**Final Task Report**

**Date: -** 20/03/2023

**Task: -** Power Plant Data Study

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**Data Assigned: -** 19/03/2023

**Assesment: -**

CO2 Emission and Temperature data of different power plants around the world is provided and we have to find some insights in this data. Data is provided according to the country, monthly, yearly, continent, city wise respectively.

**Deliverables: -**

* Data consist of coordinates of each power plant. We have to plot the points and show their location on the maps with different icons based on the type of power plant.
* Create a report of findings from the CO2 Emission and Temperature change due to a power plant.

**Markers Plotting on Map**

There are two instances of this application. First one is the API which will filter and clean the data from the CSV provided to me and sends the filtered data as a GET response. Second one is the front-end where I will make a GET request to my API for the data which later on will be used for plotting.

I first created the API. I installed the required dependencies mentioned below: -

* Node.js
* Express.js
* Typescript
* http-status-codes
* Dotenv
* csv-parser
* cors
* body-parser

I started working on the boilerplate code which included the folder structure like this: -

This is the folder structure that I followed for the API.

I first created an interface and a model of the data that I needed to send as a response so I created an interfaces with power plant name, country, location, primary fuel, capacity and then I created a model of it.

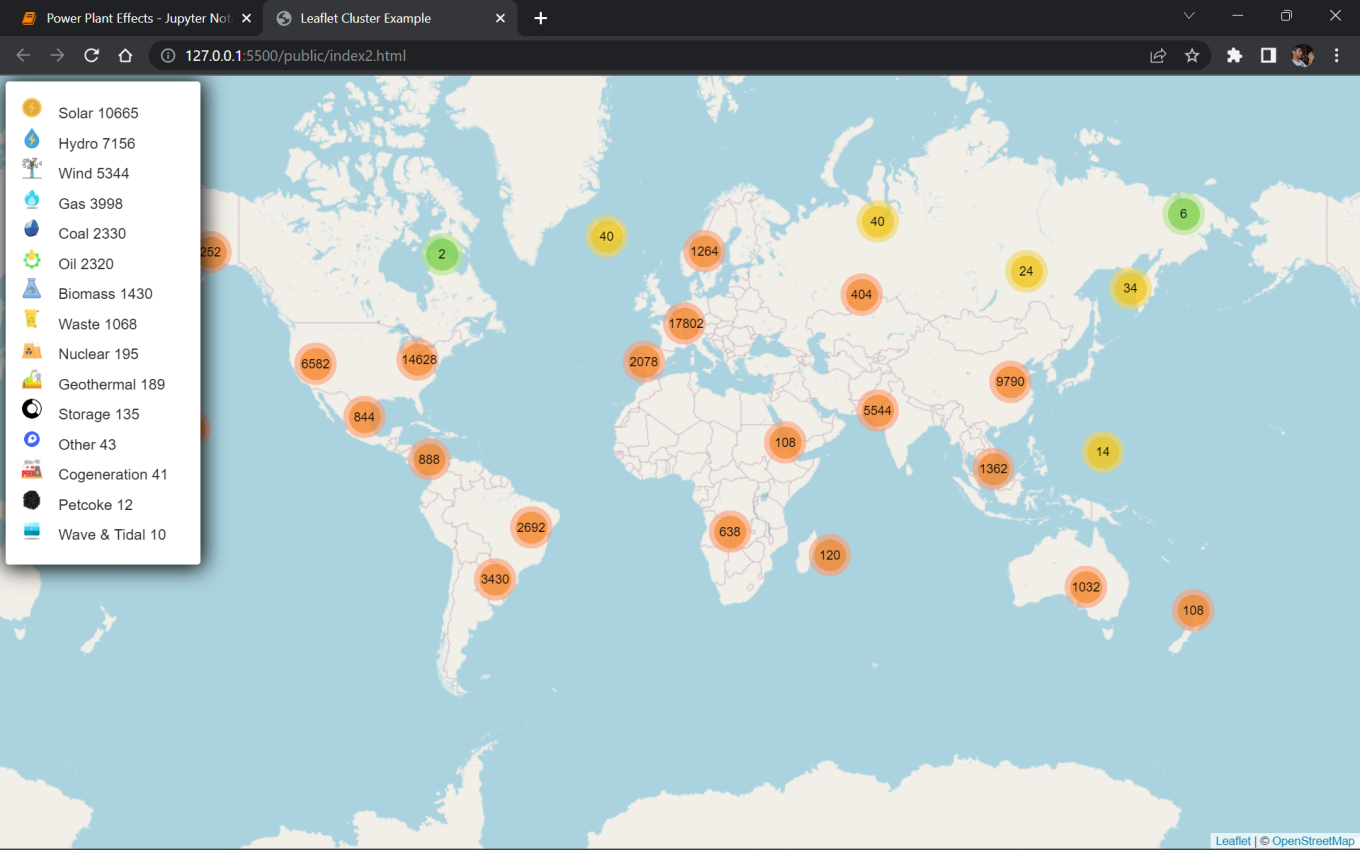
I read the data from the CSV file using csv-parser and created objects of my model and feed the necessary data to each object and created an array of objects to be returned as a response.

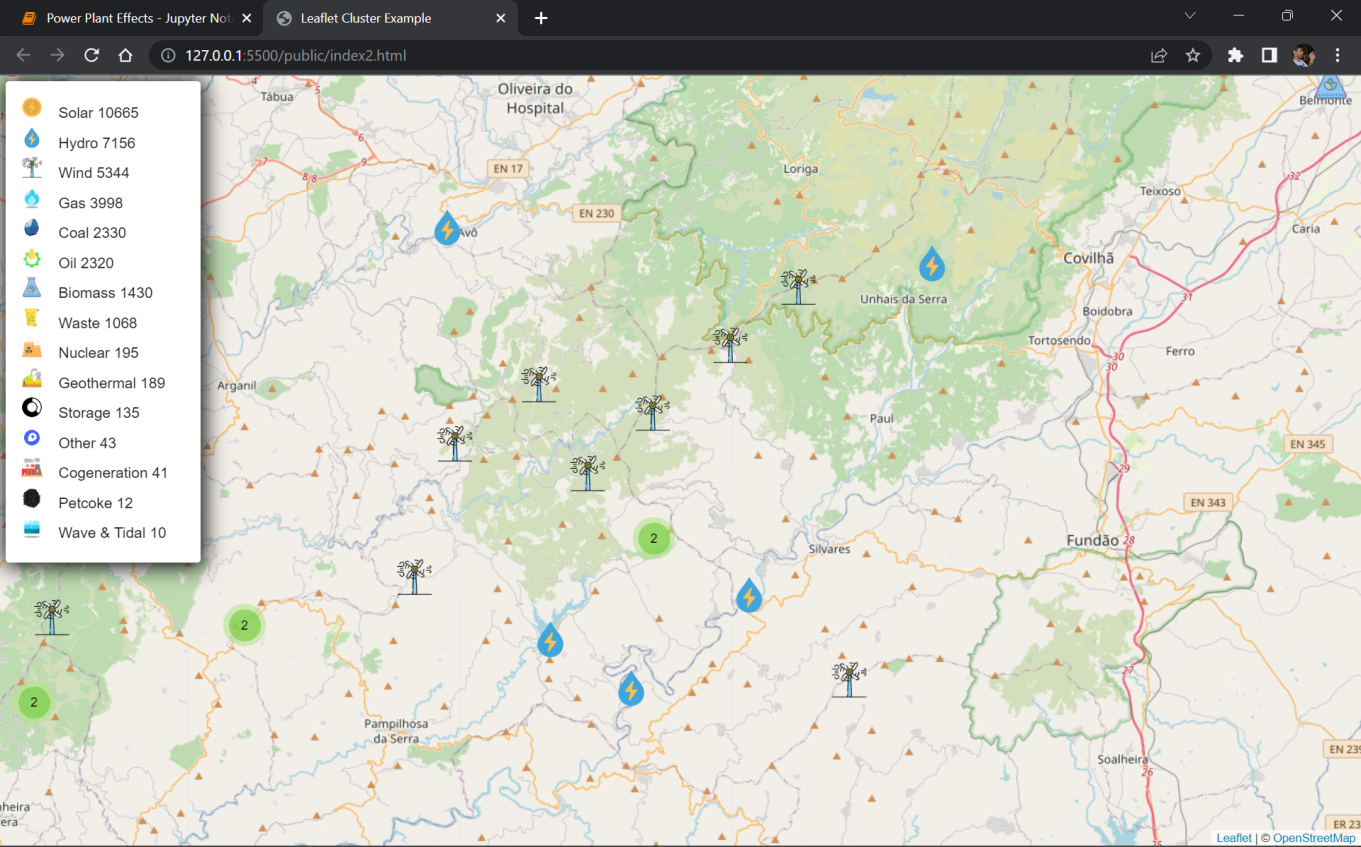
After setting the route, I tested the API using POSTMAN to see if I was able to receive the data or not. After the test, I moved to the front-end part.

I used HTML, CSS, JavaScript for the fron-tend.For maps, I first used MapBox GL JS and tried to render all the markers on the map. MapBox GL JS was using more rendering power and it was very difficult to move the map around as it froze after the render. I tries clustering but clustering requires GeoJSON in MapBox so I looked for another option.

I switched to LeafLet for maps and markers as it uses less rendering power and provides the ability to cluster my markers efficiently.

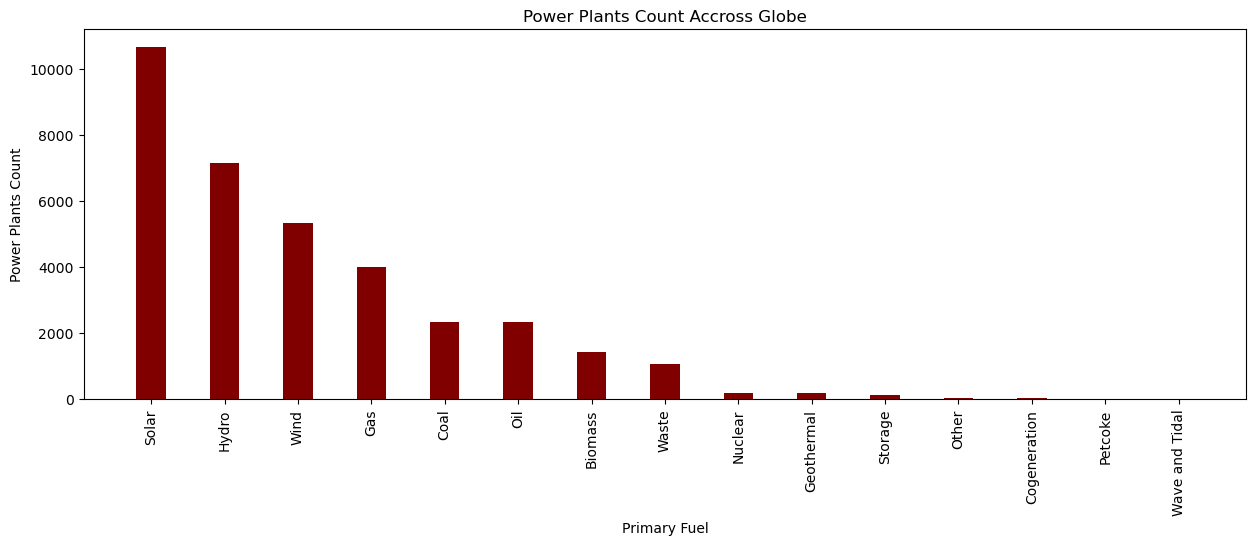
Below is the screenshot of how the cluster points look like: -





**Analysis**

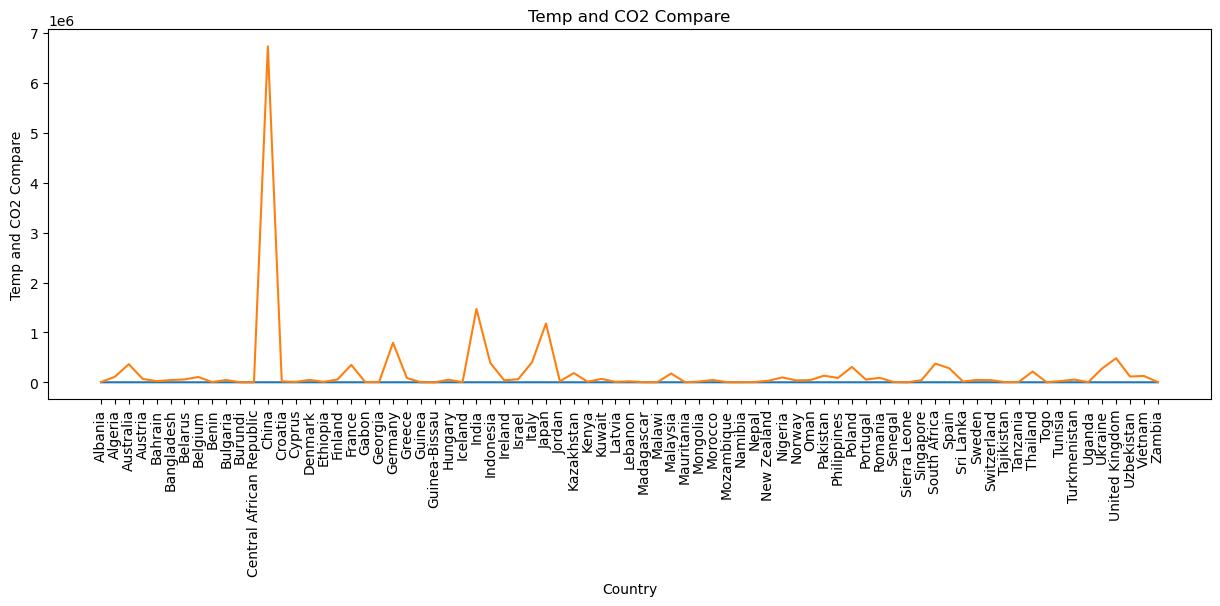
From global\_power\_plant\_database, I checked all types of primary fuel that is being used by the power plants around the world and there were total 14 types of primary fuel and some others primary fuels that are being used. I plotted a bar chart for the most used primary fuel and these were the results.



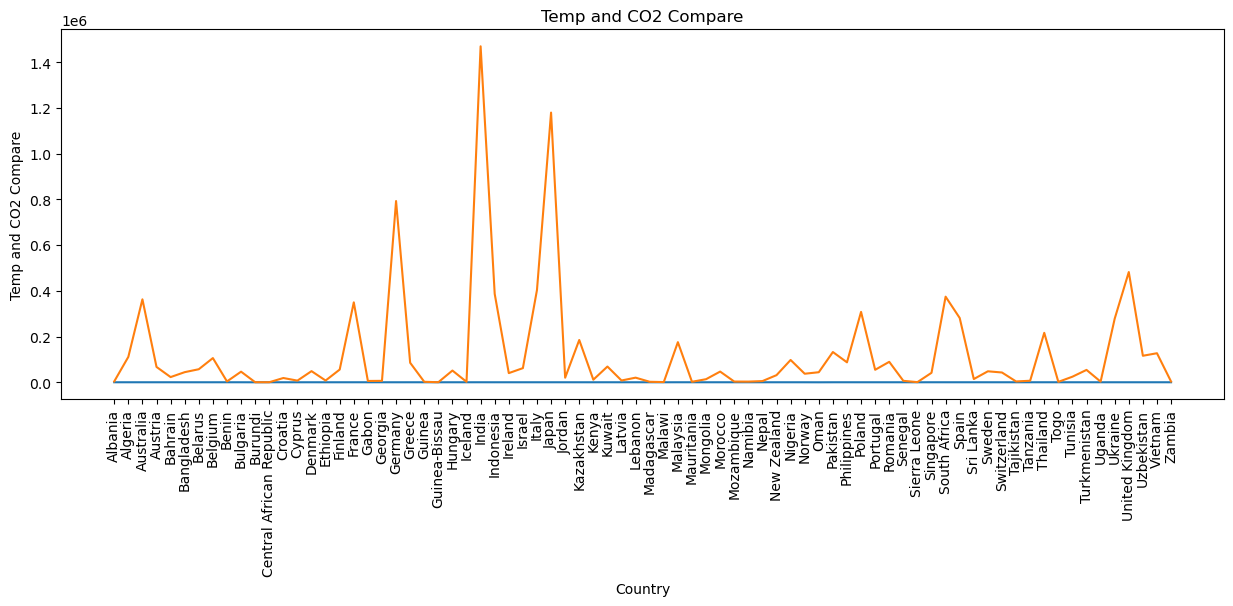
It is clear from the above graph that solar is most used primary fuel across globe. But this graph doesn’t give much information about different aspects related to it like CO2 emission and temperature change.

I worked on the other two files to look for some insight. Data was distributed according to city names and year wise so I aggregated the data according to the year so that same year data is available to me then I filtered the data again according to the country to get the unique countries data. This filtration resulted in data of 77 countries from year 1995-2019.

Now, I calculated the average temperature and average CO2 from 1995-2019 and plot a line chart.



From the graph, it was clear that China’s CO2 was the highest among others and it was an outlier. If we remove China from the Dataset then there were two countries with higher CO2. The graph is below



India and Japan were the next highest in terms of CO2 emission. So I first studied the number of plants, CO2 emission over the years and temperature change in China to understand the cause of this.