

IT'S GETTING GREENER



PROCESS BOOK

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Introduction

As populations increase and people get richer, the demand for energy across many countries in the world is growing. As a consequence, global energy consumption will continue to grow year after year if this increased demand is not offset by energy efficiency improvements in other sectors. This growth makes it more difficult to transition our energy systems from fossil fuels to low-carbon energy sources since energy produced from low carbon sources must meet this increased demand and attempt to replace existing fossil fuels in the energy mix.

The goal of our visualization is to discuss if the energy transition is on its way to becoming clean and therefore to reduce the amount of carbon emissions. First, we would like to compare the primary energy consumption that comes from renewables (hydro, solar, wind) and fossils (gas, coal, oil). Then, we would like to show the reader the global renewable energy growth that has been happening during the past few decades on an animated map, but also show him/her country-wise details on demand. Furthermore, it would be interesting to get an insight about the pioneers in this clean energy revolution by looking at the green electricity generation during all these years.

This process book presents the steps we have followed in order to achieve the final visualizations displayed on our website. It also details the challenges that we have encountered as well as the provided solutions.

Data

This project is based on worldwide energy data that can be found on Kaggle. Also, it was completed by a second dataset that contains the data necessary to visualize the world map. This time series dataset contains information about energy generation and consumption from 1900 to 2020 for every country. In total, there are 120 columns, but we have extracted only the relevant ones, based on the different topics that were addressed. In the first visualization, we used the gas, coal, oil, solar, wind and hydro consumption. In the second one we used renewable energy consumption.

Our path

Step One

Brainstorm about common interests in order to find an engaging dataset that we all like.

Step Three

We created sketches of our ideas that were based on three main axes: comparison between renewables and fossils, renewable energy consumption growth and leaderboard with the pioneering countries.

Step Five

When the individual parts were done, all the visualisations were put together on the website.

Step Two

Collect dataset and do some exploratory data analysis. This helped us see what type of visualisations would be possible.

Step Four

Each team member was assigned a visualisation and the coding part started.

Step Six

Finally, some text was added in order to build a data story.

Challenges

- One challenge was building the website itself. Despite the fact that we used [fullpage](#) and [Spectre](#) to make our website clean and easier to navigate, all tools require a bit of learning before you use them.
- One challenge with the stacked area charts was being able to transition between the “full range” and “expanded” (see further below) versions of the data. We had to be able to capture exactly what needed to be removed as well as added in our update function. Additionally we had to make the buttons trigger the function itself.

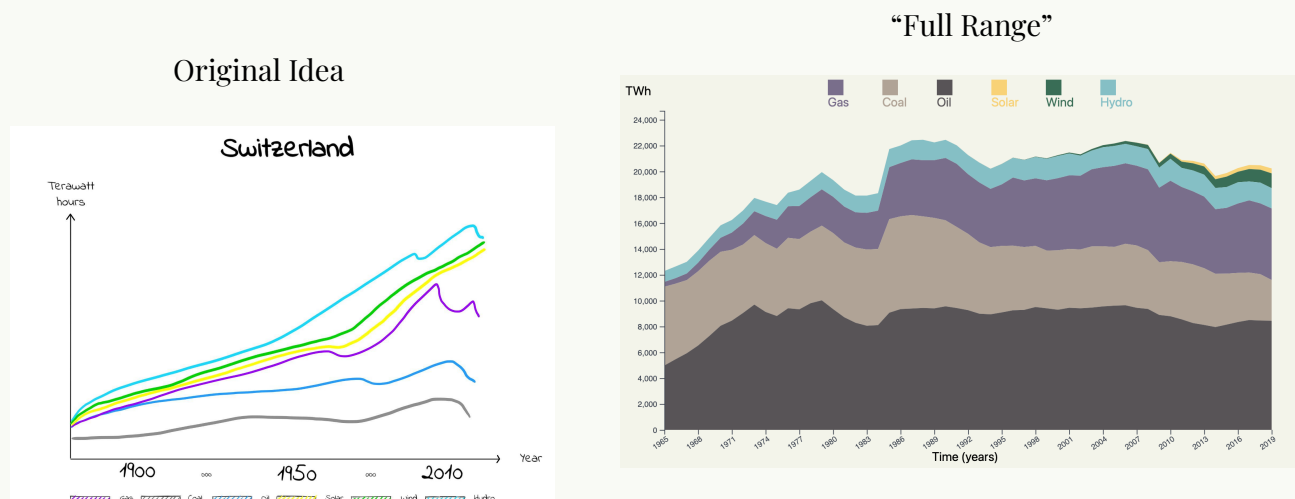
- For the stacked area chart, there was also a challenge related to making the legend hoverable, as there were different class names for each of the different charts (World, Europe etc..)
- One of the challenges was to deal with inconsistencies between the dataset used for creating the map and our energy dataset. An example is the name of the countries as one dataset used “United States of America” and the other used “United States”. Therefore, we had to find all of these inconsistencies and replace one of the values with the other.
- Another challenge was the lack of data for renewables consumption. To deal with this, we decided to assign a neutral color (gray) to that country and added a hover information with “unavailable data”. Also, we initially wanted to display the GDP of each country for the most recent year present in the dataset, but it was also missing for most of the countries, so we decided to only show the population.

Sketches and final design

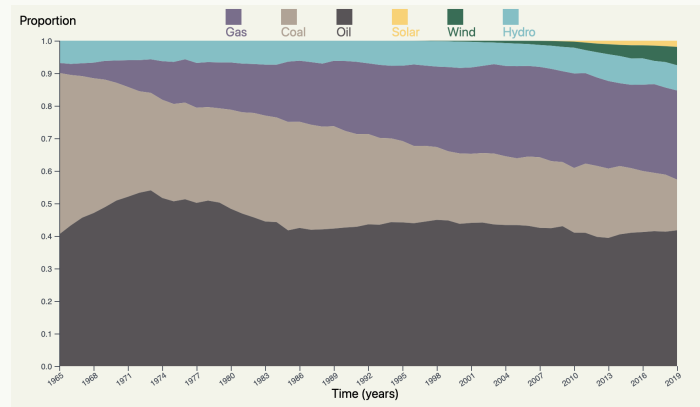
In the section below, we present the sketches we developed in the initial phase of the project and also show the final designs we came up with.

Fossils and renewables comparison

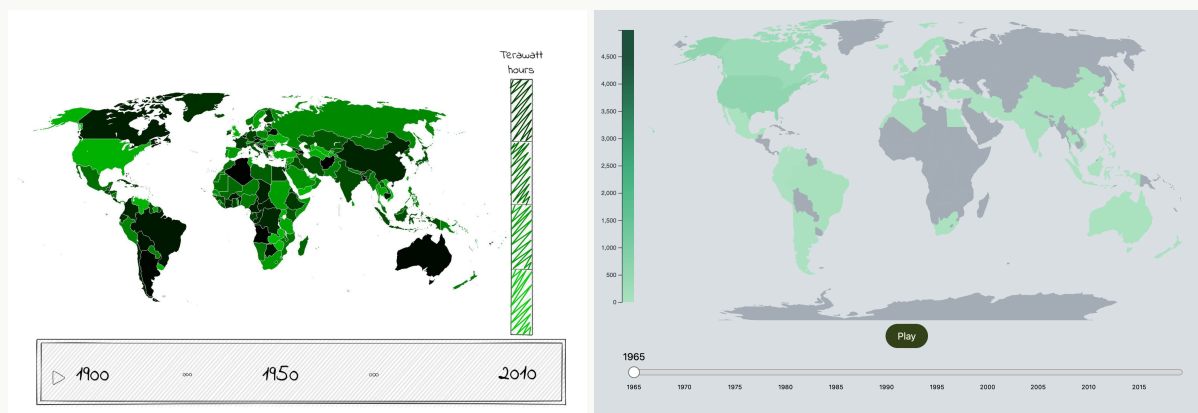
For this part, the stacked area chart is similar to what we wanted to achieve. Originally, we wanted to maybe include a brush feature using d3.brush. However, as most of the data on energy consumption was only clean starting from 1965, we decided that there was much use in adding a feature to zoom in on the time scale as the global picture was already pretty well represented in the standard chart. This standard/“full range” viewing mode gives a good idea of the global trend of consumption (e.g. increasing, decreasing etc..) but it can sometimes be difficult to identify the patterns between the energy sources themselves. Therefore, we added the option to view the data in “expanded”/“proportions” mode, where the data is stretched accordingly to take up the whole chart. This way, the comparison between the consumptions of the different energy sources is more evident.



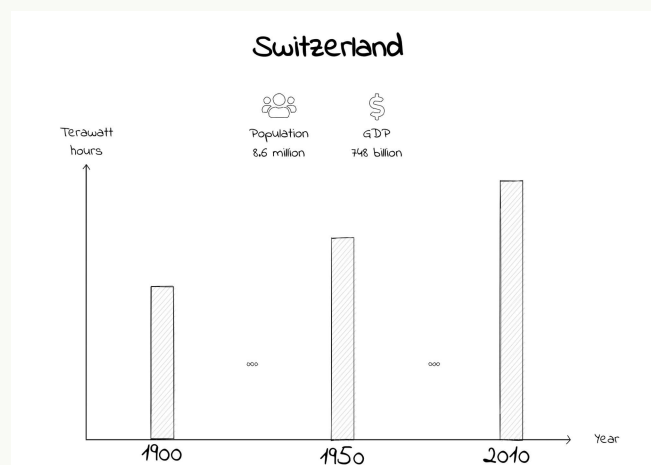
“Expanded”

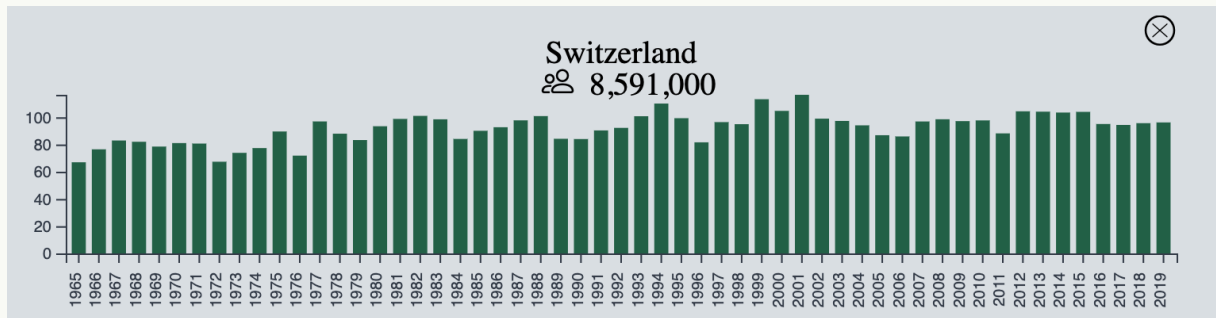


Renewables consumption map with details on demand

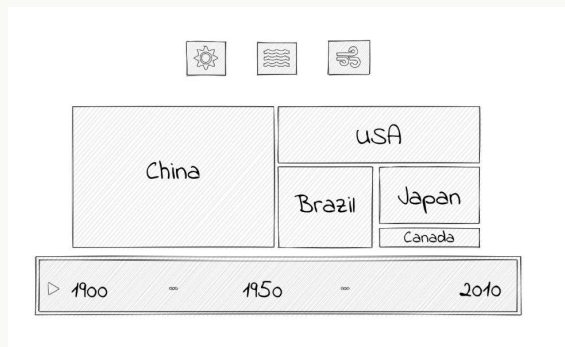


For this part of the website, the design is pretty close to the intended idea. Only minor position changes can be noted. Next, the idea was to show the reader country-specific data once he clicks on a given country. At first, we wanted to have a window that pops up and displays the chart, but we decided to display it near the map instead so that it doesn't hide it. An additional feature was added for hiding the chart by clicking on the close button. Also, as previously mentioned, the GDP was not included.





Pioneers



We were not able to create visualization in time. The last test was done with treemap.js and displayed an empty rectangle.

Peer assessment

The main contributions of each team member are the following:

- Mihaela: in the first part of the project I worked on designing sketches and exploratory data analysis. Then, I was in charge of the map visualization with details on demand. I also contributed to writing the process book and filmed the screencast video.
- Léon: In the first part of the project, I searched for datasets to find one that was suitable for us and I added some comments and plots to the exploratory data analysis. In the last part, I tried to build a treemap of the countries that have the largest renewable energy consumption. to the website. Unfortunately, I lacked organization and I did not have enough time to finish and have this visualization on the website.
- Gil: For the first milestone I mainly searched for datasets. In the second milestone I contributed to making the website skeleton and identifying the useful tools we could use such as [fullpage](#) and [Spectre](#). Finally, for the third milestone did the stacked area charts and the whole section that uses them (Europe through Norway).