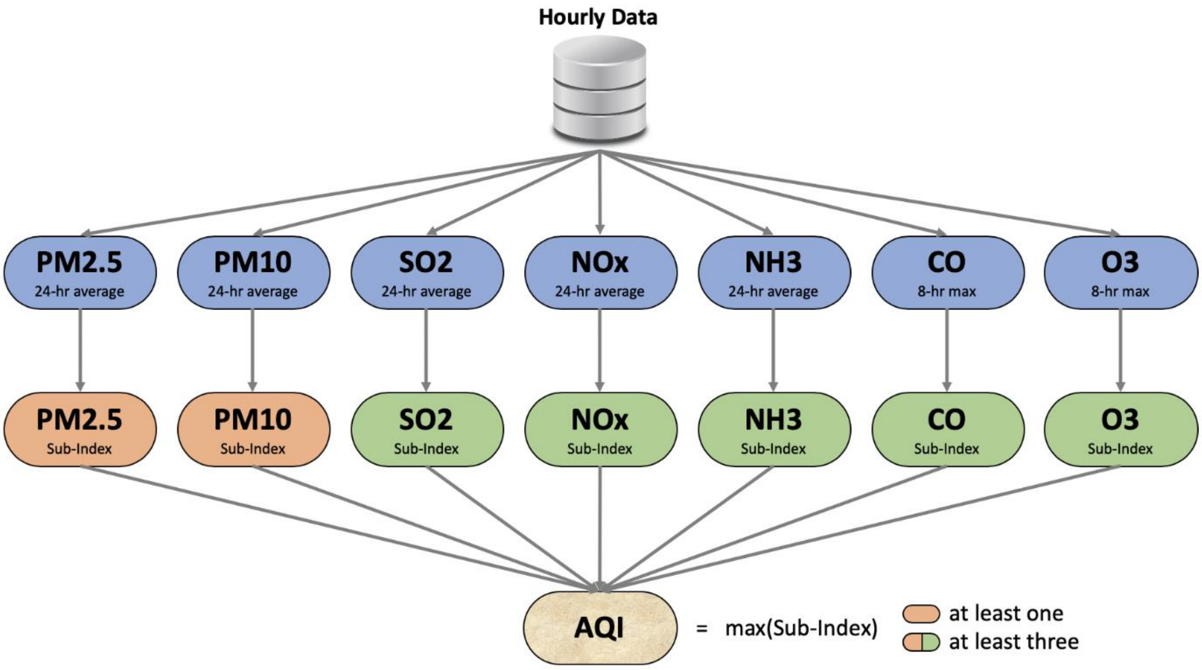
OBJECTIVE:-

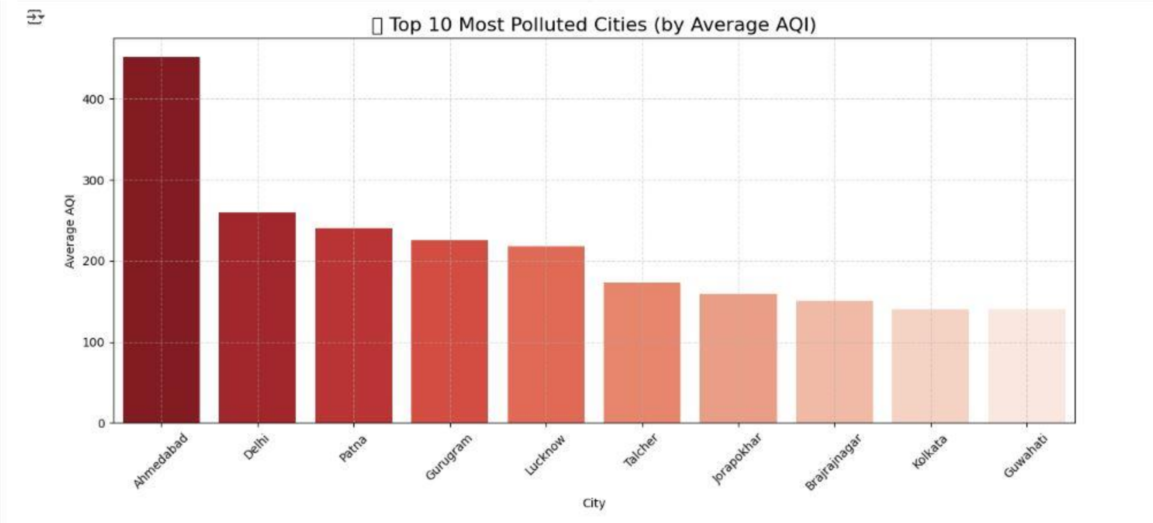
Air quality analysis using python (seaborn + pandas): Analyze Indian Air Quality Index (Aqi) Data To Identify The Most Polluted Cities, Monthly Variation, And Pollutant Composition.



KEY FINDINGS:

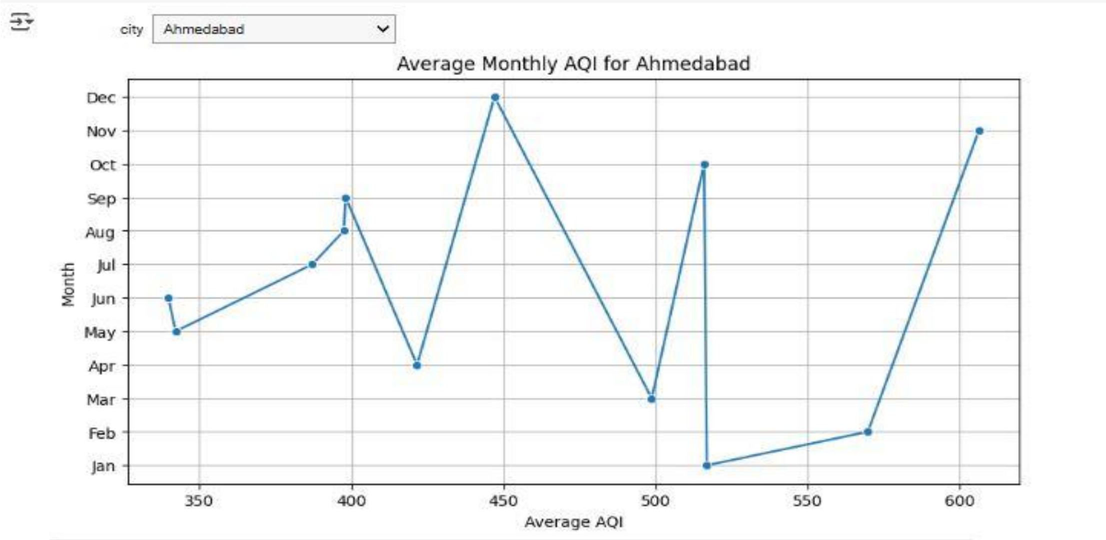
1. Most Polluted Cities in India.
2. Analyse AQI Monthly Variation in top polluted cities.
3. Analyse AQI Yearly Variation in top polluted cities.
4. Contribution Of Each Pollutant To Overall Pollution.
5. Pollutants Composition in top polluted cities.
6. Correlation heatmap between pollutants.
7. Identify most polluted station in particular city.
8. Statewise AQI trend visualization.

❖ Most Polluted Cities in India.



The average AQI across all cities and identified the top 10 most polluted cities in India. Cities like Ahmedabad, Delhi, and Patna exhibited the highest average AQI, indicating consistently poor air quality. These cities require urgent interventions to improve overall air quality and reduce health risks. The results highlight critical zones for policy makers and environmental agencies to prioritize.

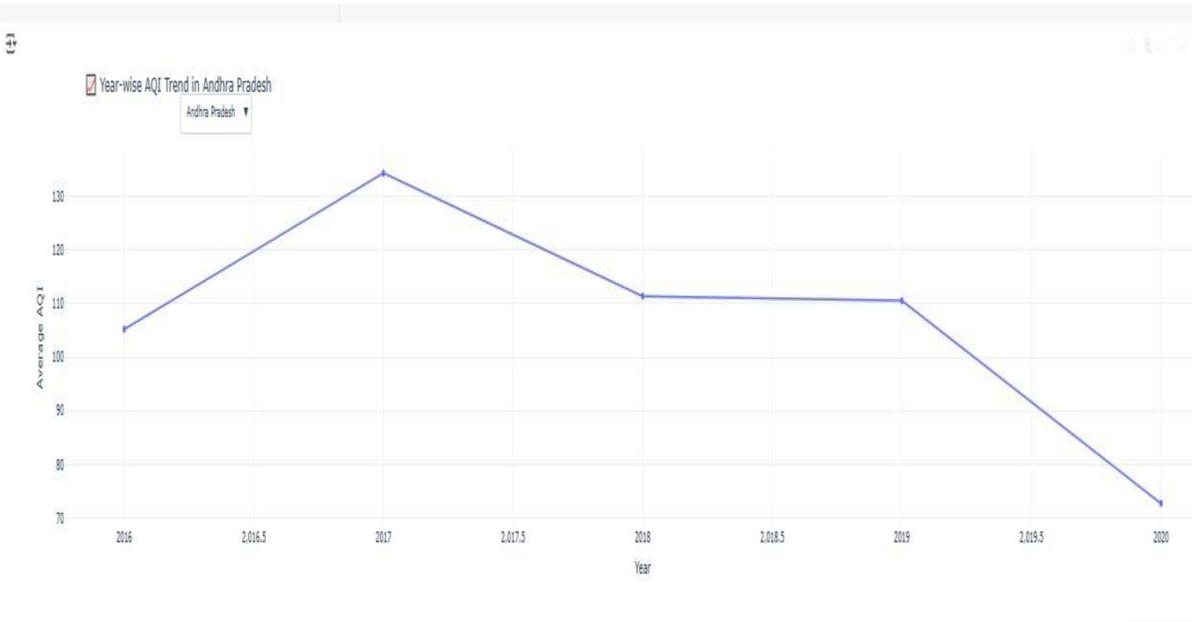
❖ Analyse AQI Monthly Variation overall And in top polluted cities.



Monthly AQI trends were studied to understand seasonal pollution patterns in the most polluted cities. We observed higher AQI values during winter months, likely due to lower wind speeds and increased emissions from heating and stubble burning. The summer and monsoon months showed comparatively lower AQI levels. This seasonal insight can help design targeted interventions at specific times of the year.

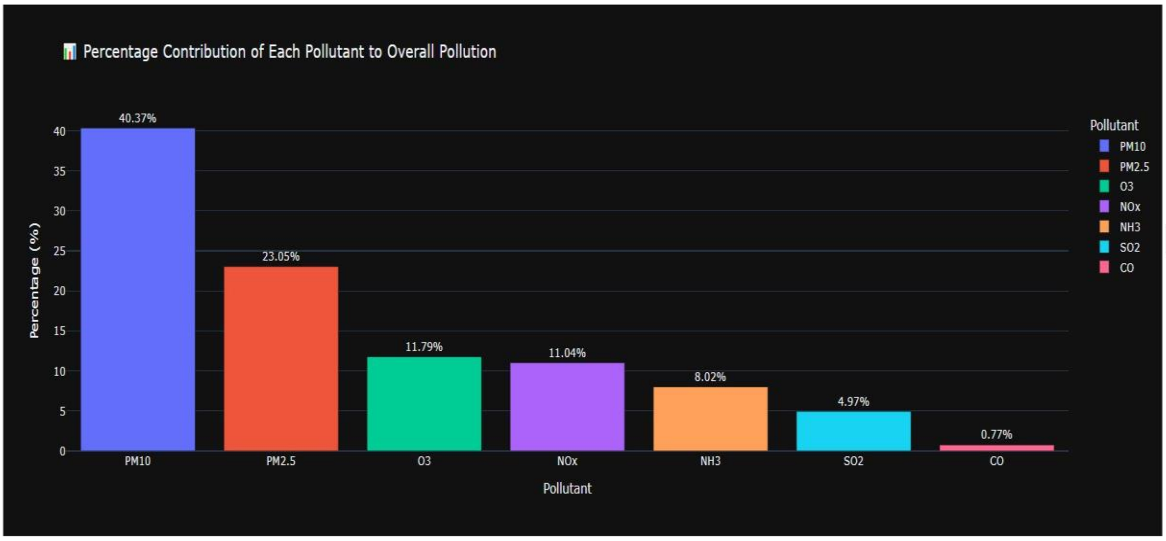
This line chart just shows Monthly Overall AQI Trend.

- ❖ Analyse AQI Yearly Variation in top polluted cities.



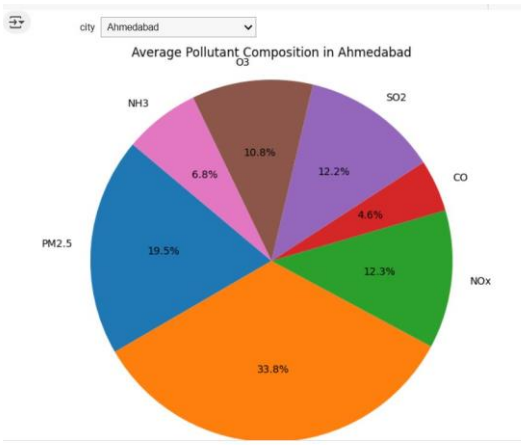
A year-wise analysis was conducted to identify long-term trends in air quality across major cities. Some cities showed gradual improvement, while others exhibited stable or worsening trends, indicating ineffective or inconsistent control measures. This long-term perspective helps evaluate the impact of policies and guides future improvement strategies. Continuous monitoring and consistent policy implementation are essential for sustained improvement.

❖ Contribution Of Each Pollutant To Overall Pollution.

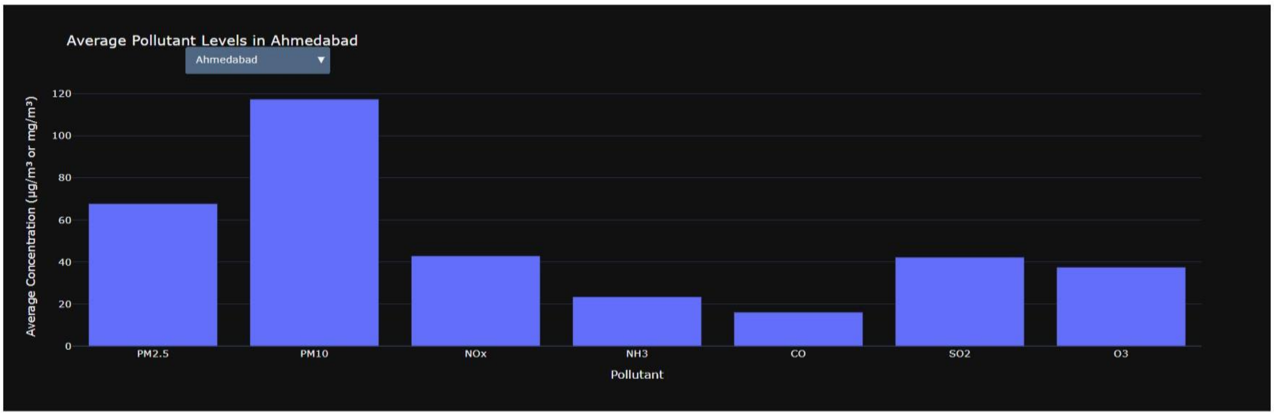


I calculated the percentage contribution of different pollutants (e.g., PM2.5, PM10, NOx) to overall pollution levels. PM10 and PM2.5 were found to be the dominant pollutants, together contributing more than 60% to overall air quality degradation. This suggests that particulate matter control should be a major focus area in pollution mitigation efforts. Understanding pollutant composition allows for better prioritization of emission sources.

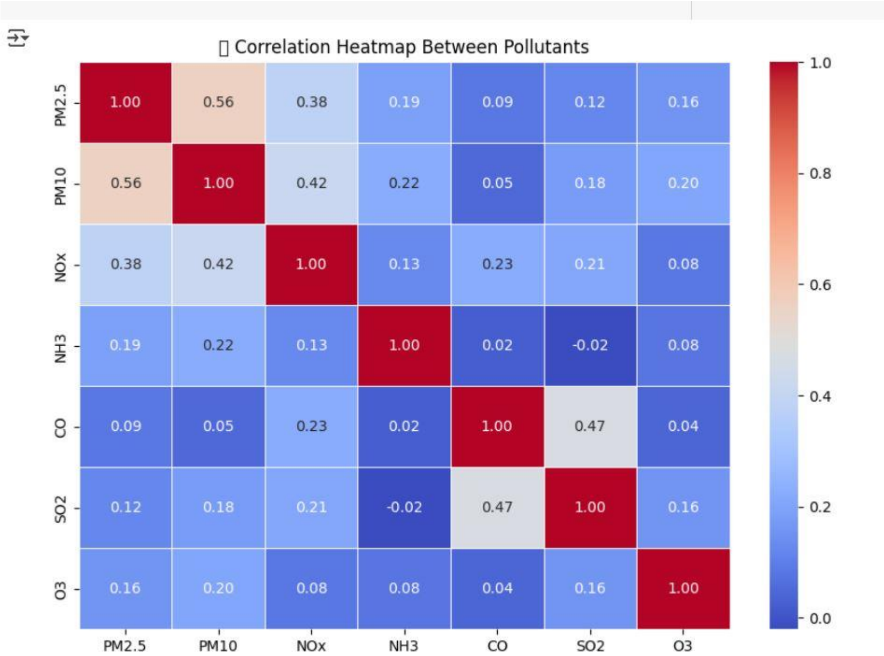
❖ Pollutants Composition in top polluted cities.



The average composition of key pollutants was analyzed in each top polluted city. This breakdown reveals unique local challenges, such as higher NOx levels in traffic-dense cities or elevated NH3 near agricultural regions. Such localized analysis enables city-specific pollution control measures rather than a one-size-fits-all approach. It empowers city planners to design more effective, targeted mitigation strategies.

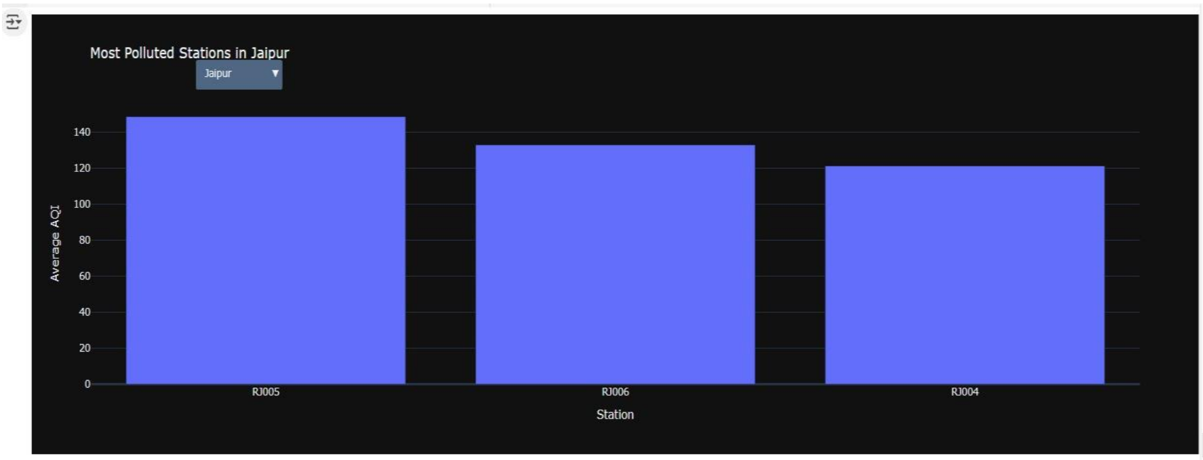


❖ Correlation heatmap between pollutants.



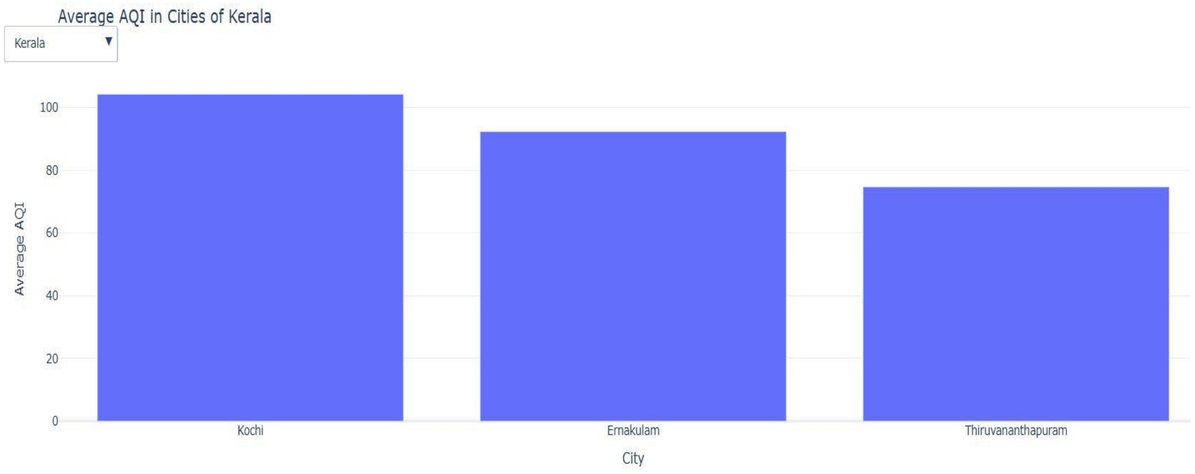
A correlation analysis was performed to understand relationships among different pollutants. Strong positive correlations were observed between PM2.5 and PM10, indicating shared sources such as vehicular emissions and construction dust. This analysis helps in identifying common sources and designing integrated pollution control strategies. Understanding pollutant interrelationships is key to holistic air quality management.

❖ Identify most polluted station in particular city.



Station-level analysis was conducted to pinpoint specific monitoring stations with the highest average AQI within top polluted cities. Identifying these hotspots helps in localizing problem areas and allows authorities to enforce stricter regulations and monitoring in those zones. This granular view supports micro-level interventions for better air quality. It also aids in effective resource allocation and enforcement planning.

❖ Statewise AQI trend visualization.



Average AQI trends were visualized across different states and cities, with an interactive breakdown at the city level. This analysis revealed significant differences in air quality across states, emphasizing regional disparities. It enables state governments to benchmark performance and identify cities needing immediate attention. Such visual insights help drive region-specific policy actions and improve accountability.

CONCLUSION

The visualizations clearly show that reducing particulate matter (PM2.5 & PM10) and focusing on high-risk cities and hotspots are the most impactful strategies. By combining city-level seasonal plans, local enforcement at stations, and pollution source control, overall air quality can improve significantly.