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Rationale and Research Questions

This report examines how local conditions affect local air quality, focusing on power plant emissions and precipitation levels. While pollution is often studied at a global level, examining its contribution to climate change and warming temperatures, its affect communities local to the emissions source is studied less frequently. This analysis considers other factors (precipitation) that may influence air quality and explores how air quality levels vary day-to-day. Texas was chosen as the study area for this analysis because of its number of power plants and counties. This report investigates the following three questions:

1) Is there a correlation between county level emission levels from power plants and county air quality in Texas?
2) Is there a trend in air quality values and emissions over time in Harris county, Texas?
3) Is there a relationship between precipitation and air quality in Harris county Texas?

Dataset Information

This report analyzes three sources of data: EPA Air Quality, Emissions & Generation Resource Integrated Database (eGRID), and *INSERT PRECIPITATION DATA*

EPA Air Quality Data is collected at local monitors across the United States. It can be downloaded by pollutant type, region, and year. This report uses data for Texas between 2018 and 2023 for PM2.5 and Ozone. PM2.5 and Ozone are two criteria pollutants that can cause respiratory issues, especially for people with pre-existing health conditions, children, and seniors. The AQI based on PM2.5 and Ozone are recorded separately and range on a scale from 0-500, with higher values being more dangerous. Values 0-50 indicate "Good" AQ, 50 - 100 "Moderate", and increasingly poor from there. For more information about Air Quality Index and criteria pollutants, visit https://www.epa.gov/outdoor-air-quality-data/air-data-basic-information

eGRID data is released annually and contains information for all power plants across the United States. It contains information about generation, age of the plant, fuel type, and emissions, including CO2 Equivalent emissions. This report uses the eGRID 2018 - 2023 annual reports and focuses only on Texas power plants.

INSERT SOMETHING ABOUT PRECIPITATION DATA

Exploratory Analysis

This report analyzes air quality data from 2019 - 2023 in Texas for both PM2.5 and Ozone. For each year, there are separate PM2.5 and Ozone files, but the structure is the same for all. Below is the structure of the 2019 Texas PM2.5 data.

```
## 'data.frame':    18138 obs. of  22 variables:
##  $ Date                           : chr  "03/16/2019" "03/17/2019" "03/18/2019" "03/19/2019" ...
##  $ Source                         : chr  "AQS" "AQS" "AQS" "AQS" ...
##  $ Site.ID                        : int  480271045 480271045 480271045 480271045 480271045 480271045 4
##  $ POC                            : int  1 1 1 1 1 1 1 1 1 1 ...
##  $ Daily.Mean.PM2.5.Concentration: num  4.4 6.3 7 11.1 12.7 5.6 7.5 8.4 7.7 14.3 ...
##  $ Units                          : chr  "ug/m3 LC" "ug/m3 LC" "ug/m3 LC" "ug/m3 LC" ...
##  $ Daily.AQI.Value                : int  24 35 39 55 58 31 42 47 43 61 ...
##  $ Local.Site.Name                : chr  "Temple Georgia" "Temple Georgia" "Temple Georgia" "Temple G
##  $ Daily.Obs.Count                : int  1 1 1 1 1 1 1 1 1 1 ...
##  $ Percent.Complete               : num  100 100 100 100 100 100 100 100 100 100 ...
##  $ AQS.Parameter.Code             : int  88101 88101 88101 88101 88101 88101 88101 88101 88101 88101
##  $ AQS.Parameter.Description      : chr  "PM2.5 - Local Conditions" "PM2.5 - Local Conditions" "PM2.5
##  $ Method.Code                    : int  209 209 209 209 209 209 209 209 209 209 ...
##  $ Method.Description             : chr  "Met One BAM-1022 Mass Monitor w/ VSCC or TE-PM2.5C" "Met On
##  $ CBSA.Code                      : int  28660 28660 28660 28660 28660 28660 28660 28660 28660 28660
##  $ CBSA.Name                      : chr  "Killeen-Temple, TX" "Killeen-Temple, TX" "Killeen-Temple, T
##  $ State.FIPS.Code                : int  48 48 48 48 48 48 48 48 48 48 ...
##  $ State                          : chr  "Texas" "Texas" "Texas" "Texas" ...
##  $ County.FIPS.Code               : int  27 27 27 27 27 27 27 27 27 27 ...
##  $ County                         : chr  "Bell" "Bell" "Bell" "Bell" ...
##  $ Site.Latitude                  : num  31.1 31.1 31.1 31.1 31.1 ...
##  $ Site.Longitude                 : num  -97.4 -97.4 -97.4 -97.4 -97.4 ...
```

Analysis

Question 1: Is there a correlation between county level emission levels from power plants and county air quality?

The eGRID data for each year was adjusted to ensure all numeric columns were imported as numeric for quantitative analysis. The year, state, plant name, county, latitude, longitude, and emissions data for all types of recorded emissions (including CO2 equivalent emissions) were selected to a new data frame. These data frames were combined and further manipulated to have a data frame with the total county emissions for each year.

Relevant columns were selected for each of the PM2.5 and Ozone data frames, including date AQI, site name, AQ type (PM2.5 or Ozone), State, County, longitude and latitude. This was combined into two dataframes, one for PM2.5 and one for Ozone and further manipulated to have data frames with the average air quality value for each county each year.

The data frames were joined to have a data frame with, for each year and each county, total emissions and average AQI.

How often is emissions data reported?

The following map displays all the plants referenced in at least one of the eGRID reports between 2019 and 2023. Not all plants listed in eGRID report CO2 equivalence. The plants that reported at some point in the 5 years are in blue. Plants that are listed in a least one of the eGRID reports but never report CO2 emissions (or have zero emissions) are in black.

How are air quality stations spatially located compared to emissions reporting power plants?

The following map shows how plants and EPA air quality monitors are spatially related. Not all counties have both an air quality monitor and at least one CO2 equivalence reporting plant. Only counties reporting both at some point between 2019 and 2023 are included in the statistical analysis below.

Are annual county emissions correlated with annual county air quality?

The following graphs and tables show the relationship between total annual county emissions and average annual county air quality. A linear regression was run on the data to determine if the relationship has a significant correlation. Harris County data points are highlighted.

Table 1: Linear Regression of Emissions vs. Ozone Air Quality

Item	Value
P-value	0.5239
R-squared	-0.0043
Degrees of Freedom	136

Table 2: Linear Regression of Emissions vs. PM2.5 Air Quality

Item	Value
P-value	0.4074
R-squared	-0.0025

Item	Value
Degrees of Freedom	125

Question 2:

```
eGRID23_PLNT <- eGRID23_PLNT %>%
  #slice(-1) %>%
  mutate(Data.Year=as.Date(paste0(Data.Year, "-01-01"))) %>%
  mutate(Plant.latitude=as.numeric(Plant.latitude)) %>%
  mutate(Plant.longitude=as.numeric(Plant.longitude)) %>%
  mutate(Plant.annual.NOx.emissions..tons.=as.numeric(
    Plant.annual.NOx.emissions..tons.)) %>%
  mutate(Plant.annual.SO2.emissions..tons.=as.numeric(
    Plant.annual.SO2.emissions..tons.)) %>%
  mutate(Plant.annual.CO2.emissions..tons.=as.numeric(
    Plant.annual.CO2.emissions..tons.)) %>%
  mutate(Plant.annual.CH4.emissions..lbs.=as.numeric(
    Plant.annual.CH4.emissions..lbs.)) %>%
  mutate(Plant.annual.N2O.emissions..lbs.=as.numeric(
    Plant.annual.N2O.emissions..lbs.)) %>%
  mutate(Plant.annual.CO2.equivalent.emissions..tons.=as.numeric(
    Plant.annual.CO2.equivalent.emissions..tons.)) %>%
  mutate(Plant.annual.Hg.emissions..lbs.=as.numeric(
    Plant.annual.Hg.emissions..lbs.)) %>%
  select("Data.Year", "Plant.state.abbreviation", "Plant.name",
         "Plant.county.name", "Plant.latitude", "Plant.longitude",
         "Plant.primary.fuel","Plant.annual.NOx.emissions..tons.",
         "Plant.annual.SO2.emissions..tons.",
         "Plant.annual.CO2.emissions..tons.",
         "Plant.annual.CH4.emissions..lbs.",
         "Plant.annual.N2O.emissions..lbs.",
         "Plant.annual.CO2.equivalent.emissions..tons.",
         "Plant.annual.Hg.emissions..lbs.")

eGRID22_PLNT <- eGRID22_PLNT %>%
  #slice(-1) %>%
  mutate(Data.Year=as.Date(paste0(Data.Year, "-01-01"))) %>%
  mutate(Plant.latitude=as.numeric(Plant.latitude)) %>%
  mutate(Plant.longitude=as.numeric(Plant.longitude)) %>%
  mutate(Plant.annual.NOx.emissions..tons.=as.numeric(
    Plant.annual.NOx.emissions..tons.)) %>%
  mutate(Plant.annual.SO2.emissions..tons.=as.numeric(
    Plant.annual.SO2.emissions..tons.)) %>%
  mutate(Plant.annual.CO2.emissions..tons.=as.numeric(
    Plant.annual.CO2.emissions..tons.)) %>%
  mutate(Plant.annual.CH4.emissions..lbs.=as.numeric(
    Plant.annual.CH4.emissions..lbs.)) %>%
  mutate(Plant.annual.N2O.emissions..lbs.=as.numeric(
    Plant.annual.N2O.emissions..lbs.)) %>%
  mutate(Plant.annual.CO2.equivalent.emissions..tons.=as.numeric(
    Plant.annual.CO2.equivalent.emissions..tons.)) %>%
```

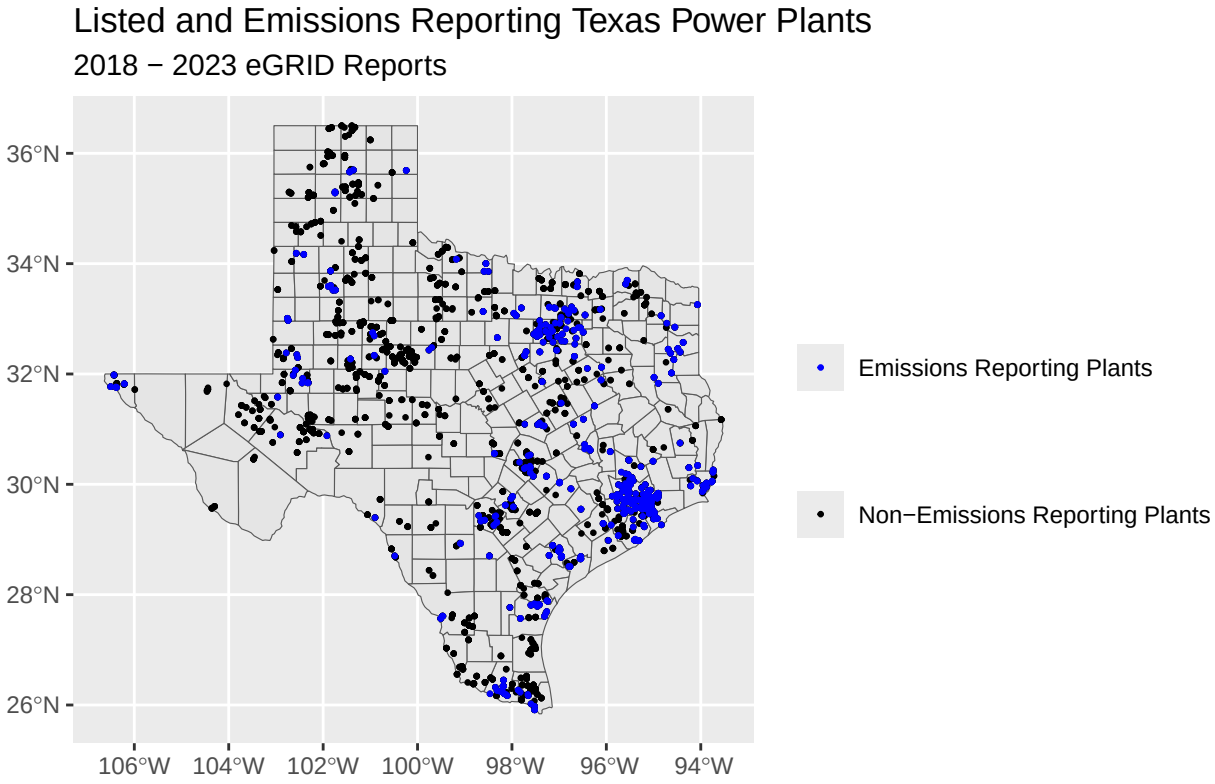


Figure 1: Listed and Emissions Reporting Texas Power Plants

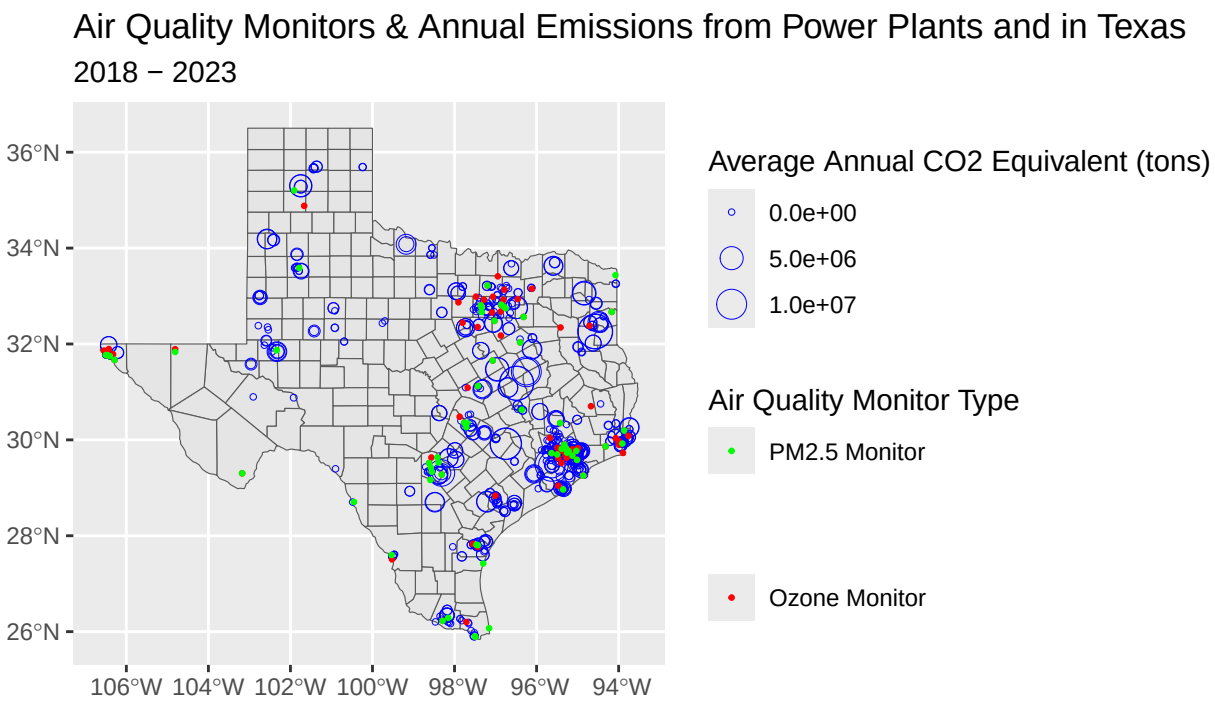


Figure 2: Air Quality Monitors & Annual Emissions from Power Plants and in Texas

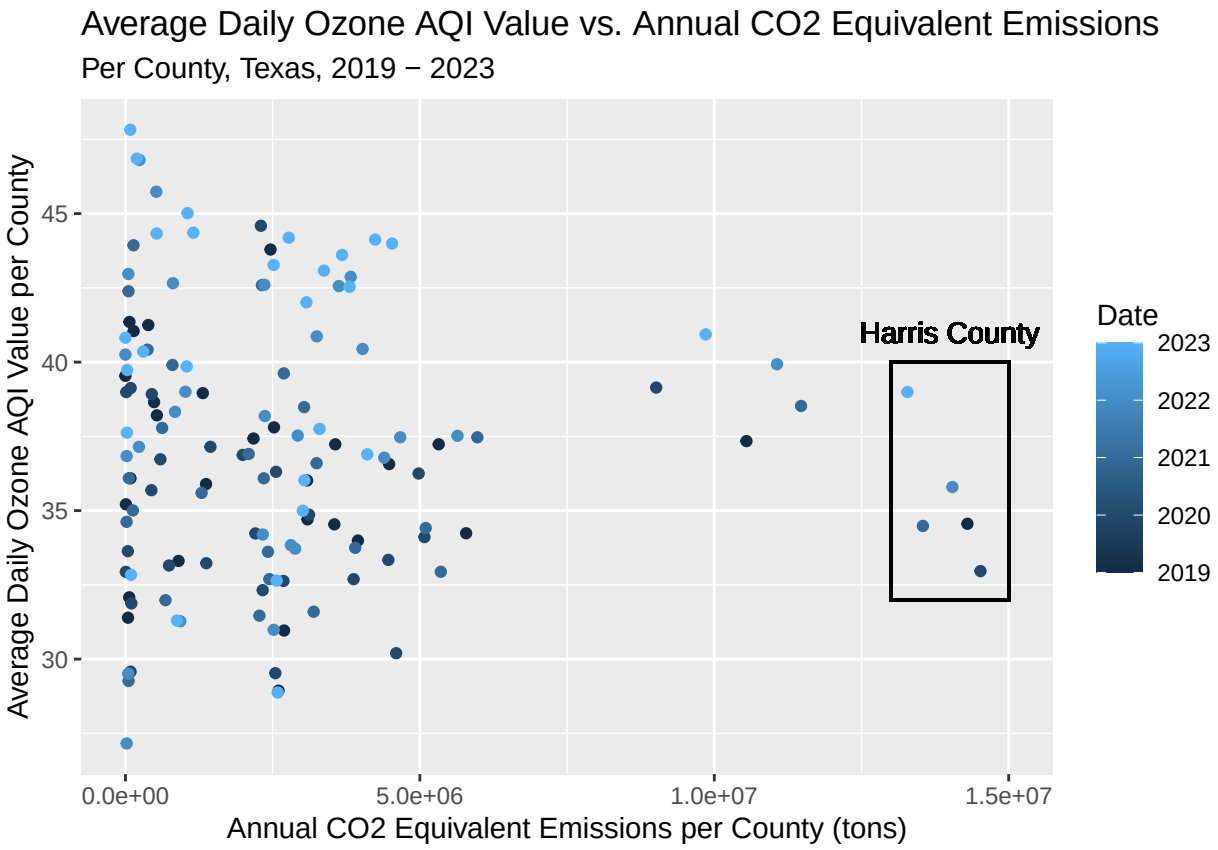


Figure 3: Average Daily Ozone AQI Value vs. Annual CO2 Equivalent Emissions

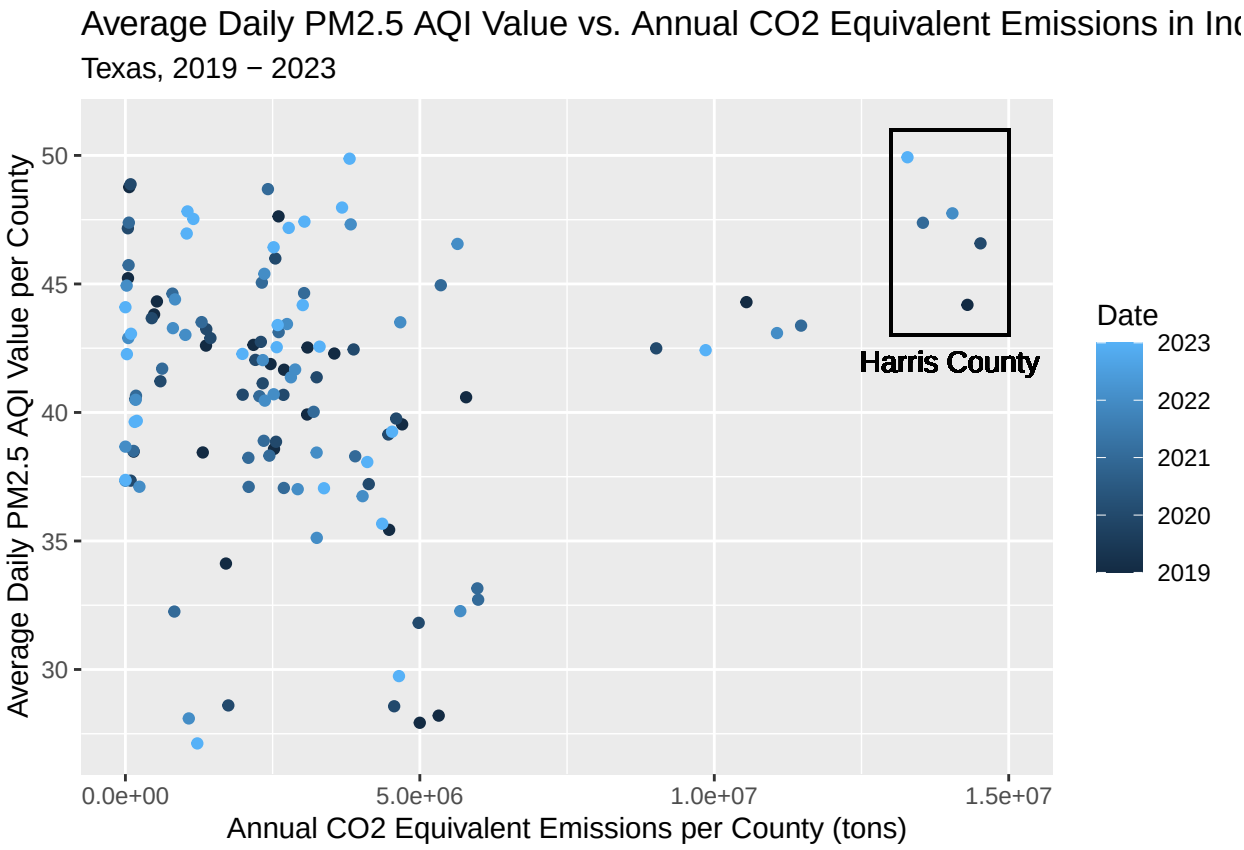


Figure 4: Average Daily PM2.5 AQI Value vs. Annual CO2 Equivalent Emissions in Individual Counties

```
  mutate(Plant.annual.Hg.emissions..lbs.=as.numeric(
    Plant.annual.Hg.emissions..lbs.)) %>%
  select("Data.Year", "Plant.state.abbreviation", "Plant.name",
         "Plant.county.name", "Plant.latitude", "Plant.longitude",
         "Plant.primary.fuel","Plant.annual.NOx.emissions..tons.",
         "Plant.annual.SO2.emissions..tons.",
         "Plant.annual.CO2.emissions..tons.",
         "Plant.annual.CH4.emissions..lbs.",
         "Plant.annual.N2O.emissions..lbs.",
         "Plant.annual.CO2.equivalent.emissions..tons.",
         "Plant.annual.Hg.emissions..lbs.")

eGRID21_PLNT <- eGRID21_PLNT %>%
  #slice(-1) %>%
  mutate(Data.Year=as.Date(paste0(Data.Year, "-01-01"))) %>%
    mutate(Plant.latitude=as.numeric(Plant.latitude)) %>%
    mutate(Plant.longitude=as.numeric(Plant.longitude)) %>%
    mutate(Plant.annual.NOx.emissions..tons.=as.numeric(
      Plant.annual.NOx.emissions..tons.)) %>%
    mutate(Plant.annual.SO2.emissions..tons.=as.numeric(
      Plant.annual.SO2.emissions..tons.)) %>%
    mutate(Plant.annual.CO2.emissions..tons.=as.numeric(
      Plant.annual.CO2.emissions..tons.)) %>%
    mutate(Plant.annual.CH4.emissions..lbs.=as.numeric(
      Plant.annual.CH4.emissions..lbs.)) %>%
    mutate(Plant.annual.N2O.emissions..lbs.=as.numeric(
      Plant.annual.N2O.emissions..lbs.)) %>%
    mutate(Plant.annual.CO2.equivalent.emissions..tons.=as.numeric(
      Plant.annual.CO2.equivalent.emissions..tons.)) %>%
    mutate(Plant.annual.Hg.emissions..lbs.=as.numeric(
      Plant.annual.Hg.emissions..lbs.)) %>%
  select("Data.Year", "Plant.state.abbreviation", "Plant.name",
         "Plant.county.name", "Plant.latitude", "Plant.longitude",
         "Plant.primary.fuel","Plant.annual.NOx.emissions..tons.",
         "Plant.annual.SO2.emissions..tons.",
         "Plant.annual.CO2.emissions..tons.",
         "Plant.annual.CH4.emissions..lbs.",
         "Plant.annual.N2O.emissions..lbs.",
         "Plant.annual.CO2.equivalent.emissions..tons.",
         "Plant.annual.Hg.emissions..lbs.")


eGRID20_PLNT <- eGRID20_PLNT %>%
  #slice(-1) %>%
  mutate(Data.Year=as.Date(paste0(Data.Year, "-01-01"))) %>%
  mutate(Plant.latitude=as.numeric(Plant.latitude)) %>%
  mutate(Plant.longitude=as.numeric(Plant.longitude)) %>%
  mutate(Plant.annual.NOx.emissions..tons.=as.numeric(
    Plant.annual.NOx.emissions..tons.)) %>%
  mutate(Plant.annual.SO2.emissions..tons.=as.numeric(
    Plant.annual.SO2.emissions..tons.)) %>%
  mutate(Plant.annual.CO2.emissions..tons.=as.numeric(
    Plant.annual.CO2.emissions..tons.)) %>%
```

```
  mutate(Plant.annual.CH4.emissions..lbs.=as.numeric(
    Plant.annual.CH4.emissions..lbs.)) %>%
  mutate(Plant.annual.N2O.emissions..lbs.=as.numeric(
    Plant.annual.N2O.emissions..lbs.)) %>%
  mutate(Plant.annual.CO2.equivalent.emissions..tons.=as.numeric(
    Plant.annual.CO2.equivalent.emissions..tons.)) %>%
  mutate(Plant.annual.Hg.emissions..lbs.=as.numeric(
    Plant.annual.Hg.emissions..lbs.)) %>%
  select("Data.Year", "Plant.state.abbreviation", "Plant.name",
         "Plant.county.name", "Plant.latitude", "Plant.longitude",
         "Plant.primary.fuel","Plant.annual.NOx.emissions..tons.",
         "Plant.annual.SO2.emissions..tons.",
         "Plant.annual.CO2.emissions..tons.",
         "Plant.annual.CH4.emissions..lbs.",
         "Plant.annual.N2O.emissions..lbs.",
         "Plant.annual.CO2.equivalent.emissions..tons.",
         "Plant.annual.Hg.emissions..lbs.")

eGRID19_PLNT <- eGRID19_PLNT %>%
  #slice(-1) %>%
  mutate(Data.Year=as.Date(paste0(Data.Year, "-01-01"))) %>%
  mutate(Plant.latitude=as.numeric(Plant.latitude)) %>%
  mutate(Plant.longitude=as.numeric(Plant.longitude)) %>%
  mutate(Plant.annual.NOx.emissions..tons.=as.numeric(
    Plant.annual.NOx.emissions..tons.)) %>%
  mutate(Plant.annual.SO2.emissions..tons.=as.numeric(
    Plant.annual.SO2.emissions..tons.)) %>%
  mutate(Plant.annual.CO2.emissions..tons.=as.numeric(
    Plant.annual.CO2.emissions..tons.)) %>%
  mutate(Plant.annual.CH4.emissions..lbs.=as.numeric(
    Plant.annual.CH4.emissions..lbs.)) %>%
  mutate(Plant.annual.N2O.emissions..lbs.=as.numeric(
    Plant.annual.N2O.emissions..lbs.)) %>%
  mutate(Plant.annual.CO2.equivalent.emissions..tons.=as.numeric(
    Plant.annual.CO2.equivalent.emissions..tons.)) %>%
  mutate(Plant.annual.Hg.emissions..lbs.=as.numeric(
    Plant.annual.Hg.emissions..lbs.)) %>%
  select("Data.Year", "Plant.state.abbreviation", "Plant.name",
         "Plant.county.name", "Plant.latitude", "Plant.longitude",
         "Plant.primary.fuel","Plant.annual.NOx.emissions..tons.",
         "Plant.annual.SO2.emissions..tons.",
         "Plant.annual.CO2.emissions..tons.",
         "Plant.annual.CH4.emissions..lbs.",
         "Plant.annual.N2O.emissions..lbs.",
         "Plant.annual.CO2.equivalent.emissions..tons.",
         "Plant.annual.Hg.emissions..lbs.")

#combine 2019-2023 egrid data into one dataframe
eGRID_PLNT <- rbind (eGRID23_PLNT, eGRID22_PLNT, eGRID21_PLNT, eGRID20_PLNT,
                     eGRID19_PLNT)

#Sum CO2 equiv at county level
#XH added: Sum CH4 at county level
```

```
eGRID_PLNT_US <- group_by(eGRID_PLNT, Plant.state.abbreviation,
                          Plant.county.name, Data.Year) %>%
  summarize(
    CO2_Equiv = sum(Plant.annual.CO2.equivalent.emissions..tons., na.rm = TRUE),
    Annual_CH4_lb = sum(Plant.annual.CH4.emissions..lbs., na.rm = TRUE)
    ) %>%
  filter(CO2_Equiv != 0, Annual_CH4_lb != 0) %>%
  ungroup()
```

```
## `summarise()` has grouped output by 'Plant.state.abbreviation',
## 'Plant.county.name'. You can override using the `.groups` argument.
```

```
#filter for just Texas (county level)
eGRID_PLNT_TX <- filter(eGRID_PLNT_US,Plant.state.abbreviation == "TX" ) %>%
  rename(Date = Data.Year) %>%
  rename(County = Plant.county.name)
```

```
#Texas PM2.5 for each year. Formatted into yearly rather than daily data
TXPM2523 <- TXPM2523 %>%
  mutate(Date=mdy(Date)) %>%
  select("Date", "Daily.AQI.Value", "Local.Site.Name",
         "AQS.Parameter.Description", "State", "County",
         "Site.Latitude", "Site.Longitude") %>%
  mutate(Year = year(Date)) %>%
  mutate(Date=as.Date(paste0(Year, "-01-01")))

TXPM2522 <- TXPM2522 %>%
  mutate(Date=mdy(Date)) %>%
  select("Date", "Daily.AQI.Value", "Local.Site.Name",
         "AQS.Parameter.Description", "State", "County",
         "Site.Latitude", "Site.Longitude") %>%
  mutate(Year = year(Date)) %>%
  mutate(Date=as.Date(paste0(Year, "-01-01")))

TXPM2521 <- TXPM2521 %>%
  mutate(Date=mdy(Date)) %>%
  select("Date", "Daily.AQI.Value", "Local.Site.Name",
         "AQS.Parameter.Description", "State", "County",
         "Site.Latitude", "Site.Longitude") %>%
  mutate(Year = year(Date)) %>%
  mutate(Date=as.Date(paste0(Year, "-01-01")))

TXPM2520 <- TXPM2520 %>%
  mutate(Date=mdy(Date)) %>%
  select("Date", "Daily.AQI.Value", "Local.Site.Name",
         "AQS.Parameter.Description", "State", "County",
         "Site.Latitude", "Site.Longitude") %>%
  mutate(Year = year(Date)) %>%
  mutate(Date=as.Date(paste0(Year, "-01-01")))

TXPM2519 <- TXPM2519 %>%
  mutate(Date=mdy(Date)) %>%
  select("Date", "Daily.AQI.Value", "Local.Site.Name",
```

```
         "AQS.Parameter.Description", "State", "County",
         "Site.Latitude", "Site.Longitude") %>%
  mutate(Year = year(Date)) %>%
  mutate(Date=as.Date(paste0(Year, "-01-01")))

#Average annual PM2.5 in Texas by County, then filter for Harris county
TXPM25 <- rbind(TXPM2519, TXPM2520, TXPM2521, TXPM2522, TXPM2523)
TXPM25_Harris <- TXPM25 %>%
  group_by(Date, County) %>%
  summarize(Avg_AQI_PM25 = mean(Daily.AQI.Value)) %>%
  filter(County == "Harris")
```

```
## `summarise()` has grouped output by 'Date'. You can override using the
## `.groups` argument.
```

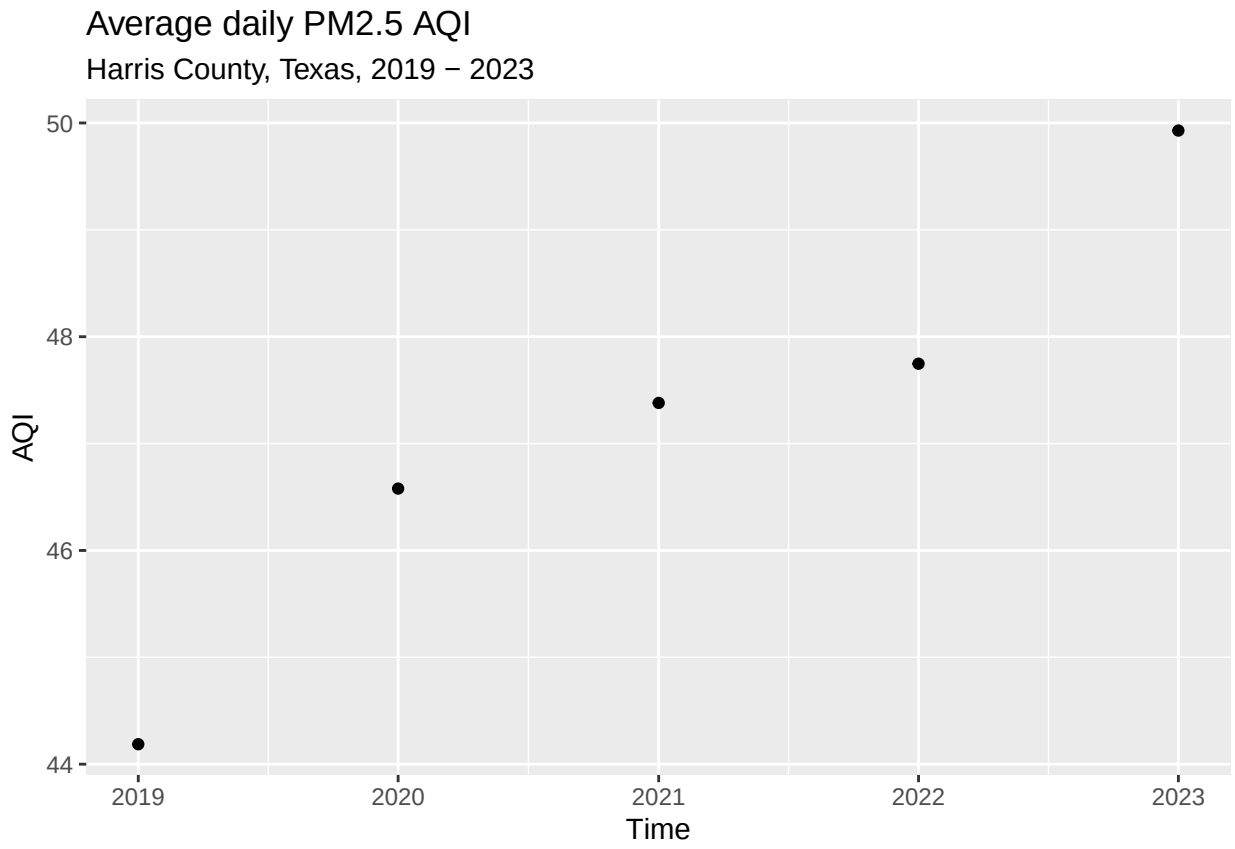
```
#Texas Ozone for each year. Formatted into yearly rather than daily data
TXOzone23 <- TXOzone23 %>%
  mutate(Date=mdy(Date)) %>%
  select("Date", "Daily.AQI.Value", "Local.Site.Name",
         "AQS.Parameter.Description", "State", "County",
         "Site.Latitude", "Site.Longitude") %>%
  mutate(Year = year(Date)) %>%
  mutate(Date=as.Date(paste0(Year, "-01-01")))

TXOzone22 <- TXOzone22 %>%
  mutate(Date=mdy(Date)) %>%
  select("Date", "Daily.AQI.Value", "Local.Site.Name",
         "AQS.Parameter.Description", "State", "County",
         "Site.Latitude", "Site.Longitude") %>%
  mutate(Year = year(Date)) %>%
  mutate(Date=as.Date(paste0(Year, "-01-01")))

TXOzone21 <- TXOzone21 %>%
  mutate(Date=mdy(Date)) %>%
  select("Date", "Daily.AQI.Value", "Local.Site.Name",
         "AQS.Parameter.Description", "State", "County",
         "Site.Latitude", "Site.Longitude") %>%
  mutate(Year = year(Date)) %>%
  mutate(Date=as.Date(paste0(Year, "-01-01")))

TXOzone20 <- TXOzone20 %>%
  mutate(Date=mdy(Date)) %>%
  select("Date", "Daily.AQI.Value", "Local.Site.Name",
         "AQS.Parameter.Description", "State", "County",
         "Site.Latitude", "Site.Longitude") %>%
  mutate(Year = year(Date)) %>%
  mutate(Date=as.Date(paste0(Year, "-01-01")))

TXOzone19 <- TXOzone19 %>%
  mutate(Date=mdy(Date)) %>%
  select("Date", "Daily.AQI.Value", "Local.Site.Name",
         "AQS.Parameter.Description", "State", "County",
         "Site.Latitude", "Site.Longitude") %>%
```

```
  mutate(Year = year(Date)) %>%
  mutate(Date=as.Date(paste0(Year, "-01-01")))

#Average annual Ozone in Texas by County, then filter for Harris county
TXOzone <- rbind(TXOzone19, TXOzone20, TXOzone21, TXOzone22, TXOzone23)
TXOzone_Harris <- TXOzone %>%
  group_by(Date, County) %>%
  summarize(Avg_AQI_Ozone = mean(Daily.AQI.Value)) %>%
  filter(County == "Harris")
```

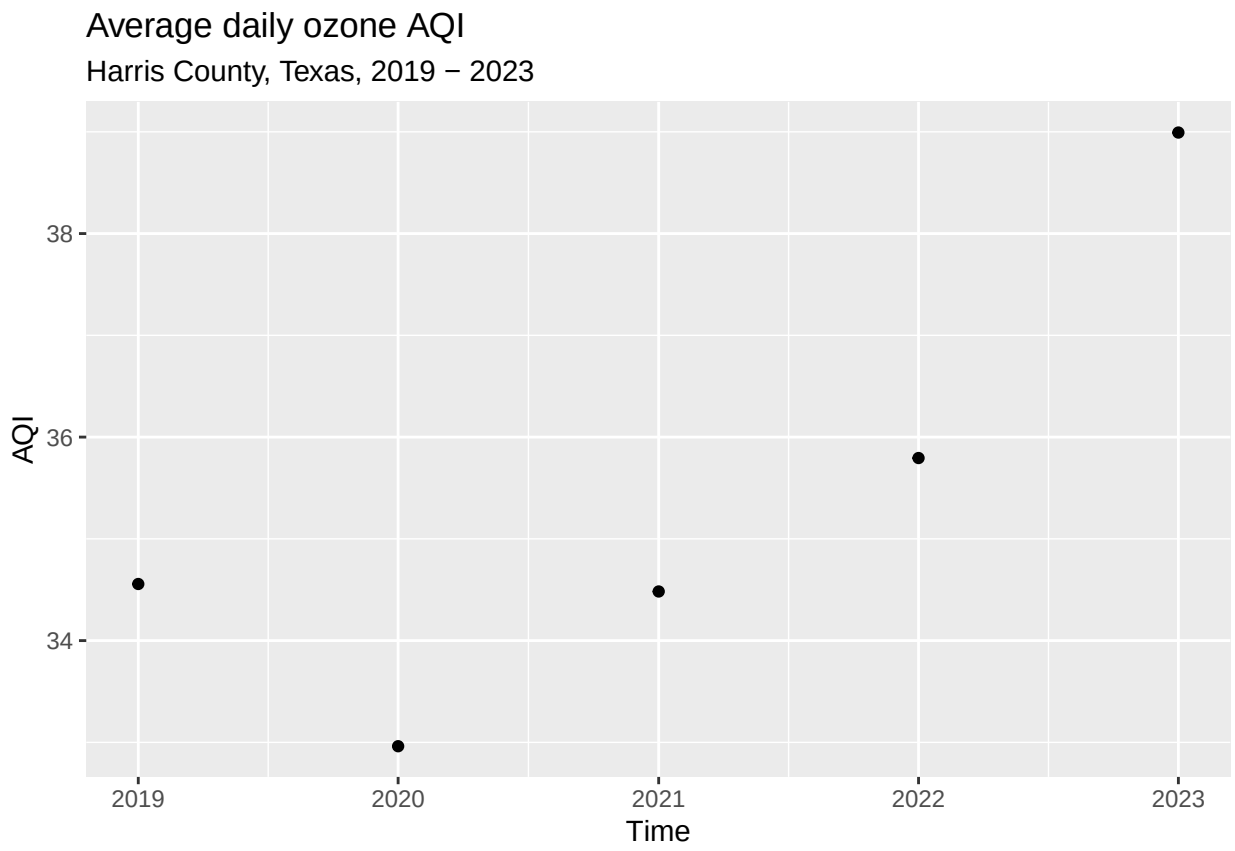
```
## `summarise()` has grouped output by 'Date'. You can override using the
## `.groups` argument.
```

```
#Annual average AQI (PM2.5/Ozone) and
#emissions (CO2 equiv/CH4) in Harris county, TX
TX_emiss_PM25_Harris <- inner_join(TXPM25_Harris, eGRID_PLNT_TX,
                                   by = c("Date", "County"))

TX_emiss_O3_Harris <- inner_join(TXOzone_Harris, eGRID_PLNT_TX,
                                   by = c("Date", "County"))
```

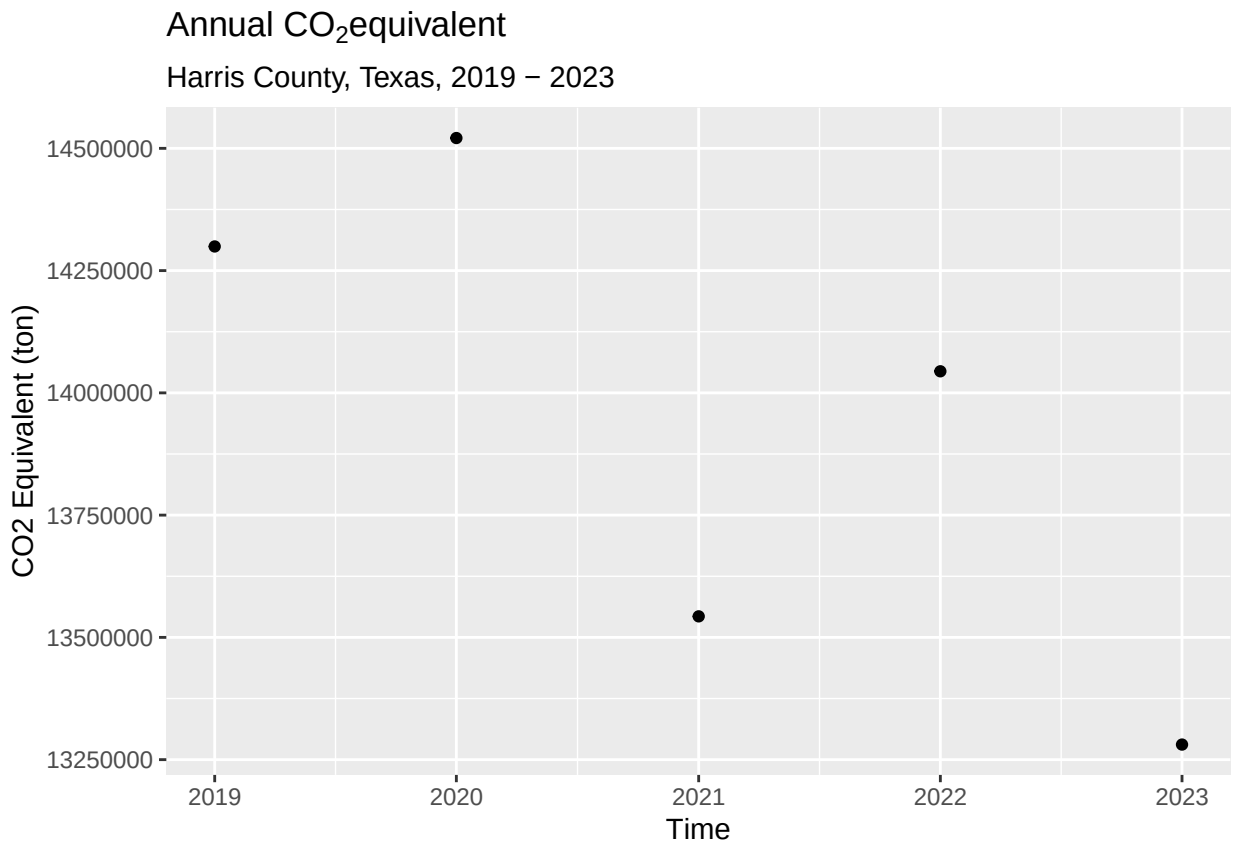
```
#Graph of PM2.5 AQI over time
PM25.plot <- TX_emiss_PM25_Harris %>%
  ggplot(
    mapping = aes(
      x = Date,
      y = Avg_AQI_PM25
    )
  )+
  geom_point()+
  xlab("Time")+
  ylab("AQI")+
  ggtitle("Average daily PM2.5 AQI",
          subtitle = "Harris County, Texas, 2019 - 2023")
PM25.plot
```



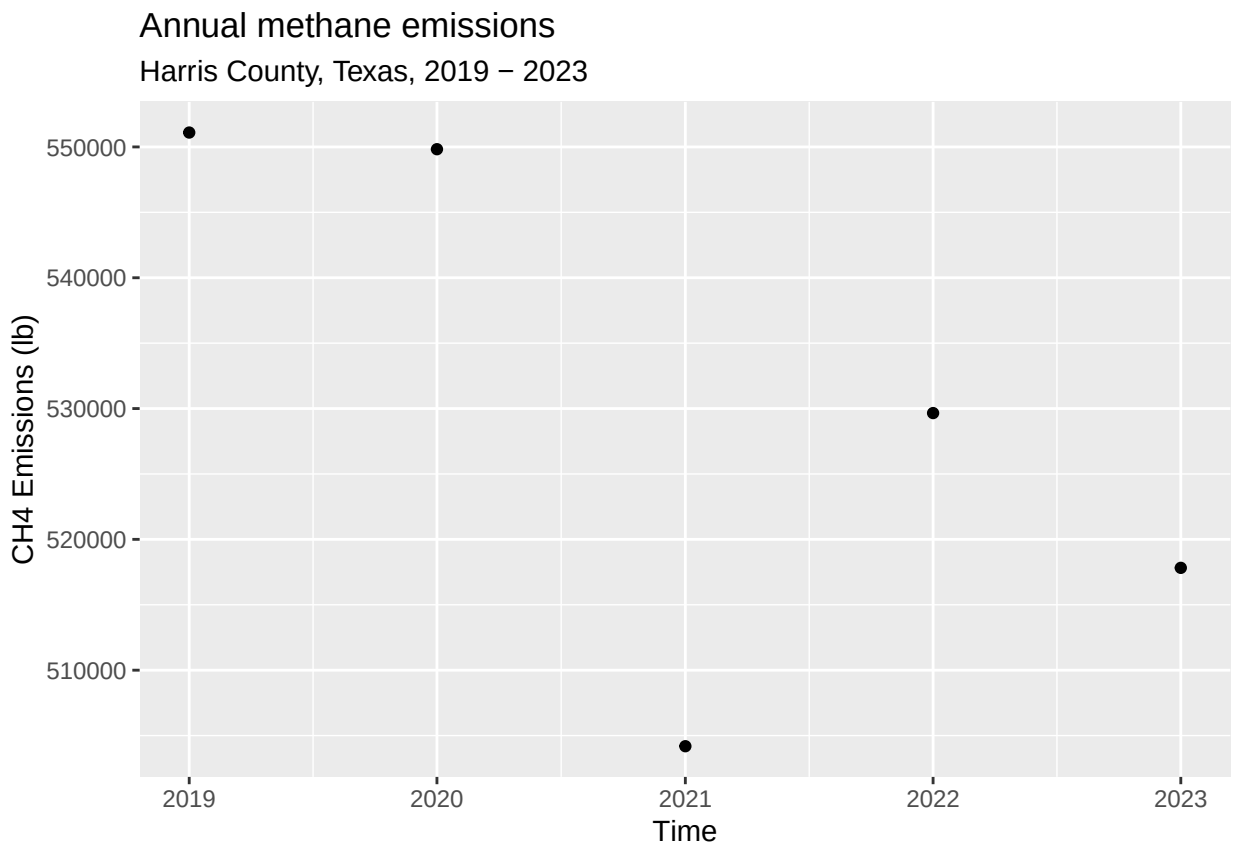

```
#Graph of Ozone AQI  over time
O3.plot <- TX_emiss_O3_Harris %>%
  ggplot(
    mapping = aes(
      x = Date,
      y = Avg_AQI_Ozone
    )
  )+
  geom_point()+
  xlab("Time")+
  ylab("AQI")+
  ggtitle("Average daily ozone AQI",
          subtitle = "Harris County, Texas, 2019 - 2023")
O3.plot
```




```
#Graph of CO2e emissions over time
CO2e.plot <- TX_emiss_O3_Harris %>%
  ggplot(
    mapping = aes(
      x = Date,
      y = CO2_Equiv
    )
  )+
  geom_point()+
  xlab("Time")+
  ylab("CO2 Equivalent (ton)")+
  ggtitle(expression("Annual CO"[2] * "equivalent"),
          subtitle = "Harris County, Texas, 2019 - 2023")
CO2e.plot
```




```
#Graph of CH4 emissions over time
CH4.plot <- TX_emiss_03_Harris %>%
  ggplot(
    mapping = aes(
      x = Date,
      y = Annual_CH4_lb
    )
  )+
  geom_point()+
  xlab("Time")+
  ylab("CH4 Emissions (lb)")+
  ggtitle("Annual methane emissions",
          subtitle = "Harris County, Texas, 2019 - 2023")
CH4.plot
```


Annual methane emissions
Harris County, Texas, 2019 − 2023
CH4 Emissions (lb)
550000
540000
530000
520000
510000
2019
2020
2021
2022
2023
Time

Question 3:

Summary and Conclusions

The analysis of correlation between air quality and emissions at the county level per year did not result in significant results. There is not a significant correlation between annual county emission from power plants and average annual county AQI score from Ozone or PM2.5. Additionally, no county on average saw any poor or unsafe Air Quality Index levels. There are two potential factors influencing this lack of correlation. One is that air quality and emissions cannot be studied at localized scale. Likely emissions disperse out of the county it is in based on local weather patterns. Conducting analysis of local air quality based on power plant emissions might be more accurate if wind patterns were taken into consideration to estimate where emissions may be concentrating. Another reason there may not be a correlation is because there are not enough data points in this analysis to see a trend. All plants do not report emissions and there are not air quality stations in all counties. To perform this analysis more accurately, data should be looked at country wide and there should be better standards for ensuring all active power plants report their emissions.

References

<add references here if relevant, otherwise delete this section>