Public Transport Impact on Urban Air Pollution

Date: June 22, 2025

Presented to Gigaversity

Presented By Neelima Rani

1. Problem Framing & Hypothesis

The project investigates whether increased usage of public transportation can positively influence air quality in urban areas, with a specific focus on PM1 (Particulate Matter ≤1µm).

Objective:
To assess the relationship between public transport ridership and pollution levels.

Hypothesis:
Cities with higher public transport ridership experience lower air pollution levels.

Key Performance Indicators (KPIs):

- Daily average PM1 levels
- Monthly PM1 trends
- Correlation between transport ridership and PM1

2. Descriptive Analysis

The dataset was first cleaned to focus solely on PM1 measurements over time. After converting datetime fields and filtering null values, we visualized the data using line and bar charts.

Key Observations:

- PM1 levels fluctuated daily with noticeable peaks and dips.
- Monthly average charts revealed seasonal patterns.
- There were periods of elevated PM1 levels that could relate to local activities or weather changes.

3. Diagnostic Analysis

Since actual transport usage data wasn't available, **simulated daily ridership numbers** were generated between 30,000 and 80,000 passengers. These values were merged with daily PM1 averages for exploratory analysis.

Key Diagnostic Steps:

- Resampled PM1 values by day.
- Created synthetic transport_ridership data.
- Plotted scatter plots comparing pollution levels and ridership.

This allowed us to visually assess if there was any trend between the two.

4. Inferential / Predictive Analysis

A **linear regression model** was developed using the simulated ridership data to predict PM1 levels.

Model Summary:

- **R-squared**: 0.149 (weak explanatory power)
- **p-value**: 0.305 (not statistically significant)
- **Correlation coefficient**: 0.386 (moderate positive correlation.

Though the model was weak due to limited/simulated data, it set the foundation for future work using real data sources.

5. Prescriptive Insights

Based on the exploratory and regression findings, the following strategies are recommended:

- **Improve accessibility and frequency** of public transport to reduce reliance on private vehicles.
- **Transition to electric or low-emission transport options** (e.g., e-buses, metro rail).
- **Implement 'Green Days' or 'No-Car Zones'** during periods of high pollution.
- **Monitor pollution in real-time** and link it with smart city traffic interventions.

6. Summary Statistics

Here are the final insights based on the available and simulated data:

Average PM1 Level: 4.39 µg/m³

Maximum PM1 Level: 22.04 µg/m³

Minimum PM1 Level: 0.00 µg/m³

Correlation with Ridership: 0.386

7. Conclusion

This analysis provides early insight into how public transport could play a role in improving urban air quality. While this project used simulated ridership data, real-world implementation could benefit greatly from integrating air quality sensors with transportation analytics in smart cities.

Further work with actual transport and AQI datasets will improve model reliability and guide future public policy in urban planning and pollution control.