COM480-EnergyVis

The EnergyVis Team

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Chapter 1: Website Construction Process

The website is built using a combination of data processing tools and web design techniques to create an interactive visualization of global power plant data.

Data Preprocessing (Python):

The raw power plant data has been preprocessed using Python scripts. This preprocessing step aims to generate a `processed_data.json` file, which contains all the necessary information for the website, thereby avoiding redundant computations on the client side, as well as simplying the javascript logic.

Website Structure (HTML):

- The `index.html` file defines the overall structure of the web page. It includes the three main sections (tabs): "Global Summary" "Plant Distribution" and "Power Growth".
- Maps and side panels for displaying statistics and charts are also defined within this file.

Styling (CSS):

The `main.css` file is used to style the elements defined in `index.html`, including buttons styles and leaflet containers, representing the displaystyle of world maps.

Interactive Logic (JavaScript):

- The `main.js` file contains the JavaScript logic for the website, including all event handling and dynamic updates.
- Mapping: `Leaflet.js` is integrated to create interactive maps for visualizing the geographic distribution of power plants in the "Plant Distribution" and "Power Growth" sections.
- Charting: `D3.js` and `Plotly.js` will be used to create responsive charts and graphs, particularly for displaying power growth trends in the "Power Growth" section.
- User Interaction: We also design logic handling user interactions such as selecting countries to view detailed statistics or clicking on energy sources to see growth curves.

Chapter 2: Potential Challenges and Design Decisions

Throughout the development of our project, we encountered several key challenges across both data processing and website implementation. Addressing these required iterative problem-solving and close collaboration.

Data

One major challenge was dealing with inconsistencies and missing values in the raw power plant dataset. The data came from different countries and sources, often with non-standardized formats, duplicate entries, or incomplete records. We had to carefully preprocess and clean the data using Python, ensuring it was structured consistently and could be easily parsed by the front-end visualization tools.

Website Design and Implementation

Turning our ideas into a functional, user-friendly website was challenging. We iterated on the layout to balance global and country-level views, ensured responsiveness across devices, and used JavaScript to handle tab interactions and dynamic visual updates efficiently.

Global Summary

For the Summary tab, our challenge was designing a clear and informative choropleth map that accurately conveyed global energy trends. Choosing an appropriate color scale and integrating it with the pie chart visualization required experimentation to avoid misleading visual impressions while maintaining aesthetic clarity.

Plant Distribution

The Distribution tab needed to show a large number of power plants without overwhelming the map. We had to fine-tune the zoom level, marker style, and interactivity so users could explore global data while easily accessing specific country details. Integrating multiple charts into a single panel without cluttering the interface was also a significant hurdle.

Country-wise Growth of Power Supply

The Growth tab involved visualizing multi-year, multi-source data in a meaningful way. We had to ensure that the line charts were readable and scalable across countries with very different energy profiles. Handling transitions between country selections and keeping the user interface responsive was particularly complex due to the volume of data and chart rendering performance.

Chapter 3: Sketches to Final Design

Before building our final website, we created a set of design sketches to plan the layout, features, and user experience of each tab. These initial drawings helped us visualize how users would interact with the data and guided our decisions on structure and content. In this chapter, we present the early designs for the Summary, Plant Distribution, and Power Growth tabs, and highlight how each evolved into the final, interactive versions on the website.

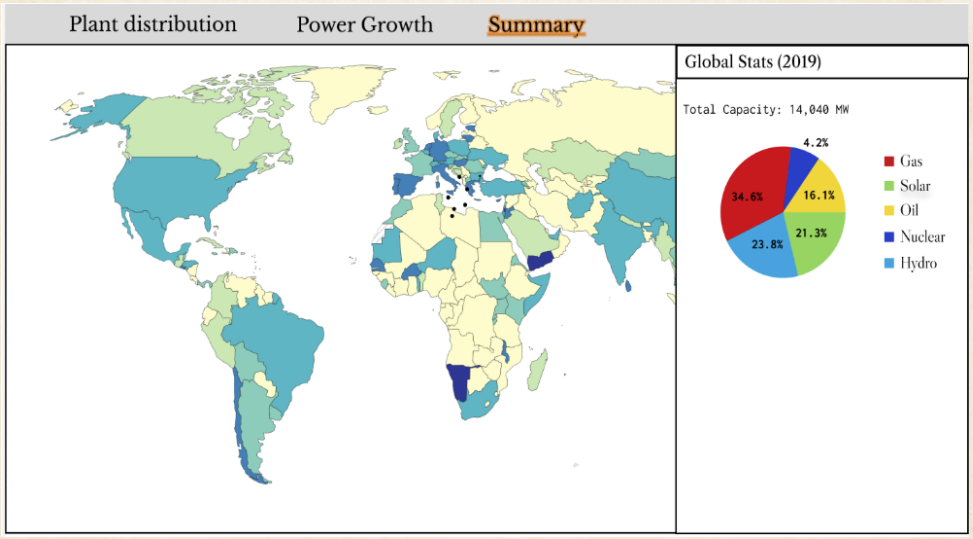

Figure 3.1: **Sketch of Summary Tab.** Originally, the summary tab featured a colored world map and a pie chart for global energy stats, but it lacked clarity and cohesion.

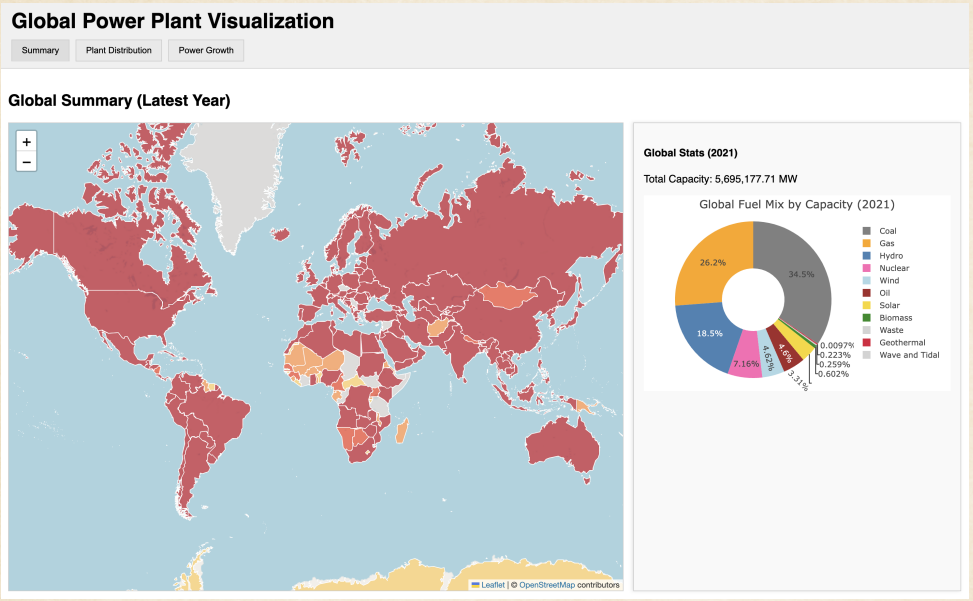

Figure 3.2: **Final Summary Tab.** The updated version refines the color scheme, improves map readability, and integrates the chart more cleanly into the layout. The total energy capacity and percentage breakdowns are now easier to interpret, offering a more informative and visually consistent snapshot of global power generation. Moreover, it is possible to click on countries to get a per-country energy-mix summary.

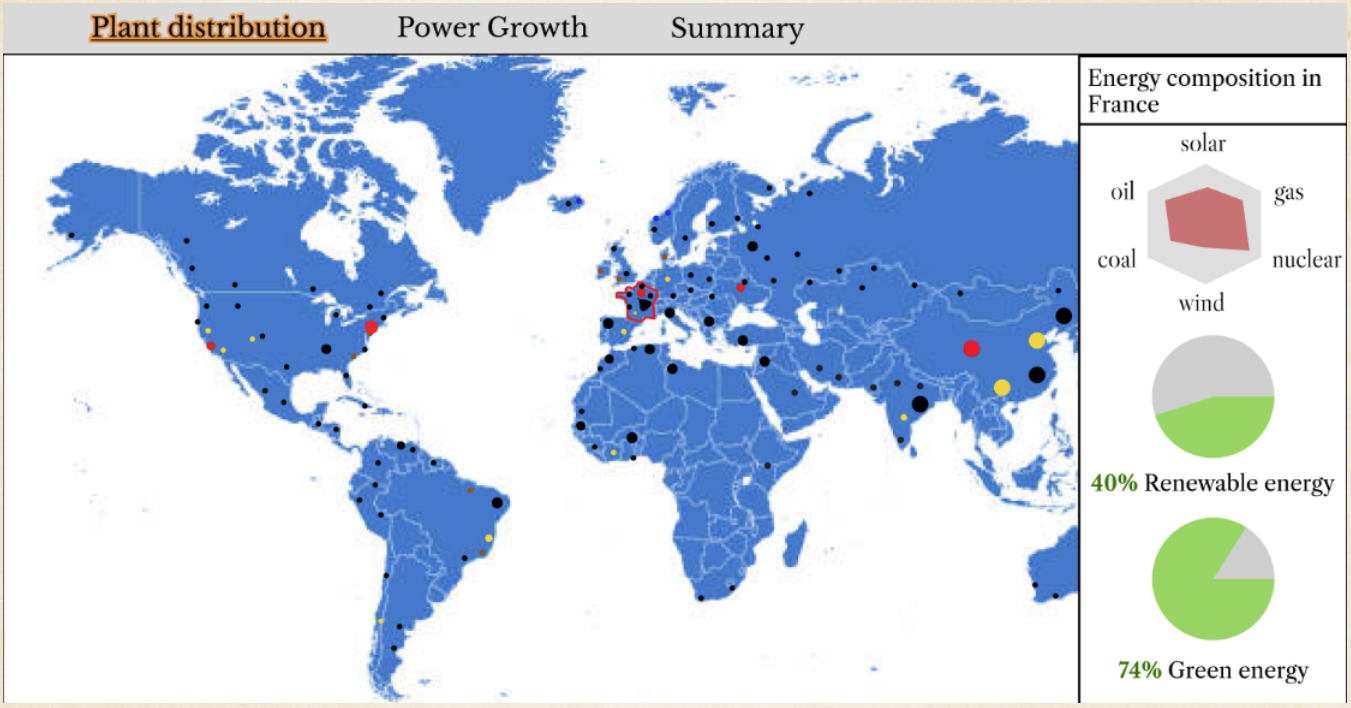

Figure 3.3: **Plant Distribution Tab.** In the initial design, this tab showed a static global map with power plants marked by colored dots and a fixed panel showing France's energy breakdown.

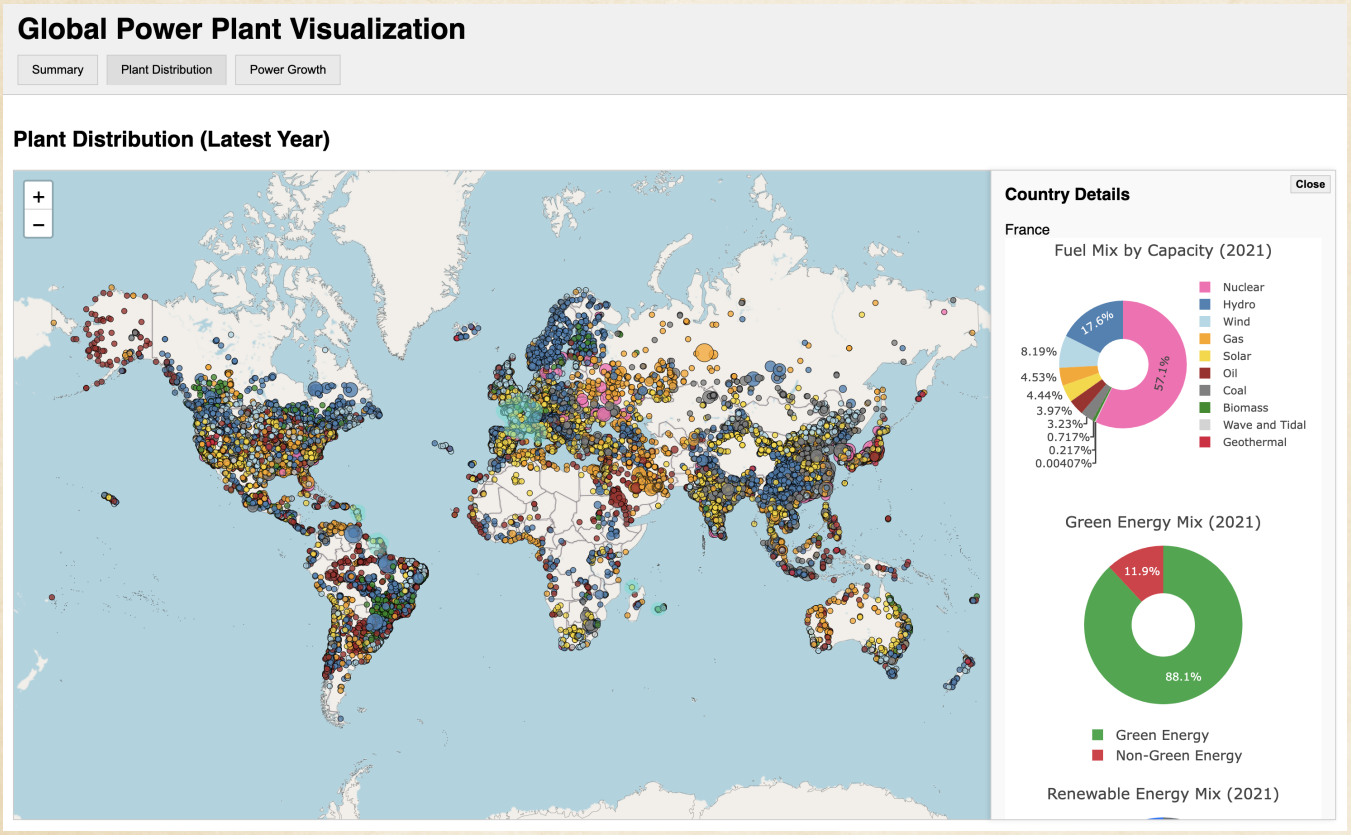

Figure 3.4: **Final Plant Distribution Tab.** In the final version, we introduced interactivity—users can now click on any country to view its specific energy composition, dynamically updating the radar and pie charts on the side. The map remains the central focus but is now more polished and informative, making the visualization more engaging and scalable.

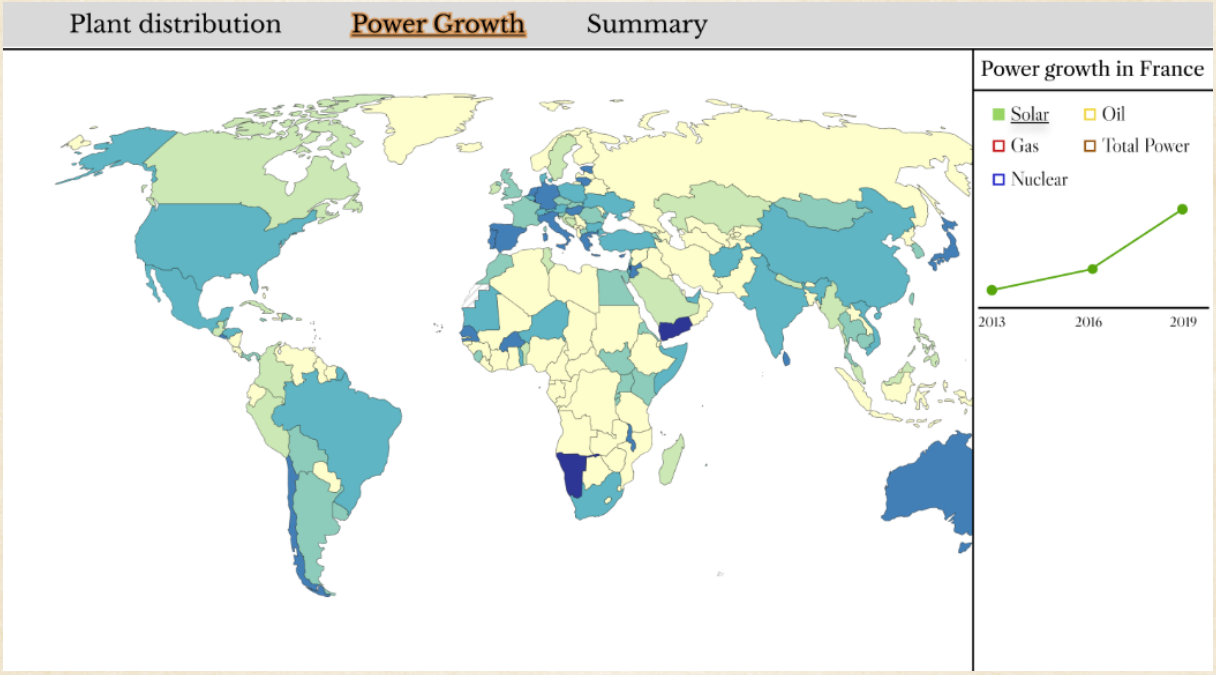

Figure 3.5: **Power Growth Tab.** The early version only showed power growth in France with a basic line chart alongside a static world map.

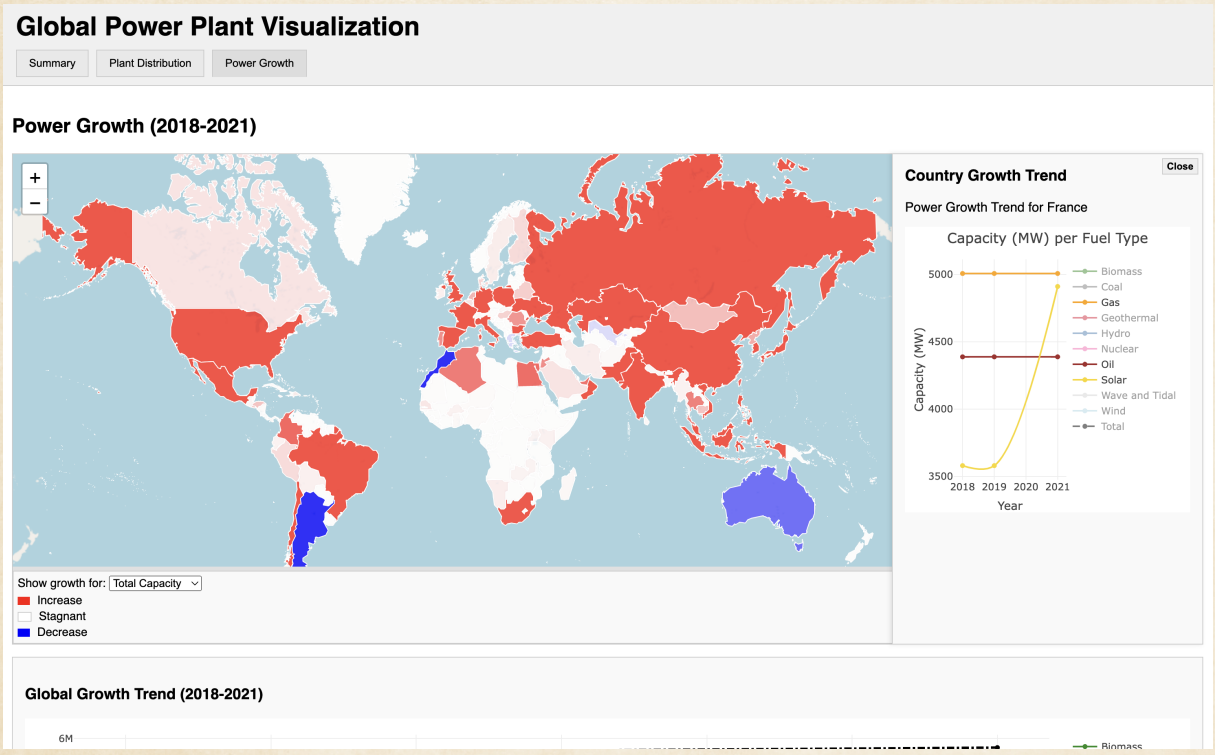

Figure 3.6: **Final Power Growth Tab.** The final version significantly expands functionality by allowing users to select any country and view its multi-source power growth over time. The improved chart now includes trends for all the fuel sources that we are covering, including solar, oil, gas, nuclear, and total power, offering a clearer and more interactive way to explore energy evolution globally. User can see the energy capacity increase/decrease for a specific country by hovering above or clicking on that country, which reveals the side panel.

Chapter 4: Peer Assessment

We worked on everything as a team from start to finish. Instead of splitting up tasks, we did most things together: brainstorming ideas, doing the work, giving feedback, and making changes. Everyone stayed involved throughout, and we made decisions together. It felt like a real team effort where each person had a voice and contributed equally.