Exercise 3 Report: Percent Change in CONUS State *CO2 Emissions Per 100k People*

Motivation:

Reductions in CO_2 emissions are necessary to prevent further ecological damage across the planet. The US represents one of the largest emitters of CO_2 because of the high level of development and population size. However, many adjustments have been made to the US economy to increase efficiency and reduce the amount of CO_2 emitted per person. While total emissions have increased over the last few decades emissions per capita have decreased in the US.

Tasks:

Given CO_2 emissions across five economic sectors for the years between 1990 and 2010 from the U.S. Energy Information Administration, which states have made progress in improving emission efficiencies as measured by the percent change in million metric tons of CO_2 emitted per 100,000 people? Are there specific economic sectors driving increased emissions per capita? Are there any geographic correlations between emission efficiencies?

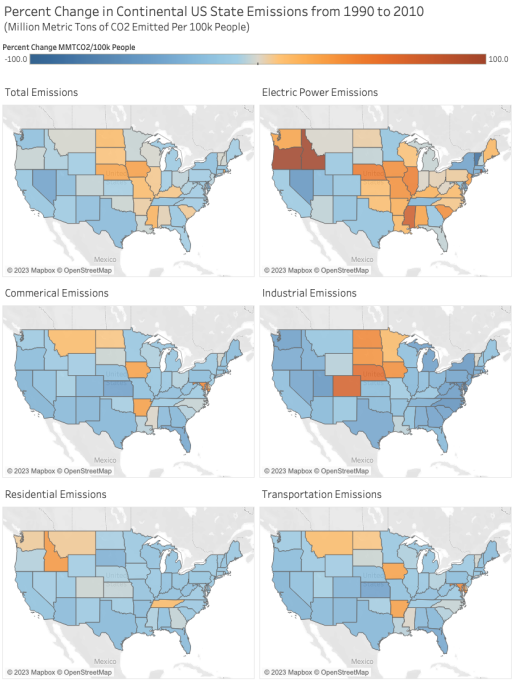
Data Augmentation:

The given data includes the million metric tons of CO_2 (MMTCO2) emitted split between five economic sectors and population for each state at each year between 1990 to 2010. For this analysis the data was adjusted to account for the emitted CO_2 per 100k people for each state in 1990 and 2010. The percent change in MMTC)/100k people between 1990 to 2010 was then calculated for each state. Alaska and Hawaii were removed from the final visualization because their geographic isolation skews their ability to make efficiency gains compared to the continental US and affected the data presentation.

Expressiveness of Design:

The design uses the magnitude channel of color saturation to show the percent change in MMTCO2/100k people for each state from 1990 to 2010. The color scale uses a continuous orange-blue diverging color hue palette centered at 0 to distinguish between states that have reduced emission per capita (blue hue) and those that have increased emission per capita (orange hue). The colors overlay a map of the continental US to use the spatial channel for easy identification of state and regional patterns.

All five economic sectors and a computed total of all sectors are shown using a common color saturation gradient scale in a single view for comparing patterns between sectors as shown in the figure below:



Effectiveness of the Solution:

Applying a common gradient of color saturation centered around 0 with two diverging color hues allows for a viewer to quickly distinguish between states that are making progress in improving emission efficiencies and those which are failing to reduce emissions per capita. The color hues were specifically chosen to be viewable by normal sighted and colorblind individuals. Applying the color channel over the spatial channel to represent states geographically makes it immediately obvious which states continue to increase their CO_2 emissions across different sectors.

By using per capita emissions instead of raw emissions it makes the data more representative of states that are improving their carbon emission efficiency as opposed to overly representing states with large populations.

Interaction:

Users can interact with the chart by selecting a state in any of the six subplots. Selecting a state will display the values of MMTCO2/100k people in 1990 and 2010 and the actual percent change.

Conclusions:

It is seen from the visuals that per capita emission increases are concentrated in the north central US. Furthermore, it is apparent that electric power production leads the increase in emission production per capita in the US. Major emitter outliers can be noticed in the large increase in the electric power emission per capita for Oregon and Idaho suggesting further investigation is necessary into how electric power production may have changed in these states during this time frame.