

Project Milestone 3

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Introduction

Since the COVID-19 breakout in 2019, there have been many unforeseen effects of the disease and subsequent fallout. We intend to investigate one of the specific side-effects, which is whether COVID-19 has impacted the environment and pollution rates in the United States in a positive manner. We recognize the pandemic is a tragedy and has resulted in suffering for people all over the world. While acknowledging the many negative societal effects, we would like to explore the possible benefits for the environment due to the unique remote environment that the pandemic has provided and the amount of people who stayed home for an extended period of time, as this is something very uncommon in history. In this report, we are going to make two visualizations to describe the carbon emission rate and the different phases of the pandemic, including mortality rates and COVID cases.

Description of Carbon Emissions Data Source

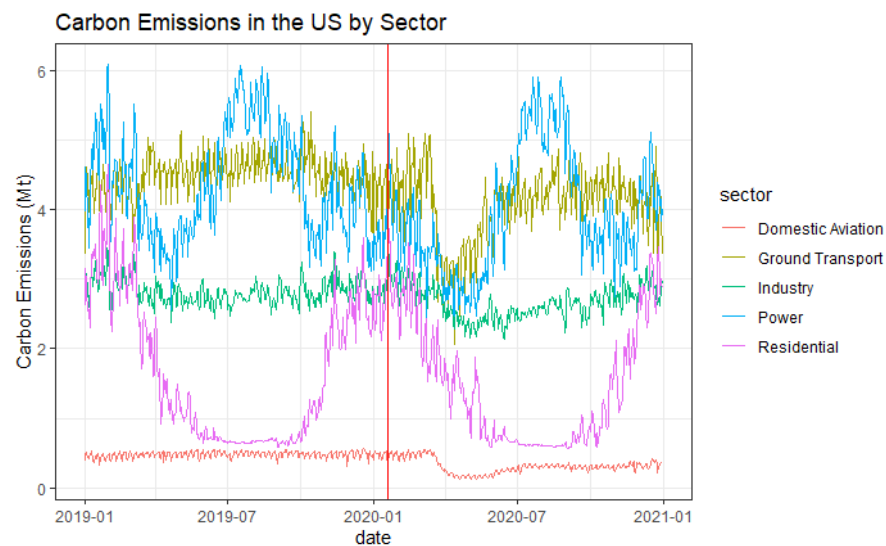
The first dataset used overviewed carbon dioxide emissions in metric tons within five sectors in the United States from approximately the beginning of January 2019 to the end of December 2020. [Carbon Monitor](#) provided the CO2 emissions dataset¹. The raw data was formatted and tidied slightly so it could be utilized easily in the creation of our visualizations. Unnecessary columns were removed and the dates were formatted to be in the form “day/month/year” to integrate smoothly into our visualization.

Description of COVID Data Source

The second dataset included cases and deaths by state and county for COVID-19 in the United States. The dataset was created by [The New York Times](#) from state, county, and regional health department reports². Cleaning the dataset involved converting the cumulative case and mortality values to a rate over time value to better show the changes in the pandemic throughout

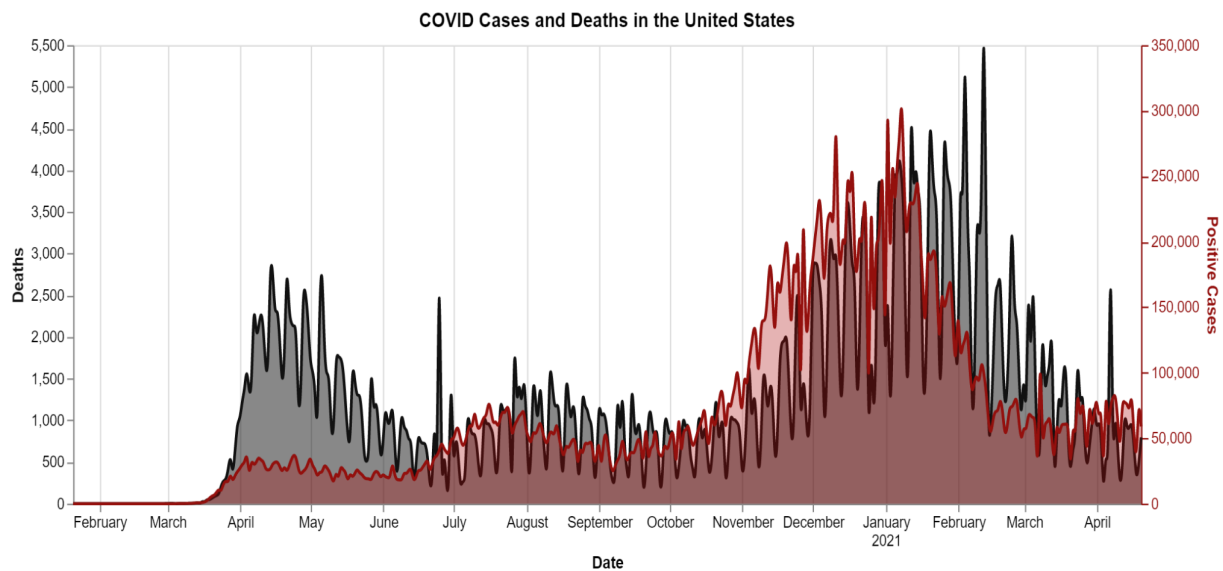
time. Additionally, to help the dataset work more smoothly in Vega-Lite, it was pivoted longer to combine the case and mortalities columns.

Carbon Emissions Visualization Explanation



This visualization emphasizes the change in carbon dioxide emissions in the United States based on different phases of the COVID-19 pandemic. It shows carbon emissions in metric tons versus the date from January 1st, 2019 to January 1st, 2021. This visualization also compares the carbon emissions from various sectors, including domestic aviation, ground transport, industry, power, and residential. The red vertical line indicates the outbreak of the first COVID case in the United States on the 19th of January in 2020. The carbon emission rates for the power, ground transport, and residential sectors appear to fluctuate throughout time while industry and domestic aviation remain fairly static, though both have a slight dip as well.

COVID Visualization Explanation



The COVID visualization depicts date against mortalities and positive cases. The encodings used in this visualization include size and texture, in the form of area under the curve and the corresponding color respectively. The left axis shows values for mortality in black, while the right axis shows the number of positive cases in red. The marks used are two lines and areas underneath that show the infection and mortality rates of COVID-19. The cases spike from zero in March of 2020. There appears to be a peak around December, January, and February of 2021 for mortalities and positive cases, with mortalities slightly lagged.

Conclusion

From the Carbon Emissions graph, a conclusion can be drawn that the carbon dioxide emissions from various sectors responded differently to the social and economic changes brought by the COVID-19 pandemic. There was a clear definition of emissions decreased in the power, ground transport, and especially residential sectors after the outbreak began and stay at home orders were put into place. This makes sense as business for many companies lagged at this time, and the residential sector likely experienced the steepest decrease in emissions due to the number

of people in the United States staying home in quarantine. The industry and domestic aviation sectors retained essentially the same pattern in 2019 and 2020, despite the pandemic.

The COVID-19 visualization exhibits two peaks in positive cases and mortality rates, one at the beginning of the pandemic in March and April 2020 and one in January 2021. With the initial peak, there is a significant decline in carbon emissions in the ground transportation, power, and residential sectors. The other sectors have a noticeable decrease as well around April of 2020, though not as significant. Unfortunately, the Carbon Emissions data were not recent enough to properly compare the data with the second peak in coronavirus cases. The COVID cases and mortalities visualization was used to solidify when the COVID-19 outbreak began and when the different phases of the pandemic occurred, specifically with multiple peaks of cases and subsequent stay at home orders. While our visualizations may connect an increase in positive cases to a decrease in carbon emissions, we would like to reiterate that the pandemic has negatively impacted much of the population and we are not making light of this tragedy in any way.

Link to Source Data, Data Curation, and Visualization File

<https://github.com/HuiheSun/Stat479-Files>

References

1. Carbon Monitor. (2021). Retrieved from <https://carbonmonitor.org/>.
2. The New York Times. (2021). Retrieved from <https://www.nytimes.com/interactive/2021/us/covid-cases.html>