A Project Report on

PLUGGING INTO THE FUTURE: AN EXPLORATION OF ELECTRICITY CONSUMPTION PATTERNS

BACHELOR OF MATHEMATICS

Submitted by

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PLUGGING INTO THE FUTURE: AN EXPLORATION OF ELECTRICITY CONSUMPTION PATTERN

1.INTRODUCTION

1.1 Overview:

Global electricity consumption has continued to go up rapidly at a rate faster than energy consumption. Between 1980 and 2013, the world's annual electricity consumption rose from 7300TWh to 22100TWh. Since the 21st century, global electricity consumption has seen even faster growth, as evidenced by an average annual increase of 3.4 percentage, 1.2 percentage points higher than average annual growth of energy consumption.

Electricity consumption is an essential component of modern life. It not only provides clean and safe light throughout the day, but also in many countries refreshes homes on hot summer days, and in others warms them in winter. In all countries, it allows the use of electrical and electricity is essential to ensure their proper functioning.

1.2 Purpose:

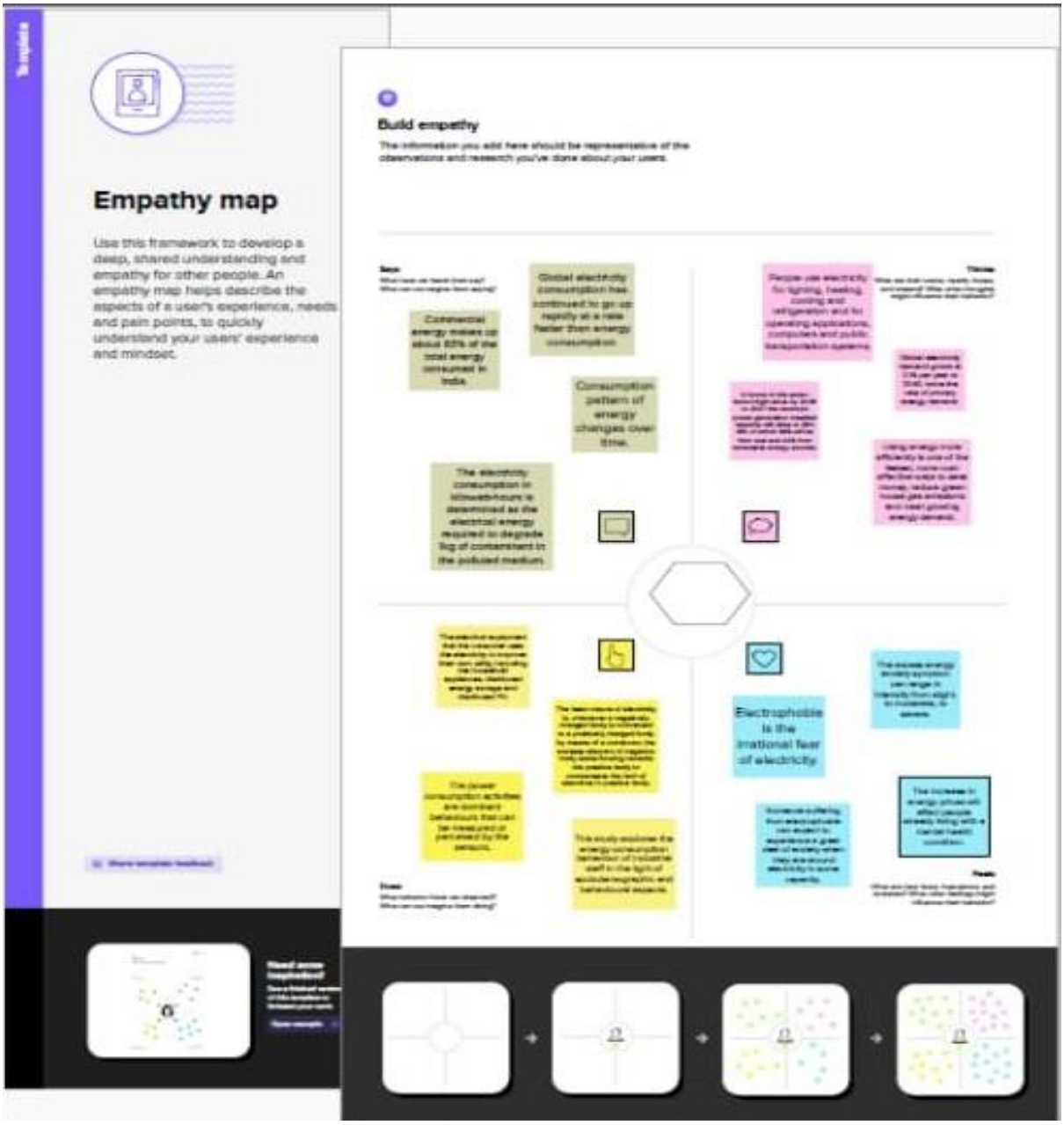
An electricity consumption per capita serves as an important measure as a country's electric power development. Generally speaking, electricity consumption grows faster when the industrialization process develops quickly and goes down rapidly when industrialization is completed or neat completion.

The importance of electricity can be seen in our daily lives. We find the application of electricity in various spheres of our life, such as

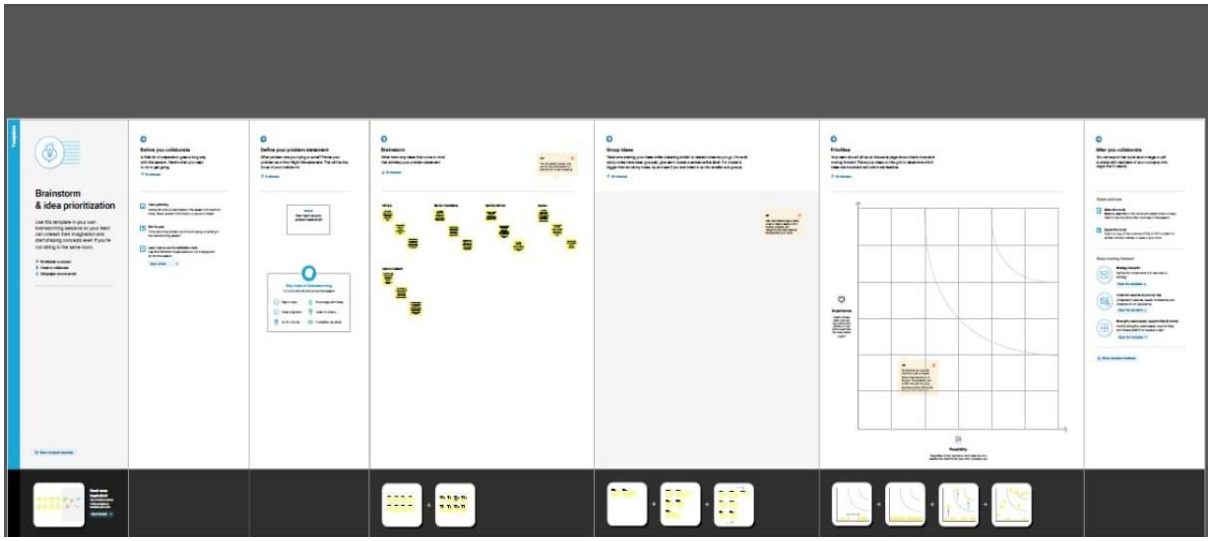
- Working efficiency at our home
- Working at our office
- We use electricity for accessing data from modes like Fibre, LAN at our workplaces.
- Electricity consumption in supplying water at our home.

2.PROBLEM DEFINITION AND DESIGN THINKING

2.1 Empathy map:


Empathy map
Use this framework to develop a deep, shared understanding and empathy for other people. An empathy map helps describe the aspects of a user's experience, needs and pain points, to quickly understand your users' experience and mindset.
Build empathy
The information you add here should be representative of the observations and research you've done about your users.
Commercial energy makes up about 63% of the total energy consumed in India.
Global electricity consumption has continued to go up rapidly at a rate faster than energy consumption.
Consumption pattern of energy changes over time.
The electricity consumption in kilowatt-hours is determined as the electrical energy required to degrade 1kg of contaminant in the polluted medium.
People use electricity for lighting, heating, cooling and refrigeration and for operating applications, computers and public transportation systems.
Using energy more efficiently is one of the fastest, most cost-effective ways to save money, reduce green-house gas emissions and meet growing energy demands.
Electrophobia is the irrational fear of electricity
The increase in energy prices will affect people already living with a low-income health condition.

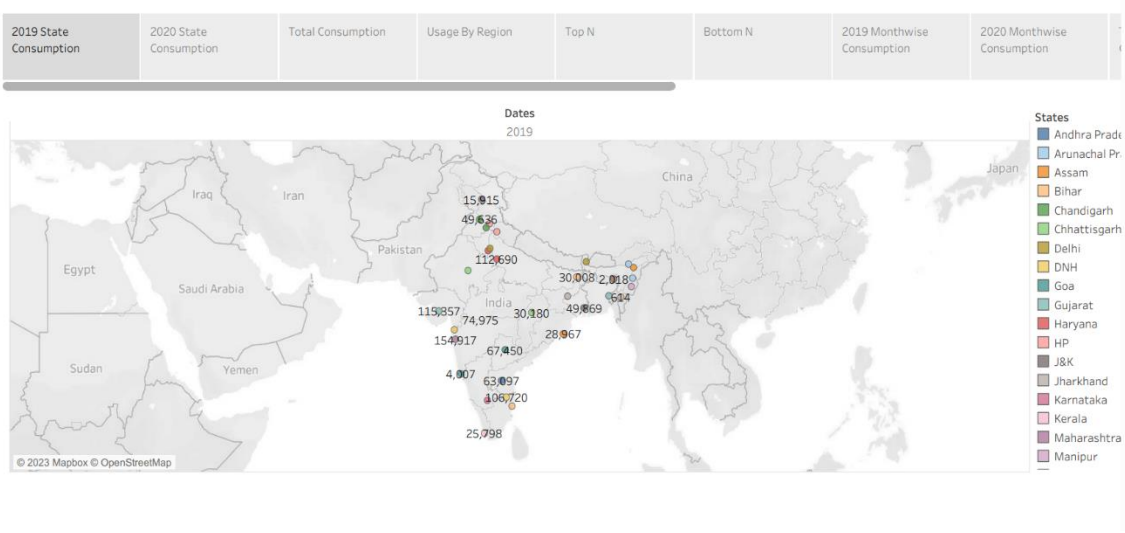
2.2 Brainstorming :



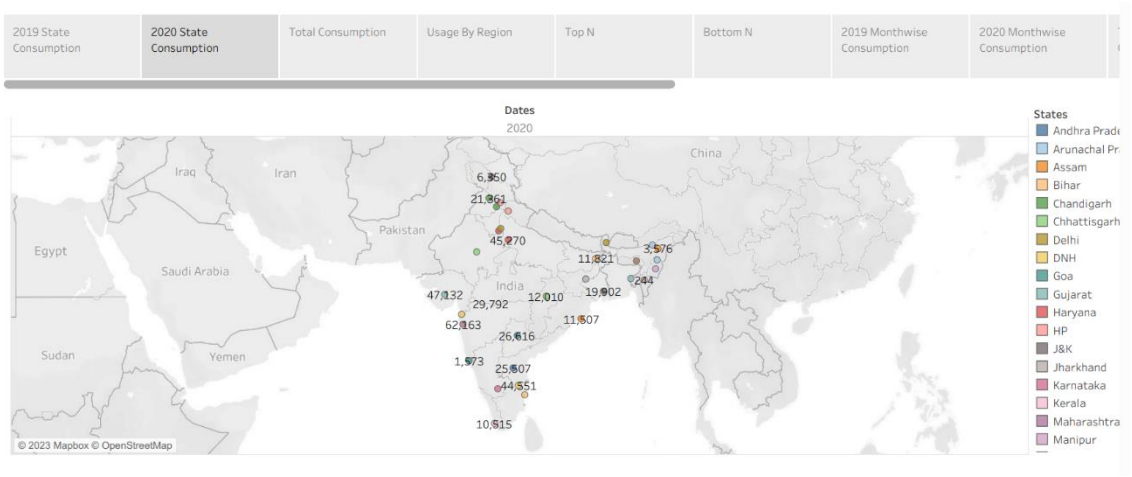
3.RESULT

STORY

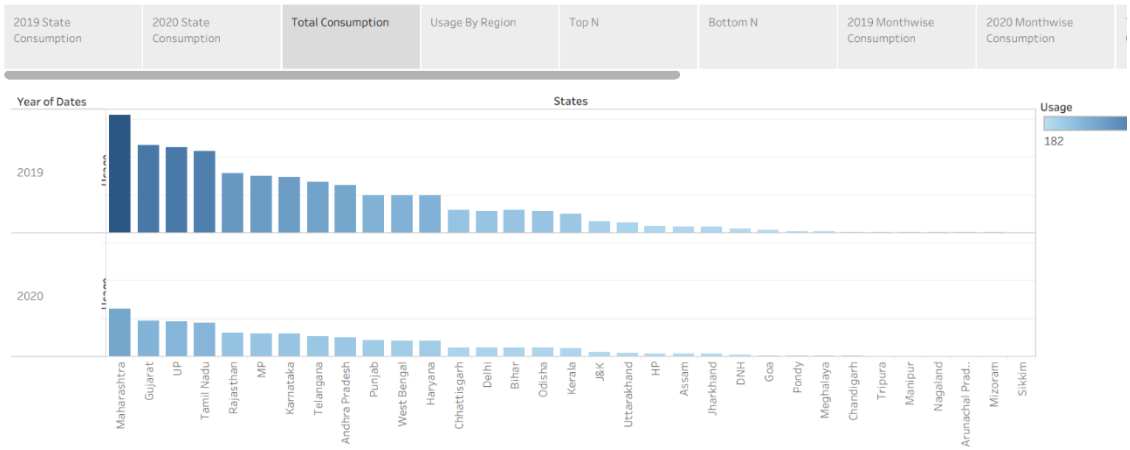
2019 state consumption



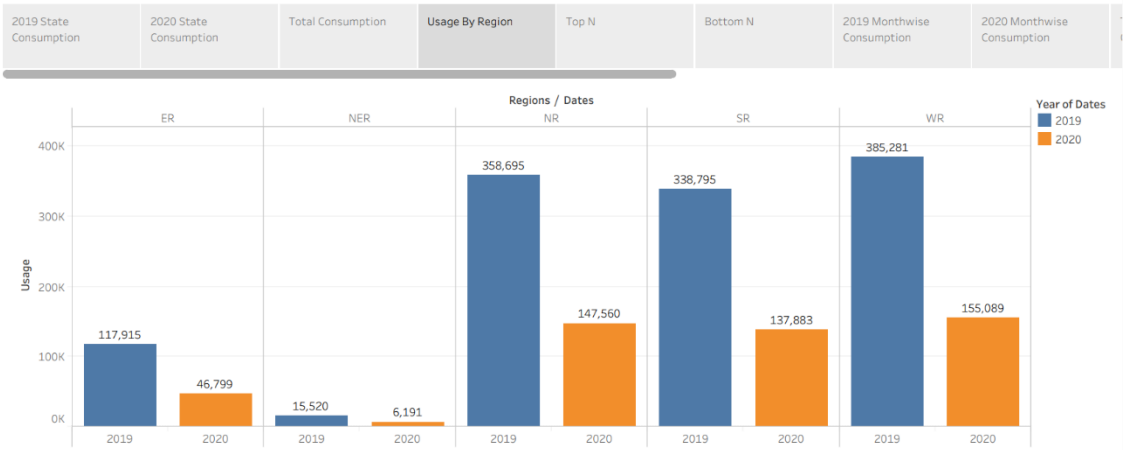
2020 state consumption



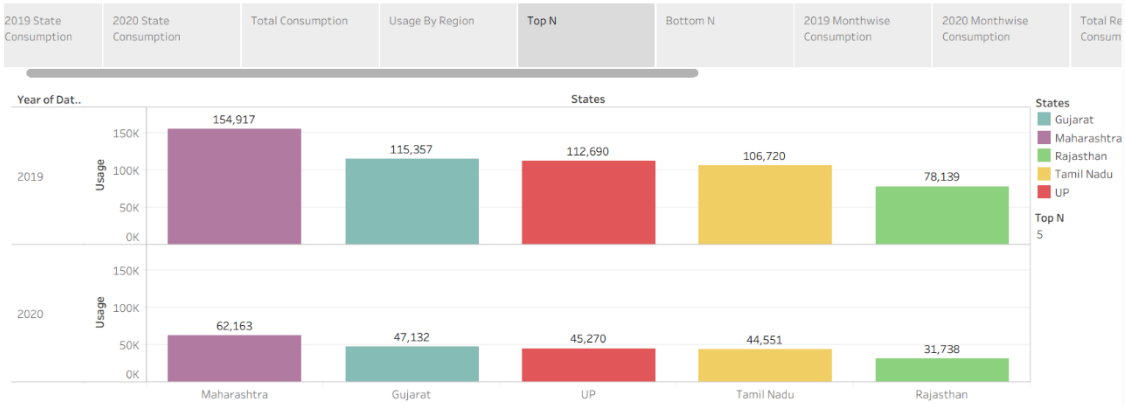
Total consumption



Usage by region



Top N



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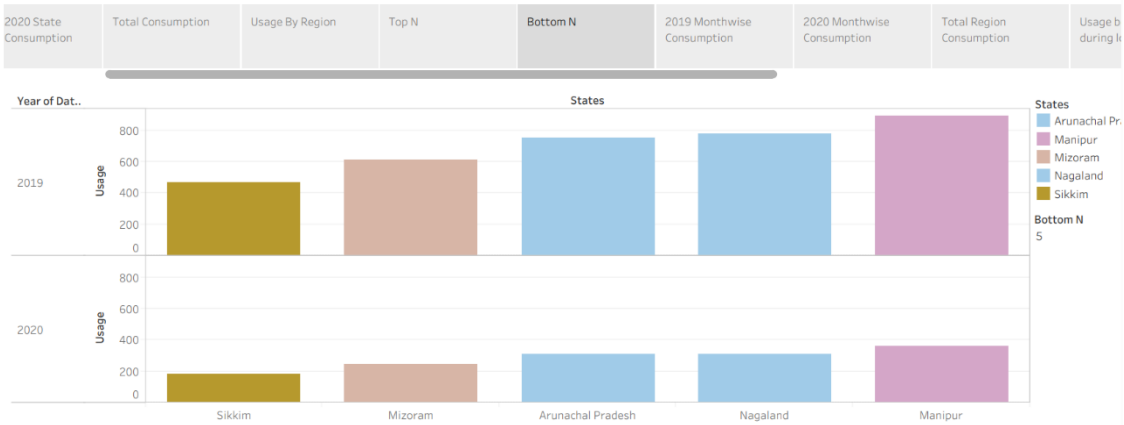
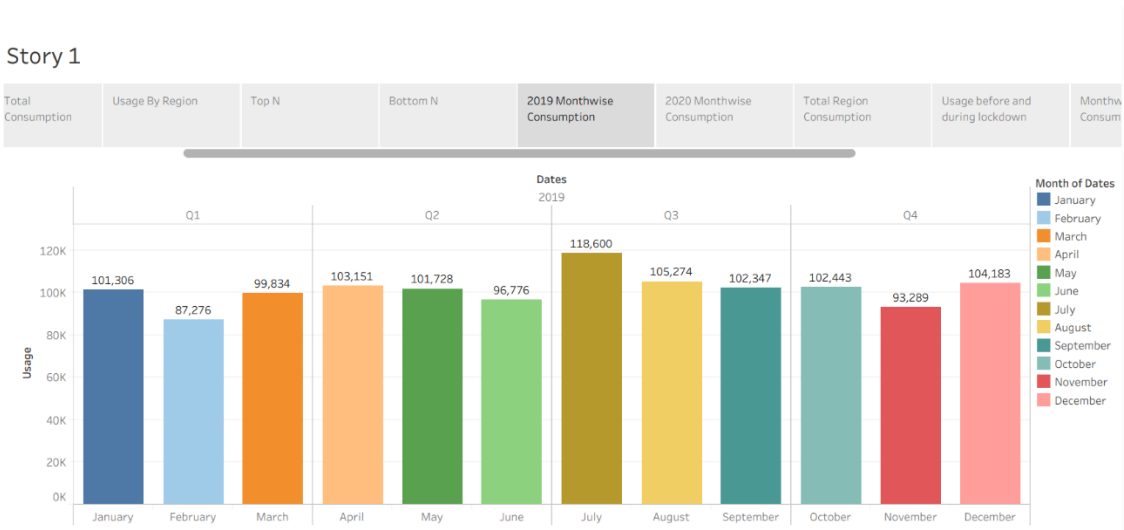
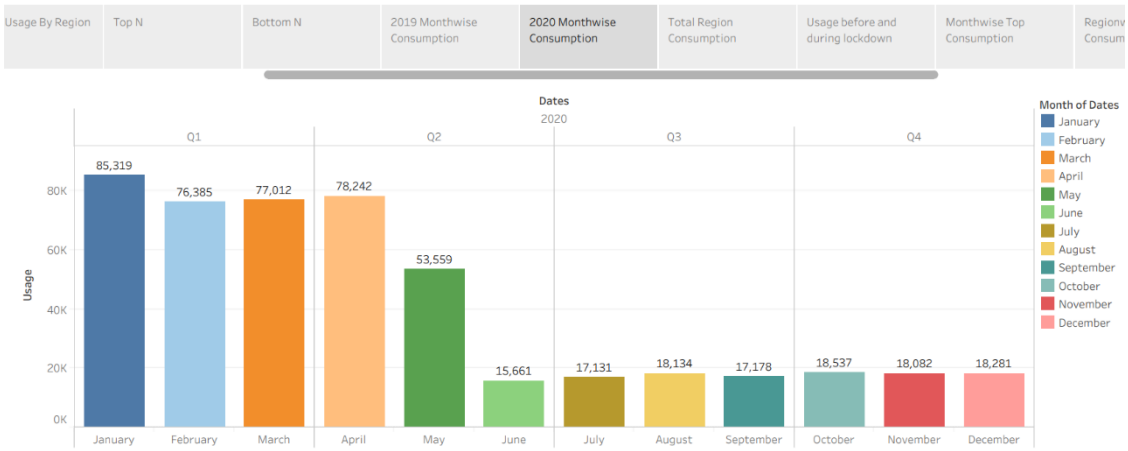


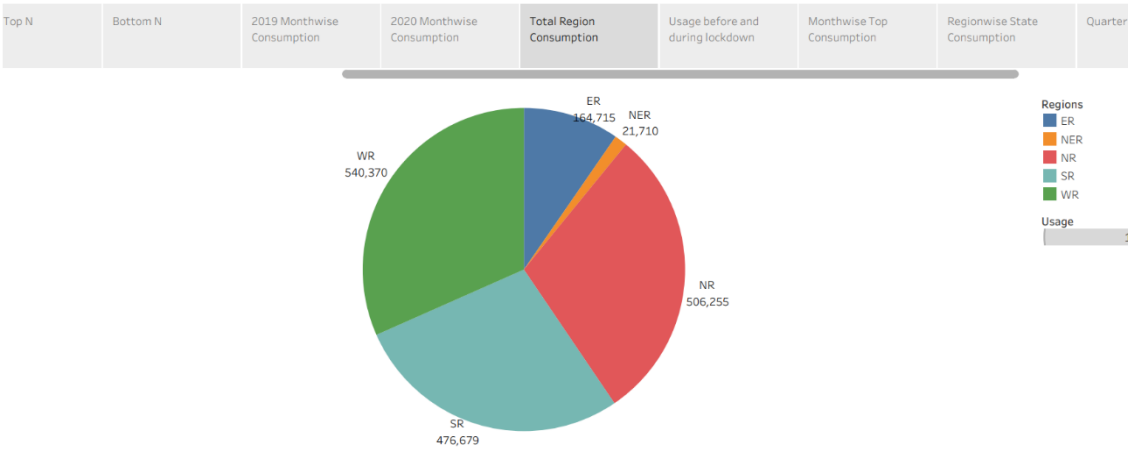
2019 month wise consumption



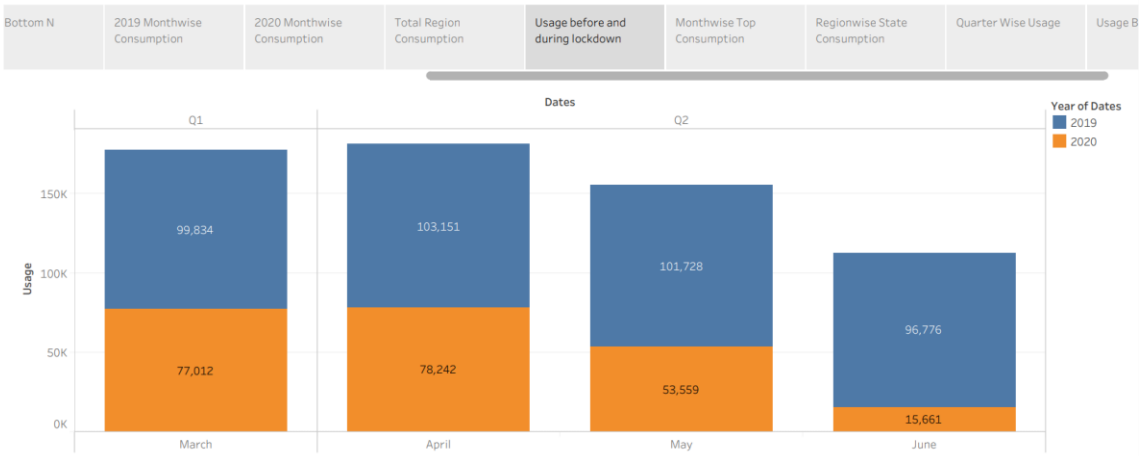
2020 Month wise consumption



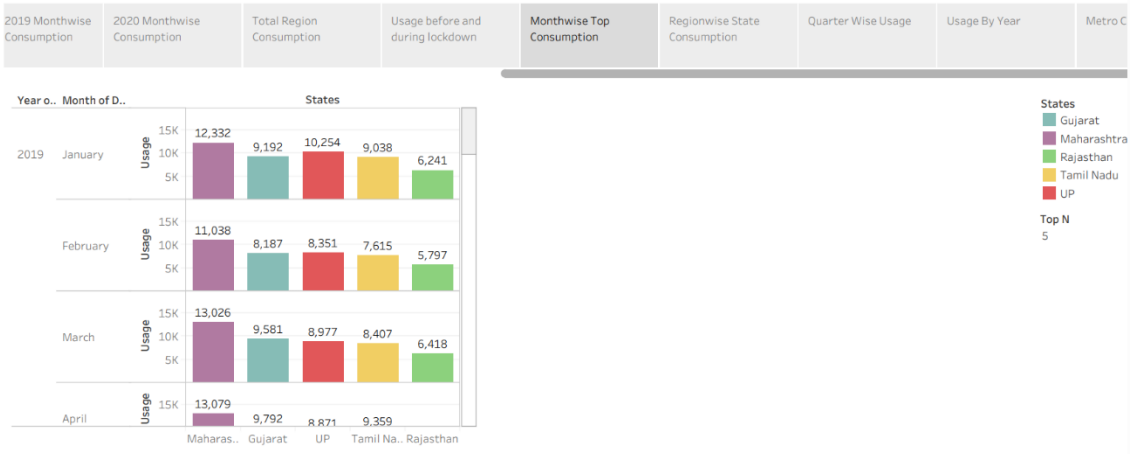
Total region consumption



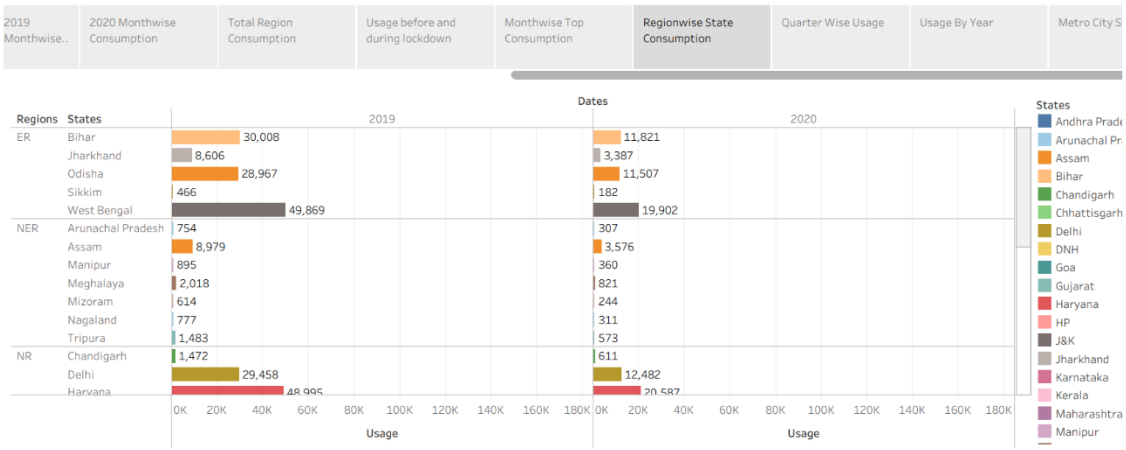
Usage before and during lockdown



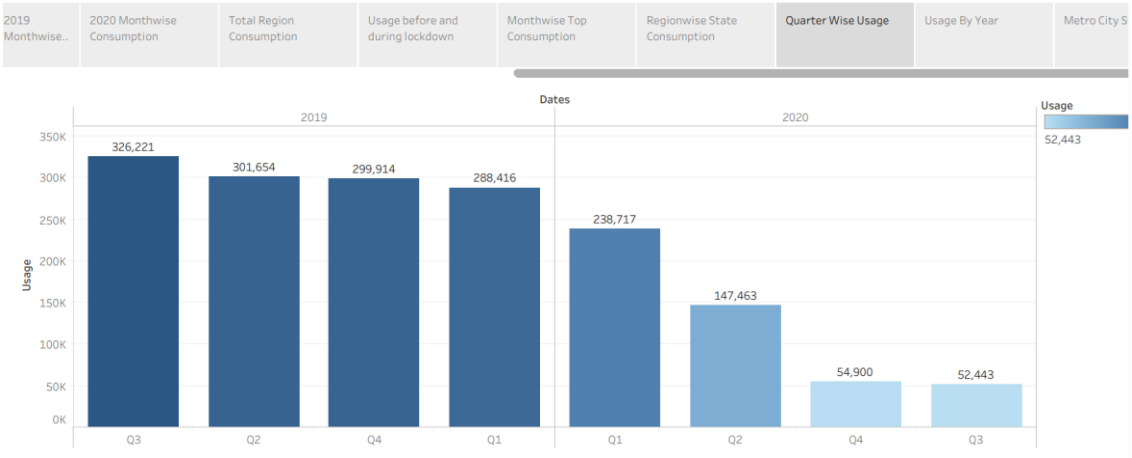
Month wise top consumption



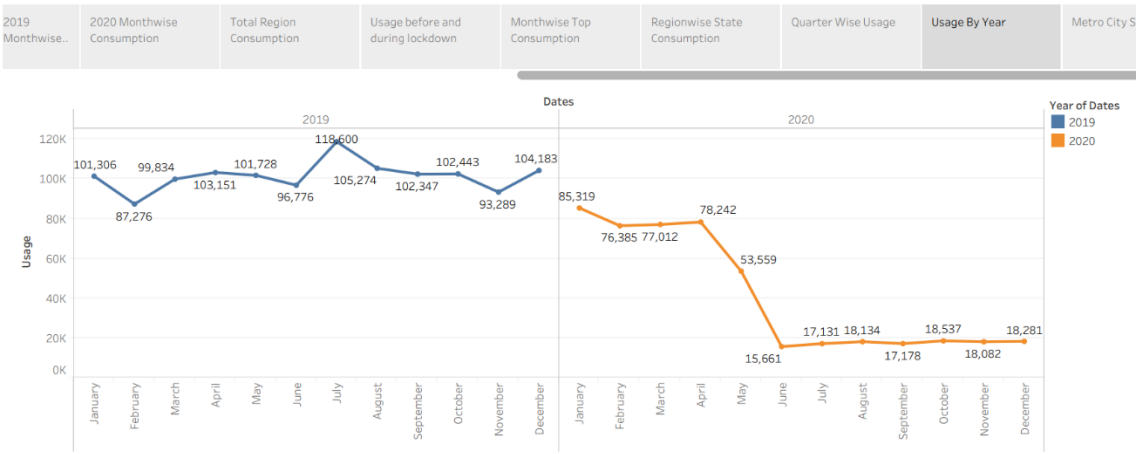
Region wise state consumption



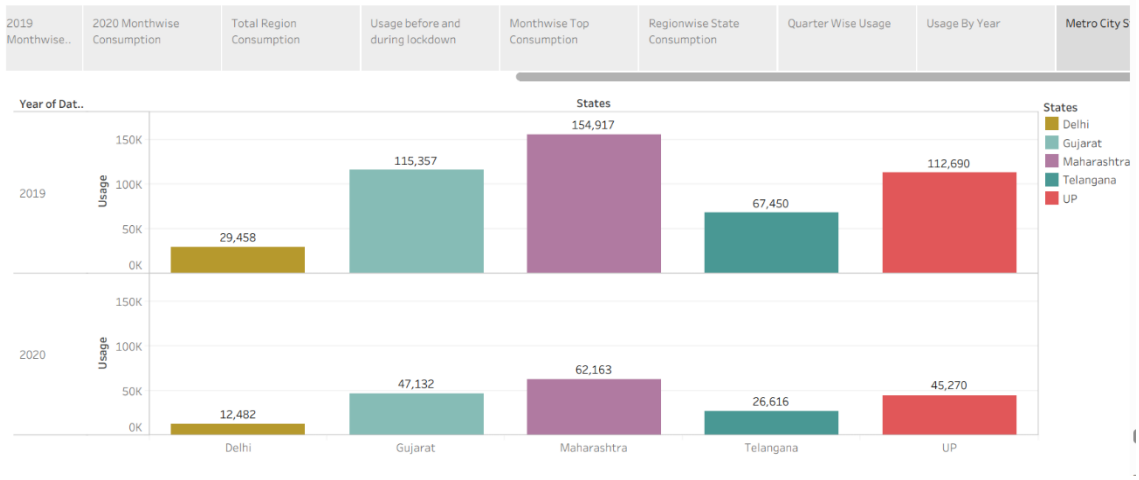
Quarter wise usage



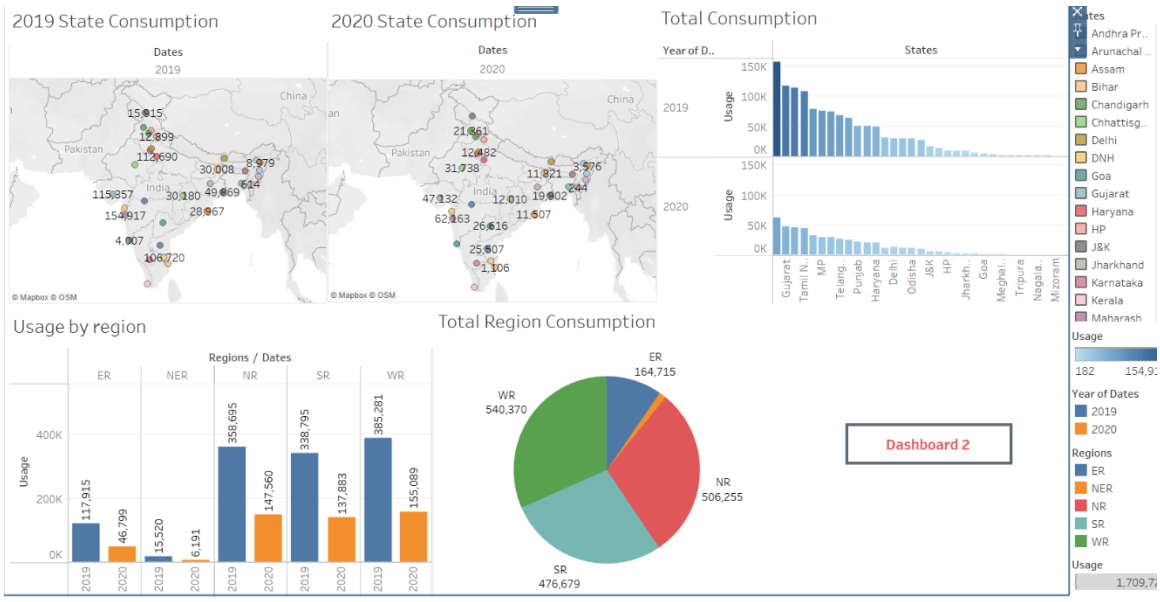
Usage by year



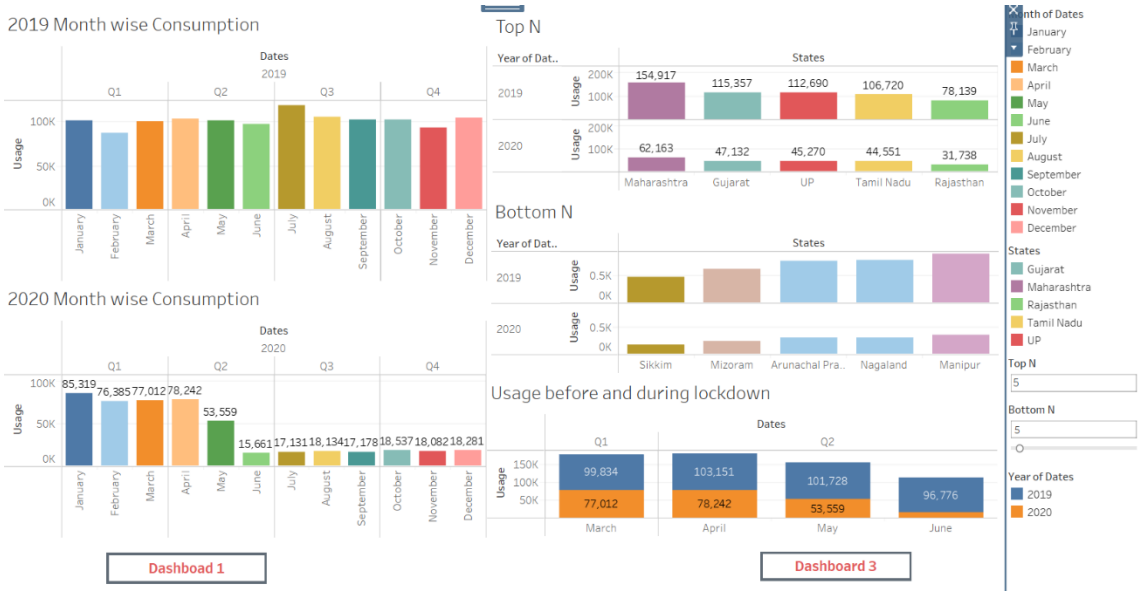
Metro city states



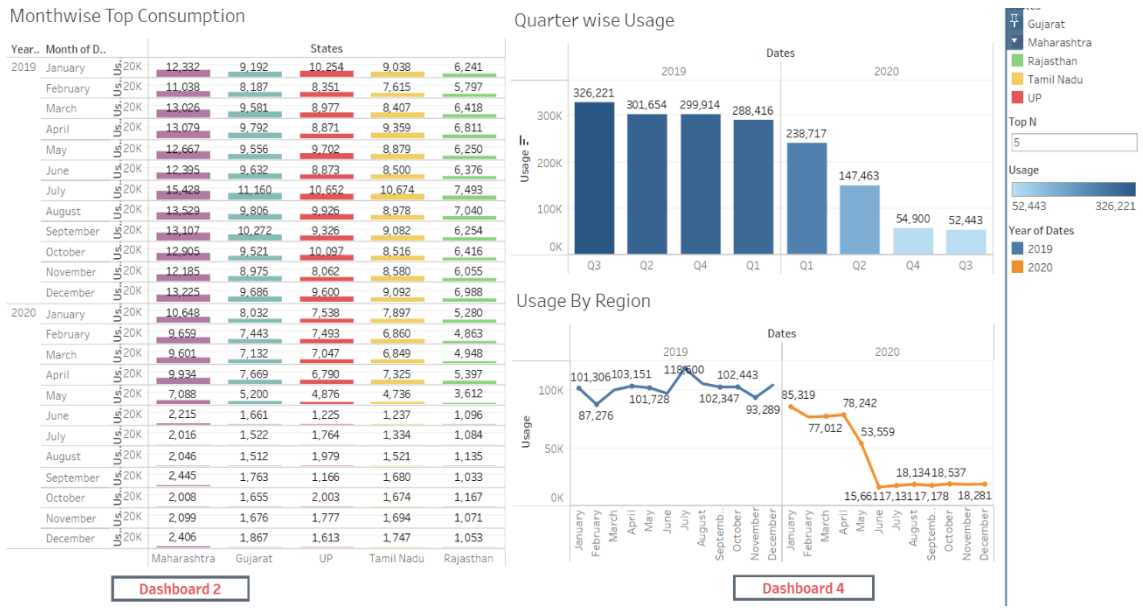
DASHBOARD 1



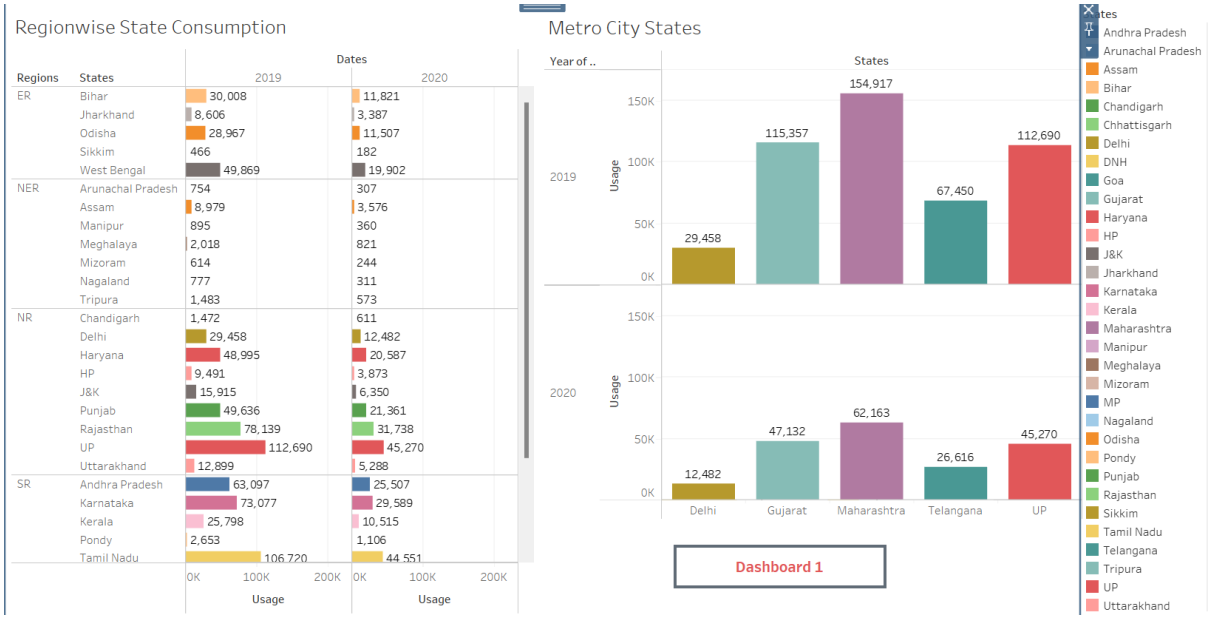
DASHBOARD 2



DASHBOARD 3



DASH BOARD 4



4.ADVANTAGES

Electric power has many advantages domestically and industrially, as most of the equipment run by electric power. Brightness in the night is only possible by the use of electricity. Almost all the factories and industries are running due to electric powers. The advantages of electric consumption is its reliable and uninterrupted supply runs the equipment efficiently and continuously. The transportation of electricity is easy once the transmission lines are functional. They work for years and need no or very less maintenance. The inversion of electric power is one of the best inventions which have changed human life drastically. It allows people to do more activities.

According to the U.S Energy Information Administration, fossil fuels such as natural gas, coal and petroleum produced 67% of the nation's electricity in 2013. In addition to obtaining electricity from nuclear power plants, some people can get hydropower, or electricity that comes when you harness the energy of falling or running water. If you live in a windy area or one that receives lots of sun, wind or solar power might be an attractive energy option. It's also possible to generate electricity by using heating from below earth's surface to produce steam that turns turbines. People also generate electricity from biomass, which is material from sources such as wood, fuel crops and agricultural wastes.

DISADVANTAGES

- Power plants that are used in the production of electricity burn biomass in order to produce suffer dioxide and nitrogen oxides.
- A lot of radioactive material is released that can be lethal to humans and other organisms.

These are two major pollutants that harm the environment.

One of the biggest issues with electricity relates to how it is generated. Most of our current electricity requirement are fulfilled by fossil fuel based plants, more commonly known as thermal power plants. These generate greenhouse gasses, apart

from other wastes. Hydroelectricity has its loss of animal habitat and possible anaerobic conditions in impounding reservoirs, among others. Nuclear power also has its own issues, most specifically the risk of leakage and disposal.

5.APPLICATIONS

India is the 3rd largest electricity consumption country. Energy use has doubled since 2000, with 80% of demand still being met by coal, oil and solid biomass.

On a per capita basis, India's energy use and emission are less than half the world average, as are other key indications such as ownership, stell and cement output. As India recovers from a covid induced slump in 2020, it is re-entering a very dynamic period in the development.

Solar power is set for explosive growth in India, matching coal's in the India power generation mix within two decades in the STEPS -or even sooner in the sustainable development scenario. As things stand, solar accounts for less than 4% of India's electricity generation, and coal lose to 70% by 2040, the coverage in the low 30% in the STEPS, and this switch is even more rapid in other scenarios. This dramatic turnaround is driven by India's policy ambitious notably the target to reach 450GWt of renewable capacity by 2030, and the extraordinary cost competitiveness of solar, which out-competes existing coal fired power by 2030 even when period with battery storage.

Energy demand for road transport in the STEPS is projected to more than double over the next two decades, although this growth in the STEPS is fuelled by direct- based freight transport. Transport has been the fastest growing and use sector in recent years, and India is set for a huge expansion of transportation infrastructure from highways, railways and metro lines to airports and ports.

Different factors such as demography, climate and economics govern electricity usage patterns at local contribute to wide variables in electricity usage among and within geographic regions.

6. CONCLUSION

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.

Analysing energy consumption within the specific context of its usage, such as home heating, clarifies the nature of the consumption process and aids in the understanding of consumer motivations and expected the analysis of energy consumption patterns to include corresponding levels of energy conservation behaviour, researches gain additional insight into opportunities for promoting behaviour change.

Our study is an attempt towards using remote sensing data and image processing driven methods to understand local scale electricity consumption pattern and understanding socio-economic dynamics within cities.

7.FUTURE SCOPE

Many assessments of future electricity demand in India project large increase in electricity consumption from adoption of air conditioning technologies in the buildings sector over the next 2 decades

In India government has been pushing for the transportation sector's electrification, starting with two and three vehicles, which is further likely to increase overall electricity demand. As of 2020 in India, there are 152000 registered electric vehicles. Air conditioning related electricity demand accounted for 32.7TWh7TWh contributing to less than 2.5% of the total demand in 2019

However, both air conditioning and transport electrification are anticipated to introduce structural changes in the temporal and spatial trends in electricity consumption patterns, that has important ramification for long-term resources planning for the electricity sector.

The India government has set a goal of converting 100% of two-wheeler sales and 30% of all vehicle sales to electric by 2030, so the starting point is vehicle sales at the state level. Using the regression equations of the corresponding GDP growth scenarios, we can project car sales with the EV targets by 2030 met in the rapid growth scenario. From vehicle sales and conversion rates, we get an estimate of the number of EV that will require charging.