

# Mini-project on air quality trends across the City of London

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## 1 Introduction

This project is all about studying the air we breathe in London. We're looking at data from 36 air monitoring spots across the city, covering the time from 01/01/2022 to 31/12/2023. We're looking at things like NO<sub>2</sub>, O<sub>3</sub>, and dust particles to see if anything's changed over time.

The air we breathe can affect our health and the environment. The aim is to observe how these pollutants vary across different locations in London and over different times.

The air we breathe can affect our health and the environment. By checking the air quality in different places, we hope to find out if there are any issues we need to pay attention to.

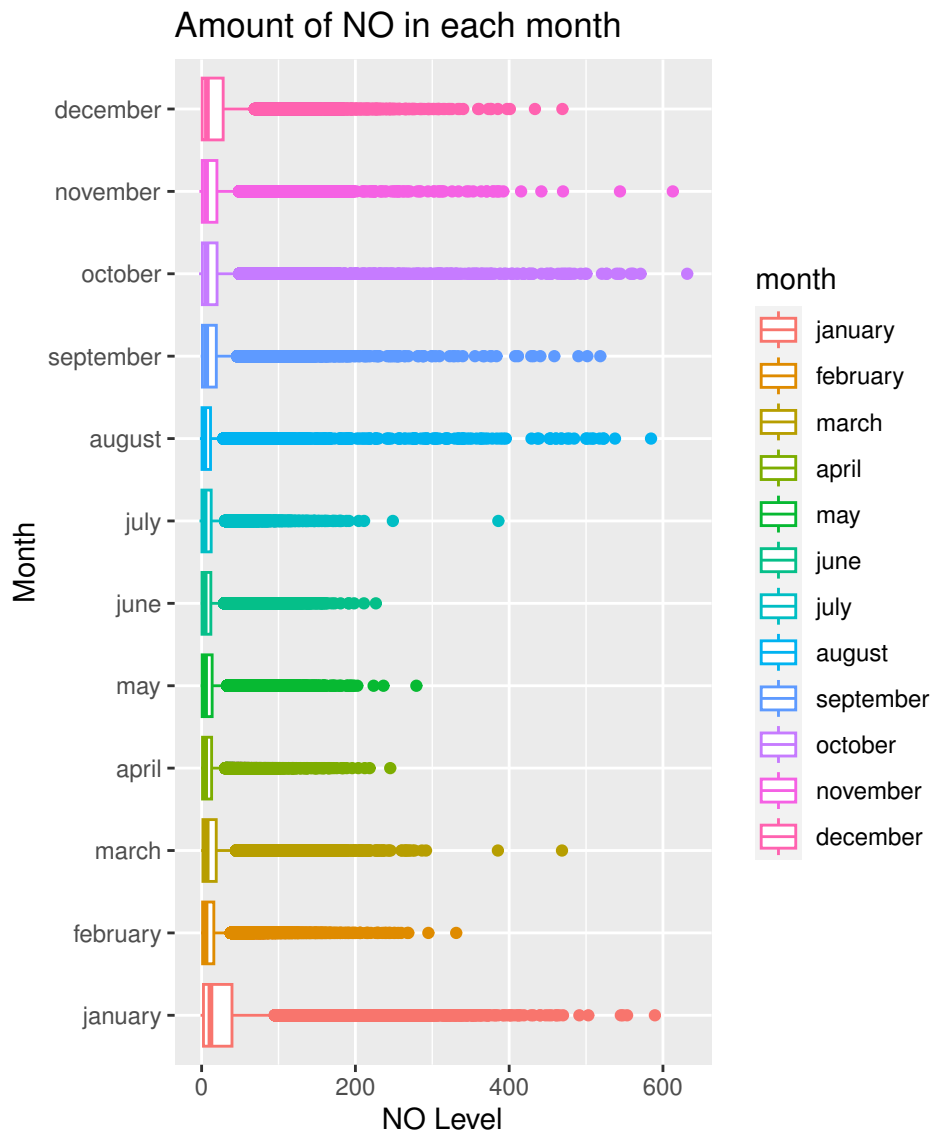
Two datasets are utilized for this analysis. One contains hourly measurements of different pollutants, and the other provides details about the monitoring sites, such as location and substances measured.

Looking into this data helps us understand what the air is like in London. We're trying to see if there are any repeating trends or patterns. The things we learn could be useful for people who make choices about the environment and for anyone who cares about the air they breathe every day.

## 2 Literature Review

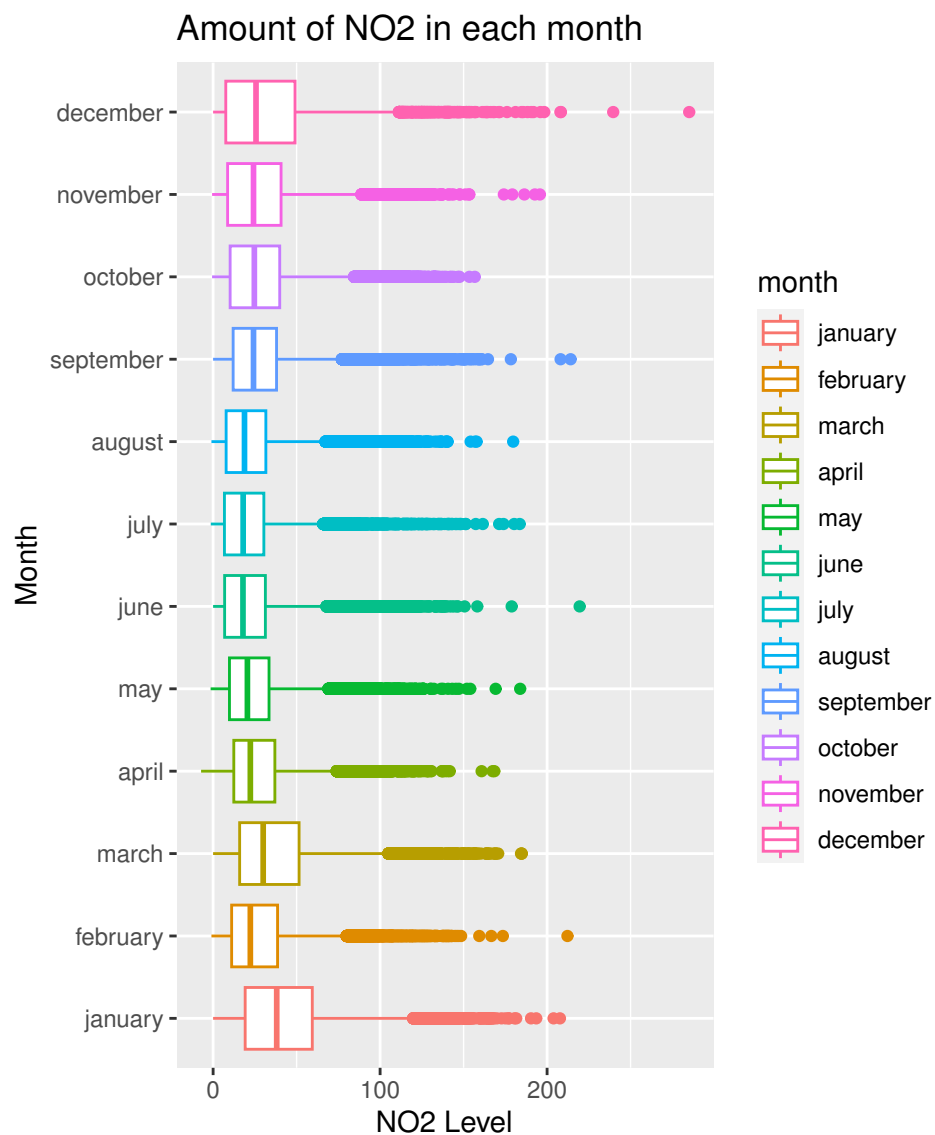
For my mini project, I used two datasets: "London Local Data 2022" and "London Local Sites." The first dataset had info about pollutants like NO, NO<sub>2</sub>, NO<sub>x</sub>, O<sub>3</sub>, SO<sub>2</sub>, PM<sub>10</sub>, and PM<sub>2.5</sub>, but some data was missing. It's common in environmental studies. The second dataset gave details about where the monitors are located. Previous studies say it's essential to have monitors in the right places. Combining both datasets helps us understand how the air quality changes over time and in different spots in London.

## 3 Data set analysis



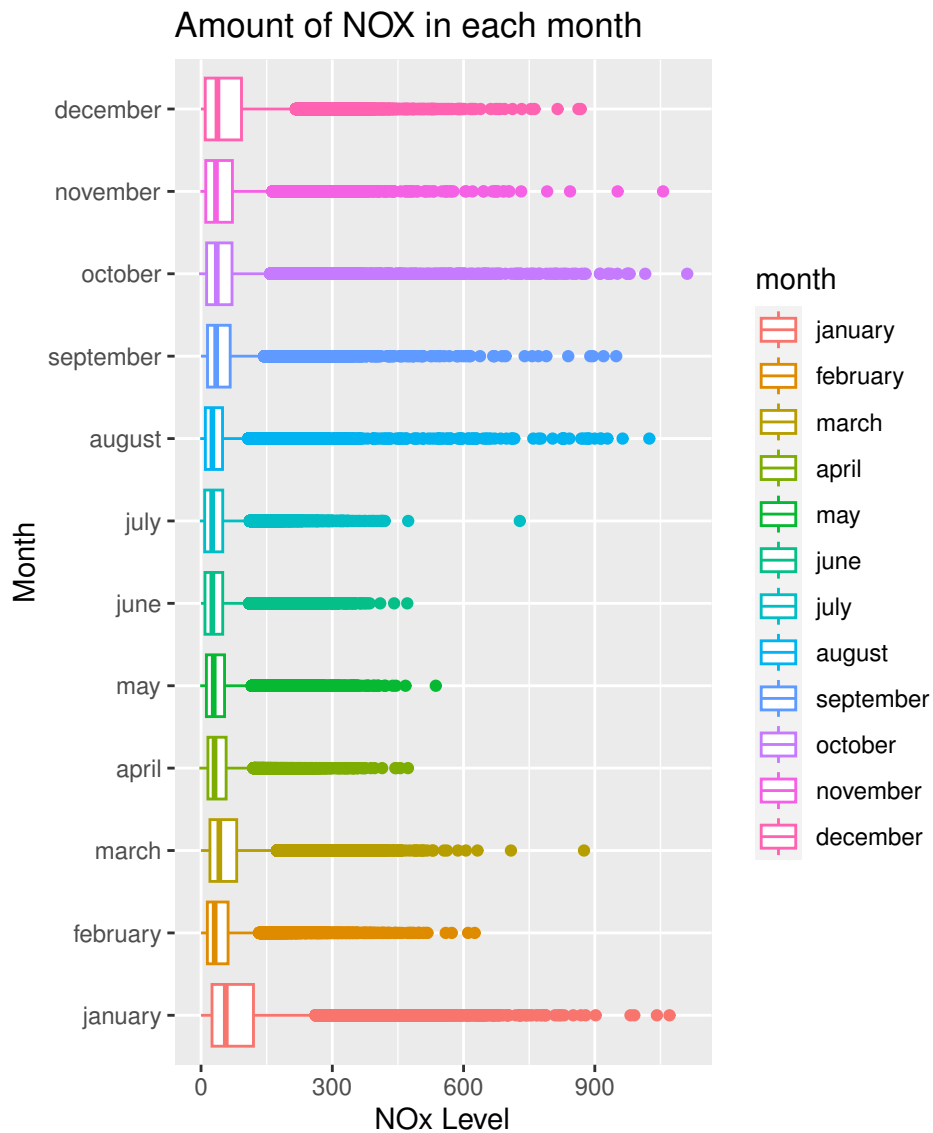
In January, the air quality is not so good because the median line shows higher average NO concentration. But in April, the air quality is better because that median line is lower, indicating lower average NO concentration. So, overall, the air is better in April compared to January.

Figure 1: Graph of NO in each month



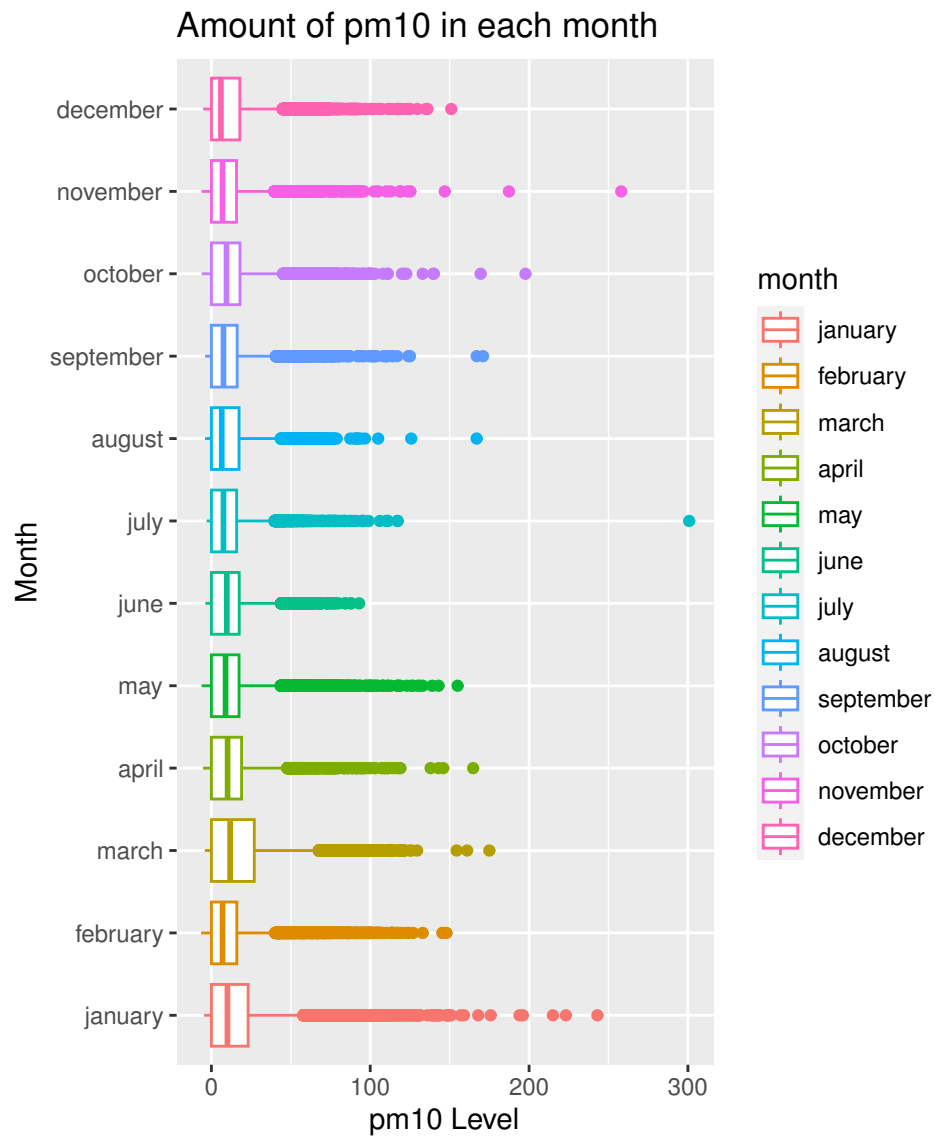
In January, the air quality is not so good because the median line shows higher average NO2 concentration. But in June and July, the air quality is better because their median lines are lower, indicating lower average NO2 concentrations. So, overall, the air is better in June and July compared to January.

Figure 2: Graph of NO2 in each month



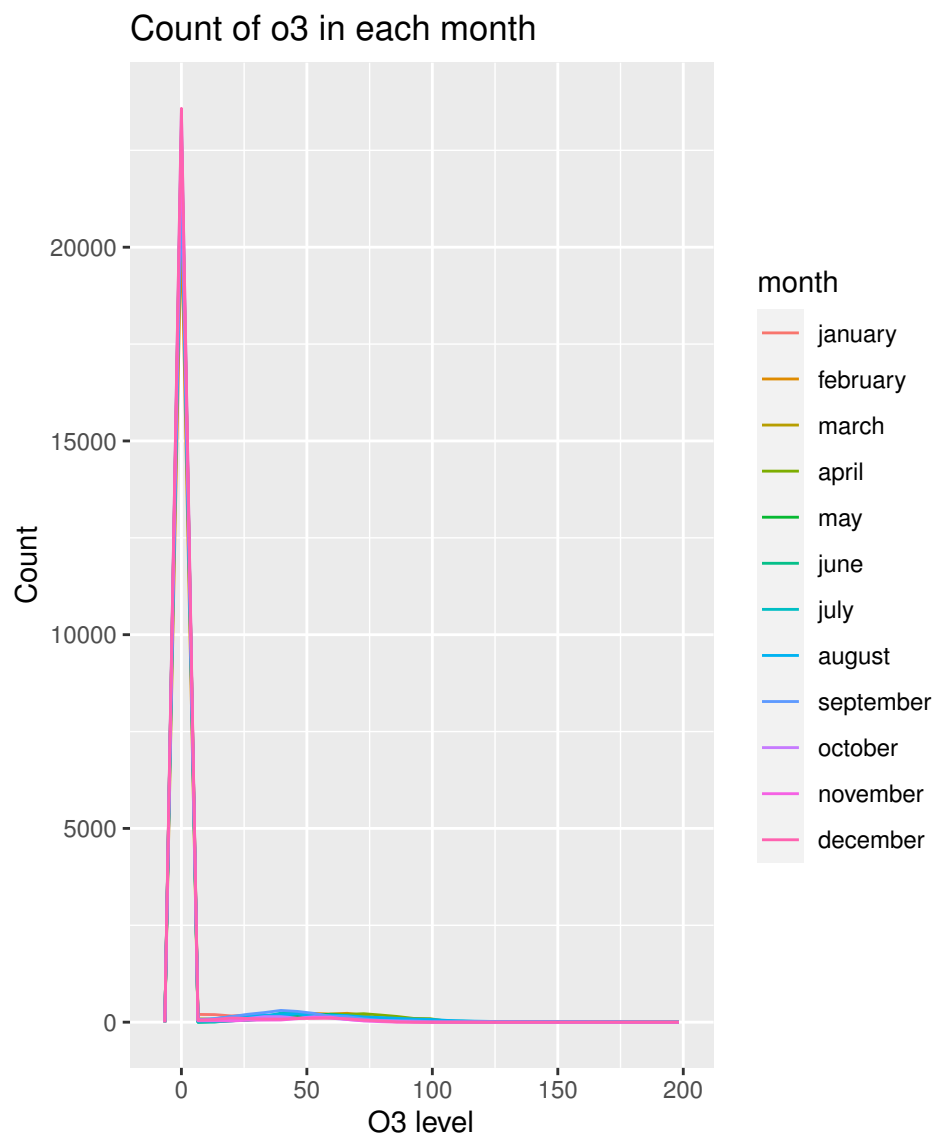
In January, the air quality is not so good because the median line shows higher average NOx concentration. But in July, the air quality is better because that median line is lower, indicating lower average NOx concentration. So, overall, the air is better in July compared to January.

Figure 3: Graph of NOx in each month



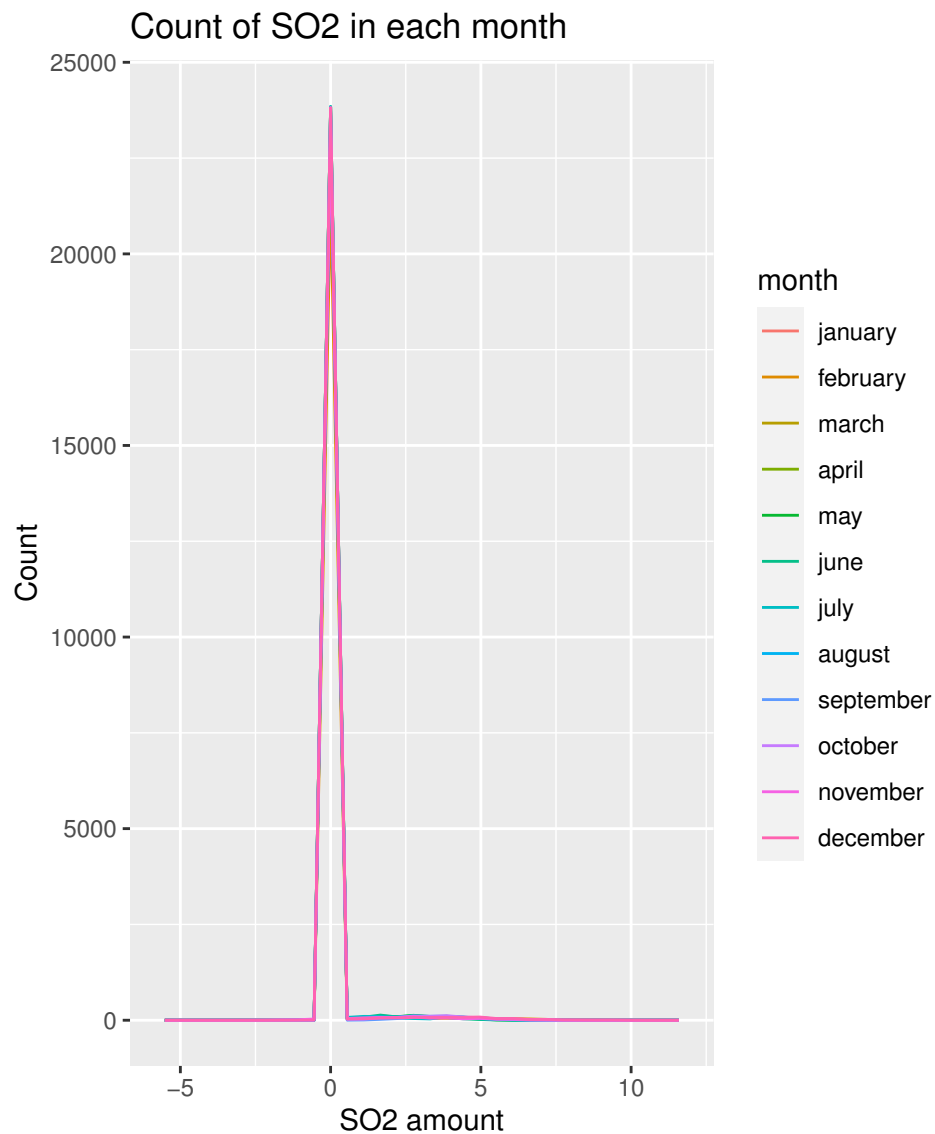
In March, the air quality is not so good because the median line shows higher average pm10 concentration. But in December, the air quality is better because that median line is lower, indicating lower average pm10 concentration. So, overall, the air is better in December compared to March.

Figure 4: Graph of pm10 in each month



In the O3 graph, the highest point on the polygon shows the most common concentration level, and it occurs in December. This concentration level represents the average O3 levels for December, indicating that the air quality is generally low during that month. The graph doesn't have any big spikes or gaps, suggesting that the concentrations are quite consistent and not significantly different from the majority.

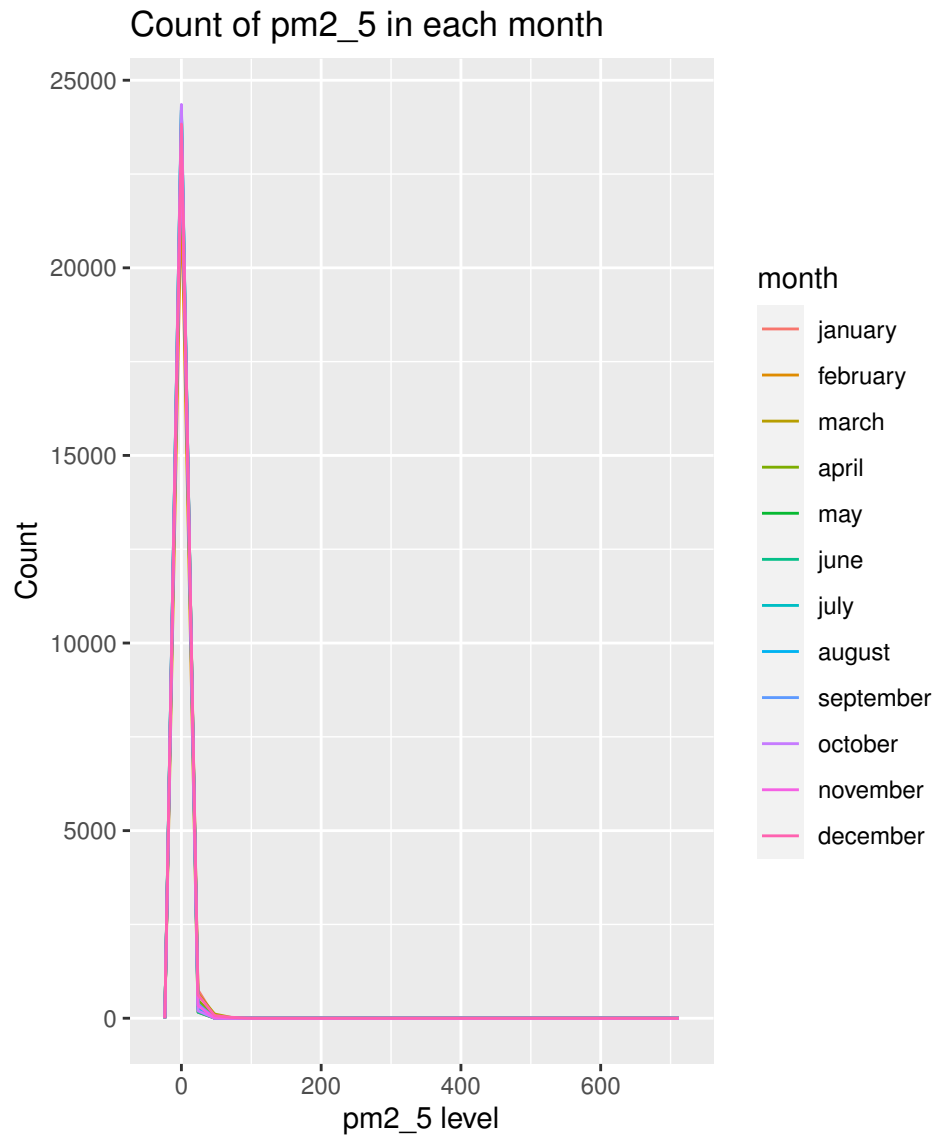
Figure 5: Graph of O3 in each month



In the SO2 graph, the highest point on the polygon shows the most common concentration level, and it occurs in November and December. This concentration level represents the average SO2 levels for November and December, indicating that the air quality is generally low during those months.

The graph doesn't have any big spikes or gaps, suggesting that the concentrations are quite consistent and not significantly different from the majority.

Figure 6: Graph of SO2 in each month



In the pm2.5 graph, the highest point on the polygon shows the most common concentration level, and it occurs in November and December. This concentration level represents the average SO<sub>2</sub> levels for November and December, indicating that the air quality is generally low during those months. The graph doesn't have any big spikes or gaps, suggesting that the concentrations are quite consistent and not significantly different from the majority.

Figure 7: Graph of pm2.5 in each month



## 4 Results and Discussions

### Overall quantity of air pollutants at each site

By considering the overall quantity of air pollutants at each site, calculated by adding up the hourly measurements for all months in 2022. Lambeth - Brixton Road has the highest total amount of air pollutants in London, reaching "2355163.5". On the other hand, City of London - Upper Thames Street shows the lowest total, recorded at 251.0, indicating high air quality and low pollution levels in that area.

### Overall Amount of Air Pollutants in Each Month in Year 2022

By considering the overall air pollutants for each month in 2022. The highest amount was found in January, indicating poor air quality in that period. On the other hand, June had the lowest total, "2011924," suggesting high air quality during that time.

### London's most air-polluted areas

This table highlights the key locations with significant air pollutant levels in London. Additionally, it indicates that these sites had poor air quality and higher air pollution compared to others in the region.

Air Pollutant	Site Name
nox	Ealing - Western Avenue
no2	Lambeth - Brixton Road
no	Ealing - Hanger Lane Gyratory
pm10	Lambeth - Bondway Interchange
o3	Southwark - Elephant and Castle
pm2-5	Hounslow Gunnersbury
so2	Lambeth - Bondway Interchange

Table 1: **Air polluted areas in London**

## 5 Conclusion

- \* The site with the highest air quality in London for the year 2022 was City of London - Upper Thames Street.
- \* Conversely, the site with the lowest air quality was Lambeth - Brixton Road in London during the same year.
- \* The month with the relatively highest air quality in London for 2022 was June.
- \* In contrast, the month with the relatively lowest air quality was January.
- \* Ealing - Western Avenue had the highest amount of NO<sub>x</sub> among the sites.
- \* Lambeth - Brixton Road recorded the highest amount of NO<sub>2</sub>.
- \* Ealing - Hanger Lane Gyratory had the highest amount of NO.
- \* Lambeth - Bondway Interchange showed the highest amount of PM<sub>10</sub>.
- \* Southwark - Elephant and Castle had the highest amount of O<sub>3</sub>.
- \* Hounslow Gunnersbury recorded the highest amount of PM<sub>2.5</sub>.
- \* Lambeth - Bondway Interchange had the highest amount of SO<sub>2</sub>.