RAISING AWARNESS ABOUT THE GLOBAL IMPACT OF DISASTERS

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INTRODUCTION

Goal

Our main goal with our visualisations is to **raise awareness** about disasters affecting the world. Focusing on both natural phenomena, such as earthquakes, and technological mishaps such as industrial accidents we want to shed light on such events leaving a strong mark on the populations. Fortunate people living in less affected areas of the world might not fully understand the scale of these disasters.

Target audience

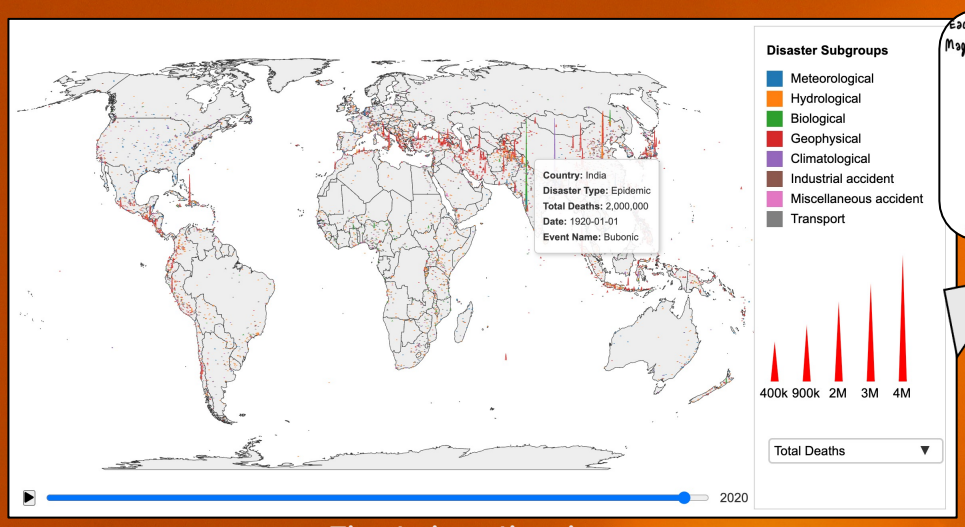
In addition to everyone we want to raise awareness among, our target audience are **researchers** in natural disasters and **geography students** and **educators**. These groups may have an idea of the data, but for deeper understanding, great visualisations are important. Accessible visual representations of historical disaster data and their geographical spread will aid anyone interested in the subject in developing a more robust understanding.

Originality

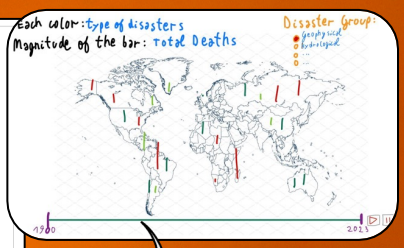
Our approach to make this subject original is to have interactive charts with the possibility to change parameters and areas to focus on. You might only be interested in earthquakes worldwide you are able to focus on that information. We have built our site such that you can switch between different categories of disasters across all features.

Originality also stems from the exploration of the inequalities regarding disasters, with the help of our Choropleth map. This depicts the response and help from other countries which, to our knowledge, has not been extensively explored online with this dataset.

SPIKE MAP OF DISASTERS ACROSS TIME



Final visualisation



Initial sketch

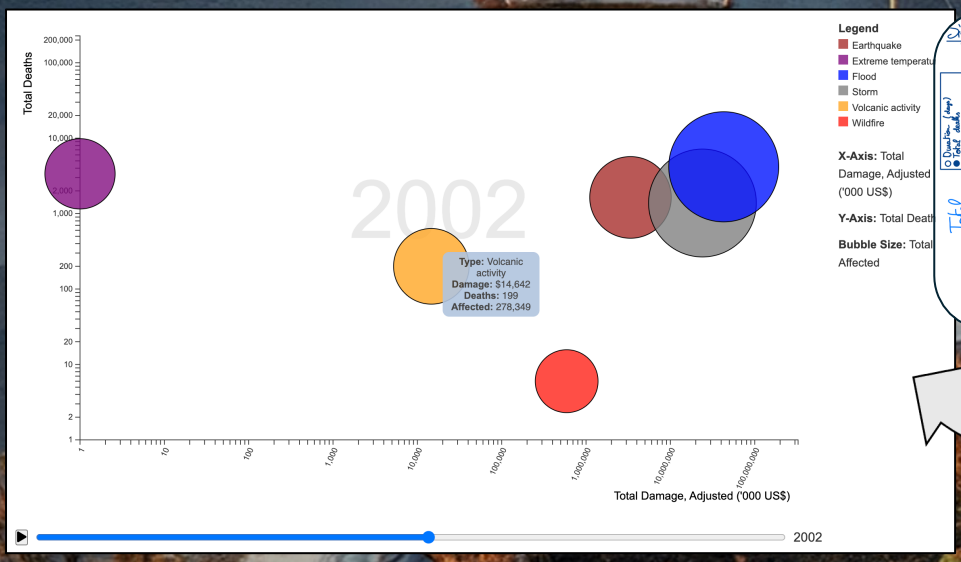
Brief description
In our initial visualization, we aim to dynamically illustrate the magnitude of historical disasters on a global scale. Each disaster will appear over time, marked by spikes that vary in length according to the severity of the event, such as the total number of deaths. This approach is designed to provide a preliminary glimpse into the historical significance and geographical diversity of disasters, enhancing our storytelling through visual impact.

Main challenge
One major challenge was the lack of precise geographical coordinates. Although we have country-level location data for all disasters, pinpointing specific locations required significant data preprocessing. Some disasters included additional columns with geographical names of locations, which allowed us to improve the availability of coordinate data from 10% to 60%. However, missing values in the disaster magnitude variable affected this improvement. Consequently, adjusting the magnitude filter might cause some disasters to disappear or appear from the visualization due to incomplete data.
This necessary compromise didn't significantly affect our primary goal: to offer users a preliminary visual representation of disaster magnitudes and their historical significance. However, it's important to note that due to incomplete or inaccurate data, some disasters, particularly in less developed countries, might be underrepresented.

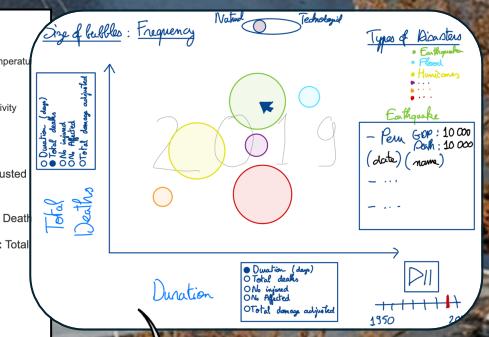
Surprising Discovery
While exploring the map, we discovered a discrepancy: a disaster thought to be in Pakistan was in Chile, revealed when hovering the mouse over the spike for more information. Initially, we suspected a preprocessing error, but the mistake was finally in the original dataset. This incident underscores the value of dynamic visualizations not only for exploring trends and dynamics but also for verifying the integrity of the data itself.

Additional challenge
Another challenge was managing the legend for the magnitude of the disasters. Disasters vary widely in their impact; some are frequent but less severe, while others are rare but devastating. We used a square root scale for spike sizes to balance visibility and comparability on the map, preventing it from becoming overly crowded. However, this approach means smaller spikes for many disasters, requiring users to zoom in for details. To keep the legend accurate across zoom levels, we display a fixed-size spike while dynamically adjusting the corresponding values, ensuring the legend remains useful and accurate as users interact with the visualization.

DYNAMIC BUBBLE CHART SHOWING YEARLY IMPACT OF NATURAL DISASTERS



Final visualisation



Initial sketch

Path to Final Result

To create the bubble chart, the process began with an initial sketch to conceptualize the layout and design. The first step involved plotting data for a specific year to ensure the scaling and visual representation were accurate. This initial plot allowed for adjustments to be made, particularly in terms of scaling. It was found that linear scaling was ineffective, so the focus shifted to logarithmic scaling. However, this also presented challenges due to the wide range of values, making it difficult to represent all data points visibly and accurately.

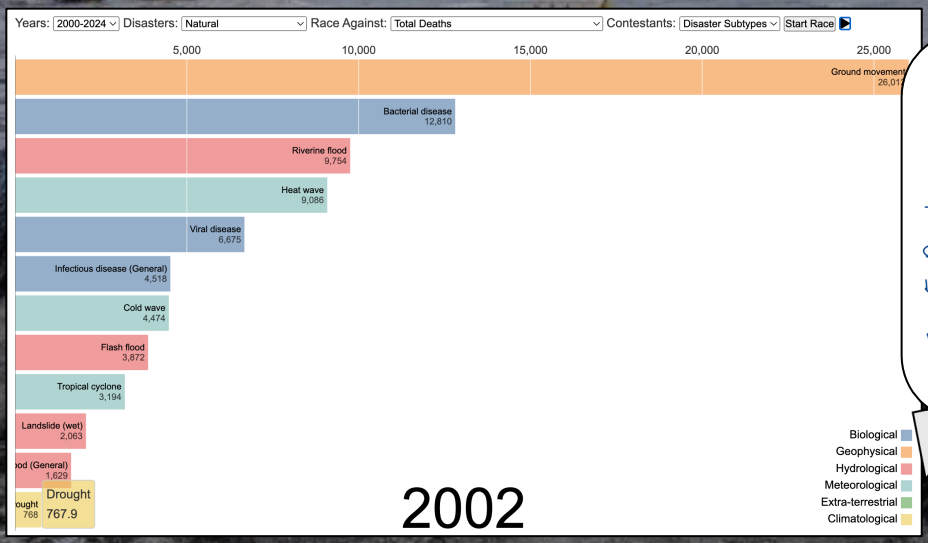
To address these issues, adjustments were made to ensure all elements were visible simultaneously. One key decision was to make the bubbles semi-transparent, which helped in overlapping situations and enhanced the overall readability of the chart. Once the scaling and visibility issues were resolved, the chart was expanded to accommodate data across all years, adding an animated play feature that transitions through the years, providing a dynamic and informative visualization of disaster impacts over time.

Challenges & Design Decisions

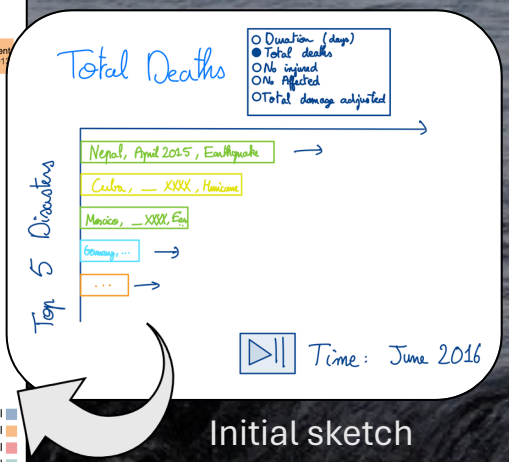
The primary challenge faced during the creation of the bubble chart was getting the scaling correct. Linear scaling was quickly ruled out as it did not effectively represent the data. Logarithmic scaling was more promising but required fine-tuning to balance the visibility of all data points, especially when dealing with extremes in the data sets. The final approach involved careful adjustment of the scales and making the bubbles transparent, which helped in cases of overlapping data points.

Another significant design decision was the inclusion of interactive elements, such as tooltips and animations. Tooltips were added to provide detailed information on hover, enhancing the user experience by offering immediate insights into the data without cluttering the chart. The play button and year slider were also implemented to allow users to explore the data over time, making the chart both interactive and informative.

CUMULATIVE BAR CHART RACE TRACKING DISASTER IMPACT



Final visualisation



Initial sketch

Description

The interactive bar chart race lets you chose a timeframe (1900 or 2000 to 2024), whether you want to use only natural disasters or add technological disasters; then the variable to race against (for example total deaths, total damage, ...) and the contestants in the race, being either the disaster subtypes or the different countries. Once launched, the bars dynamically move by accumulating the values across the years for each contestant. You can pause the race at any moment to look more closely at the standings and the corresponding values. Sometimes a certain bar is very dominant relative to the rest, and it can be hard to read the name and value of other bars. Therefore, a small pop-up window appears when you scroll over a bar, displaying the name and the value of the bar.

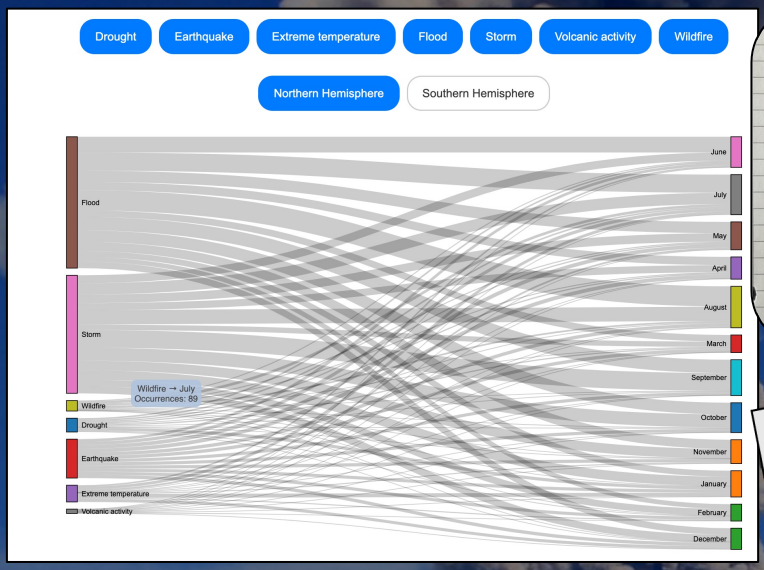
Path to Final Result & Challenges

In the initial sketch the idea was to have individual disasters as the contestants, but unfortunately this setup doesn't make the visualisation dynamically interesting. Most disasters don't span across a long range of time; therefore, major disasters would simply pop up on the podium and stay there for many years, making the race static.

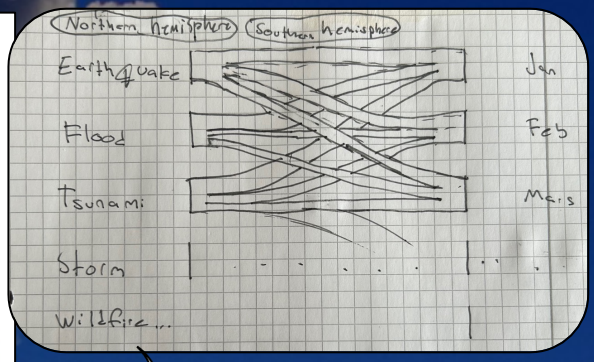
After switching to having the different disaster subtypes as the contestants, at first the values where not accumulated throughout the years. Unfortunately, a major challenge arose due to the data, since for some years, certain disaster types did not occur which led to a year with value zero. As such a major disaster type occurring at a certain year could skyrocket to a huge value to take first place in the race, then drop down to zero the next year and therefore drop from the podium. This made the transition of the bar charts complicated, and too fast for it to be visually appealing.

The final implementation accumulates the previous years' values, making the race steadier but still dynamic. This enables to the user to gain insights either on the impact a disaster has had on a specific category of interest, or how much a country has suffered from disasters altogether.

SANKEY DIAGRAM ILLUSTRATING SEASONAL DISTRIBUTION OF NATURAL DISASTERS



Final visualisation



Initial sketch

Path to Final Result

The creation of the Sankey diagram also started with a sketch, outlining the desired flow and structure. The next step involved processing the data to fit the requirements of a Sankey diagram. This included sorting and filtering the data to ensure it accurately represented the chosen disasters. A key design element was allowing users to select which disasters to showcase, providing a customizable and interactive experience.

To better illustrate the impacts of various disasters, the data was split by hemispheres, enabling a more detailed and regional analysis. This split necessitated further data processing but ultimately led to a more informative and visually compelling diagram.

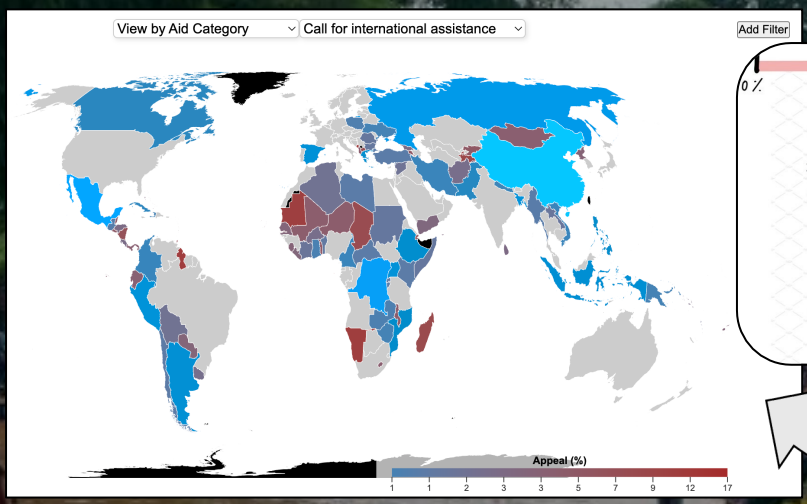
Challenges & Design Decisions

One of the main challenges in creating the Sankey diagram was effectively showcasing the impacts of different disasters across months. This required splitting the data by hemispheres, which involved significant data processing but resulted in a more insightful visualization. Ensuring the months were in the correct order and that the flows were accurately represented were crucial steps that demanded careful sorting and filtering of the data.

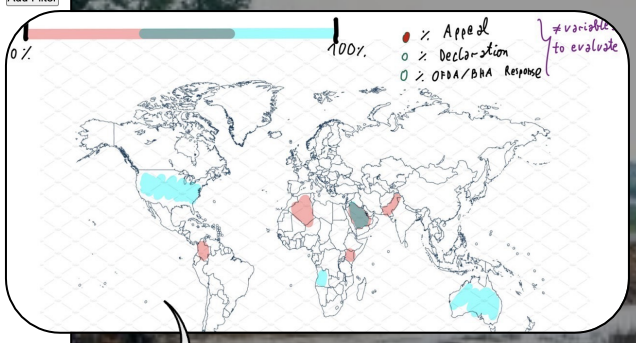
Design decisions included the use of distinct colors for different disaster types and interactive elements like tooltips that provided additional information on hover. These elements were critical in making the diagram not only visually appealing but also highly informative. The result is a Sankey diagram that clearly illustrates the flow and impact of various disasters over time and across different regions, providing a valuable tool for understanding disaster trends and their effects.

By addressing these challenges and making thoughtful design decisions, both the bubble chart and the Sankey diagram were developed into effective visual tools for analyzing and understanding disaster data.

WORLD CHOROPLETH DISASTER INEQUALITIES



Final visualisation



Initial sketch

Brief description

Our final visualization will feature a choropleth map designed to offer a clear visual representation of dynamic disasters across countries. The primary aim is to highlight inequalities by displaying metrics such as the percentage of international aid requests (Appeals) and declarations of state of emergency per disaster. We have refined our analysis by allowing users to set minimum thresholds for disaster magnitudes. This feature enables users to focus on significant events, filtering out frequent but low-impact disasters. By exploring various dynamics, users can observe how different variables influence conclusions, shedding light on regional disparities and inequalities.

Main challenge

One of the challenges in creating this visualization was managing large volumes of historical data and numerous columns with missing values, especially concerning disaster magnitudes. Setting thresholds for specific variables can automatically exclude disasters with missing values, complicating the comparison and visualization of inequalities among countries. Additionally, we needed to manually adjust some country names to align with standard names used in our JSON file for map projections, ensuring data consistency across our visualization.

Secondary challenge

Another challenge was selecting an appropriate scale for viewing the Aid Category. The percentage values were often very small due to the large number of disasters throughout history, making it difficult to differentiate between countries. The solution was to use a logarithmic scale and dynamically adapt the scales according to the maximum values. The filter options also help mitigate this issue by allowing users to focus on more relevant data.

These refinements and solutions enhance the map's ability to convey meaningful insights into disaster-related inequalities across different regions, providing users with a powerful tool to explore and understand the underlying patterns.

PEER ASSESEMENT

Elias Hörnberg

- Worked on the design of the website.
- Worked on the text for milestone 1, 2 and 3.
- Sketched and implemented the “Sankey Diagram Illustrating Seasonal Distribution of Natural Disasters”.
- Sketched and implemented the “Dynamic Bubble Chart Showing Yearly Impact of Disasters”.

David Friou

- Worked on the design of the website.
- Worked on the text for milestone 1, 2 and 3.
- Sketched and implemented the “Spike Map of Disasters Across Time”.
- Sketched and implemented the “World Choropleth Disaster Inequalities”.

Wesley Monteith-Finas

- Worked on the design of the website.
- Worked on the text for milestone 1, 2 and 3.
- Sketched and implemented the “Cumulative Bar Chart Race Tracking Disaster Impact”.
- Designed the Process Book.

USEFUL LINKS

Code Repository: https://github.com/com-480-data-visualization/project-2024-DisasterClass

Website: https://com-480-data-visualization.github.io/project-2024-DisasterClass/

Dataset: https://www.emdat.be/

Screencast: https://youtu.be/g4ebzn1w3dg