

TRACKING CARBON EMISSIONS

LMC 3705

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Tracking Carbon Emissions

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As our final project for this class we were assigned to create an interactive data visualization as a form of inquiry and a mode of argumentation. We were to choose an issue or topic and present data to the class in a way that invited further exploration or discussion. For this project, we worked in small groups of two to four members.

After we divided into project groups, we started by brainstorming topic ideas. Since the project brief seemed to fit well with social or political issues, we came up with a short list of possible areas of exploration such as:

- Introduction
- Poverty
 - Infant mortality
 - Climate change
 - Immigration
 - World literacy
 - Foreign language education
 - Religious identity
 - Food waste

We decided that climate change was a relevant issue with a lot of potential, so we began the process of researching and looking for interesting datasets.

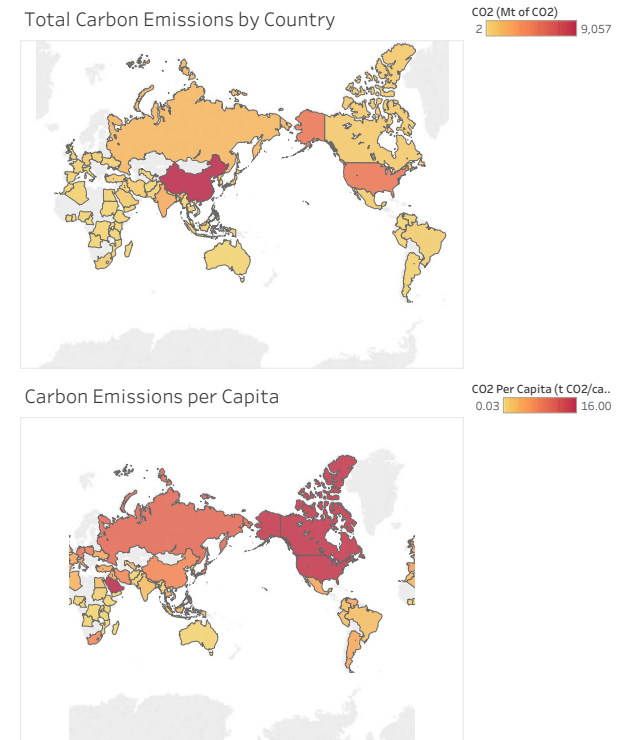
Group members: Maddy Ben-Yoseph, Eva Christensen, & Rita Young

Since climate change is believed to be caused by the proliferation of greenhouse gases in the atmosphere, we looked into data on carbon emissions, as carbon dioxide is the most prevalent greenhouse gas as of 2016 according to the Environmental Protection Agency.

Our first iteration is inspired by a study mentioned in a TED Talk from David McCandless in which he examined the military spending of different countries and visualized the data to reflect the populations of those countries. We started by creating a similar visualization in Tableau.

First Iteration

Our first attempt in Tableau was created from data published by the International Energy Agency. We found it interesting that while China was the clear leader in carbon emissions overall, the U.S. and Canada produced more carbon per capita. While the visualization offers a context that might not generally be considered, it lacked depth.



Sources: <https://www.epa.gov/ghgemissions/overview-greenhouse-gases>, <https://www.iea.org/>

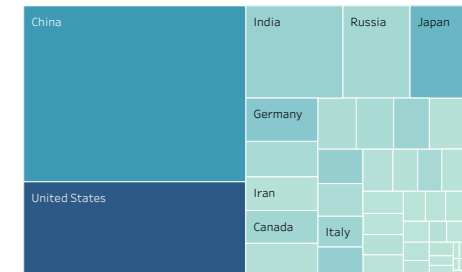
Second Iteration

Following class critique, we thought an interesting connection might be made with the data if we incorporated a social aspect to our research, so we looked into possible correlations with Gross Domestic Product and income inequality within different countries.

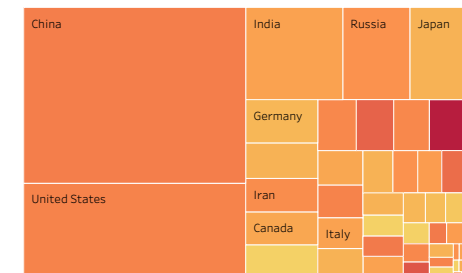
We created a treemap for each topic in relation to the country's carbon dioxide emissions, and although the visualizations were more meaningful, they did not offer a cohesive story. For example, in the first visualization, the only countries that stood out were the United States and China, which unsurprisingly also had the highest GDP.

The second visualization offered an interesting perspective, but no correlation was found between emissions and income inequality. The outstandingly high income inequality for South Africa, denoted by the single dark red color, is due more to lasting effects from Apartheid than from mass industrialization or environmental factors.

Carbon Dioxide Emissions and Gross Domestic Product
GDP (billion 2010 USD)
31 16,920



Carbon Dioxide Emissions and Income Inequality Index
Income Inequality Index
26 63



Sources: World Bank, <https://www.iea.org/>

Final Iteration

It was suggested from critique that we narrow our focus onto one of these topics in relation to carbon emissions, so we began searching for more scientific articles that might offer an interesting dataset for us to work with. Although we had found a study that found a correlation between higher income inequality and lower carbon emissions, we were unable to support this with more recent data. There seemed to be more complex factors at play, as we had found with the case with South Africa.

It was at this stage that we had to make a decision between pursuing this particular inquiry into why this correlation could not be supported and choosing another avenue of investigation. Because income inequality itself is a complex topic to present, we thought that such a deep study into a country's economic, political, social, and environmental policies in order to find a possible connection would not be the best direction to take this particular project.

We began investigating the data we already had and observed that China and the US are by far the countries with the highest carbon emissions -- together they make up almost half of the world's carbon footprint. We then came up with a few key questions in order to help focus our next iteration:

- Where are these emissions coming from? Who or what is responsible for the majority of these emissions?
- How do the carbon emissions here in the United States compare to China, the only other significant contender?
- How might emissions be reduced, either through individual action or through policy changes?

We began looking at how emission sources in the United States are categorized and found that the Environmental Protection Agency defined them into sectors, the most significant being:

- Transportation - burning fossil fuel for cars, trucks, ships, trains, and planes. Primarily petroleum-based fuel, such as gasoline and diesel.
- Electricity production - generating electricity from coal and natural gas.
- Industry - emissions that are generated from the production of goods from raw materials.
- Commercial & residential - emissions from business and homes, primarily through heating and the handling of waste.

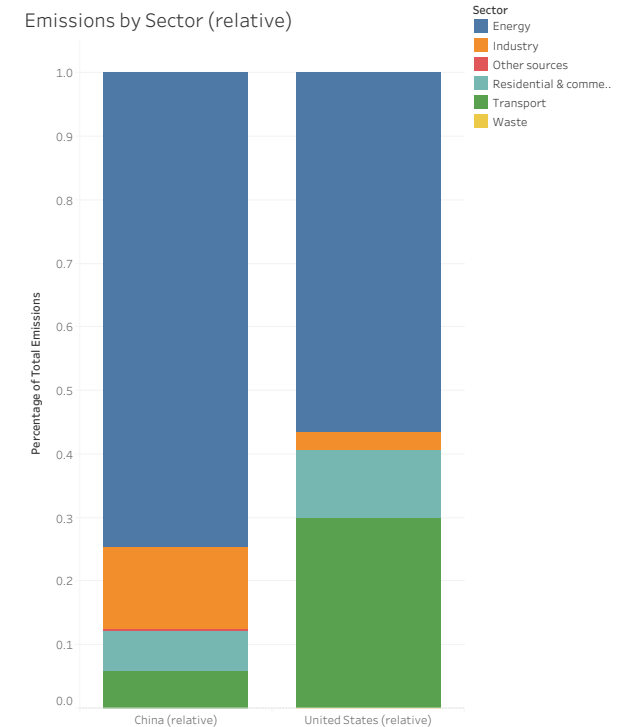
Sources: M Ravallion, M Heil, J Jalan; Carbon emissions and income inequality, Oxford Economic Papers, Volume 52, Issue 4, 1 October 2000, Pages 651–669, <https://doi.org/10.1093/oep/52.4.651>

Final Iteration

This is our first concept in comparing carbon emissions between the United States and China. This first visualization is based on the relative percentage that each sector takes of the overall emissions for each country. Although it is interesting to see and inquire about the various differences (e.g. China has more emissions coming from industry whereas we have a much more significant percentage from transport) we thought it would be important to include a source of context, perhaps first by providing a visualization of carbon emissions by sector for the United States.

We also wanted to include different ways that emissions could be reduced based on their sources and after doing some research, came up with two key solutions per sector, each represented by a color-coded icon.

After adding the filtering feature on Tableau so that users can highlight



a particular sector to focus on that subset of figures, we were ready for our final edits and critique sessions.

Source: <https://www.epa.gov/ghgemissions/sources-greenhouse-gas-emissions>

Final Design

Our final significant addition to our collection of datasets is the comparison of emissions by sector over time which we thought would be interesting to convey, considering China's relatively recent increase in emissions from the energy sector in comparison to the United States' more stable but nonetheless significant emissions.

After implementing a red-to-yellow on dark blue color scheme in order for the figures to stand out, standardizing the icons at the bottom, and adding a header and description, we completed the visualization for the project.

An interactive version which includes the filtering and hover effects can be found here:

<https://tabsoft.co/2OZJ6iF>

