CO2 Emission Trends within the United States

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Trip Bastian, John Kathe, Manu Kolluru

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Project Report

Introduction

Our group decided to investigate the trends of CO2 emissions in the United States, given it being considered a serious issue in the world and in our country today. Seeing how CO2 emissions have played a role in our changing climate, we felt that it would be meaningful to use the data available to visualize it for people who are interested in the magnitude of CO2 emissions in the United States, such that they can see where the country and its states have progressed or regressed over time.

Dataset

Since our primary goal is to visualize trends of CO2 emission within the United States, we focused on data sets that would contain data spanning multiple years as well as datasets with information from all the states. There are three data sets that we used to create our visualizations to further our story. Our first two data sets are both from the U.S. Energy Information Administration (EIA). One of these datasets contains the state-related CO2 emissions by year from 1990 - 2017 for all of the states. The other dataset contains CO2 emissions by sector (commercial, electric power, residential, industrial, and transportation) for each state in 2017. Our third data is from the United States Environmental Protection Agency (EPA). It contains the emissions caused by various sources from the years 1990 - 2018 for the entire United States. These datasets were cleaned and narrowed down to produce our visualizations.

Links:

https://www.eia.gov/environment/emissions/state/ (table 2)

https://www.eia.gov/environment/emissions/state/ (table 4)

https://www.epa.gov/sites/production/files/2020-08/chapter_0.zip (table 2-1)

Design solution

We decided on a solution that focused on giving the untrained viewer, someone who isn't deeply invested in the issue of climate change or CO2 emissions, a quick and easy way to evaluate how the United States has progressed or regressed over time in regards to CO2 emissions. Given this goal for a solution, we looked into ways to make sure our design gave our viewers the clearest view of the simplest data points to help familiarize them with CO2 emissions.

Given our initial plans and data sets, much of the work in our project involved sifting through the details and data we collected initially and settling with the most critical and simple data to visualize for our targeted viewership. Our initial work on paper and on Tableau was quite ambitious, as we were trying to find data to articulate more minute details in CO2 emissions, such as emissions in regard to population, GDP, or number of cars, among other things. While this would allow for more interesting visualizations and a more detailed look at the issue of CO2 emissions, such visualizations would go beyond the scope of our goal of providing simple data points for our viewers to digest quickly and easily. Accordingly, we abandoned the more complex datasets and focused on simplicity as we set our goal to be.

Our first visualization is that of a map of the United States. After condensing all the data that we wanted to present, one of the first ones to help with our story was the net change in carbon dioxide emissions over several decades. Originally the data was in a table, but we took that data and turned it into an interactable map. We chose a map above other mediums because we believe that it provided a spatial and colorful spread of information, with some revealing information on which states have changed the most. Idaho, for instance, changed the most. This is represented by a color scale from blue to red, with white in the middle. Blue represents a decrease in total CO2 emissions, whereas a red tint represents an overall increase in CO2 emissions. The interactibility on this map is by hovering over each state; when you hover over a state, it will highlight it and show the name with the corresponding data point attached to it.

Our second visualization is a line graph of all 50 states with changes of CO2 over time. Though the information itself is all present in this single graph, having 50 different lines through the graph was too cluttered, so we provided another point of interaction; the ability to highlight each line and distinguish it from the rest. When the

viewer would hover over each line, the state and data point for that instance would be provided, allowing the user to trace the line on the graph to get a better understanding of that state's specific trend. We originally planned to add another layer of interaction between the map and this illustration, but we ran into many difficulties trying to set it up so that the two graphs could communicate with one another. We chose a line graph because we wanted to show that behind the net changes seen in the map, each state had its own story to tell of CO2 emissions over time, and how they change. Texas, for instance, showed a large increase from 1995 to 1998, but cooled off towards the end. This is also reflected in the map, showing that Texas has only increased by 17% over 47 years.

Our third and final visualization is a chronological bar graph of each type of pollution being produced in the United States. Continuing our story, we wanted to show that just having each state answer for how much CO2 they produce, we took a step back and looked at the entirety of CO2 emissions and broke down each type over time and represented it here. We chose this medium because we wanted to also show how much each category has increased over time relative to each other, and bar graphs are perfect for that. Something you can pick out of this graph of significance is the fall of industrial sources of CO2 emissions; As the years go by in the animation, it is constantly being overtaken by the two leading causes of CO2 (Transportation and electric power). The interaction provided to the viewer with this visualization is the sliding scale over time. There is also a play button as well so that the viewer can see each bar changing over time, as opposed to them sliding it themselves.