The US Environmental Protection Agency (US EPA) has remote monitoring stations across the country for monitoring air quality. The data is compiled and can be downloaded from <https://aqs.epa.gov/aqsweb/airdata/download_files.html>.

The US Census Bureau website was the location for the population data for each county in Colorado from 2010 to 2019. The website was <https://www2.census.gov/programs-surveys/popest/tables/2010-2019/counties/totals/co-est2019-annres-08.xlsx> for the 2010 – 2019 data. The website was <https://www2.census.gov/programs-surveys/popest/tables/2000-2010/intercensal/county/co-est00int-01-08.xls> for the 2010 – 2019 data.

For this project, we will be looking at how the air quality has changed over the last 20 years along the front range of Colorado. The following are some questions that we could look into answering:

* The Denver-Boulder metro area is experiencing a population boom over the last 20 years. Is there a relationship between population and air quality?
* There has been growth in the oil &gas industry in the last 20 years. Is there a relationship between the O&G production and air quality?
* Are there seasonality affects on the air quality? (Evergreen pollen season / forest fires)

To check some of these changes we can look at different areas along the front range to these relationships. For example, we can compare population effects by looking at a baseline county that does not have high growth (Larimer country or one in WY) to Denver County. We could also try normalizing to a specific county to a specific year as well. Seasonal affects could also be viewed by comparing relative changes in counties such as Jefferson County to Denver County.

The parameters and databases are the following:

* Air Quality Index (AQI): This is a scale that ranges from 0 – 500 that indicates the amount of pollution in the air, with 0 being low pollution and 500 extremely polluted air. Typically, the desired AQI is 50 or less. The AQI is calculated from six major pollutants that include ground-level ozone, particulates, carbon monoxide, sulfur dioxide, nitrogen dioxide, and lead. We will use the AQI by County databases for the analysis.
* Ozone: Ozone takes two form high-altitude ozone and ground-level ozone. What is monitored as a pollutant is ground-level ozone (subsequently referred to as ozone). Ozone is formed between reactions of volatile organic compounds (VOCs) and nitrogen oxide (NOx) compounds in the presence of sunlight. Ozone is typically found where manmade combustion occurs, such as operation of cars, power plants, or heavy industry. We will use the Ozone (44201) databases for the analysis.
* Particulates PM2.5 and PM10: The particulates measurement is a gravimetric measurement of the mass for aerosols and particles in the air that are greater than 2.5 micron and 10 micron in diameter respectively. The PM2.5 FRM/FEM data will be used over PM2.5 non FRM/FEM data because the PM2.5 FRM/FEM uses a standardized method as described in the Code of Federal Regulations (CFRs). Particulates can be from a variety of sources including pollen from plants, forest fires, and man-made processes such as car exhaust, coal-fired or diesel-fired power generation, or boiler operations. We will use the PM2.5 FRM/FEM Mass (88101) databases for the analysis.
* Carbon monoxide, sulfur dioxide, nitrogen dioxide are oxidized species of carbon-based compounds, sulfur-base compounds, and nitrogen-based compounds, respectively. These are most from the man-made combustion sources. The major source of these gases is from car exhaust. These gases re also found in power generation but the amount should be decreasing over time based upon regulations requiring selective catalytic reduction for NOX, scrubbers for SOX removal, and the adaptation of natural gas to coal-fired plants. The databases used are SO2 (42401), CO (42101), NO2(42602)
* Meteorological Data (Wind, Temperature and Relative Humidity) will also be measured.
* Population