# US Pollution Analysis Report (2000–2023)

**Tool Used**: Power BI  
**Dataset Source**: [Kaggle – US Pollution Data (2000–2022)](https://www.kaggle.com/datasets/guslovesmath/us-pollution-data-200-to-2022)

**1. Introduction**

This report presents a comprehensive analysis of air pollution trends across the United States from 2000 to 2023. Using Power BI, the data has been visualized to highlight patterns in four major pollutants:

* **Ozone (O₃)**
* **Carbon Monoxide (CO)**
* **Sulfur Dioxide (SO₂)**
* **Nitrogen Dioxide (NO₂)**

The goal is to identify geographic hotspots, temporal fluctuations, and pollutant-specific behaviors that influence air quality across states and cities.

**2. Dataset Overview**

The dataset includes daily pollutant readings collected from various locations across the U.S. Each pollutant is measured using:

* **Mean concentration**
* **First maximum value**
* **Hour of peak concentration**
* **Air Quality Index (AQI)**

**Key Columns:**

* Date, Address, State, County, City
* O₃ Mean, O₃ Max Value, O₃ Max Hour, O₃ AQI
* CO Mean, CO Max Value, CO Max Hour, CO AQI
* SO₂ Mean, SO₂ Max Value, SO₂ Max Hour, SO₂ AQI
* NO₂ Mean, NO₂ Max Value, NO₂ Max Hour, NO₂ AQI

**3. Dashboard Summary**

**Overview Dashboard**

* Interactive pollutant selection
* Filters by state and city
* Map visualization of AQI distribution
* Pie chart showing quarterly AQI peaks

This dashboard provides a high-level view of pollution across the country and allows users to drill down into specific pollutants and regions.

**4. Pollutant-Specific Analysis**

**Carbon Monoxide (CO)**

* **Highest CO Level**: Calexico, California
* **Peak AQI Year**: 2000
* **Top State by CO AQI**: California
* **Insights**:
  + CO levels are highest in urban areas with dense traffic.
  + AQI trends show a gradual decline post-2010, likely due to improved vehicle emission standards.

**Ozone (O₃)**

* **Highest O₃ Level**: Rubidoux, California
* **Peak AQI Years**: 2002, 2006, 2018
* **Top State by Max AQI**: California (237)
* **Highest Avg AQI**: Arizona
* **Lowest Avg AQI**: Alaska
* **Insights**:
  + Ozone levels peak during warmer months due to photochemical reactions.
  + Southwestern states show consistently high O₃ AQI.

**Sulfur Dioxide (SO₂)**

* **Highest SO₂ Level**: East Saint Louis, Illinois (351 ppb)
* **Peak Hour**: 23:00
* **Top States by Max AQI**: Illinois and Oklahoma (200)
* **Peak AQI Years**: 2000, 2005, 2010, 2020
* **Highest Avg AQI**: Illinois (12.16)
* **Insights**:
  + SO₂ levels are linked to industrial activity.
  + Illinois shows persistent high levels, indicating potential regulatory gaps.

**Nitrogen Dioxide (NO₂)**

* **Highest NO₂ Level**: Albuquerque, New Mexico (371.7 ppb)
* **Peak Hour**: 23:00
* **Top State by Max & Avg AQI**: New Mexico
* **Peak AQI Year**: 2023 (153)
* **Insights**:
  + NO₂ levels are highest in states with urban sprawl and vehicular emissions.
  + AQI spikes during winter months due to atmospheric inversion.

**5. Conclusion**

The Power BI report reveals significant regional and temporal disparities in air pollution across the U.S. While some pollutants show declining trends, others remain persistent in industrial and urban zones.

This analysis underscores the importance of:

* Targeted environmental policies
* Continuous monitoring
* Public awareness and education

**6. Recommendations**

* Strengthen emission regulations in high-AQI states
* Promote clean energy and public transportation
* Increase public access to pollution data through interactive dashboards