Arunachala Arts and Science (Women) college

Vellichandai

(Affiliated by Manonmaniam Sundaranar University).

PLUGGING INTO THE FUTURE: AN EXPLORATION OF ELECTRICITY CONSUMPTION PATTERNS

Submitted by

S.K. Induja

S. Raasika

S. Fathima Safna

V.S. Akshaya

R. Abisha

1. INTRODUCTION:

Energy is the capacity to do work and power is the rate of energy delivery. Energy is essential for most activities of modern society. Its use or consumption is generally taken as an index of standard of living. We use energy in the form of firewood, fossil fuels and electricity to make life comfortable and convenient. At home we use electricity for our lights and fans, air-conditioner, water heater and room heaters, oven, microwave, washing machine and drier etc. We use petrol, diesel, CNG for our cars, buses, autos etc. Large amounts of energy are consumed in agriculture and industry. In offices we use energy to run air conditioners, fans, lights, computers, copying machines etc. We use fossil fuel to run buses, trucks, trains, airplanes, ships etc. and thus transportation uses a large percentage of all the energy used. In this lesson, we learn about the role of energy in society.

1.1 Overview:

The project measures the production of power plants and combined heat and power plants less transmission, distribution, and transformation losses and own use by heat and power plants. 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.

1.2 Purpose:

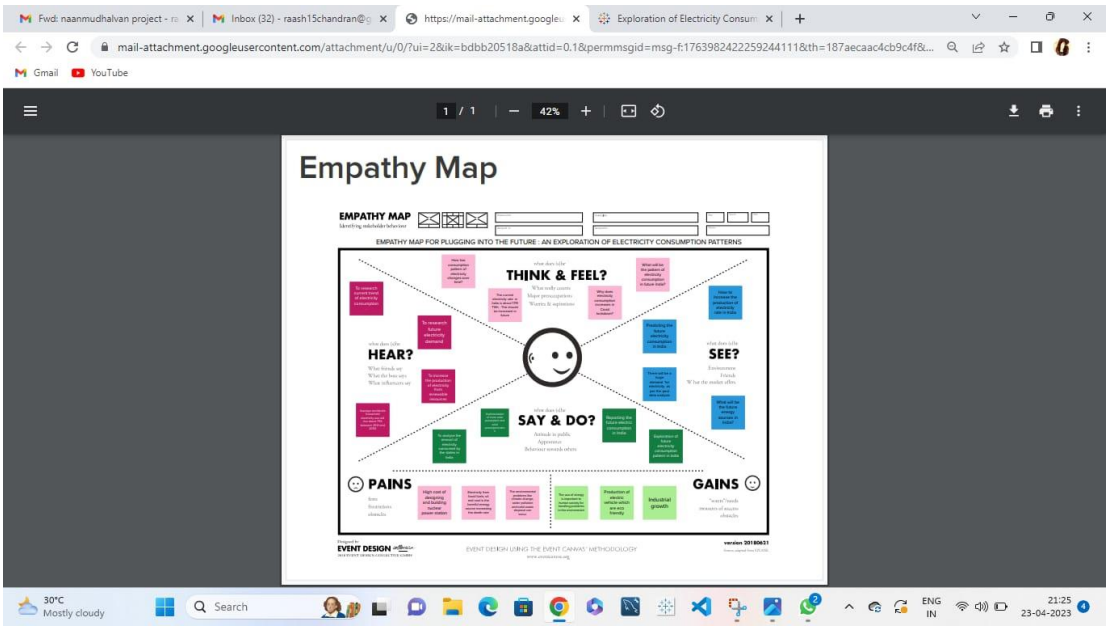
Consumption pattern of energy shows the percentage use of different sources (solar energy, wind energy, geothermal energy, biogas, and tidal power). The consumption pattern of energy changes over time. Commercial sources of energy: Commercial energy makes up about 65% of the total energy consumed in India.

During the 2018-19 fiscal year, the gross electricity generated by utilities in India was 1,372 TWh and the total electricity generation (utilities and non-utilities) in the country was 1,547 TWh. The gross electricity consumption in 2018-19 was 1,181 kWh per capita.
In 2015-16, electric energy consumption in agriculture was recorded as being the highest (17.89%) worldwide. The per capita electricity consumption is low compared to most other countries despite India having a low electricity tariff.

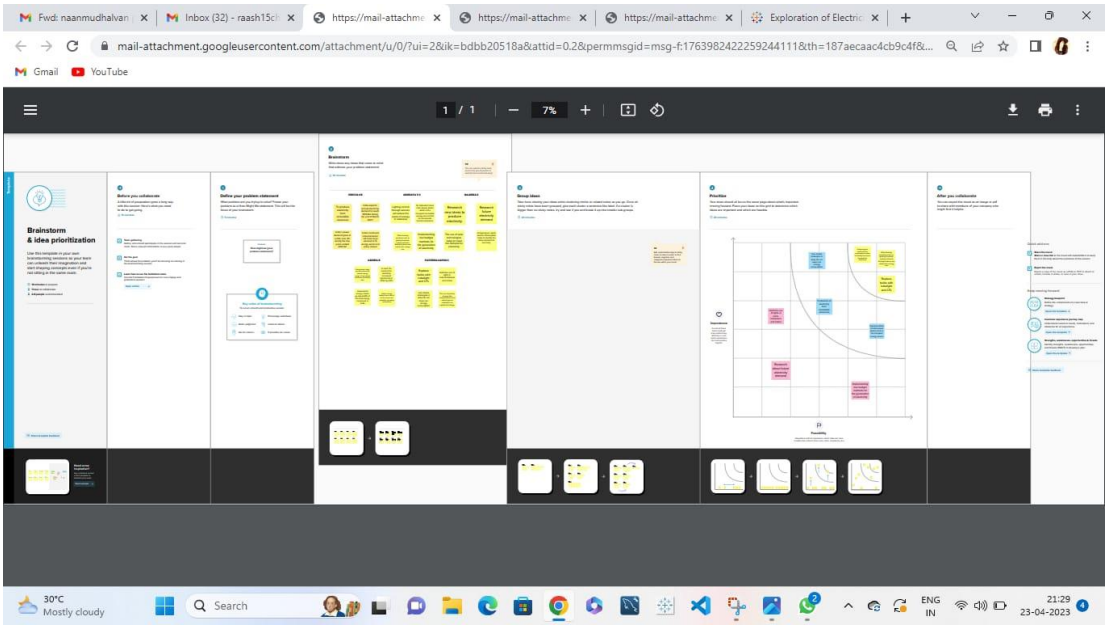
Considering the recent COVID-19 situation, when everyone has been under lockdown for the months of April & May the impacts of the lockdown on economic activities have been faced by every sector in a positive or a negative way.
With the electricity consumption being so crucial to the country, we came up with a plan to study the impact on energy consumption state and region wise.

2. Problem Definition & Design Thinking:

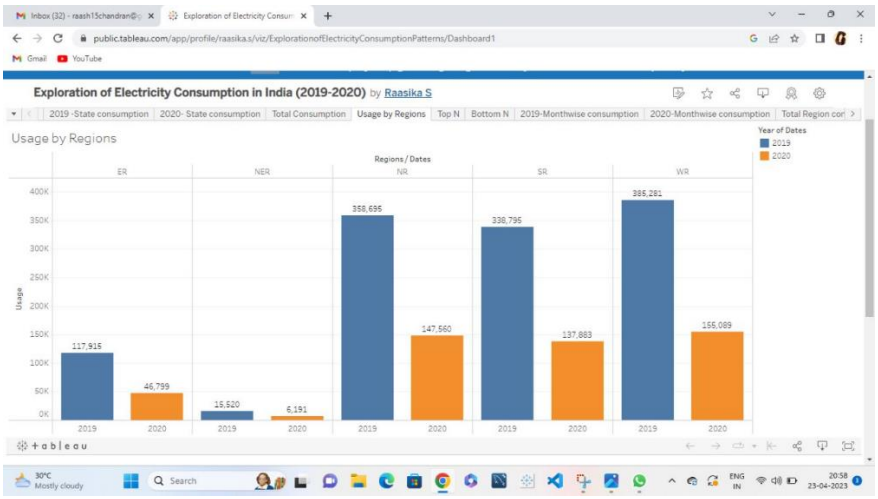
2.1 Empathy Map:

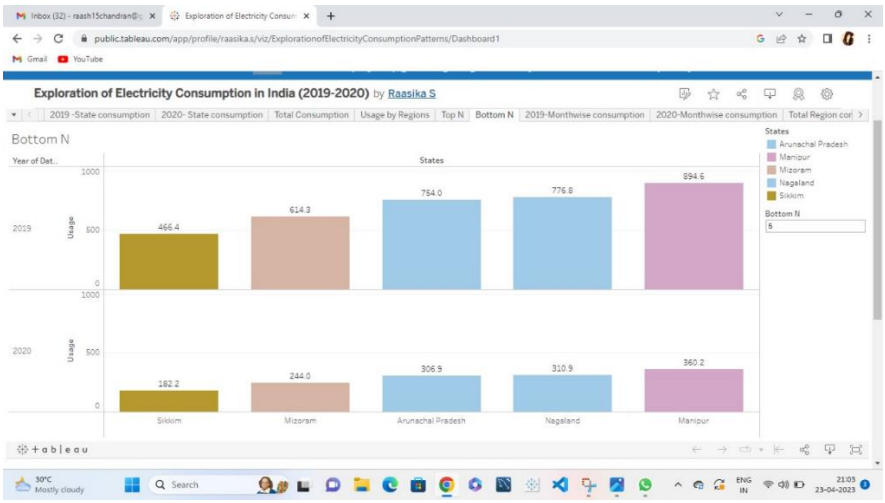


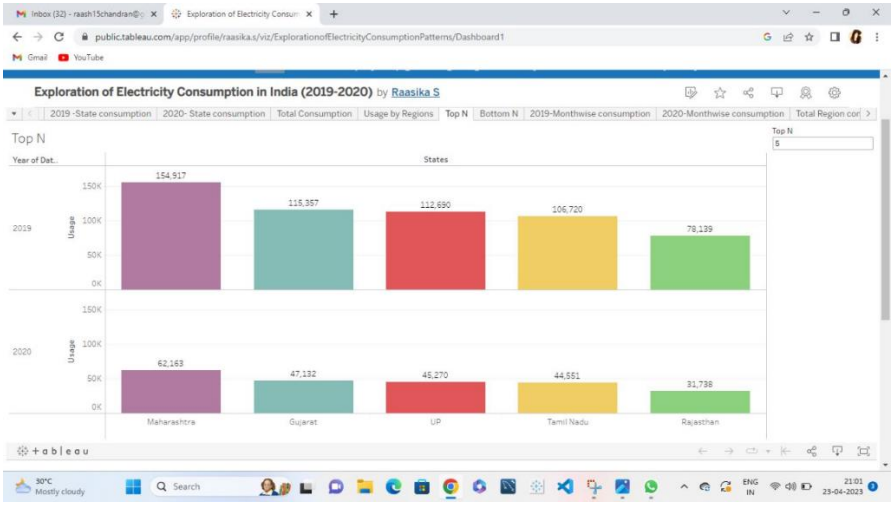
2.2. Ideation & Brainstorming Map:

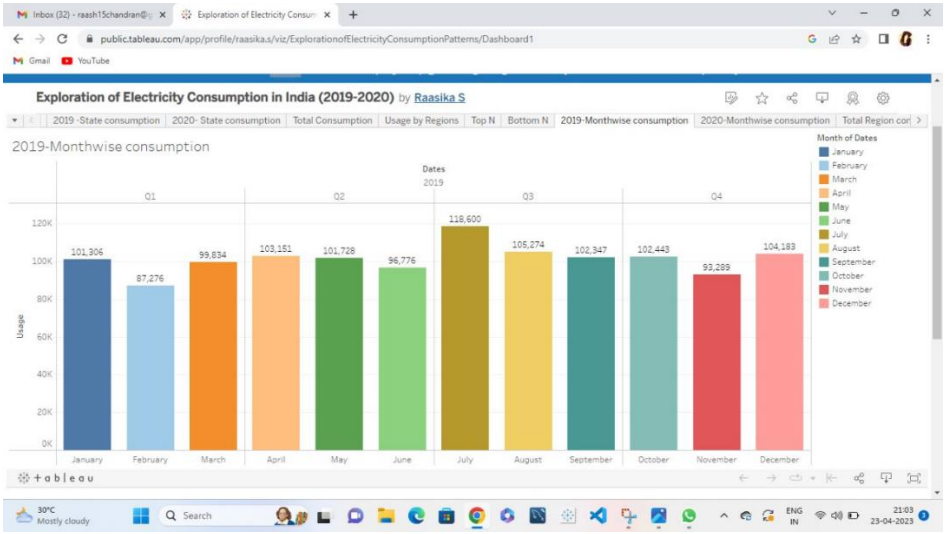


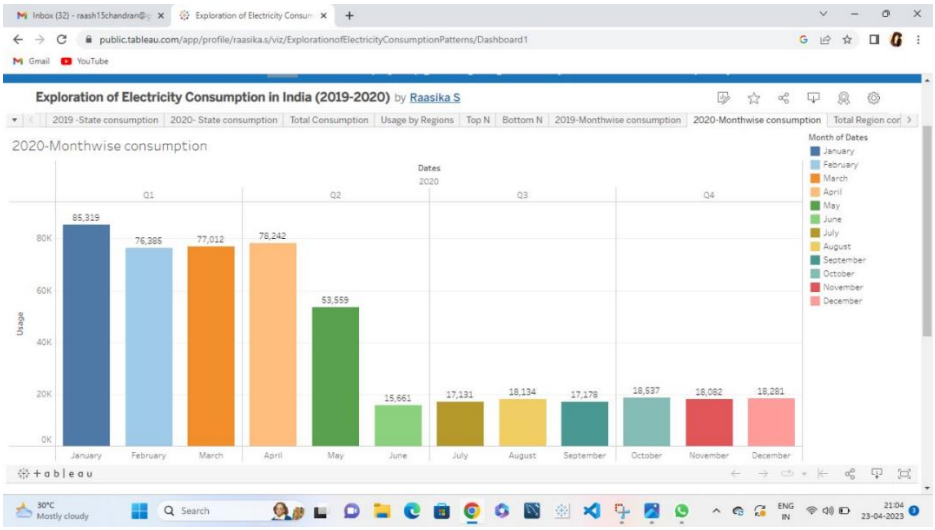
3. Results:

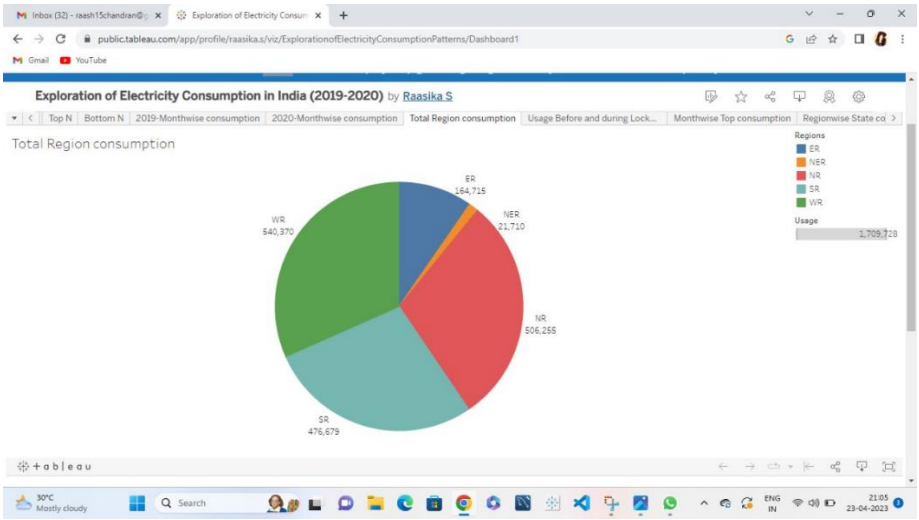

Exploration of Electricity Consumption in India (2019-2020) by Raasika S
Usage by Regions
Regions / Dates
ER
NER
NR
SR
WR
Year of Dates
2019
2020
117,915
46,799
15,520
6,191
358,695
147,560
338,795
137,883
386,281
155,089

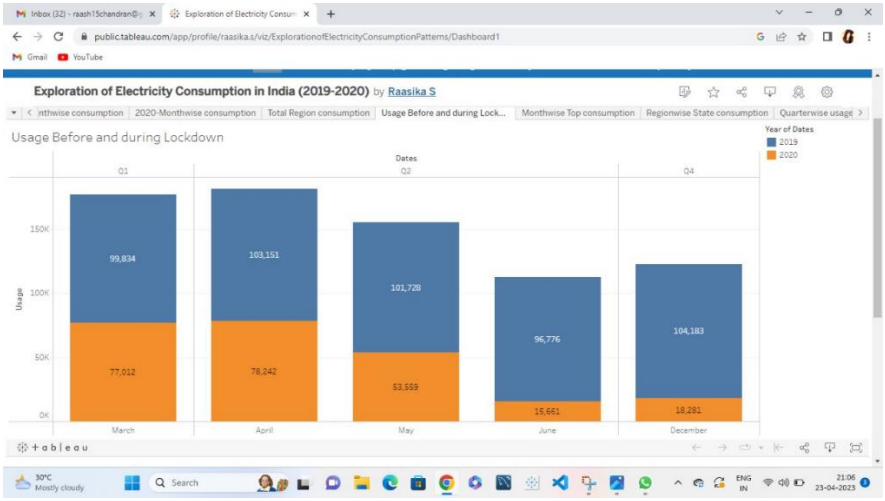

Exploration of Electricity Consumption in India (2019-2020) by Raasika S
Bottom N
States
Arunachal Pradesh
Manipur
Mizoram
Nagaland
Sikkim
Bottom N
5
466.4
614.3
754.0
776.8
894.6
182.2
244.0
306.9
310.9
360.2
Sikkim
Mizoram
Arunachal Pradesh
Nagaland
Manipur

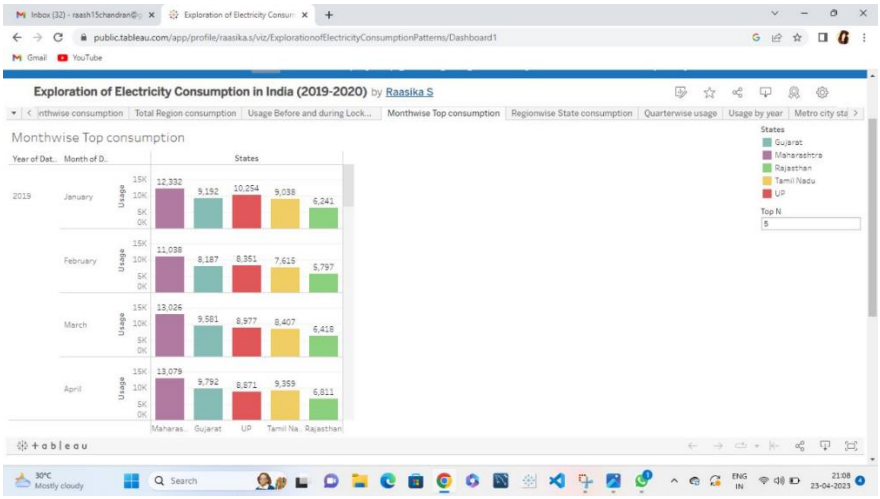

Exploration of Electricity Consumption in India (2019-2020) by Raasika S
Top N
States
Top N
5
154,917
115,357
112,690
106,720
78,139
62,163
47,132
46,270
44,551
31,738
Maharashtra
Gujarat
UP
Tamil Nadu
Rajasthan

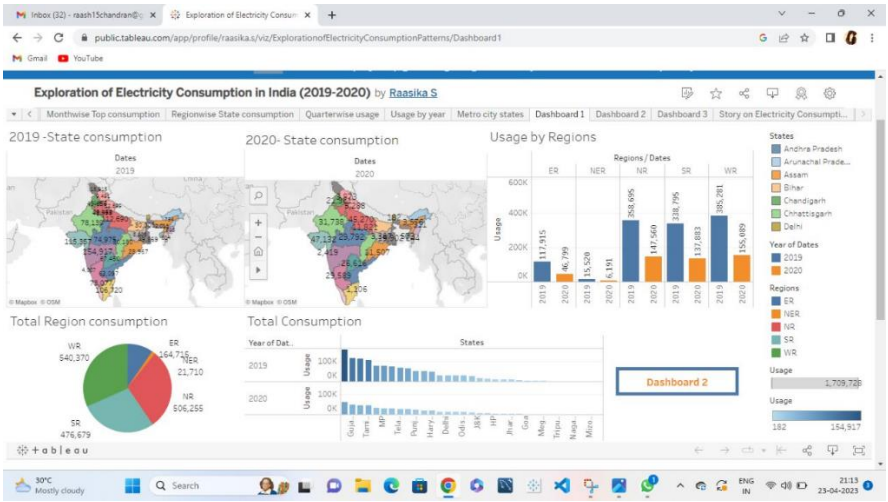

Exploration of Electricity Consumption in India (2019-2020) by Raasika S
2019 -State consumption
2020- State consumption
Total Consumption
Usage by Regions
Top N
Bottom N
2019-Monthwise consumption
2020-Monthwise consumption
Total Region cor
2019-Monthwise consumption
Dates
2019
Q1
Q2
Q3
Q4
Usage
120K
100K
80K
60K
40K
20K
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 of Dates
January
February
March
April
May
June
July
August
September
October
November
December
+ableau

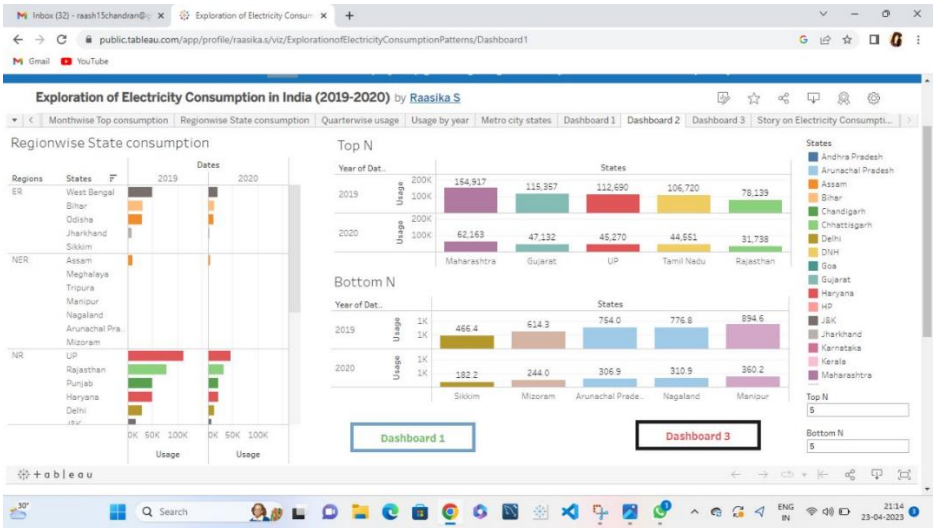

Exploration of Electricity Consumption in India (2019-2020) by Raasika S
2019 -State consumption
2020- State consumption
Total Consumption
Usage by Regions
Top N
Bottom N
2019-Monthwise consumption
2020-Monthwise consumption
Total Region cor
2020-Monthwise consumption
Dates
2020
Q1
Q2
Q3
Q4
Usage
80K
60K
40K
20K
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 of Dates
January
February
March
April
May
June
July
August
September
October
November
December
+ableau

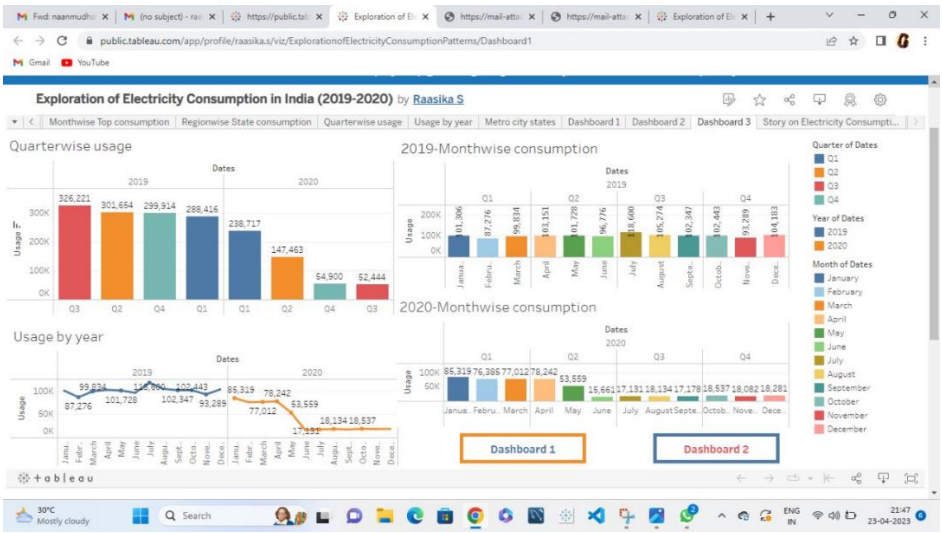

Exploration of Electricity Consumption in India (2019-2020) by Raasika S
Top N
Bottom N
2019-Monthwise consumption
2020-Monthwise consumption
Total Region consumption
Usage Before and during Lock...
Monthwise Top consumption
Regionwise State co
Total Region consumption
ER
164,715
NER
21,710
NR
506,255
SR
476,679
WR
540,370
Regions
ER
NER
NR
SR
WR
Usage
+ableau

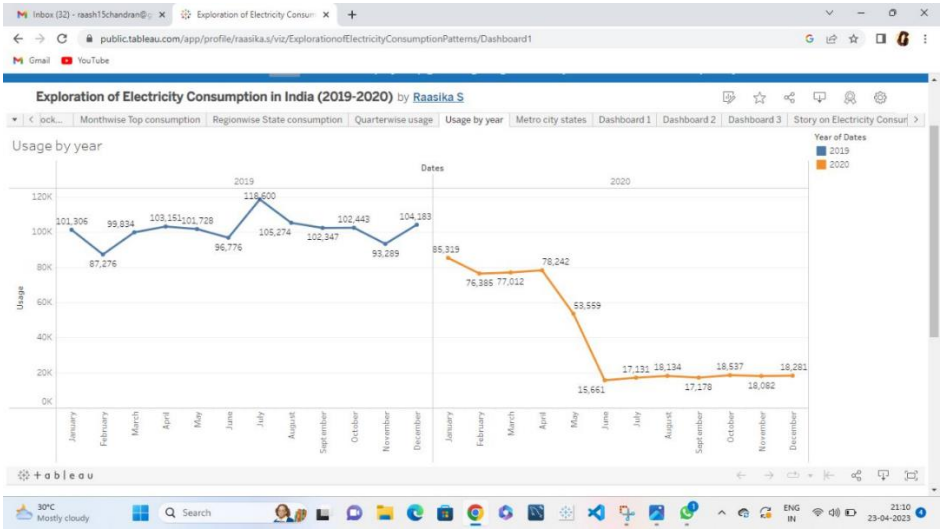

Exploration of Electricity Consumption in India (2019-2020) by Raasika S
Usage Before and during Lockdown
Year of Dates
2019
2020
Dates
Q1
Q2
Q4
Usage
150K
100K
50K
0K
99,834
77,012
103,151
78,242
101,728
53,559
96,776
15,661
104,183
18,281
March
April
May
June
December
+ableau


Exploration of Electricity Consumption in India (2019-2020) by Raasika S
Monthwise Top consumption
States
Gujarat
Maharashtra
Rajasthan
Tamil Nadu
UP
Top N
5
Year of Dat..
Month of D..
2019
January
February
March
April
Usage
12,332
9,192
10,254
9,038
6,241
11,038
8,187
8,351
7,615
5,797
13,026
9,581
8,977
8,407
6,418
13,079
9,792
8,871
9,359
6,811
Maharas..
Gujarat
UP
Tamil Na..
Rajasthan
+ableau


Exploration of Electricity Consumption in India (2019-2020) by Raasika S
2019 -State consumption
2020- State consumption
Usage by Regions
Dates
2019
2020
Regions / Dates
ER
NER
NR
SR
WR
Usage
600K
400K
200K
0K
117,915
96,799
35,520
6,151
358,695
147,560
338,795
137,883
385,281
355,689
States
Andhra Pradesh
Arunachal Prade...
Assam
Bihar
Chandigarh
Chhattisgarh
Delhi
Year of Dates
2019
2020
Regions
ER
NER
NR
SR
WR
Usage
1,709,728
182
154,917
Total Region consumption
WR
$40,370
ER
164,716
NER
21,710
NR
506,255
SR
476,679
Total Consumption
Year of Dat..
States
2019
2020
Usage
100K
0K
Dashboard 2
+ableau


Exploration of Electricity Consumption in India (2019-2020) by Raasika S
Monthwise Top consumption | Regionwise State consumption | Quarterwise usage | Usage by year | Metro city states | Dashboard 1 | Dashboard 2 | Dashboard 3 | Story on Electricity Consumpti...
Regionwise State consumption
Top N
Bottom N
Dashboard 1
Dashboard 3


Exploration of Electricity Consumption in India (2019-2020) by Raasika S
Monthwise Top consumption | Regionwise State consumption | Quarterwise usage | Usage by year | Metro city states | Dashboard 1 | Dashboard 2 | Dashboard 3 | Story on Electricity Consumpti...
Quarterwise usage
2019-Monthwise consumption
2020-Monthwise consumption
Usage by year
Dashboard 1
Dashboard 2


Exploration of Electricity Consumption in India (2019-2020) by Raasika S
Monthwise Top consumption | Regionwise State consumption | Quarterwise usage | Usage by year | Metro city states | Dashboard 1 | Dashboard 2 | Dashboard 3 | Story on Electricity Consumpti...
Usage by year

4. ADVANTAGES & DISADVANTAGES:

4.1 ADVANTAGES:

By actively measuring your businesses energy consumption allows you to determine whether energy usage is high, this can directly affect the cost of electricity bills, the cost of infrastructure, and allows your business to examine a way for them to become more sustainable and competitive.

In May 2019, the NCC made a range of changes regarding power monitoring in new building developments throughout Australia. Compliance of the changes are a legal requirement, and to make sure you comply, we have outlined the changes to J8.3 below.

- A building or sole-occupancy unit with a floor area of more than 500m^2 must have an energy meter configured to record the time-of-use consumption of gas and electricity.
- A building with a floor area of more than 2,500m^2 must have energy meters configures to enable individual time-of-use energy consumption data recording, in accordance with (c), of the energy consumption of:

1. air-conditioning plant including, where appropriate, heating plant, cooling plant and air handling fans; and
2. artificial light; and
3. appliance power; and
4. central hot water supply; and
5. internal transport devices including lifts, escalators and moving walkways where there is more than one serving the building; and
6. other ancillary plant

- Energy meters required by (b) must be interlinked by a communication system that collates the time-of-use energy consumption data to a single interface monitoring system where it can be stored, analysed and reviewed.

4.2 DISADVANTAGE:

Power plants that burn biomass release sulfur dioxide and nitrogen oxides, two undesirable pollutants, into the air. Power plants that burn fossil fuel pump carbon dioxide into the atmosphere. Carbon dioxide is a greenhouse gas that causes Earth's temperature to rise. Nuclear power plants must find ways to dispose of radioactive waste safely. Building dams to create hydropower plants can affect wildlife and natural resources adversely.

Unless you generate your own power using a source such as solar, you probably pay a monthly utility bill that varies between regions. If you get your electricity from your own solar or wind source, you have no monthly fees. In fact, it's sometimes possible for you to sell excess power you generate using these methods to utility companies. Although you must pay for solar equipment and installation, prices continue to drop as the market matures.

You may have lived without electricity when storms or accidents disabled power lines or transformers or experienced brownouts during which you received reduced electricity. These incidents may occur when power demands exceed a utility company's ability to provide it.

5. APPLICATIONS:

During 2021-22, the per capita electricity consumption in India is 945.98 kilowatt-hour (Kwh). According to the official data the total installed capacity of the country stood at 4,12,212 MW, as on Feb. 2023. Thermal power plants constitute 57.4 % of the installed capacity and hydropower about 11.4. Consumption pattern of energy shows the percentage use of different sources (solar energy, wind energy, geothermal energy, biogas, and tidal power). The consumption pattern of energy changes over time. Commercial sources of energy: Commercial energy makes up about 65% of the total energy consumed in India. Industry uses fossil fuels and renewable energy sources for: Heat in industrial processes and space heating in buildings. Boiler fuel to generate steam or hot water for process heating and generating electricity. Feedstocks (raw materials) to make products such as plastics and chemicals.

This special report maps out possible energy futures for India, the levers and decisions that bring them about, and the interactions that arise across a complex energy system. The increasing urgency driving the global response to climate change is a pivotal theme. India has so far contributed relatively little to the world's cumulative greenhouse gas emissions, but the country is already feeling their effects. This report's analysis is based on a detailed review of existing or announced energy reforms and targets. These include the aims of quadrupling renewable electricity capacity by 2030, more than doubling the share of natural gas in the energy mix, enhancing energy efficiency and transport infrastructure, increasing domestic coal output, and reducing reliance on imports. Progress towards these policy goals varies across our report's different scenarios, none of which is a forecast. Our aim is rather to provide a coherent framework in which to consider India's choices and their implications.

- The **Stated Policies Scenario** (STEPS) provides a balanced assessment of the direction in which India's energy system is heading, based on today's policy settings and constraints and an assumption that the spread of Covid-19 is largely brought under control in 2021.
- The **India Vision Case** is based on a rapid resolution of today's public health crisis and a more complete realization of India's stated energy policy objectives, accompanied by a faster pace of economic growth than in the STEPS.
- The **Delayed Recovery Scenario** analyses potential downside risks to India's energy and economic development if the pandemic is more prolonged.
- The **Sustainable Development Scenario** explores how India could mobilize an additional surge in clean energy investment to produce an early peak and rapid subsequent decline in emissions, consistent with a longer-term drive to net zero, while accelerating progress towards a range of other sustainable development goals.

6. CONCLUSION:

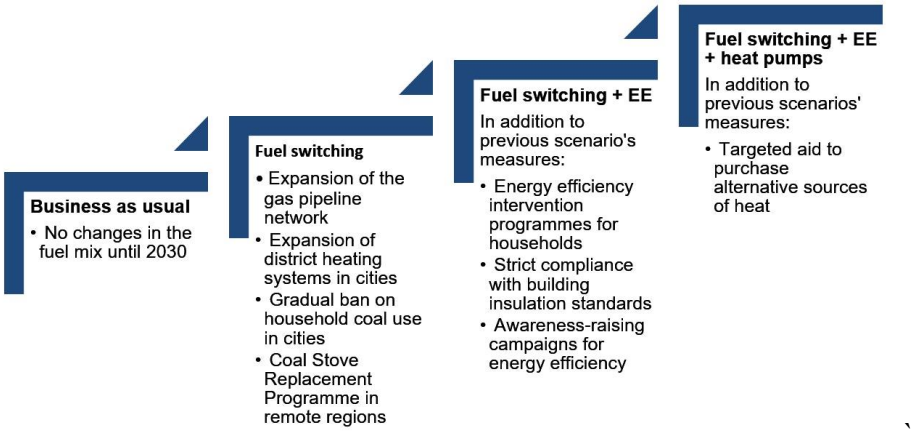
Energy is a very important natural resource. It should be saved because it's not at all free. Energy conservation is the effort made by us to reduce the consumption of energy by using less of an energy service or using renewable energy. This can be achieved either by using energy more efficiently or by reducing the amount of service used or using renewable energy.

Energy efficiency is the wave of the future. An energy efficient home is a personal step toward the direction of renewable energy, environmental protection, and sustainable living. Having such a home helps homeowners reduce their bills and provides an excellent investment.

7. FUTURE SCOPE:

The Indian power sector is forecasted to attract investments worth $128.24-135.37 Bn between FY19-23. The future of the sector looks bright since by 2026-27 the country's power generation installed capacity will be close to 620 GW, of which 38 % will be from coal and 44% from renewable energy sources. IEEFA and Climate Energy Finance estimated that India will reach 405 gigawatts of renewable energy capacity by 2030. It's expected to surpass the government's target of producing 50% of its electricity from non-fossil fuel sources by the end of the decade.

In the **Stated Policies Scenario**, global electricity demand grows at 2.1% per year to 2040, twice the rate of primary energy demand. This raises electricity's share in total final energy consumption from 19% in 2018 to 24% in 2040. Electricity demand growth is set to be particularly strong in developing economies. Government policies, market conditions and available technologies collectively set a course for electricity supply to shift towards low-carbon sources, with their share increasing from 36% today to 52% in 2040 in the Stated Policies Scenario.



In the **Sustainable Development Scenario** electricity plays an even larger role, reaching 31% of final energy consumption. In the Sustainable Development Scenario, electricity is one of the few energy sources that sees growing consumption in 2040 – mainly due to electric vehicles – alongside the direct use of renewables, and hydrogen. The share of electricity in final consumption, less than half that of oil today, overtakes oil by 2040. Accelerated efforts on renewables, nuclear power and carbon capture technologies rapidly decarbonize electricity supply, compensating for the sharp decline of coal-fired power generation and reducing power sector CO_2 emissions by three-quarters by 2040.

Electricity demand follows two distinct regional paths. In advanced economies, future growth linked to increasing digitalization and electrification is largely offset by energy efficiency improvements. In developing economies, rising incomes, expanding industrial output and a

growing services sector push demand firmly up. Developing economies contribute nearly 90% of global electricity demand growth to 2040 in the Stated Policies Scenario, but demand per person in these economies remains 60% lower than in advanced economies.

8. APPENDIX

https://drive.google.com/file/d/1246KuIi4ywgjOCZv0Mg_bG1XYtAjt_kD/view?usp=sharing