Phase 4

Air Quality Analysis in Tamil Nadu

Phase 4: Development Part 2

In this part we will perform:

- Perform the air quality analysis and create visualizations.
- Calculate average SO2, NO2, and RSPM/PM10 levels across different monitoring stations, cities, or areas. Identify pollution trends and areas with high pollution levels.
- Create visualizations using data visualization libraries (e.g., Matplotlib, Seaborn).
- Access the provided link for Air Quality Analysis dataset.

Dataset Link: https://tn.data.gov.in/resource/location-wise-daily-ambient-air-qualitytamilnadu-year-2014

Introduction:

Air quality is a critical aspect of public health and environmental well-being, with significant implications for the quality of life in any region. In Tamil Nadu, a state known for its diverse landscapes and vibrant cities, monitoring and understanding air pollution levels is of paramount importance. This analysis aims to delve into the levels of Sulphur Dioxide (SO2), Nitrogen Dioxide (NO2), and Respirable Suspended Particulate Matter (RSPM) or Particulate Matter (PM10) across various monitoring stations and cities within Tamil Nadu.

By examining this data, we seek to discern trends, identify areas with heightened pollution levels, and generate visual representations that vividly depict the state of air quality in different regions. The insights gained from this analysis will not only inform public awareness but also serve as a foundation for informed policy decisions to safeguard the environment and public health in Tamil Nadu. Utilizing data visualization techniques, we aim to present this information in a clear and accessible manner, facilitating a deeper understanding of air quality dynamics in the region.

Calculation of dataset and trends are provided in this link:
https://colab.research.google.com/drive/1anYn6B2b5YXLiuDzUD0rQwQa2q_d0p-f

calculating the average of SO2, NO2 and RSPM/PM10 in general:

```
# Calculate the mean for each column
average_values = newdata.mean()

# Print the average values
print(average_values)
```

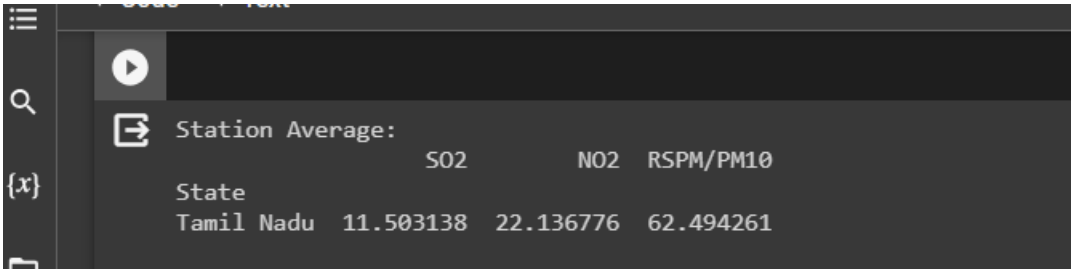
```
Stn Code     475.750261
SO2           11.503138
NO2           22.136776
RSPM/PM10     62.494261
dtype: float64
<ipython-input-33-85c5c67cd3a7>:2: FutureWarning: The default value of num
  average_values = newdata.mean()
```

Calculating the average of SO2,NO2,RSPM/PM10 level across different monitoring state, Cities/Town/Village/Area, Location in Tamil Nadu.

```
import pandas as pd

# Load the data
data = pd.read_csv("cpcb_dly_aq_tamil_nadu-2014 (1).csv")

# Calculate averages
station_avg = data.groupby('State')[['SO2', 'NO2', 'RSPM/PM10']].mean()
city_avg = data.groupby('City/Town/Village/Area')[['SO2', 'NO2', 'RSPM/PM10']].mean()

# Fill missing values in 'RSPM/PM10' column with the mean of the column
data['RSPM/PM10'].fillna(data['RSPM/PM10'].mean(), inplace=True)

location_avg = data.groupby('Location of Monitoring Station')[['SO2', 'NO2', 'RSPM/PM10']].mean()

print("State Average:")
print(station_avg)

print("\nCity/Town Average:")
print(city_avg)

print("\nLocation Average:")
print(location_avg)
```

Output:

Calculating the average of SO2, NO2,RSPM/PM10 in state:



```
Station Average:
                 SO2        NO2  RSPM/PM10
State
Tamil Nadu  11.503138  22.136776  62.494261
```

Calculating the average of SO2, NO2,RSPM/PM10 in City/Town/Village/Area:

```
City/Town Average:
                              SO2        NO2  RSPM/PM10
City/Town/Village/Area
Chennai                 13.014042  22.088442  58.998000
Coimbatore               4.541096  25.325342  49.217241
Cuddalore                8.965986  19.710884  61.881757
Madurai                 13.319728  25.768707  45.724490
Mettur                   8.429268  23.185366  52.721951
Salem                    8.114504  28.664122  62.954198
Thoothukudi             12.989691  18.512027  83.458904
Trichy                  15.293956  18.695055  85.054496
```

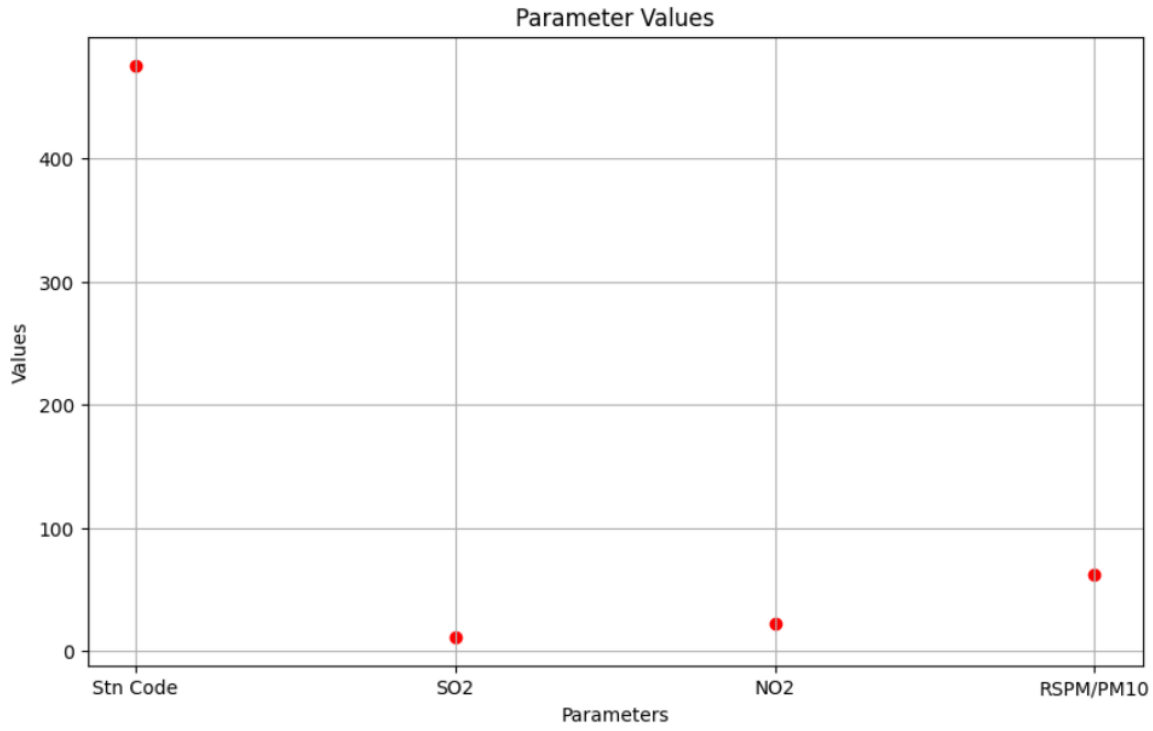
Calculating the average of SO2, NO2, RSPM/PM10 in Location:

Location Average:

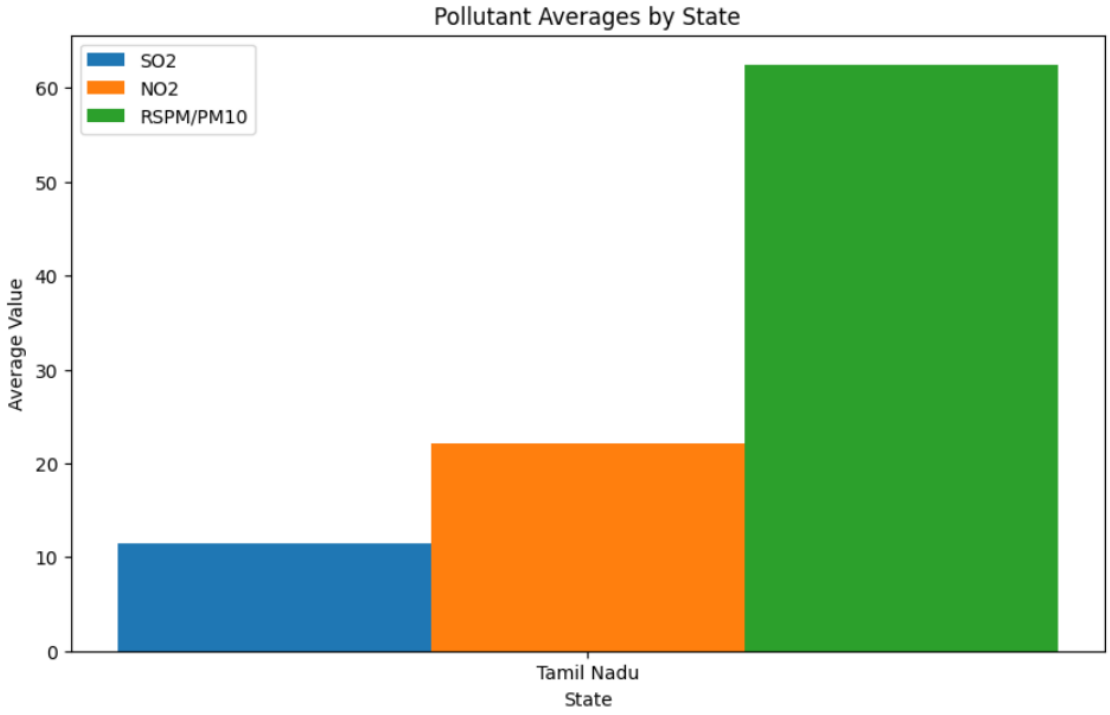
Location of Monitoring Station	SO2	NO2
AVM Jewellery Building, Tuticorin	9.302083	12.697917
Adyar, Chennai	13.252174	18.965217
Anna Nagar, Chennai	13.873874	20.754545
Bishop Heber College, Tirchy	11.800000	14.942857
Central Bus Stand, Trichy	18.013333	21.506667
District Environmental Engineer Office, Imperia...	8.101010	19.151515
Distt. Collector's Office, Coimbatore	4.554348	25.793478
Eachangadu Villagae	11.916667	22.395833
Fenner (I) Ltd. Employees Assiciation Building ...	13.643564	27.198020
Fisheries College, Tuticorin	14.526882	20.204301
Gandhi Market, Trichy	17.148649	20.797297
Golden Rock, Trichy	12.014085	15.000000
Govt. High School, Manali, Chennai.	13.043011	15.408602
Highway (Project -I) Building, Madurai	11.947917	24.458333
Kathivakkam, Municipal Kalyana Mandapam, Chennai	12.925532	15.170213
Kilpauk, Chennai	19.232759	27.172414
Kunnathur Chatram East Avani Mollai Street, Mad...	14.340206	25.577320
Madras Medical College, Chennai	7.418605	27.465116
Main Guard Gate, Tirchy	17.135135	20.837838
NEERI, CSIR Campus Chennai	5.931034	23.758621
Poniarajapuram, On the top of DEL, Coimbatore	4.126214	23.019417
Raja Agencies, Tuticorin	15.058824	22.441176
Raman Nagar, Mettur	7.572816	20.407767
SIDCO Industrial Complex, Mettur	9.294118	25.990196
SIDCO Office, Coimbatore	4.969072	27.329897
SIPCOT Industrial Complex, Cuddalore	6.969697	17.666667
Sowdeswari College Building, Salem	8.114504	28.664122
Thiruvottiyur Municipal Office, Chennai	8.360465	28.069767
Thiruvottiyur, Chennai	13.010417	15.583333
Thiyagaraya Nagar, Chennai	18.849558	28.250000

Location of Monitoring Station	RSPM/PM10
AVM Jewellery Building, Tuticorin	70.175258
Adyar, Chennai	57.068966
Anna Nagar, Chennai	72.187500
Bishop Heber College, Tirchy	45.633803
Central Bus Stand, Trichy	120.546667
District Environmental Engineer Office, Imperia...	64.020202
Distt. Collector's Office, Coimbatore	42.972933
Eachangadu Villagae	75.591837
Fenner (I) Ltd. Employees Assiciation Building ...	40.732673
Fisheries College, Tuticorin	85.255319
Gandhi Market, Trichy	101.743243
Golden Rock, Trichy	46.222222
Govt. High School, Manali, Chennai.	44.612903
Highway (Project -I) Building, Madurai	46.427083
Kathivakkam, Municipal Kalyana Mandapam, Chennai	46.851064
Kilpauk, Chennai	88.103448
Kunnathur Chatram East Avani Mollai Street, Mad...	50.226804
Madras Medical College, Chennai	35.837209
Main Guard Gate, Tirchy	107.693333
NEERI, CSIR Campus Chennai	43.678161
Poniarajapuram, On the top of DEL, Coimbatore	48.883495
Raja Agencies, Tuticorin	94.230336
Raman Nagar, Mettur	51.106796
SIDCO Industrial Complex, Mettur	54.352941
SIDCO Office, Coimbatore	55.969072
SIPCOT Industrial Complex, Cuddalore	46.171717
Sowdeswari College Building, Salem	62.954198
Thiruvottiyur Municipal Office, Chennai	34.310345
Thiruvottiyur, Chennai	42.604167
Thiyagaraya Nagar, Chennai	102.327434

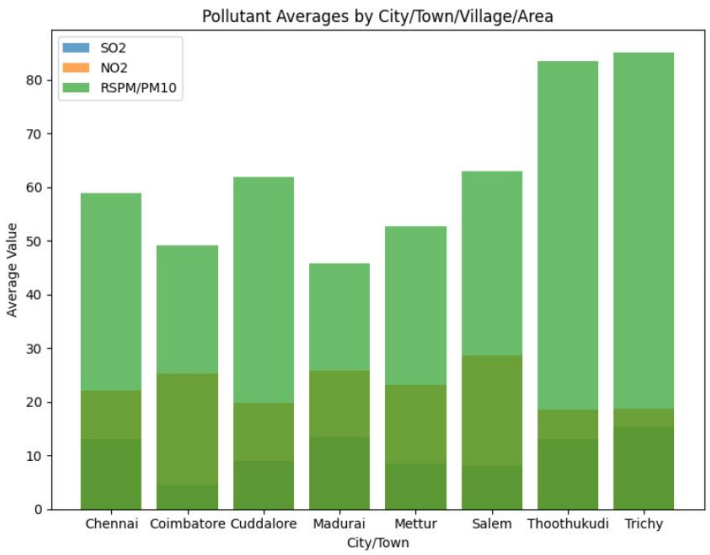
The average of SO2, NO2 and RSPM/PM10 in general:

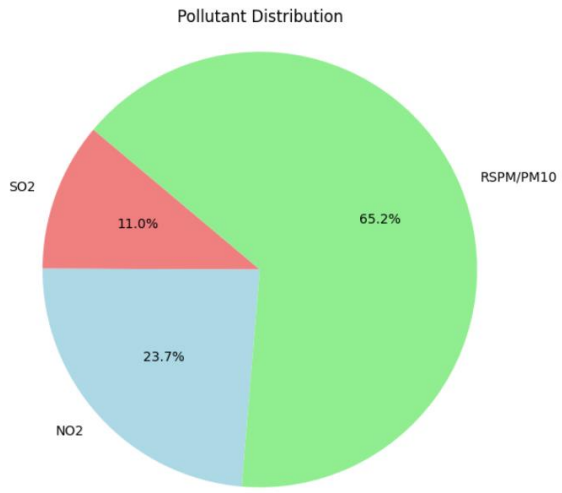


Visualization for State - average between SO2, NO2, RSPM/PM10:

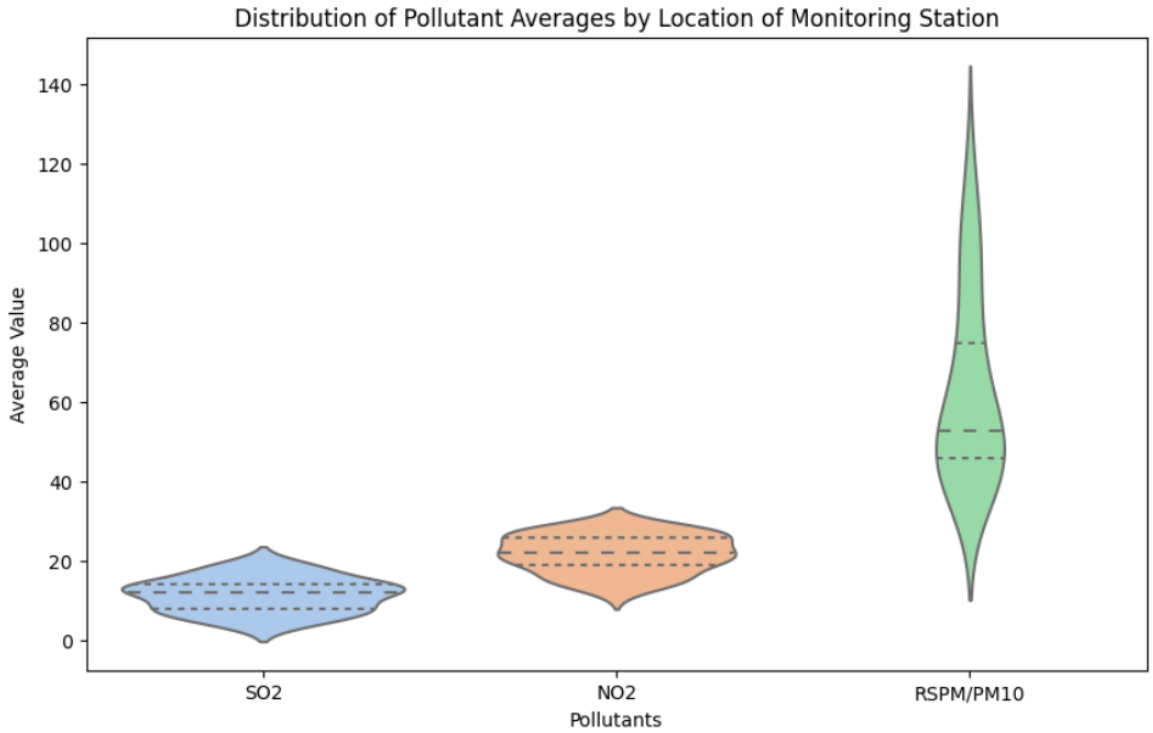


Visualization for city/town/village/area wise average between SO2, NO2, PSPM/PM10:

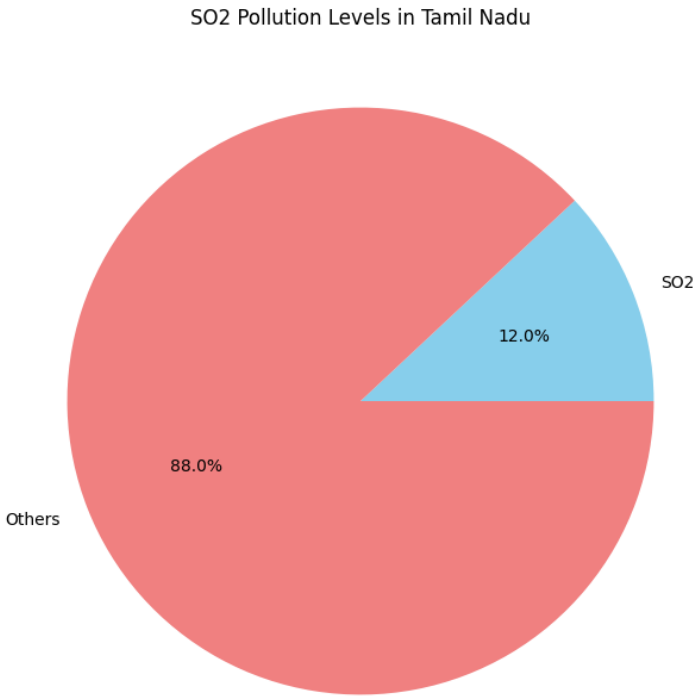


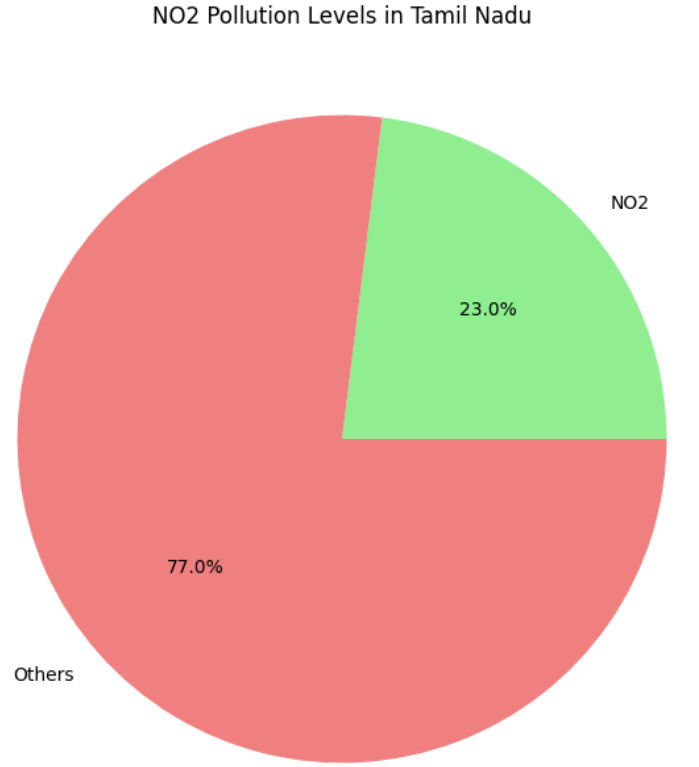


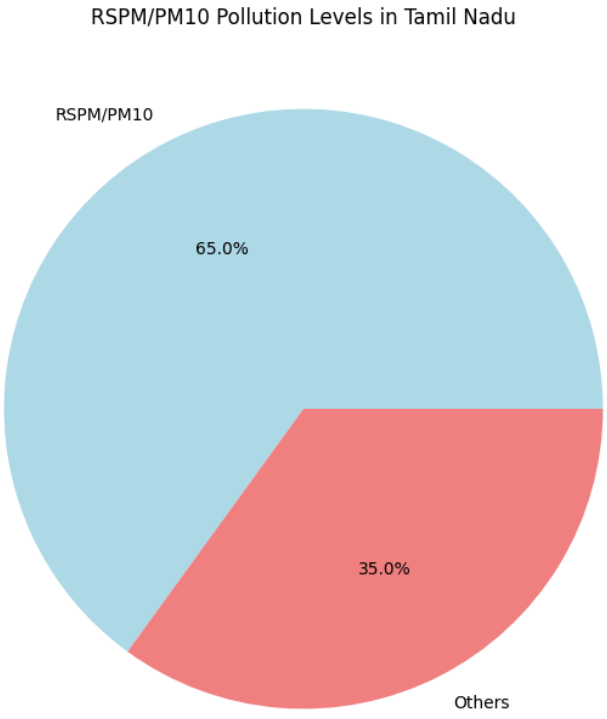
visualization for Location wise average between SO2, NO2 ,PSPM/PM10:



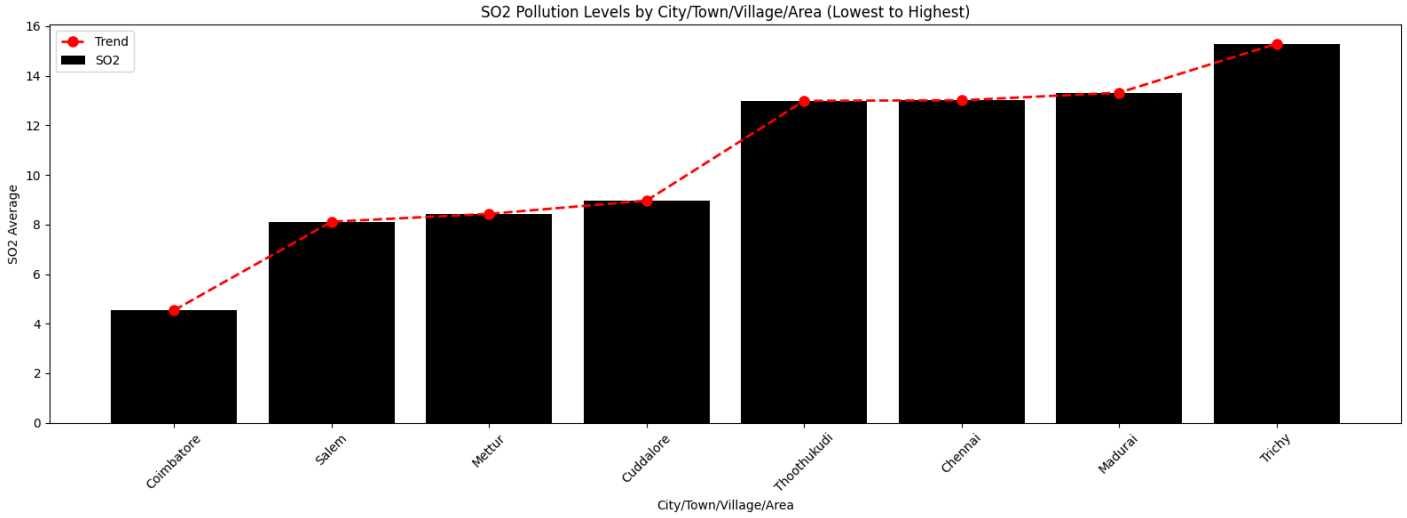
Separate charts for SO2, NO2 & RSPM/PM10 in Tamil Nadu using pie chart:

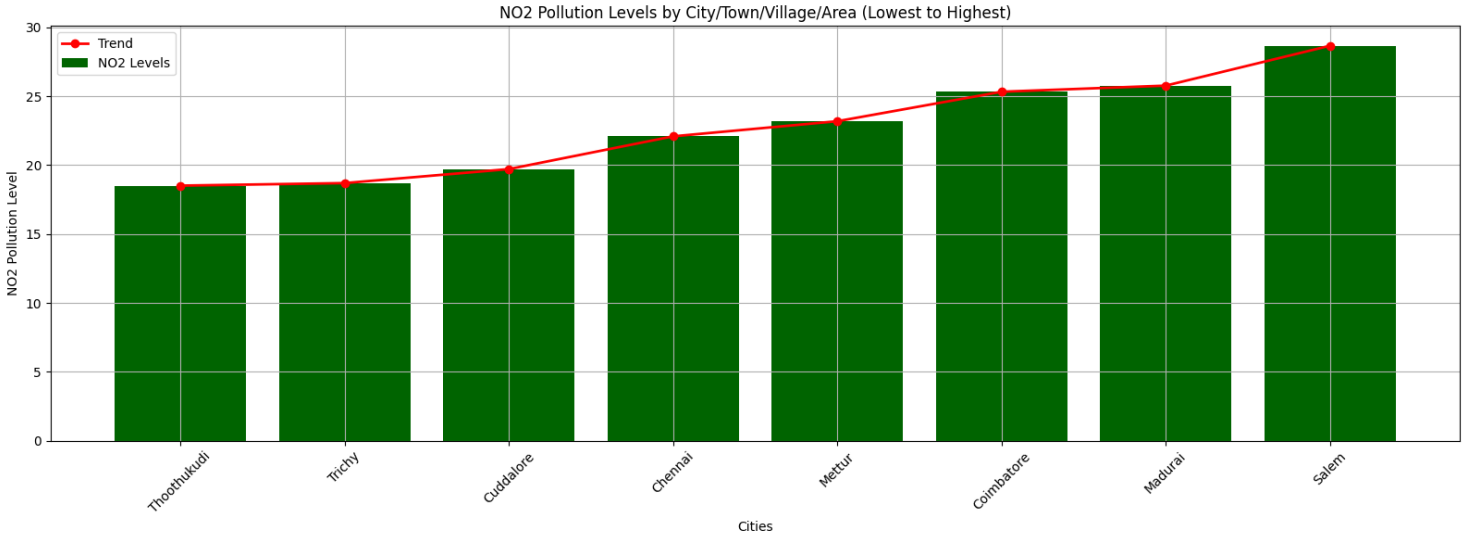


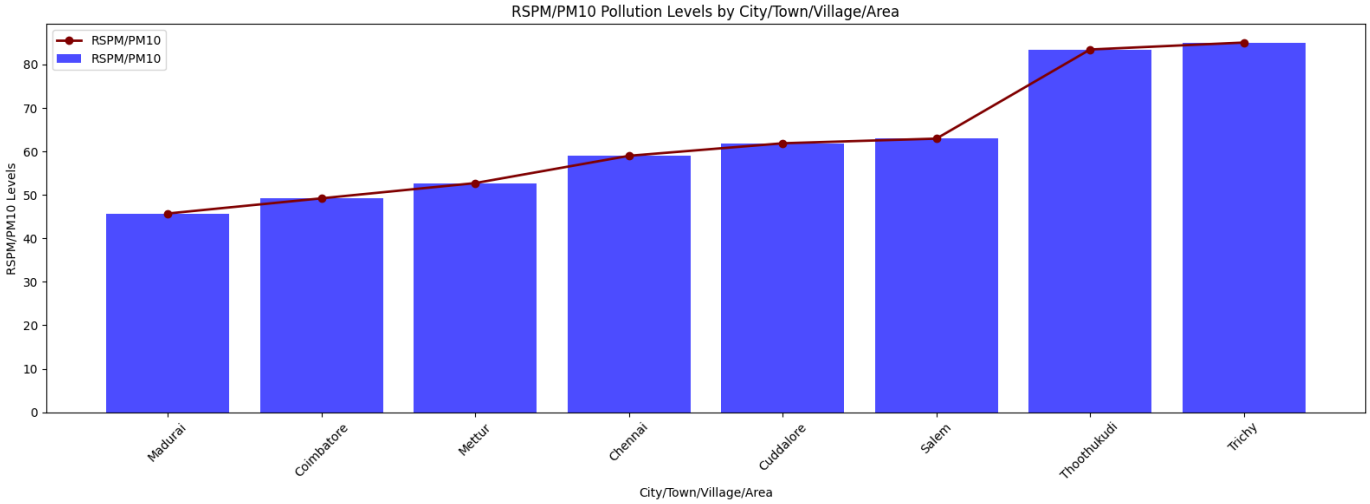



RSPM/PM10 Pollution Levels in Tamil Nadu
RSPM/PM10
65.0%
35.0%
Others

Providing visualization by displaying it in lowest to highest pollution format for SO2,NO2 RSPM/PM10 (separate) using bar chart & line chart combination under the area - City/Town/Village/Area:

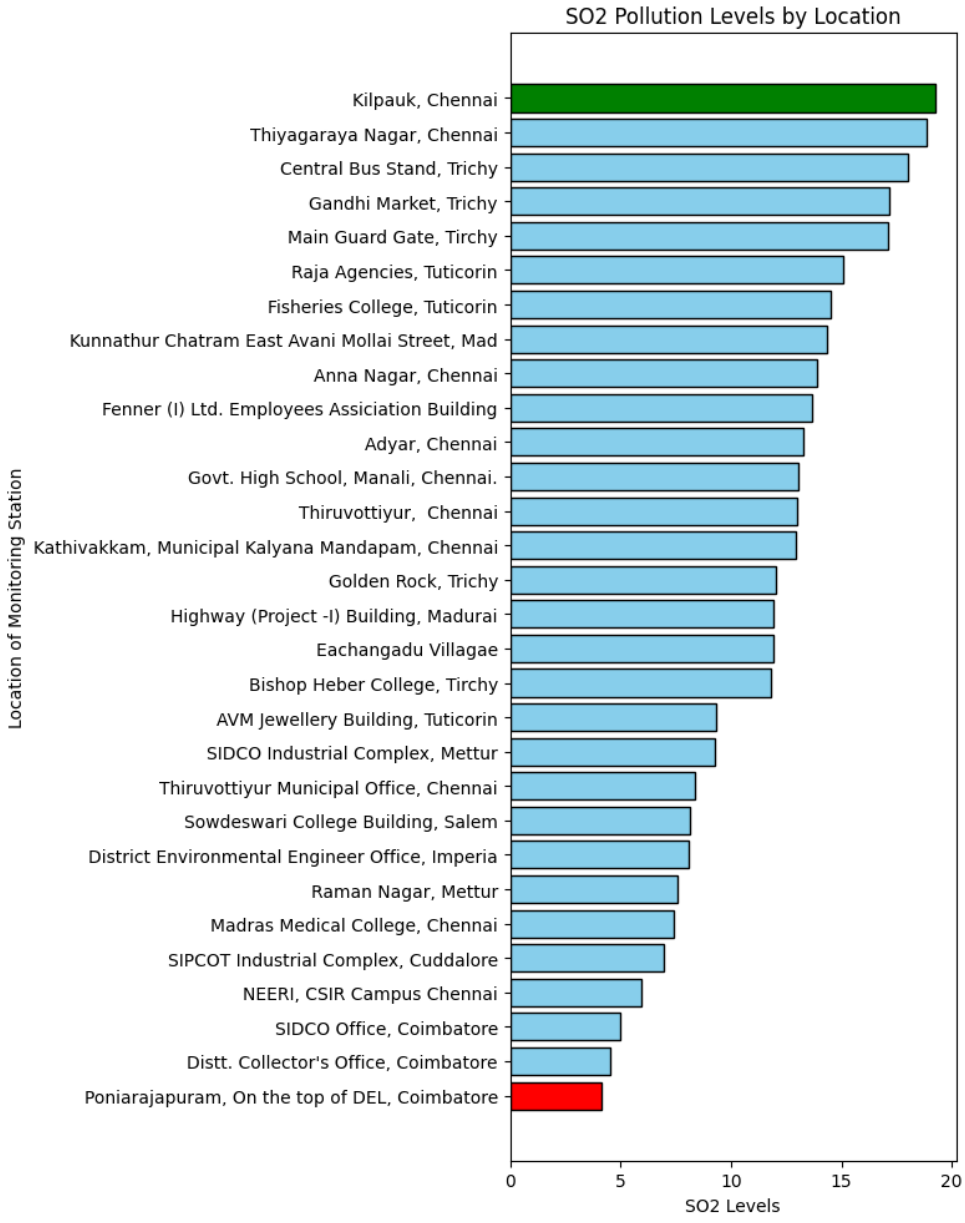


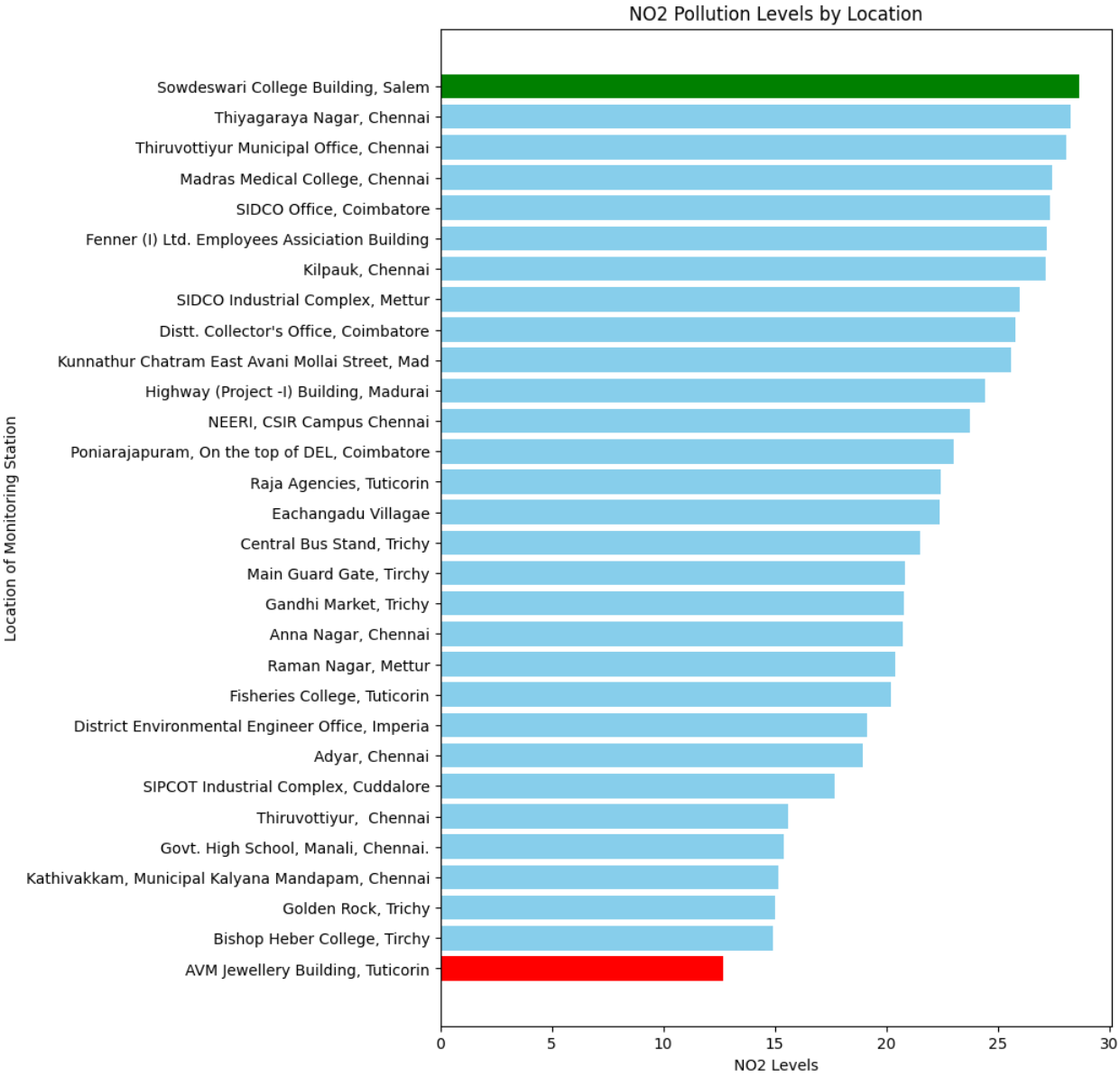


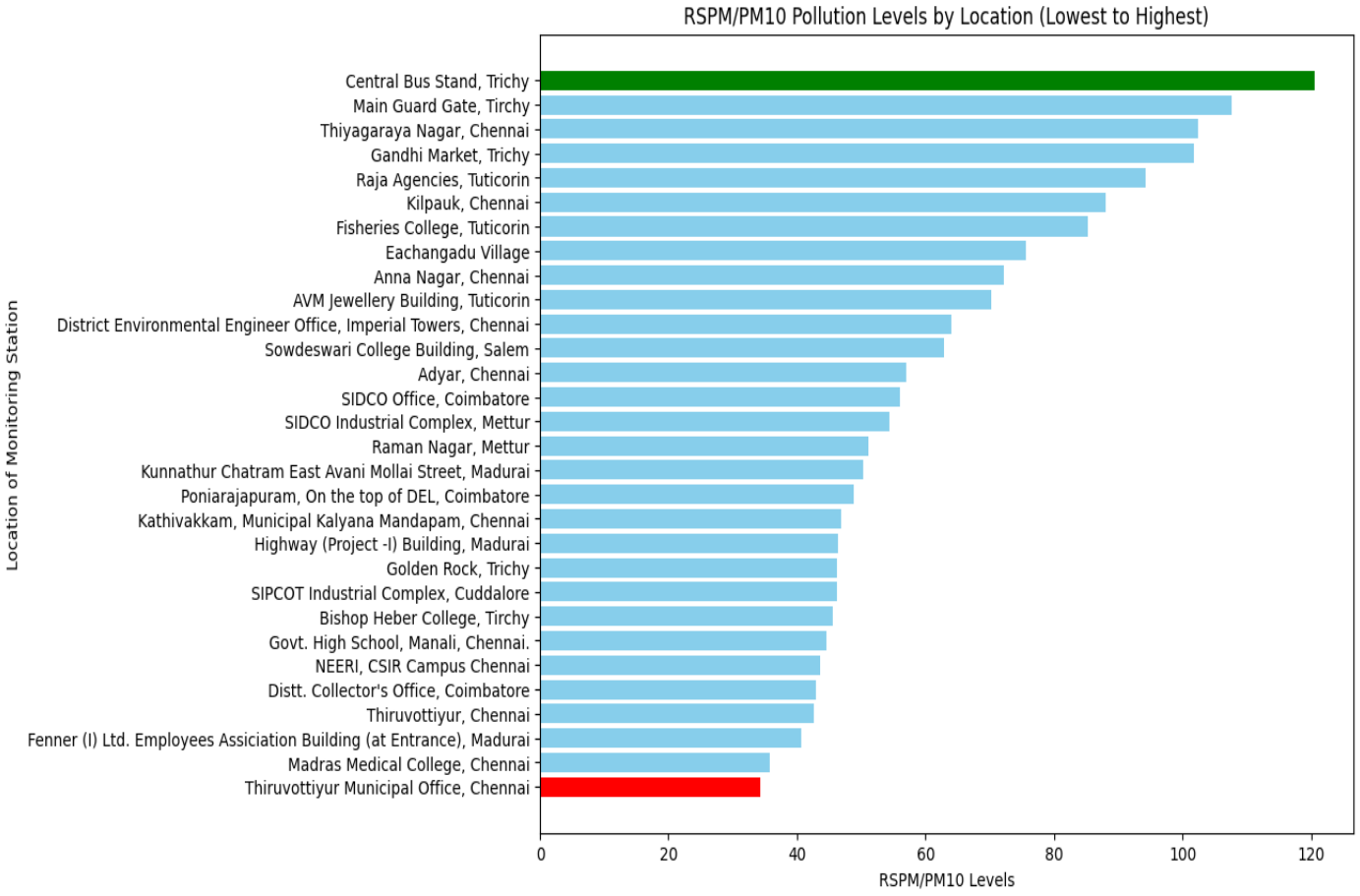

RSPM/PM10 Pollution Levels by City/Town/Village/Area
RSPM/PM10
RSPM/PM10
RSPM/PM10 Levels
0
10
20
30
40
50
60
70
80
Madurai
Coimbatore
Mettur
Chennai
Cuddalore
Salem
Thoothukudi
Trichy
City/Town/Village/Area

providing visualization by displaying lowest to highest pollution format for SO2, NO2 & RSPM/PM10 (separate) using bar chart & line chart combination under the area – Location:

- SO2, NO2 & RSPM/PM10 Pollution Levels shown through the Location. (here green shows highest and red shows lowest)




NO2 Pollution Levels by Location
Location of Monitoring Station
Sowdeswari College Building, Salem
Thiyagaraya Nagar, Chennai
Thiruvottiyur Municipal Office, Chennai
Madras Medical College, Chennai
SIDCO Office, Coimbatore
Fenner (I) Ltd. Employees Assiciation Building
Kilpauk, Chennai
SIDCO Industrial Complex, Mettur
Distt. Collector's Office, Coimbatore
Kunnathur Chatram East Avani Mollai Street, Mad
Highway (Project -I) Building, Madurai
NEERI, CSIR Campus Chennai
Poniarajapuram, On the top of DEL, Coimbatore
Raja Agencies, Tuticorin
Eachangadu Villagae
Central Bus Stand, Trichy
Main Guard Gate, Tirchy
Gandhi Market, Trichy
Anna Nagar, Chennai
Raman Nagar, Mettur
Fisheries College, Tuticorin
District Environmental Engineer Office, Imperia
Adyar, Chennai
SIPCOT Industrial Complex, Cuddalore
Thiruvottiyur, Chennai
Govt. High School, Manali, Chennai.
Kathivakkam, Municipal Kalyana Mandapam, Chennai
Golden Rock, Trichy
Bishop Heber College, Tirchy
AVM Jewellery Building, Tuticorin
0
5
10
15
20
25
30
NO2 Levels



Conclusion:

Through rigorous analysis and visualization, we have successfully illuminated the Air quality analysis in Tamil Nadu. These visual representations vividly display the varying levels of Sulphur Dioxide (SO2), Nitrogen Dioxide (NO2), and Respirable Suspended Particulate Matter (RSPM/PM10) across different regions, ranging from urban centers to more remote areas.

This analysis has unequivocally identified areas of both elevated and comparatively lower pollution levels, providing crucial insights for targeted interventions. High-pollution zones necessitate immediate attention and concerted efforts towards mitigation strategies, while areas exhibiting lower pollution levels serve as examples of potential best practices.

Hence, this analysis stands as a testament to the power of data-driven insights in safeguarding the environment and public health in this diverse and dynamic state of Tamil Nadu**.**