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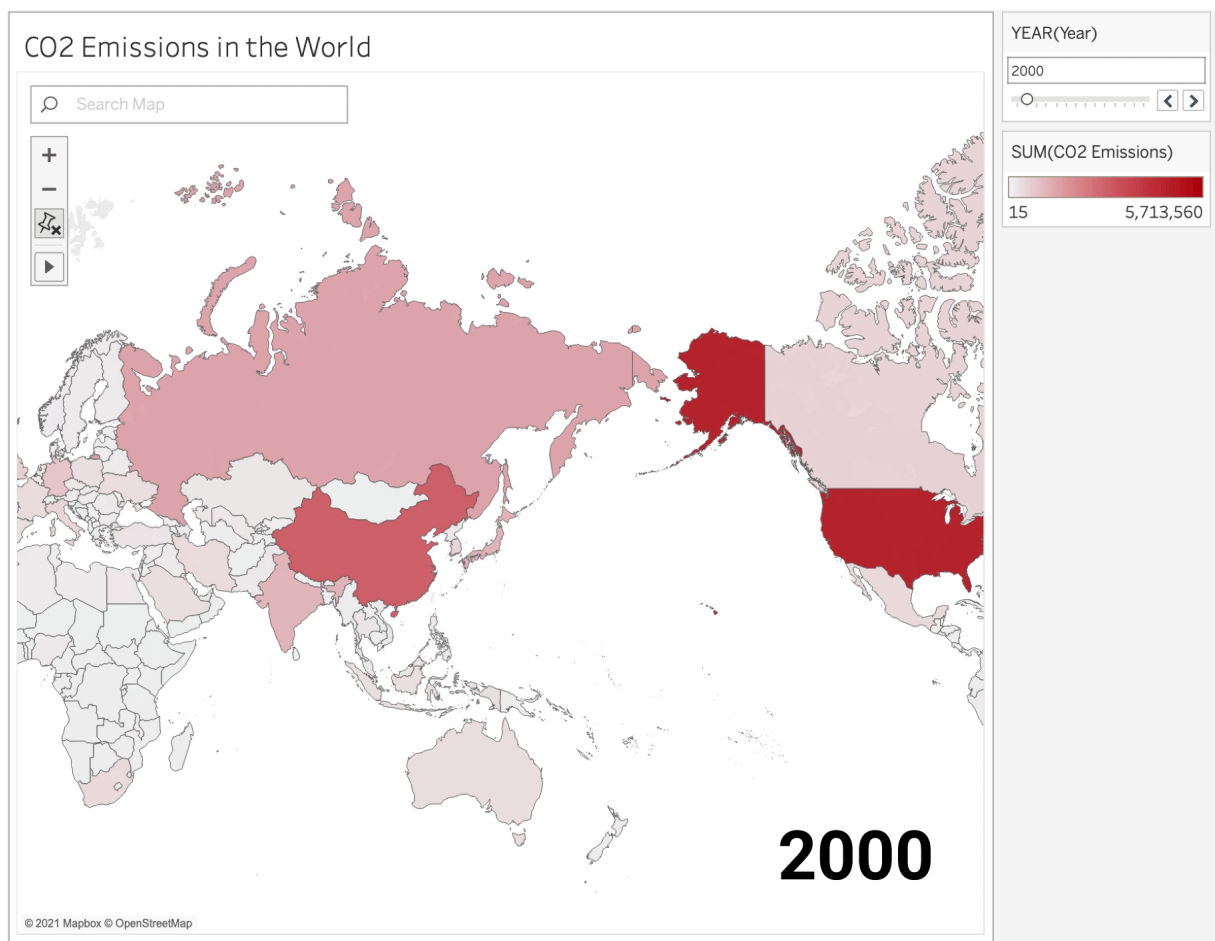
A4: Visualization Narrative ([Medium Post](#))



Introduction

It is the year 2050 and the front page of the New York Times reads Polar Bears are now extinct due to rising sea levels and an increase in global temperatures. The extinction of arctic animals is just one of many examples that have resulted from the increase in emissions of Carbon Dioxide (CO₂) into the atmosphere. Few more examples that can be detrimental to our society and environment as a result of global warming include heat waves, coral bleaching, flash floods,

erosion, and many more. Our team was curious to solve the issue on whether or not it was possible to put an end to the impending doom of climate change through analyzing the trends of data compiled by the World Development Indicators from years 2000 to 2010. This dataset from World Development is a reliable source as it includes the CO2 emissions statistics from countries all over the world and allows for the analysis of the regions and countries that were responsible for emitting the highest amount of CO2 emissions in terms of magnitude.



Investigating the relationship between CO2 emissions and global warming is paramount because it can put a decline to the issues mentioned above and most importantly save the lives of many individuals too. “Climatic changes already are estimated to cause over 150,000 deaths

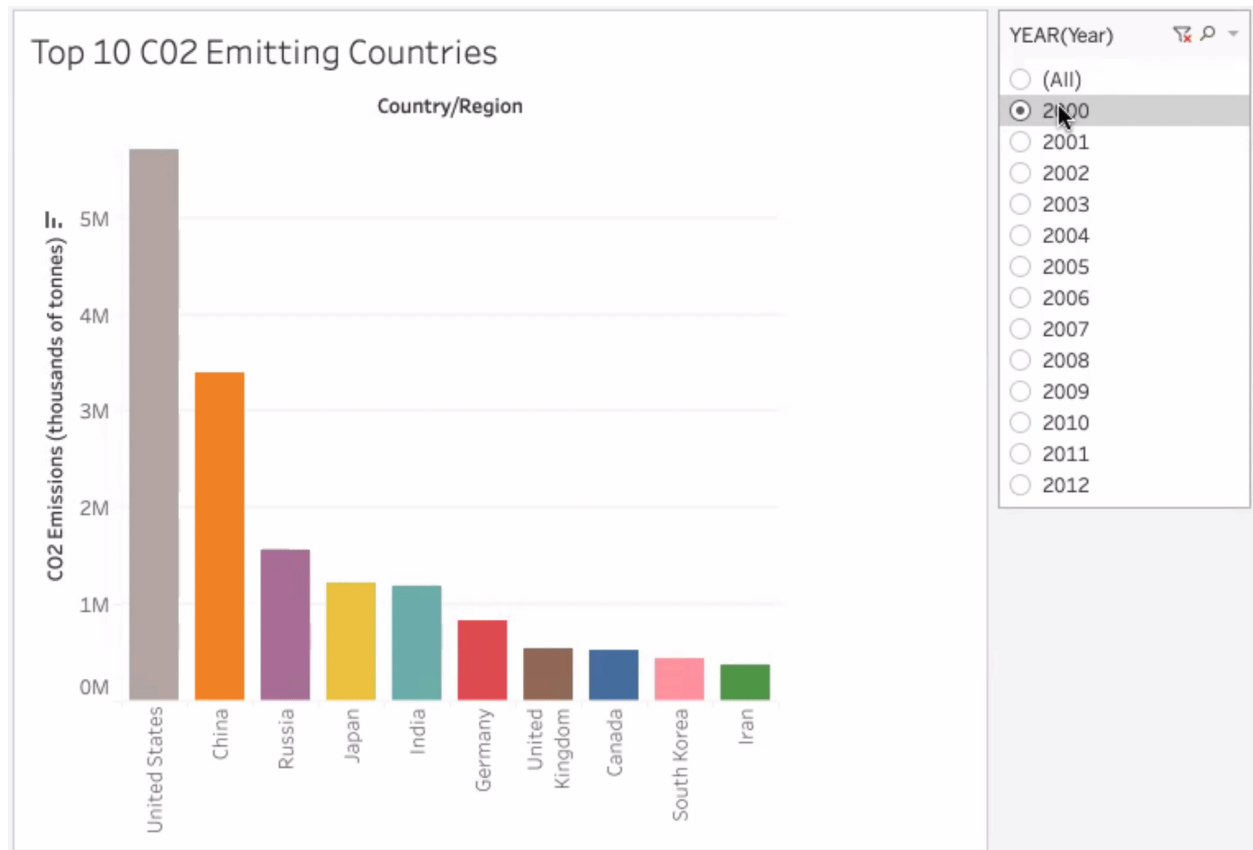
annually” (HELI). It is also stated that the rise in global temperatures is due to the “industrialization, with the burning of ever-greater quantities of oil, gasoline, and coal” (HELI). Before we can stop the impending destruction of climate change, we have to understand which stakeholders or countries are responsible for it; this analysis and data visualization aims to inform climate advocates, authorities such as the United Nations (UN), World Health Organization (WHO), World Wildlife Fund (WWF), and major key players of the countries that are contributing most to the problem. By identifying these countries, authorities can take more of a systematic approach to help and encourage countries to transition to a more sustainable form of energy production and reduction of any industrial efforts that may contribute to the cause of climate change.

Looking for the source of the CO2

Our first step in identifying major contributors to global CO2 emissions from 2000-2010 was to analyse how different countries compared to each other in this statistic. It is fairly obvious that a more developed country with high levels of industry would produce more emissions than less developed countries; we wanted to see how extreme this difference actually was.

In our analysis of the data, we found that the 10 countries with the highest CO2 emissions accounted for 67.3% of total emissions during this ten year time period. This was our first immediate flag that in order to analyze the trends of CO2 emissions during this time, we should look at these top countries. Below is an interactive bar chart showing how the emissions of these top 10 countries compare to each other during each year in the time range; you can toggle between an overview of each country’s overall emissions across the 10 years, or filter to only the emissions numbers from individual years. We were inspired to include these settings by Shneiderman’s paper *The Eyes Have It: A Task by Data Type Taxonomy for Information*

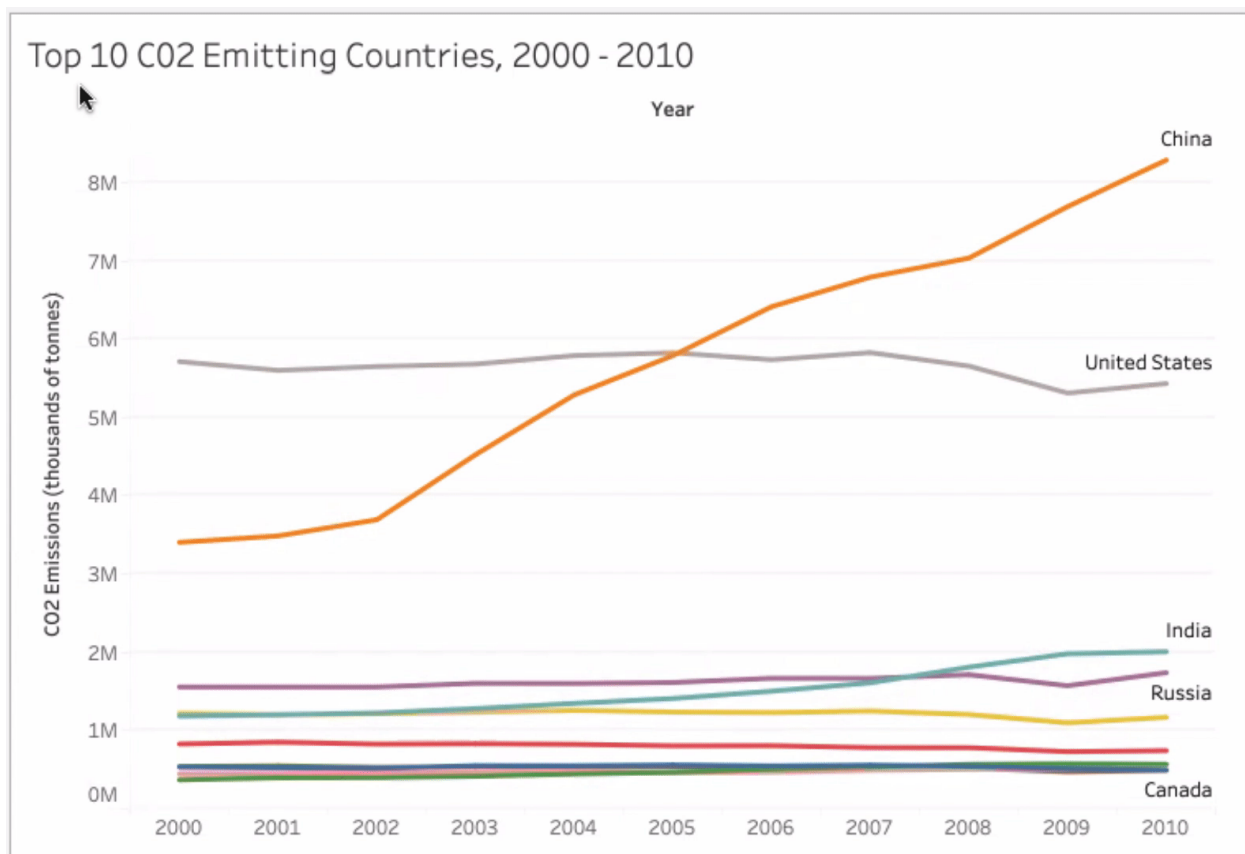
Visualization (1996), in which he explains that it is beneficial for a visualization to have functions such as an overview and a filter, as well as how these two functions should work.



When looking at this chart, you can see that the top 10 producers are indeed some of the countries with the highest levels of development. Additionally, across all the years in the time range, the United States and China had a significantly higher amount of CO2 emissions compared to the rest of the countries listed. This large gap can be attributed to the difference in population between these two countries and the rest; by 2010, the United States had a population of around 300 million people (Mackun et al., 2011), while Russia, the next highest ranked country on the list, had a population of half that coming in at just under 150 million people (The

Embassy of the Russian Federation to the United Kingdom of Great Britain and Northern Ireland, 2012).

Having identified the two largest contributors to CO2 emissions from the time period, we thought that it would be beneficial to chart out the trends of these 10 countries across the years covered in the data. Below we have included a line chart to help visualize the variation in emissions. Further in accordance with Shneiderman's (1996) ideas on how giving a visualization a details-on-demand function can help minimize the user's interaction with irrelevant data, in this visualization you may hover over each of the lines to access statistics specific to each year.



When looking at this graph, the first thing that again immediately stands out is that the United States and China are significantly higher than the other eight countries presented;

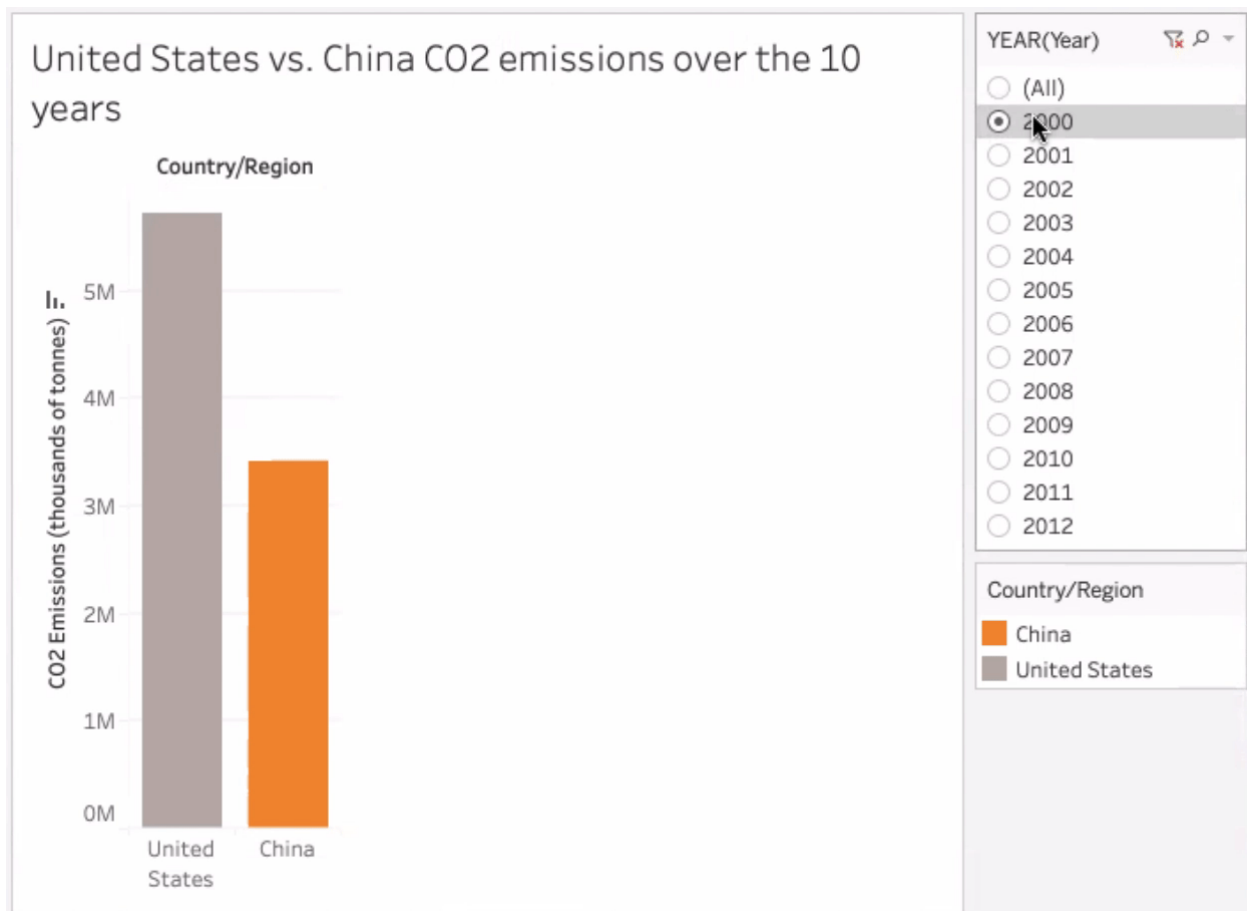
however, while the United States (along with the other countries lower on the list) remain relatively constant across the time period, China starts off relatively high but continues to ramp up dramatically until it dwarfs even the US in CO2 production.

At this point, the trends in CO2 emissions were becoming clearer:

- 67.3% of CO2 emissions in the 2000's came from the top 10 producing countries
- Of these 10 countries, the United States and China are far greater producers than any of the other countries
- China in particular had a sharp increase in CO2 emissions from 2000 - 2010

Now it seemed that in order to fully understand the trend in global CO2 levels we would need to dig into the specifics of emissions in the United States and China, and in particular to look for the reason behind China's massive spike in emissions.

Emissions in the US and China



In our visualisation we used different colors to encode our data to distinguish the changes between the U.S. and China over the decade from 2000 to 2010. This is to support the preattentive attributes of the user's perception (Few, 2005).

This data visualisation shows that China has an exponential increase in its CO₂ emissions passing the United States within five to six years and it is continuing to increase. Because of such a spike we were interested in knowing the factors behind such an increase and its contribution to the climate change. In our research we found that, according to Liu et al., the main factor in China's CO₂ emissions is the industrialization and its infrastructure development with an average annual rate of 6% (2019). The U.S. on the other hand had an increase in its CO₂ emissions due to its strong economic growth and the use of fossil fuels (LAT, 2001). The burning of fossil fuels for electricity, heat and the transportation in the U.S. is the main reason why it kept its increase in CO₂ emissions.

Are China and the U.S. taking measures to cease the CO₂ emissions and increase the renewable energy sources? The good news is yes. China alone contributes to the 28% of the global CO₂ emissions as of 2020. Furthermore, China's such peak will continue to increase until 2030 and aim to neutralize it by 2060 (McGrath, 2020). U.S. and China addressed, in their joint statement in April 2021, that they both agreed to work together on the implementation of the Paris Agreement and take short term actions towards furthering to address the climate crises (U.S. Department of State, 2021). Having said that we are the individuals to keep track of our own as well as our governments contributions towards the global climate change.

Conclusion

Having explored the data, we now know we can attribute the majority of CO₂ emissions during the 2000's to the total emissions of both the United States and China. We also looked into the specific reasons behind the high rate of emissions in these two countries, and also looked into the potential future of China's rising numbers. Hopefully, looking back on this information about increasing CO₂ production across this decade will allow policymakers to more effectively fight climate change.

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