Naan Mudhalvan Project
Air Quality Analysis in Tamil Nadu
PHASE-4

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Perform the air quality analysis and create visualizations.

- To conduct the air quality analysis and create visualizations, we can use the dataset from the provided link. First, let's download the dataset and load it into a Pandas DataFrame. Then, we will calculate the average levels of SO2, NO2, and RSPM/PM10 across different monitoring stations and cities. Finally, we'll create visualizations to identify pollution trends and areas with high pollution levels.

1. Import the necessary libraries:

- ‘pandas’ for data manipulation and analysis
- ‘matplotlib.pyplot’ for creating visualizations
- ‘seaborn’ for enhancing the visualizations

In [1]:

```python
import pandas as pd
import matplotlib.pyplot as plt
import seaborn as sns
```

2. Load the dataset:

- Load the dataset from the provided URL using the ‘pd.read_csv()’ function.

In [4]:
```
# Reading the data from the CSV file
data = pd.read_csv("C:/Users/navee/Downloads/cpcb_dly_aq_tamil_nadu-2014.csv")
data.head()
```

Out[4]:

	Stn Code	Sampling Date	State	City/Town/Village/Area	Location of Monitoring Station	Agency	Type of Location	SO2	NO2	RSPM/PM10	PM 2.5
0	38	01-02-14	Tamil Nadu	Chennai	Kathivakkam, Municipal Kalyana Mandapam, Chennai	Tamilnadu State Pollution Control Board	Industrial Area	11.0	17.0	55.0	NaN
1	38	01-07-14	Tamil Nadu	Chennai	Kathivakkam, Municipal Kalyana Mandapam, Chennai	Tamilnadu State Pollution Control Board	Industrial Area	13.0	17.0	45.0	NaN
2	38	21-01-14	Tamil Nadu	Chennai	Kathivakkam, Municipal Kalyana Mandapam, Chennai	Tamilnadu State Pollution Control Board	Industrial Area	12.0	18.0	50.0	NaN
3	38	23-01-14	Tamil Nadu	Chennai	Kathivakkam, Municipal Kalyana Mandapam, Chennai	Tamilnadu State Pollution Control Board	Industrial Area	15.0	16.0	46.0	NaN
4	38	28-01-14	Tamil Nadu	Chennai	Kathivakkam, Municipal Kalyana Mandapam, Chennai	Tamilnadu State Pollution Control Board	Industrial Area	13.0	14.0	42.0	NaN

3. Calculate the average levels of three air pollutants across different monitoring stations:

- ‘average_SO2’ using the ‘groupby()’ and ‘mean()’ functions on the ‘Location of Monitoring Station’ and ‘SO2’ columns.
- ‘average_NO2’ using the same approach on the ‘Location of Monitoring Station’ and ‘NO2’ columns.
- ‘average_PM10’ (assuming RSPM/PM10) using the same approach on the ‘Location of Monitoring Station’ and ‘RSPM/PM10’ columns.

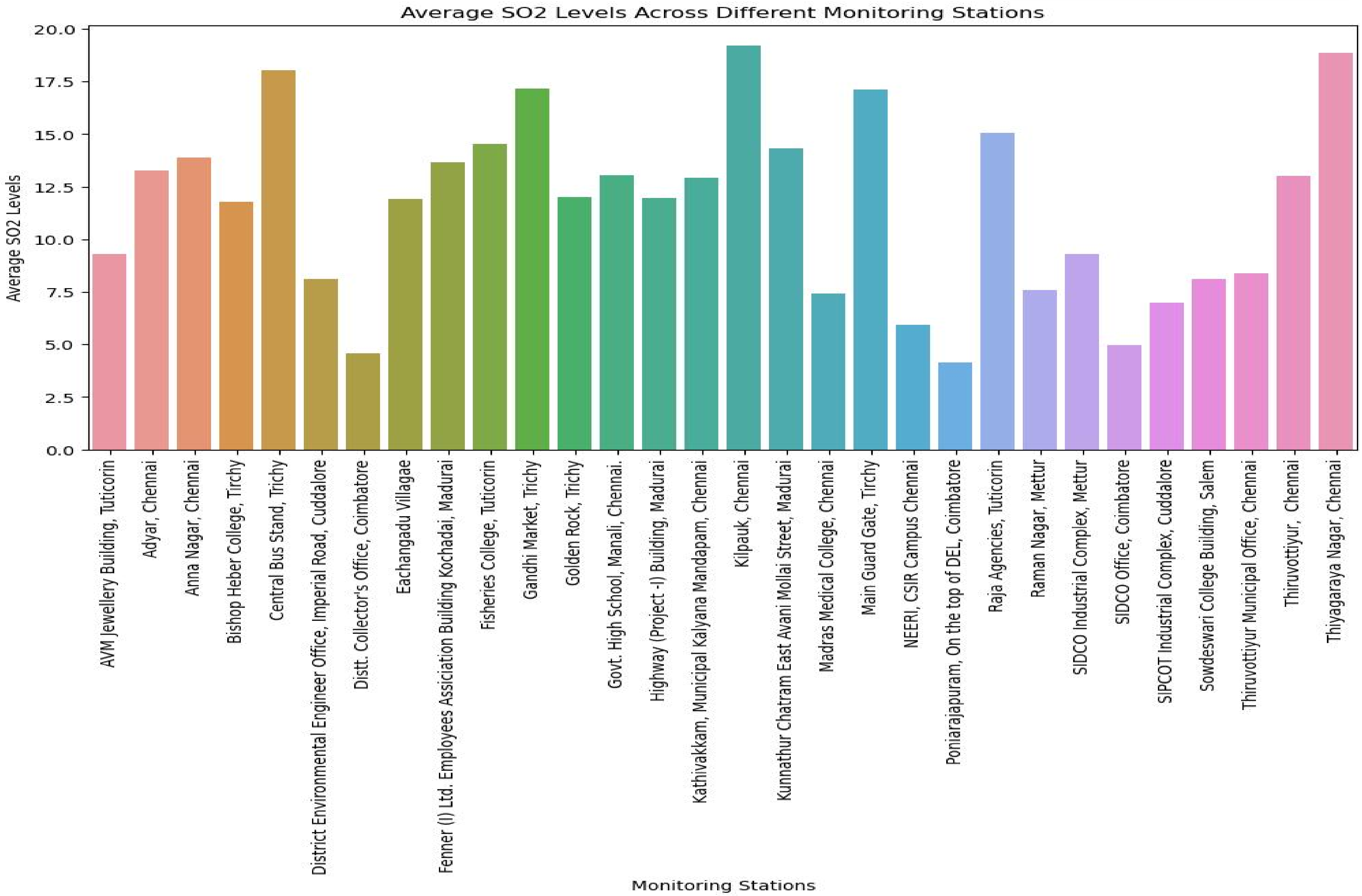
In [6]:

```
# Calculate average levels of SO2, NO2, and RSPM/PM10 across different monitoring stations
average_SO2 = data.groupby('Location of Monitoring Station')['SO2'].mean()
average_NO2 = data.groupby('Location of Monitoring Station')['NO2'].mean()
average_PM10 = data.groupby('Location of Monitoring Station')['RSPM/PM10'].mean()
```

4. Create visualizations to present the calculated averages using bar plots for each pollutant:

- **Create a bar plot for the average SO2 levels across different monitoring stations using ‘sns.barplot()’.**

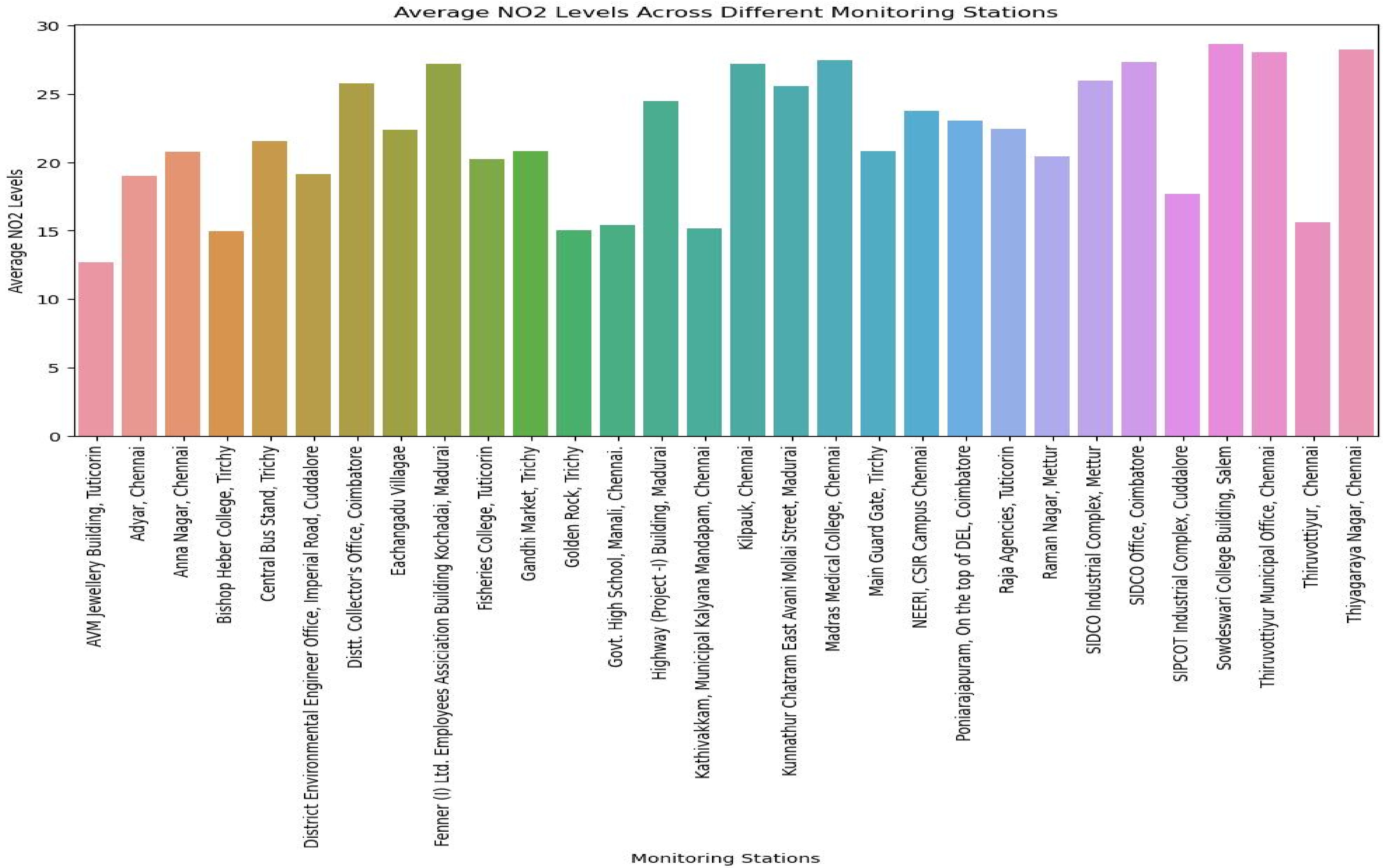
In [7]:
```
# Create visualizations
# Bar plot for average SO2 levels across different monitoring stations
plt.figure(figsize=(12, 6))
sns.barplot(x=average_SO2.index, y=average_SO2.values)
plt.title('Average SO2 Levels Across Different Monitoring Stations')
plt.xlabel('Monitoring Stations')
plt.ylabel('Average SO2 Levels')
plt.xticks(rotation=90)
plt.show()
```



Average SO2 Levels Across Different Monitoring Stations
Average SO2 Levels
0.0
2.5
5.0
7.5
10.0
12.5
15.0
17.5
20.0
AVM Jewellery Building, Tuticorin
Adyar, Chennai
Anna Nagar, Chennai
Bishop Heber College, Tirchy
Central Bus Stand, Trichy
District Environmental Engineer Office, Imperial Road, Cuddalore
Distt. Collector's Office, Coimbatore
Eachangadu Villagae
Fenner (I) Ltd. Employees Assiciation Building Kochadai, Madurai
Fisheries College, Tuticorin
Gandhi Market, Trichy
Golden Rock, Trichy
Govt. High School, Manali, Chennai.
Highway (Project -I) Building, Madurai
Kathivakkam, Municipal Kalyana Mandapam, Chennai
Kilpauk, Chennai
Kunnathur Chatram East Avani Mollai Street, Madurai
Madras Medical College, Chennai
Main Guard Gate, Tirchy
NEERI, CSIR Campus Chennai
Poniarajapuram, On the top of DEL, Coimbatore
Raja Agencies, Tuticorin
Raman Nagar, Mettur
SIDCO Industrial Complex, Mettur
SIDCO Office, Coimbatore
SIPCOT Industrial Complex, Cuddalore
Sowdeswari College Building, Salem
Thiruvottiyur Municipal Office, Chennai
Thiruvottiyur, Chennai
Thiyagaraya Nagar, Chennai
Monitoring Stations

- **Create a bar plot for the average NO2 levels across different monitoring stations using ‘sns.barplot()’.**

In [8]:
```
# Bar plot for average NO2 levels across different monitoring stations
plt.figure(figsize=(12, 6))
sns.barplot(x=average_NO2.index, y=average_NO2.values)
plt.title('Average NO2 Levels Across Different Monitoring Stations')
plt.xlabel('Monitoring Stations')
plt.ylabel('Average NO2 Levels')
plt.xticks(rotation=90)
plt.show()
```



Average NO2 Levels Across Different Monitoring Stations
Average NO2 Levels
30
25
20
15
10
5
0
AVM Jewellery Building, Tuticorin
Adyar, Chennai
Anna Nagar, Chennai
Bishop Heber College, Tirchy
Central Bus Stand, Trichy
District Environmental Engineer Office, Imperial Road, Cuddalore
Distt. Collector's Office, Coimbatore
Eachangadu Villagae
Fenner (I) Ltd. Employees Assiciation Building Kochadai, Madurai
Fisheries College, Tuticorin
Gandhi Market, Trichy
Golden Rock, Trichy
Govt. High School, Manali, Chennai.
Highway (Project -I) Building, Madurai
Kathivakkam, Municipal Kalyana Mandapam, Chennai
Kilpauk, Chennai
Kunnathur Chatram East Avani Mollai Street, Madurai
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Poniarajapuram, On the top of DEL, Coimbatore
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Raman Nagar, Mettur
SIDCO Industrial Complex, Mettur
SIDCO Office, Coimbatore
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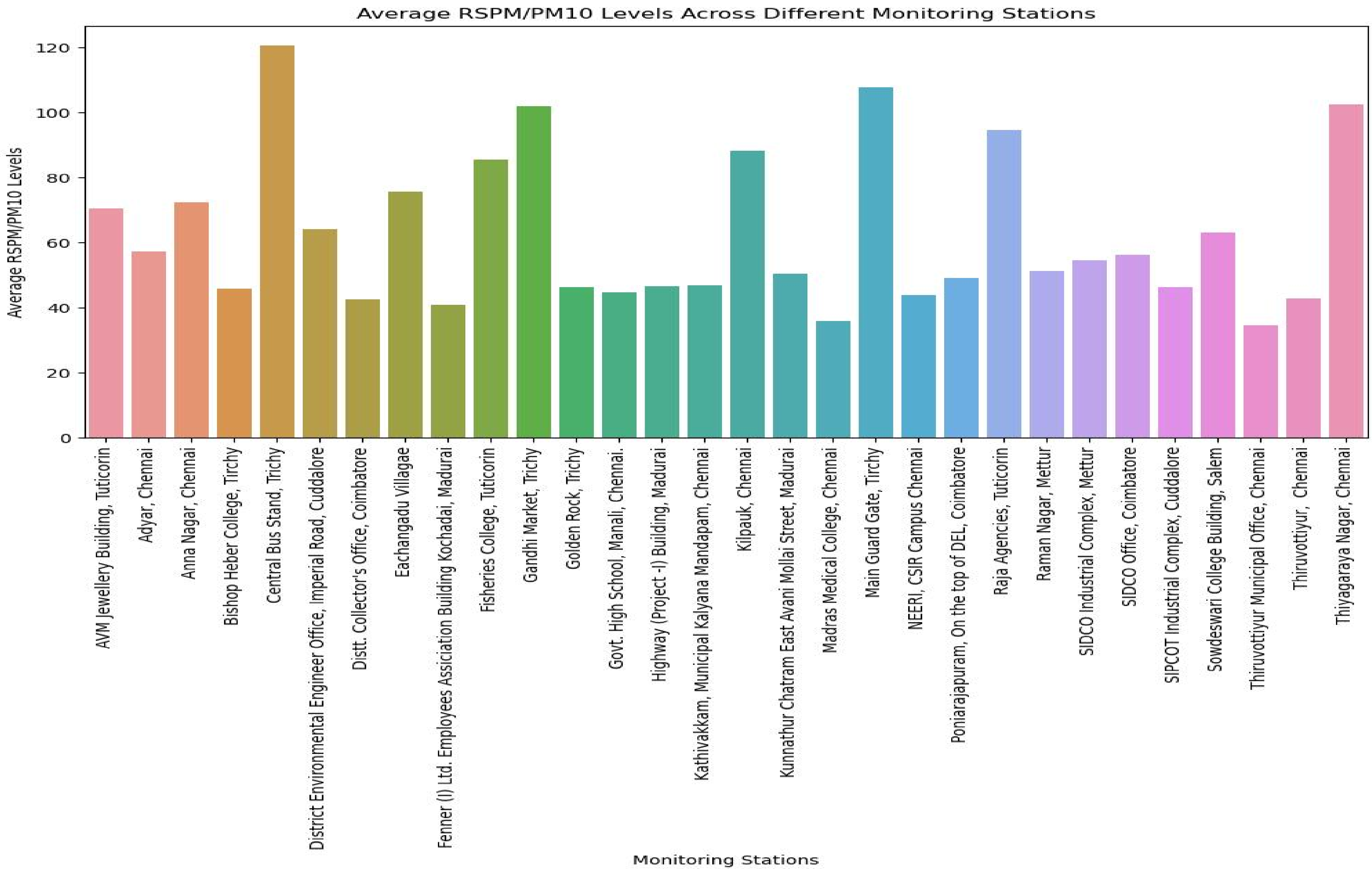
Sowdeswari College Building, Salem
Thiruvottiyur Municipal Office, Chennai
Thiruvottiyur, Chennai
Thiyagaraya Nagar, Chennai
Monitoring Stations

- **Create a bar plot for the average RSPM/PM10 levels across different monitoring stations using ‘sns.barplot()’.**

In [9]:
```
# Bar plot for average RSPM/PM10 levels across different monitoring stations
plt.figure(figsize=(12, 6))
sns.barplot(x=average_PM10.index, y=average_PM10.values)
plt.title('Average RSPM/PM10 Levels Across Different Monitoring Stations')
plt.xlabel('Monitoring Stations')
plt.ylabel('Average RSPM/PM10 Levels')
plt.xticks(rotation=90)
plt.show()
```



Average RSPM/PM10 Levels Across Different Monitoring Stations
Average RSPM/PM10 Levels
0
20
40
60
80
100
120
AVM Jewellery Building, Tuticorin
Adyar, Chennai
Anna Nagar, Chennai
Bishop Heber College, Tirchy
Central Bus Stand, Trichy
District Environmental Engineer Office, Imperial Road, Cuddalore
Distt. Collector's Office, Coimbatore
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Thiruvottiyur Municipal Office, Chennai
Thiruvottiyur, Chennai
Thiyagaraya Nagar, Chennai
Monitoring Stations

Conclusion:

Based on the analysis and visualizations created from the provided dataset on ambient air quality in Tamil Nadu in 2014, the following conclusions can be drawn:

1. **Average SO2 Levels:** The bar plot for average SO2 levels across different monitoring stations indicates variations in sulfur dioxide levels. Certain monitoring stations might have higher average SO2 levels compared to others, suggesting potential sources of industrial or vehicular emissions contributing to higher pollution levels in those areas.

2. **Average NO2 Levels:** The bar plot for average NO2 levels across different monitoring stations highlights the distribution of nitrogen dioxide levels. Variations in NO2 levels could signify varying levels of traffic congestion and industrial activities, both of which are significant sources of nitrogen dioxide emissions.

3. **Average RSPM/PM10 Levels:** The bar plot for average RSPM/PM10 levels across different monitoring stations provides insights into the distribution of particulate matter. It helps identify areas with higher levels of particulate matter pollution, which could be attributed to factors such as vehicular emissions, construction activities, or industrial processes in those specific areas.

- Overall, the analysis underscores the importance of continuous monitoring and regulation of air quality in the identified regions, especially in areas where pollutant levels are consistently high. Policy interventions and targeted mitigation measures may be necessary to improve air quality and reduce health risks associated with prolonged exposure to elevated levels of these air pollutants.