Overview of Website Skeleton.

We present the initial website skeleton at: energyvis.github.io .

Our website visualizes key aspects of global power plants and energy distribution through three main sections: (1) The **Global Summary** section provides an overview of worldwide power plants along with summary statistics at the global level. (2) The **Plant Distribution** section allows users to explore the geographic spread of power plants and view detailed statistics by selecting specific countries. (3) Lastly, the **Power Growth** section incorporates time-based data to show how power generation and distribution have evolved over the years.

Figure 1: Global Summary.

The sketch of **Figure 1** shows the layout of the **Global Summary** section as follows. Users can choose which aspect to visualize on the world map, such as the ratio of green to traditional energy, total power generation, or overall capacity. In addition to the map-based distribution, summary statistics are displayed at the bottom for a comprehensive overview.

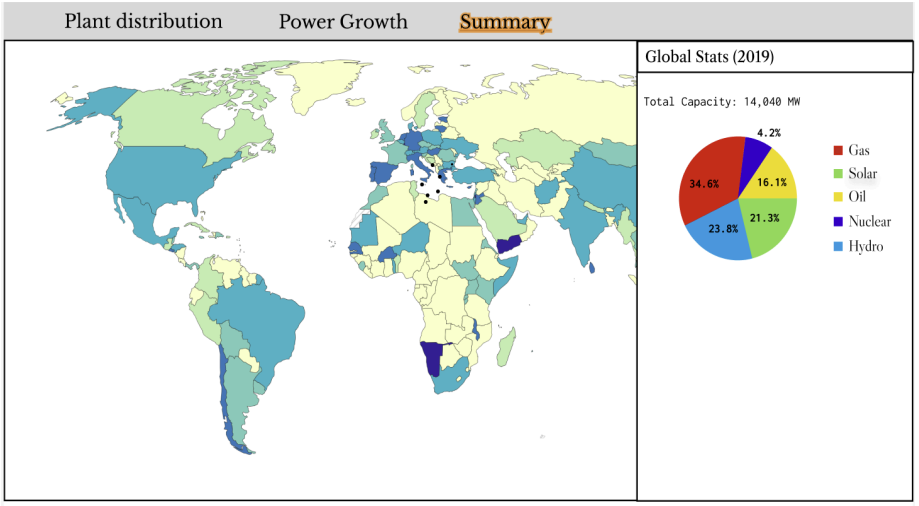


Figure 2: Plant Distribution.

The sketch of **Figure 2** shows the layout of the Power **Plant Distribution** section. In this section, we draw one dot per power plant, the color indicating the type of fuel utilized by the plant, its size representing the power output. The user can click on countries. When this happens, a window pops up describing the power mix of that country, including the distribution of maximum power output per fuel type, and the percentage of green energy in the total mix. We consider green energy, all the energy derived from sources with low CO2 emissions, such as solar, wind, geothermal, hydro, and nuclear. We also consider a different dichotomy: renewable vs non-renewable, which groups together solar, wind, geothermal, hydro on one side, and nuclear, gas, coal on the other. Importantly, the information shown would only consider the max capacity of each plant and fuel type, and ignore the fluctuations due to natural conditions (solar production peaks during mid-day / wind requires appropriate meteorological conditions, etc.).

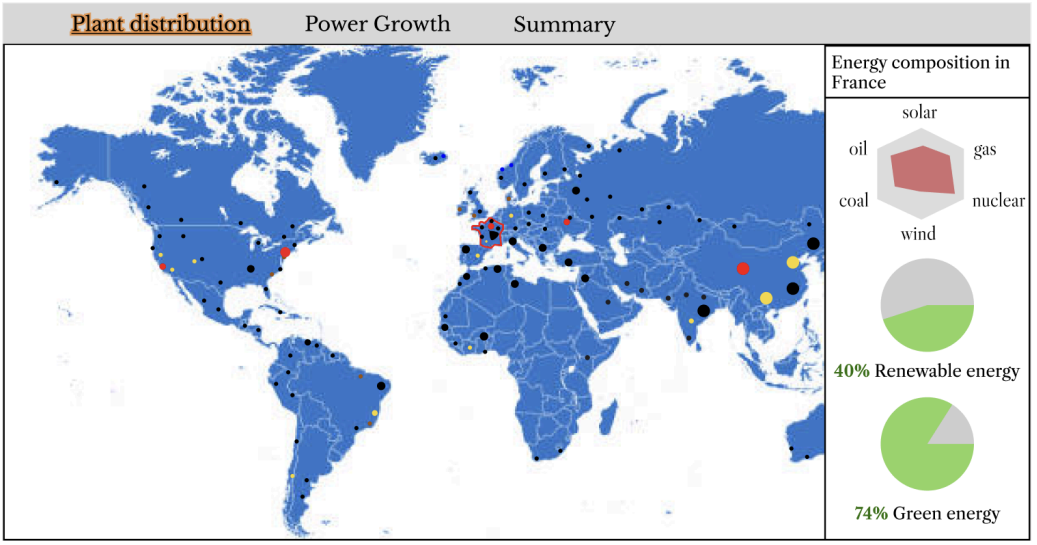


Figure 3.1: Country-wise Growth of Power Supply

Figure 3.1 shows the layout of the **Growth of Power Supply** from the user-specified countries. The user can click on a specific country on a global map, and a pop-up box will display the growth trend of the power supply from each energy source between the years 2013-2019.

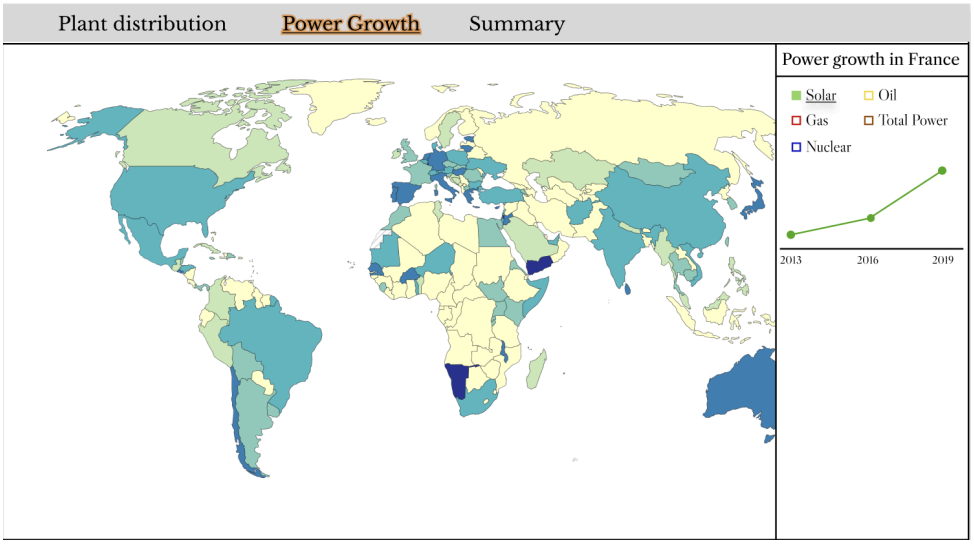
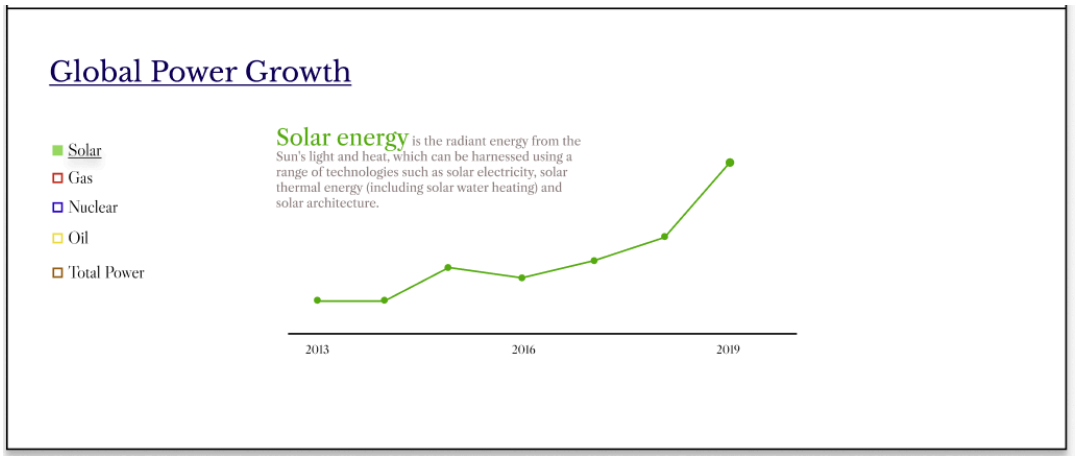


Figure 3.2: Global Growth of Power Supply

Figure 3.2 shows the trend of global (world-wide) power supply growth between 2013-2019. The user can choose the specific energy source of interest by clicking on the box, and the line chart on the right will display the growth curve with a description of the specific energy source.



Tools to be used:

We will use **JavaScript** to build a dynamic and interactive website that allows users to explore global power plant data.
To visualize geographic distributions of power plants in Figure 2 and Figure 3, we will use **Leaflet.js** to integrate interactive maps. To display the trends of power growth in Figure 3, we also use both **D3.js** and **Plotly.js** to create responsive charts and graphs that highlight trends across regions and energy types.To simplify the javascript logic, we plan to preprocess our data using python, and generate a json file that contains already all the relevant information to be processed. This allows us to avoid redundant computation on the client side. We plan to use the following structure for our code:

```
website/data/processed_data.json
website/js/main.js
website/style/main.css
website/index.html
```

processed_data.json contains the preprocessed data generated by the python script. **main.js** javascript logic, including all the event handling. **main.css** is defining the style of each element, relying on flexbox to elegantly adjust the size of elements. Finally, **index.html** is defining all the elements of the page, including the three tabs, maps, and side panels.

What to add: We plan to add the prediction of power growth in the future years to the “Power Growth” page. For predictive modeling, we will use **PyTorch and a statistical time-series prediction model** to forecast future distributions and energy transitions based on historical data, offering insights into the evolving global energy landscape.