I chose the NOAA Integrated Surface Database (<https://registry.opendata.aws/noaa-isd/>). My interest is how efforts to reduce greenhouse gas emissions is affected by weather.

**Q1. Has changing weather over the past 20 years affected wind in a manner that is more or less beneficial to the usage of wind mills.**

Question Limits:

Date – Two queries need to be run for comparison. Query 1 from 1980 to 2000. Query 2 from 2000 to 2020.

Time – all are legitimate – windmills don’t need rest.

Wind Speeds – limit between 4 – 25 m/s (<https://en.wikipedia.org/wiki/Wind_turbine_design>)

Overview:

Better wind conditions would be caused by higher windspeed, within our limits, over the course of each day. We sum the wind speed for each hour over each year – higher numbers mean more wind overall for the year. Winds above or below our limits would result in fewer data points and reduce the sum of yearly, effective wind. We then average over all stations each year to normalize the case were more stations produce more data points. We can then compare the year by year averages for 1980 to 2000 with 2000 to 2020 to see if there is an increase in the overall effective wind.

**Q2. Has changing weather over the past 20 years affected cloud coverage in a manner that is more or less beneficial to using solar panels.**

Question Limits:

Date – Same as Q1 compare 1980-2000 to 2000-2020.

Time – Since this involves night time and different positions for the weather stations, we would need to take those into effect. The approach I would most likely take would be to average out the average times for the four seasons, as well as different latitudes.

Sunlight – This is not easy to measure, but we can use the ceiling height as an indicator. Reports of a ceiling height would correspond to low panel output.

Overview:

Similar to the wind question, this would involve counting the number of hours that panels might produce output, and determining if any patterns are observed year to year.

**Q3 Given recent weather patterns (last 5 years), how many days could an average commuter bike to work vs driving?**

Question Limits:

Date – No holidays, but otherwise unrestricted.

Time – Between 11:00Z and 00:00Z to correspond with most working hours in the US.

Weather: This corresponds to comfortable outdoor conditions for bike riding: temps 50-85, no precip, wind < 15mph

Locations: This would need to correspond to metropolitan areas with a sufficiently high population density.

Overview:

Answering this question would involve additional databases on population densities, and the location of those areas. Weather stations would need to be geographically close to those areas. It would also require parsing the variable data at the end of the weather data for information on precipitation and other possible inhibiting conditions. Once those are able to be collected, then a counting and averaging approach would be used across time and population areas to determine the average number of days available.

**Q4. Reducing global emissions on a personal and societal level requires the ability to plan activities in conjunction with the weather. This might include bike riding to work, hanging clothes out to dry in the sun, etc. In the past 20 years, has global warming affected the rate at which weather changes and subsequently the ability to plan for these efforts.**

Question Limits:

Date – all dates are valid

Time – All times are valid since we have not defined a specific activity.

Weather conditions – All conditions are valid.

Locations – All locations are valid.

Overview:

To answer this question, the analysis would focus on specific geographic areas, and review the weather reports that are geographically close to those areas. This would use the same resources as used in Q3. Rate of change would correspond to the change in temperature, wind, and precipitation from hour to hour for a specific area. I am unsure how this would be measured for comparison purposes. For temperature and wind, we may be able measure the delta (difference) between each hour for each area and create an average for each of those. For the precipitation, we would count the changes each day and average those up for each area.