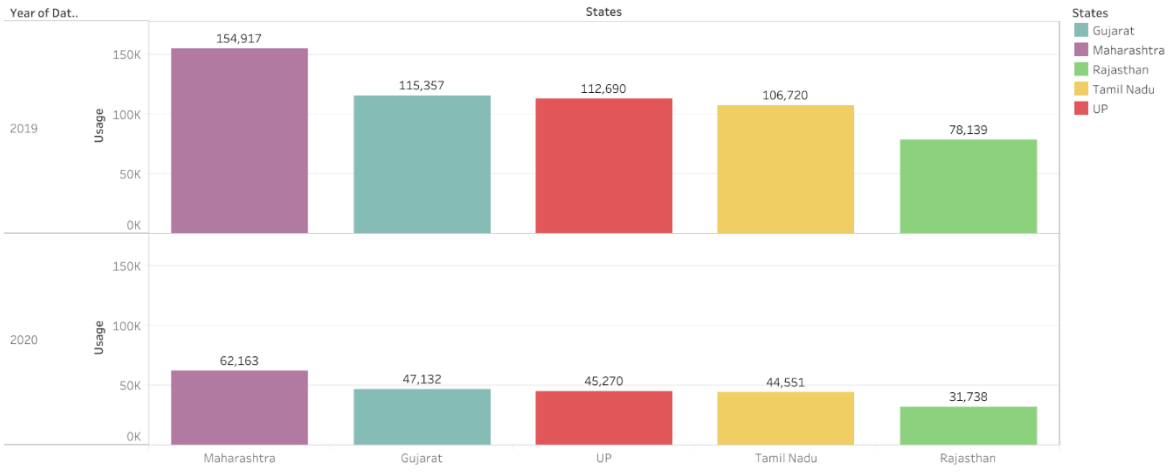
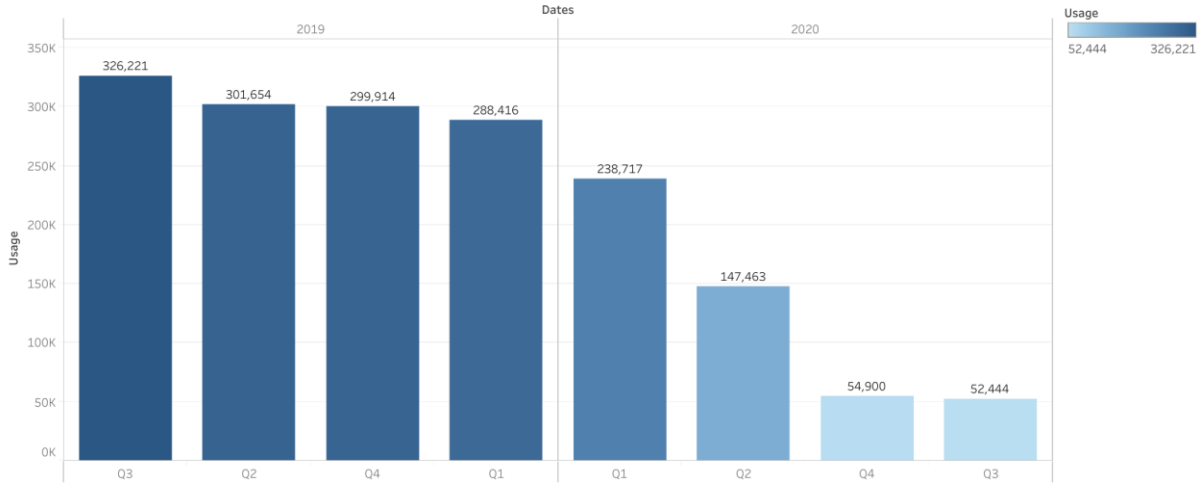
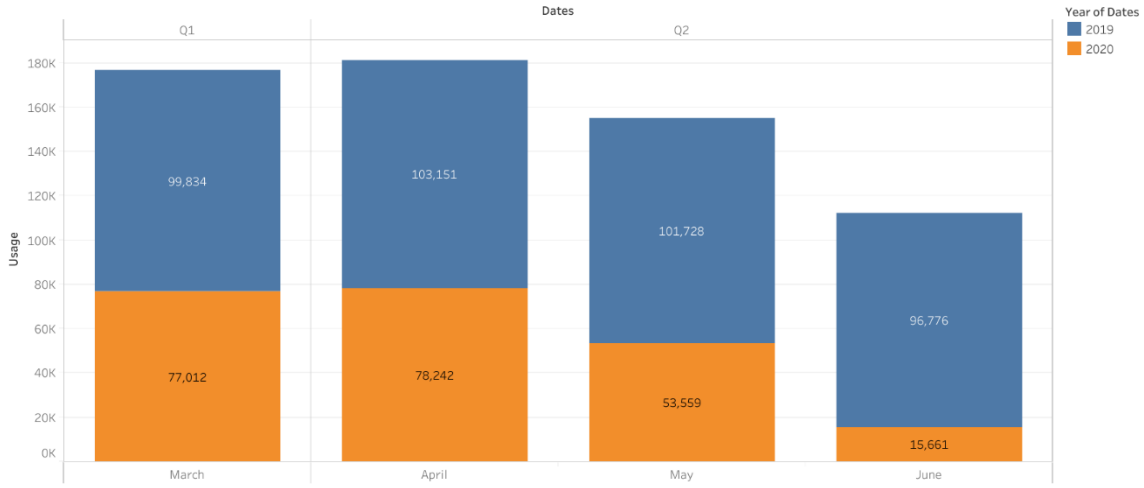


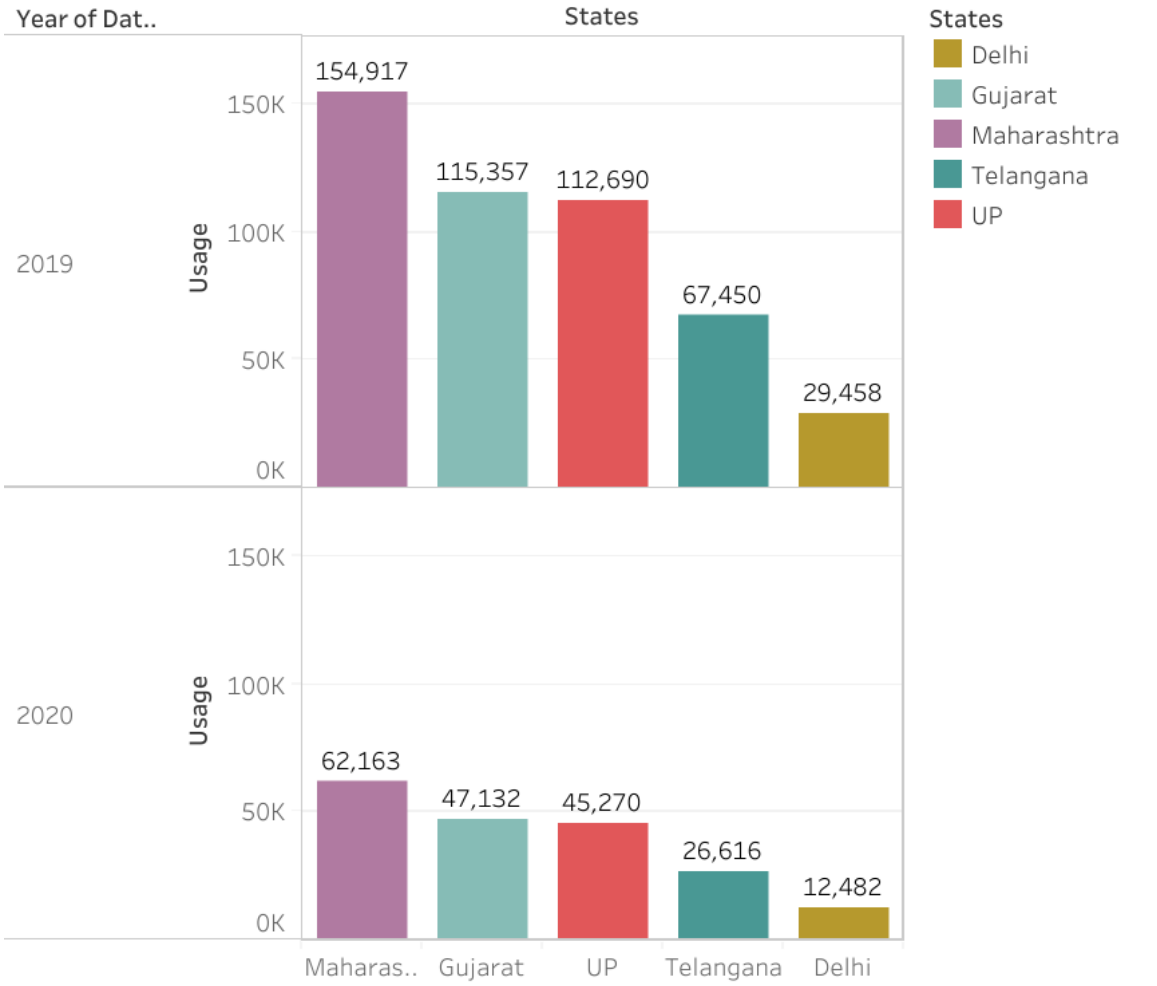
Quarter Wise Usage



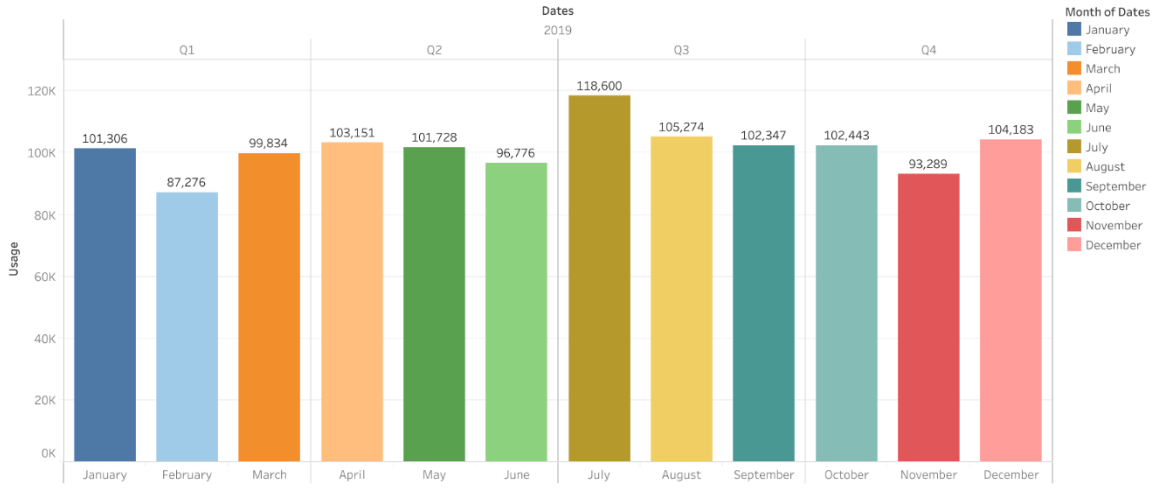
Usage before and during Lockdown



Metro City States



2019 Monthwise Consumption



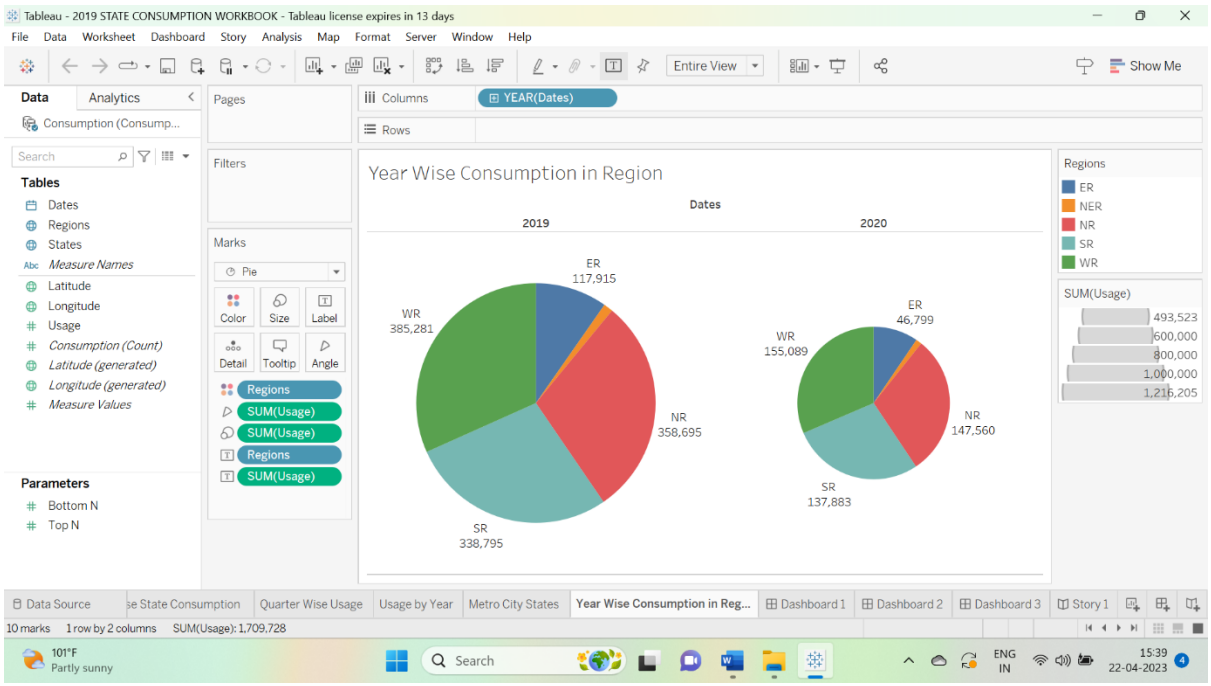


Tableau - 2019 STATE CONSUMPTION WORKBOOK - Tableau license expires in 13 days
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Tables
Dates
Regions
States
Measure Names
Latitude
Longitude
Usage
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Pie
Color Size Label
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Regions
SUM(Usage)
SUM(Usage)
Regions
SUM(Usage)
Columns
YEAR(Dates)
Rows
Year Wise Consumption in Region
Dates
2019
2020
ER 117,915
WR 385,281
NR 358,695
SR 338,795
ER 46,799
WR 155,089
NR 147,560
SR 137,883
Regions
ER
NER
NR
SR
WR
SUM(Usage)
493,523
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Data Source
State Consumption
Quarter Wise Usage
Usage by Year
Metro City States
Year Wise Consumption in Reg...
Dashboard 1
Dashboard 2
Dashboard 3
Story 1
10 marks
1 row by 2 columns
SUM(Usage): 1,709,728
101°F
Partly sunny
Search
ENG
IN
15:39
22-04-2023

➢ DASHBOARDS

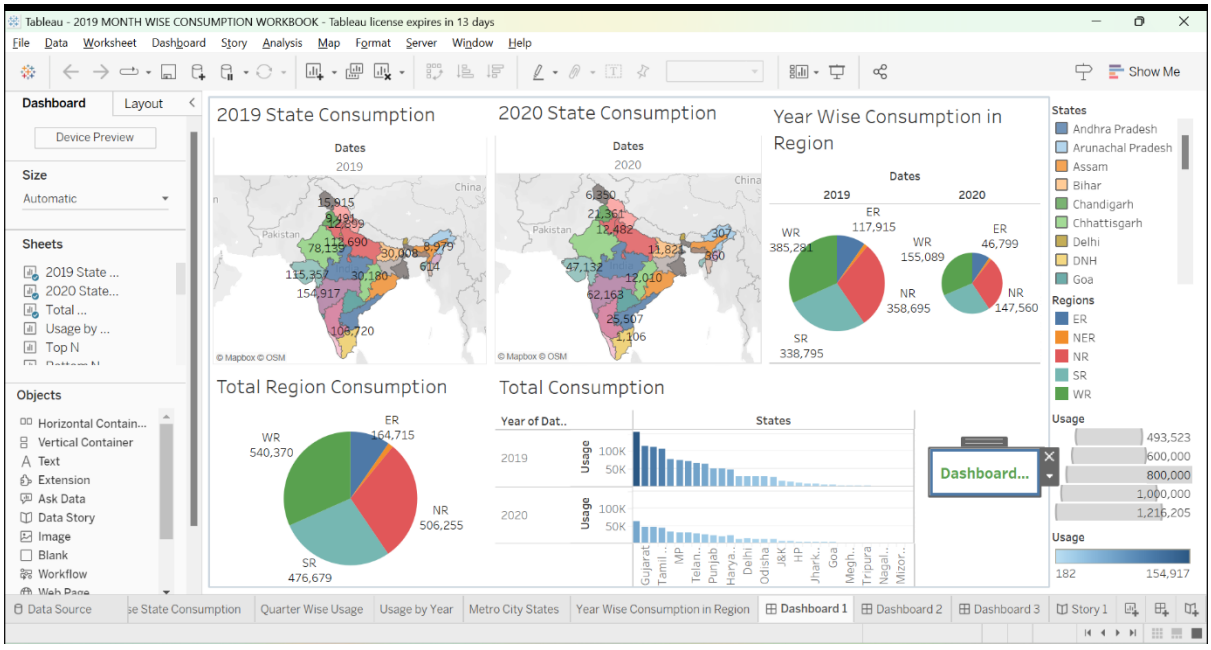
Tableau - 2019 MONTH WISE CONSUMPTION WORKBOOK - Tableau license expires in 13 days
File Data Worksheet Dashboard Story Analysis Map Format Server Window Help
Show Me
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2020 State...
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Vertical Container
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Extension
Ask Data
Data Story
Image
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2019 State Consumption
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2019
2020 State Consumption
Dates
2020
Year Wise Consumption in Region
Dates
2019
2020
ER 117,915
WR 385,281
NR 358,695
SR 338,795
ER 46,799
WR 155,089
NR 147,560
Total Region Consumption
ER 164,715
WR 540,370
NR 506,255
SR 476,679
Total Consumption
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Dashboard...
States
Andhra Pradesh
Arunachal Pradesh
Assam
Bihar
Chandigarh
Chhattisgarh
Delhi
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Goa
Regions
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NR
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Usage
493,523
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182
154,917
Data Source
State Consumption
Quarter Wise Usage
Usage by Year
Metro City States
Year Wise Consumption in Region
Dashboard 1
Dashboard 2
Dashboard 3
Story 1

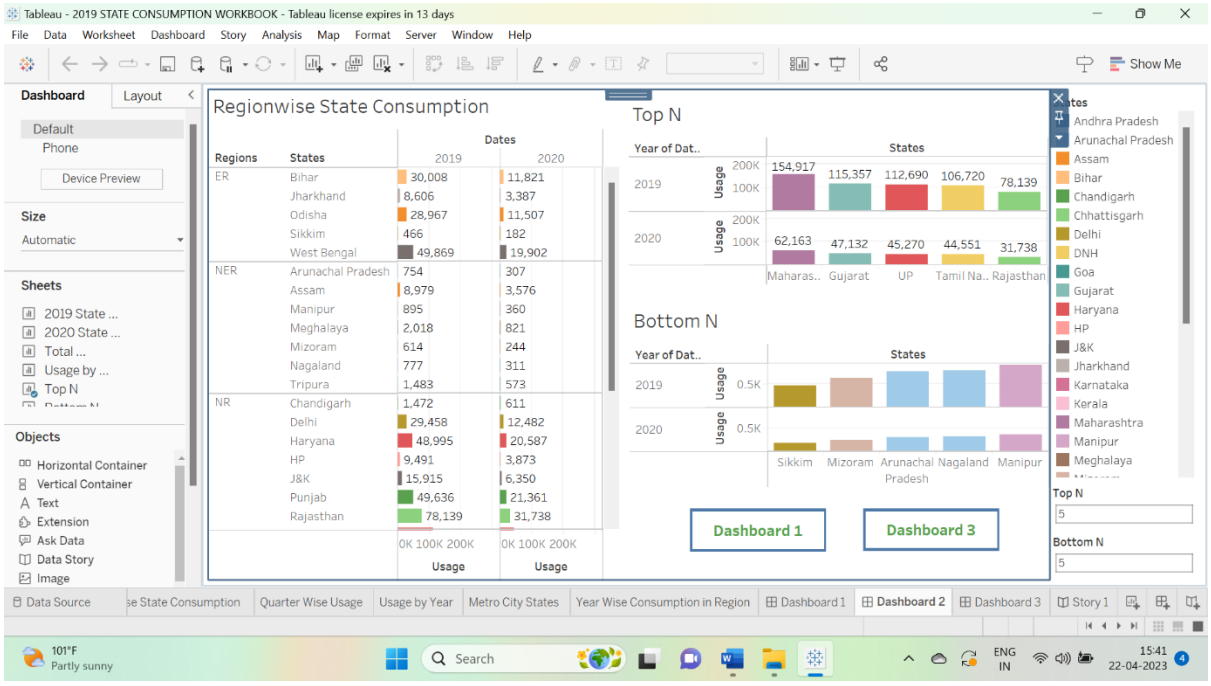
Tableau - 2019 STATE CONSUMPTION WORKBOOK - Tableau license expires in 13 days
File Data Worksheet Dashboard Story Analysis Map Format Server Window Help
Show Me
Dashboard Layout
Default
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Automatic
Sheets
2019 State ...
2020 State ...
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Usage by ...
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Vertical Container
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Extension
Ask Data
Data Story
Image
Regionwise State Consumption
Regions States Dates 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
0K 100K 200K Usage
Top N
Year of Dat..
States
2019
2020
Usage
154,917 115,357 112,690 106,720 78,139
62,163 47,132 45,270 44,551 31,738
Maharas.. Gujarat UP Tamil Na.. Rajasthan
Bottom N
0.5K
Sikkim Mizoram Arunachal Pradesh Nagaland Manipur
Dashboard 1
Dashboard 3
Andhra Pradesh
Arunachal Pradesh
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Bihar
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Maharashtra
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Meghalaya
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Data Source
Quarter Wise Usage
Usage by Year
Metro City States
Year Wise Consumption in Region
Dashboard 1
Dashboard 2
Dashboard 3
Story 1
101°F Partly sunny
Search
ENG IN
15:41 22-04-2023

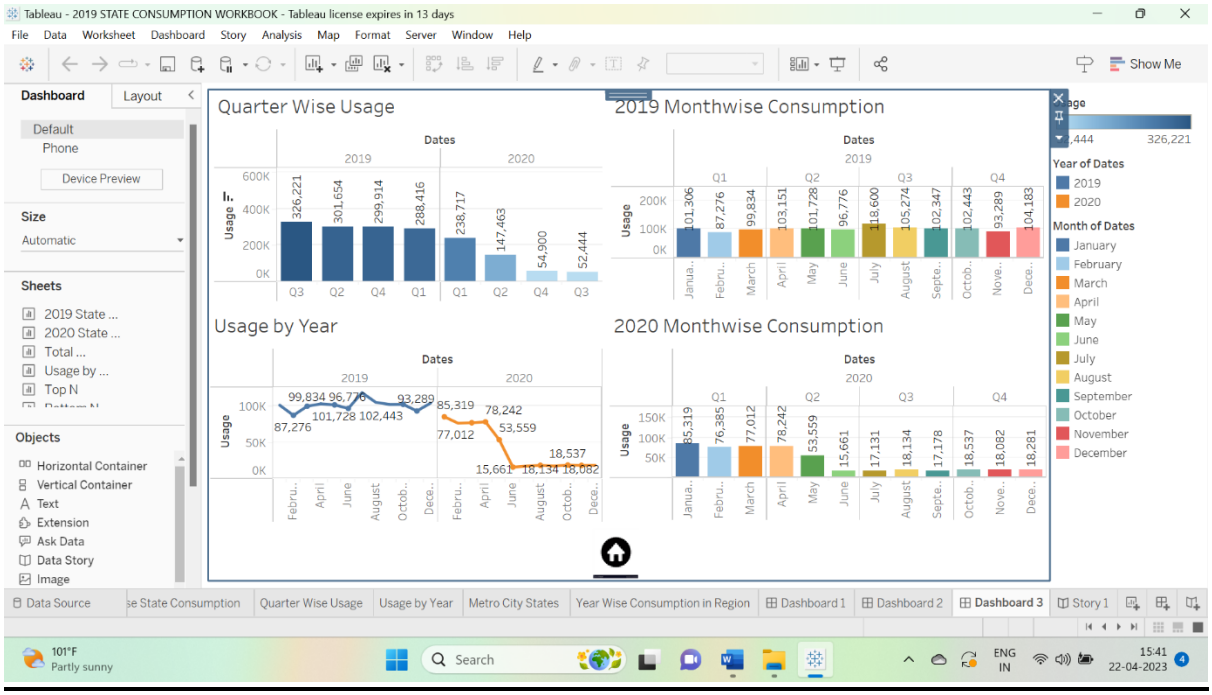
Tableau - 2019 STATE CONSUMPTION WORKBOOK - Tableau license expires in 13 days
File Data Worksheet Dashboard Story Analysis Map Format Server Window Help
Show Me
Dashboard Layout
Default
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Device Preview
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Sheets
2019 State ...
2020 State ...
Total ...
Usage by ...
Top N
Objects
Horizontal Container
Vertical Container
Text
Extension
Ask Data
Data Story
Image
Quarter Wise Usage
Dates
2019
2020
Usage
326,221 301,654 299,914 288,416 238,717 147,463 54,900 52,444
Q3 Q2 Q4 Q1 Q1 Q2 Q4 Q3
2019 Monthwise Consumption
Q1 Q2 Q3 Q4
101,306 87,276 99,834 103,151 101,728 96,776 118,600 105,274 102,347 102,443 93,289 104,183
Janua.. Febru.. March April May June July August Septe.. Octob.. Nove.. Dece..
Usage by Year
99,834 96,776 93,289 85,319 78,242 87,276 101,728 102,443 77,012 53,559 18,537 15,661 18,134 18,082
2020 Monthwise Consumption
85,319 76,385 77,012 78,242 53,559 15,661 17,131 18,134 17,178 18,537 18,082 18,281
326,221
Year of Dates
2019
2020
Month of Dates
January
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March
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October
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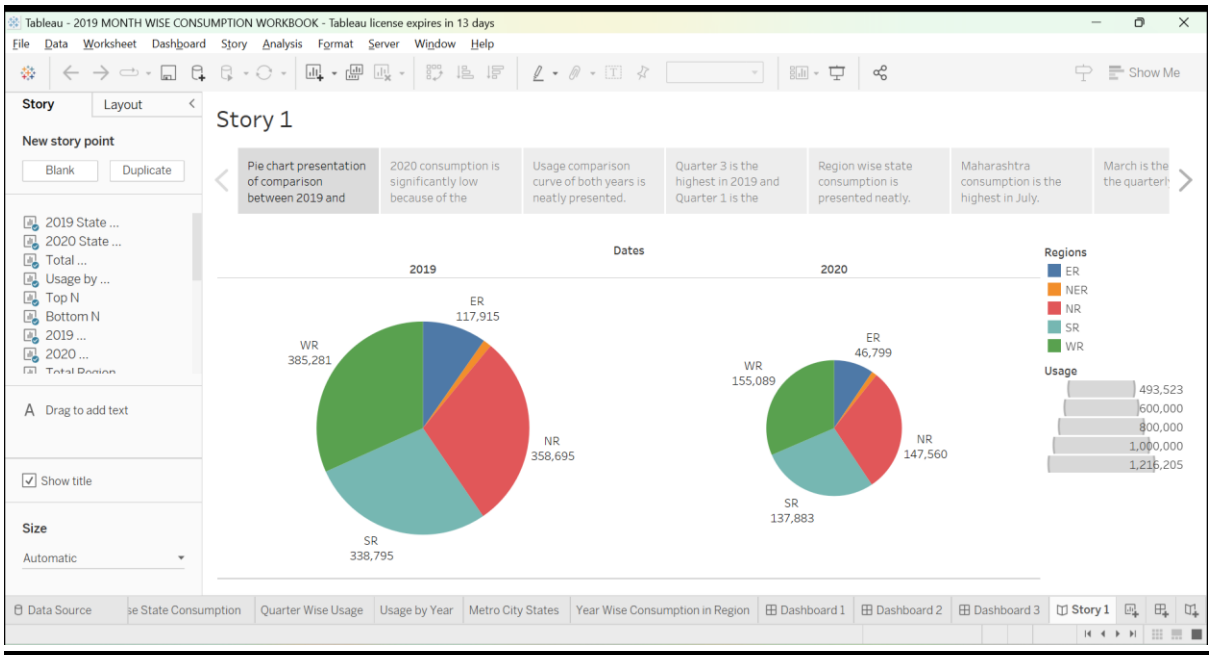
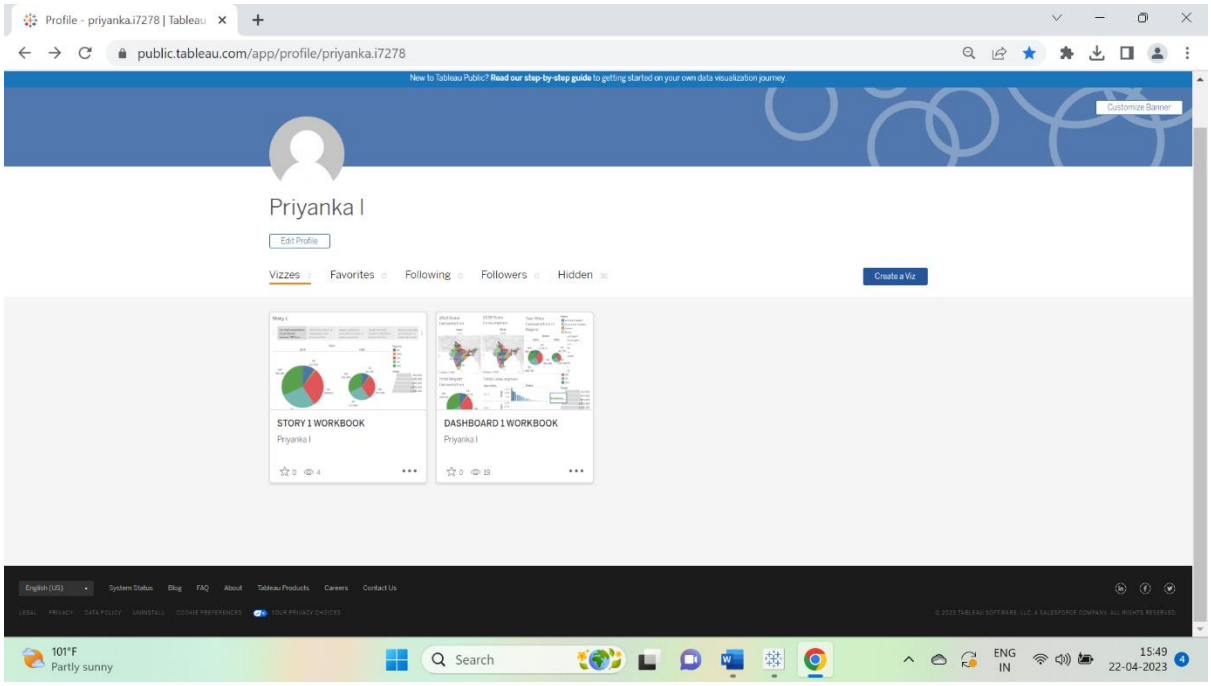
December
Data Source
Quarter Wise Usage
Usage by Year
Metro City States
Year Wise Consumption in Region
Dashboard 1
Dashboard 2
Dashboard 3
Story 1
101°F Partly sunny
Search
ENG IN
15:41 22-04-2023

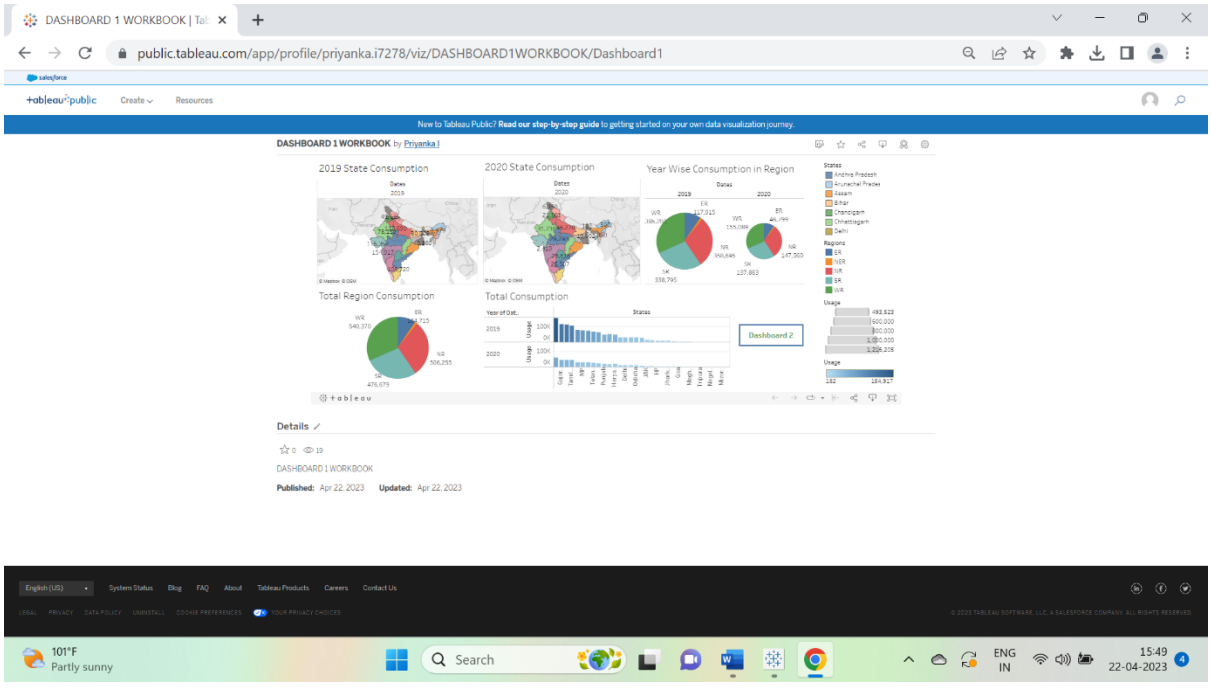
➢ STORY

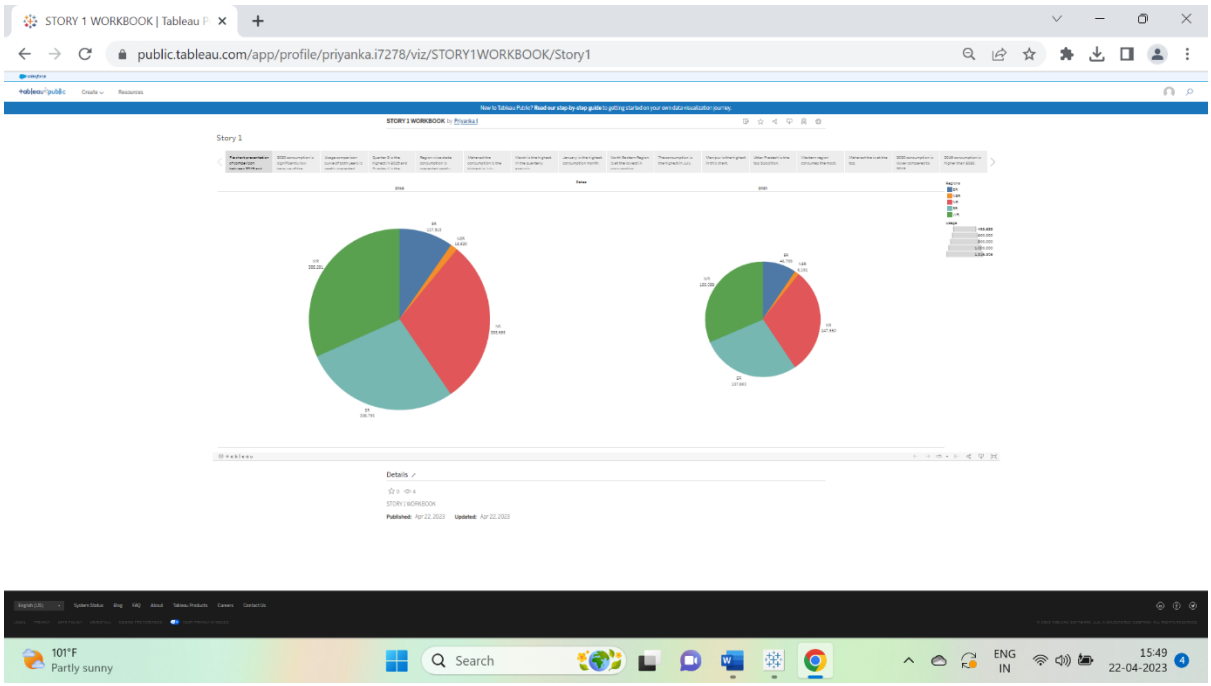


Now, open the dashboard and story workbook created on Tableau and start publishing the work on the given website using the share icon, then click ‘connect’ and save the workbook by giving it a title. After publishing dashboard and story on tableau public, this is how it will look like.



The pictures below are the published workbook of dashboard and story of the project shown on the above profile.





➢ RESULTS & CONCLUSION

There was a considerable increase in the peak domestic consumption, as the peak load reached 3320 MW in 2017 with an annual increment rate of 4.9%. Regarding energy efficiency, the value of total electrical energy losses reached 13% in 2017; around 90% of this loss occurred in the electrical distribution stage. Geographical distribution of the household

electrical power shows that the east and middle parts of Amman have low consumption levels compared to the west residential parts. The energy consumption pattern has an inverse relation with the population distribution, family size, and building characteristics in the city. This is clearly identified by addressing the downtown region that has the lowest energy consumption and the highest-density population, while the western part has the highest energy consumption and low-population density. These variations can be referred to as differences in social and economic behaviours of inhabitants in both high-density and low-density population areas.

This analysis reflects the influence of several factors that should be taken into account in energy sustainability strategies. Energy consumption is influenced by the characteristics of households which include building size, household income, total energy cost, and building characteristics (e.g., building design, age, location, and using thermal insulation system for buildings).

➢ APPENDIX

SOURCE CODE

file:///C:/Users/OTHERS/AppData/Local/Temp/Temp1_Electricity%20Consumption%20Analysis-20230422T122821Z-001.zip/Electricity%20Consumption%20Analysis/index.html

TABLEAU PROFILE LINKS FOR

DASHBOARD

https://public.tableau.com/views/DASHBOARD1WORKBOOK/Dashboard1?:language=en-US&:display_count=n&:origin=viz_share_link

STORY

https://public.tableau.com/views/STORY1WORKBOOK/Story1?:language=en-US&:display_count=n&:origin=viz_share_link