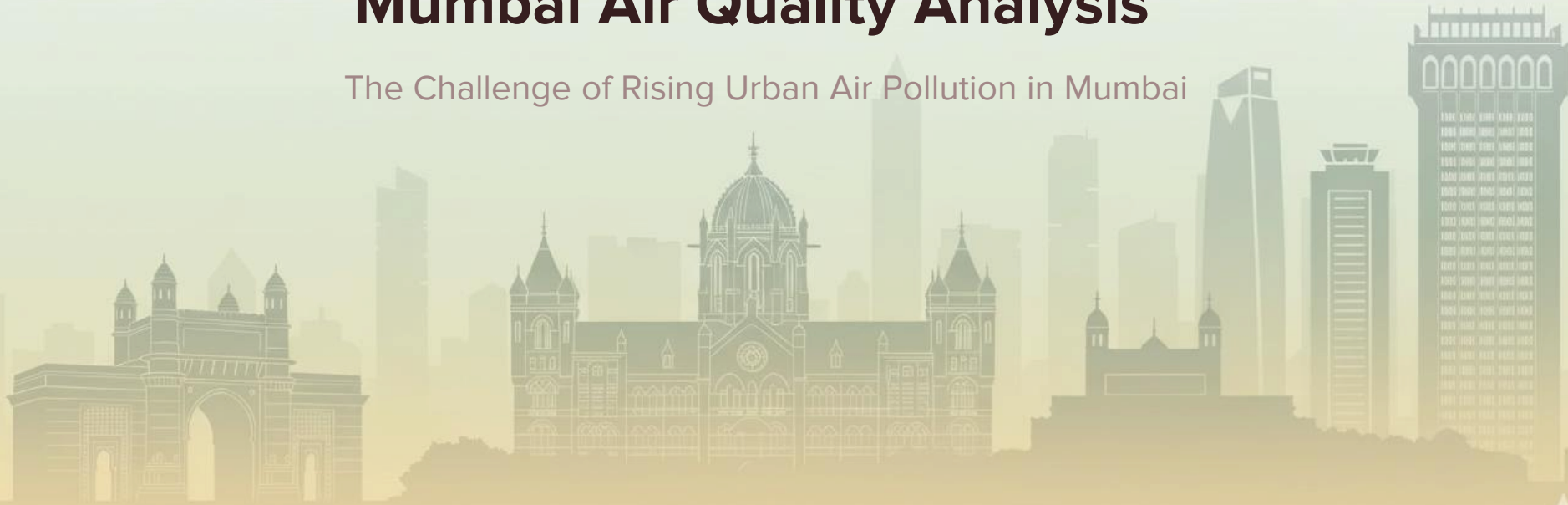


Mumbai Air Quality Analysis

The Challenge of Rising Urban Air Pollution in Mumbai



Problem Statement

The Urban Air Quality Challenge

- **Rising Urban Air Pollution:** Mumbai, like many big cities, is struggling with worsening air quality because of rapid industrial growth, heavy traffic, and ongoing construction.
- **Health and Environmental Risks:** Prolonged exposure to polluted air increases respiratory, cardiovascular, and neurological risks while also contributing to climate change.
- **Lack of Accessible Monitoring:** Citizens and policymakers struggle with fragmented or hard-to-interpret data sources, making it difficult to take act on .
- **Need for a Unified System:** An integrated platform is essential to provide actionable insights, track trends, and identify pollution hotspots for informed decision-making.



Purpose of the Project

Transforming Air Quality Data into Actionable Insights



Provide Clarity

Simplify complex air quality metrics into an easy-to-understand format for both policymakers and citizens.



Support Policy Decisions

Offer data-driven insights that guide urban planning, traffic management, and industrial regulations.



Track Pollution Hotspots

Enable identification of areas with the highest and lowest pollution levels to support targeted interventions.



Raise Public Awareness

Empower citizens with transparent air quality information, promoting behavioral change and advocacy for cleaner air.

Dataset Structure & Air Quality Metrics

Breaking Down the Data in Simple Terms

Date	Location	AreaType	AQI	AQI Category	PM2.5	PM10	NO2	O3	SO2	CO
01-01-2023	Colaba	Residential	56.6	Satisfactory	15.08	32.32	21.75	18.71	7.3	0.521
02-01-2023	Colaba	Residential	86.8	Satisfactory	29.2	33.15	20.94	25.79	7.49	0.501
03-01-2023	Colaba	Residential	79.4	Satisfactory	25.76	43.91	18.36	23.95	6.87	0.594
04-01-2023	Colaba	Residential	77.6	Satisfactory	24.93	31.36	21.98	24	7.41	0.566
05-01-2023	Colaba	Residential	79.5	Satisfactory	25.78	49.59	20.36	26.61	6.27	0.558
06-01-2023	Colaba	Residential	75.5	Satisfactory	23.92	41.75	17.17	22.11	5.99	0.673
07-01-2023	Colaba	Residential	72.5	Satisfactory	22.54	30.58	22.72	28.93	8.11	0.453

Our Data

We collected data for every day with columns like Date, Location, Area Type (Residential, Commercial, Industrial), AQI, AQI Category, and six main pollutants. This helps us see how air quality changes by time, place, and type of area.



AQI Categories (Color Scale)

This color system makes it simple for anyone to understand health risks.



What is AQI?

The Air Quality Index (AQI) is a single number that shows how clean or polluted the air is. It combines the effect of all main pollutants into one easy score.



Pollutants in Our Data

PM2.5: Very tiny particles from vehicles, burning, and factories.

PM10: Bigger dust particles from roads and construction.

NO2: Gas from cars and fuel burning.

O3: Forms in sunlight when gases react; main part of smog.

SO2: Comes from coal and diesel burning; causes acid rain

CO: From incomplete burning of fuel, harmful for heart and brain.

Metrics

What We Measure in the Dashboard

- **Average AQI and PM2.5:** These give us a quick idea of how clean or polluted the air is overall. A higher number means worse air quality.
- **Air Quality Status Breakdown:** Shows the percentage of days in Good, Satisfactory, Moderate, or Poor categories. Helps us see the bigger picture of air health.
- **Pollutant Mix:** Explains which pollutants are most responsible for bad air—whether it's dust, gases from vehicles, or industrial smoke.
- **Most & Least Polluted Areas:** Highlights the dirtiest places and the cleanest places.
- **By Area Type:** Compares air quality in residential, commercial, and industrial areas to understand how human activity affects pollution.
- **Periodically :** Compares air quality over the period of time , and how it fluctuates over seasons

Dashboard Insights

KPIs

95.15

Avg. AQI

32.98

Avg. PM2.5

DAILY AVERAGE AQI

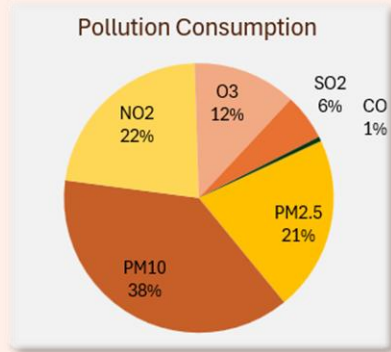
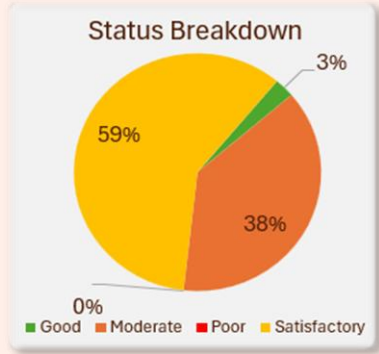
- **Overall AQI & PM2.5 Tiles:** At the top of the dashboard, simple number tiles show the city's average AQI and PM2.5. This gives a quick snapshot of air quality.

- Mumbai's **Avg AQI** of past 3 years was **95.15** falling into the '**Satisfactory**' category, leaning on Moderate side meaning the air is often unhealthy for sensitive groups.

- The overall **Avg PM2.5** around same period was **32.98**, determining it being one the dominant pollutant contributing

Dashboard Insights

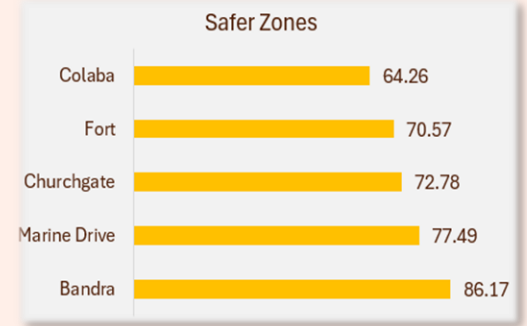
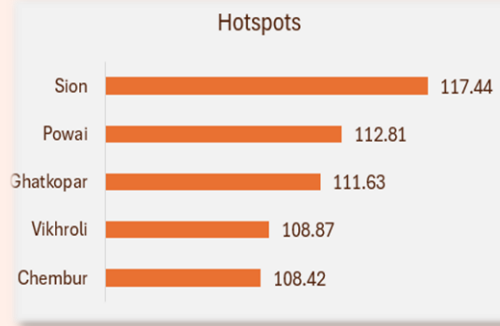
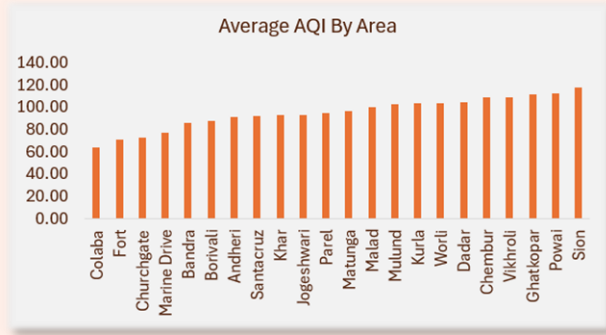
Pollutant Metrics



- **Air Quality Status Chart:** A pie chart shows what percentage of days were Good, Satisfactory, Moderate, or Poor. Easy way to see the balance of clean vs. polluted days.
- About **59%** of days were **Satisfactory** , **38% Moderate** , and only a few were Good . This shows clean air days are rare
- **Pollutant Consumption :** Another chart shows which pollutants contribute most—whether dust (PM10), tiny particles (PM2.5), or gases (NO2, O3, SO2, CO).
- **PM10** (roads and constructions) contributed the most, followed by **PM2.5** (tiny particles from burning, industries) and **NO2** (traffic)

Dashboard Insights

Location Comparison



- **Average AQI by Location** : A bar chart comparing different areas highlighting where air is worse or better.
- **Hotspots vs. Safe Zones**: Areas like Sion, Powai, and Ghatkopar were the dirtiest, while Colaba, Fort, and Churchgate were relatively cleaner.
- **Area Type Impact**: Industrial and traffic-heavy zones had much worse air quality compared to coastal and commercial areas.

Dashboard Insights

Further Findings from the Data

- **Monthly Patterns:** November recorded the worst air with an average AQI of **122** and PM2.5 at **46.9**. Winters generally see higher pollution because cooler air traps pollutants close to the ground. In contrast, monsoon months (June–July) had much cleaner air, averaging **72 AQI**, as rain helps wash away dust and particles.
- **Yearly Trend:** Year-on-year data shows that Mumbai's AQI has been **worsening steadily**, pointing to unchecked growth in traffic, industries, and construction as key drivers.
- **Industrial Areas:** These are the dirtiest zones with an average AQI of **106.7**. **Sion** is the worst hotspot, reflecting heavy traffic and industrial activity, while **Jogeshwari** performs slightly better.
- **Residential Areas:** Average AQI is **95.8**, showing that even homes are not safe from poor air. **Kurla** is worst affected due to congestion and road dust, while **Borivali** remains cleaner thanks to greenery and lower traffic.
- **Commercial Areas:** With an average AQI of **82.8**, these are the least polluted zones. **Colaba**, being coastal, benefits from sea breeze and scores best, while **Dadar's** heavy traffic makes it the worst among commercial hubs.

How the Dashboard Helps

Turning Data into Action

Unified View & Awareness:

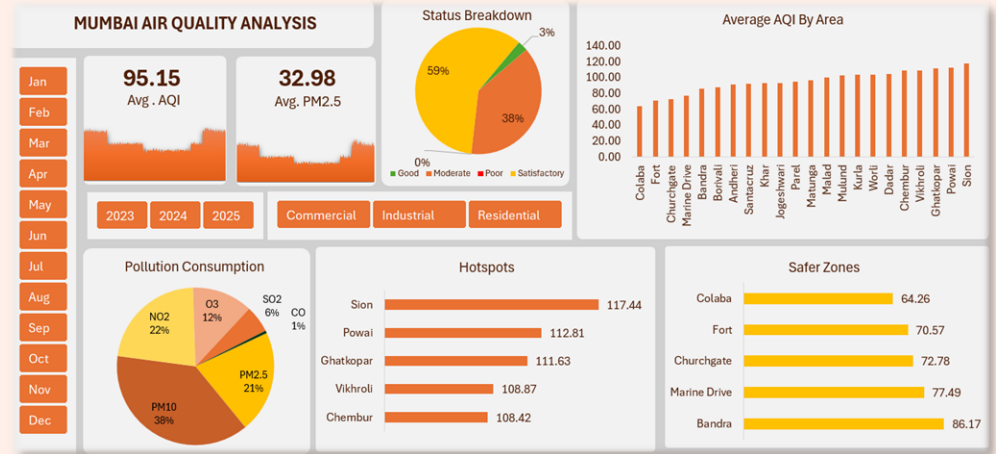
The dashboard brings all air quality data into one place, helping spot pollution hotspots, guide effective policies, and keep citizens well-informed.

Policymaker Actions:

Enforce stricter emission rules, control construction dust, promote public transport, adopt renewable energy, and expand green spaces.

Citizen Actions:

Use public transport or carpool, avoid burning waste, plant trees, check daily AQI before outdoor activities, and support stronger environmental policies.



Conclusion & Next Steps

From Insights to Action

- Our analysis showed that **Mumbai's air quality is mostly in the Satisfactory to Moderate** , with very few clean days. November and winter months had the worst air, while the monsoon helped clean it up. Over the years, the trend shows pollution is **getting worse**. We have seen prominent pollutants contributing how much in which zones.
- We also saw how it is a need to act on either through **stricter rules, better planning, or lifestyle changes**.
- **Future Roadmap:** Next steps include adding real-time data, forecasts, and linking health impact data for deeper insights.

Thank You !

Together Towards Cleaner Air