Trending PM2.5: A Comparison of Two Mega Cities

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The Problem

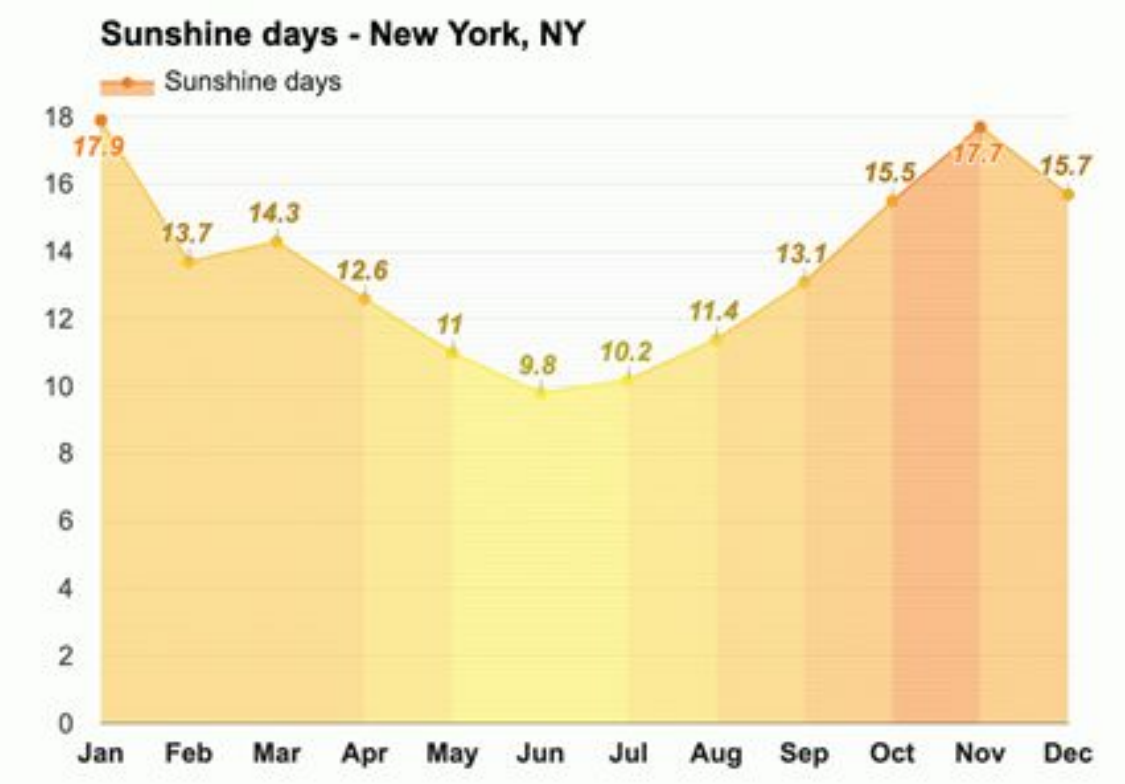
- Each city has ~20 million people
- Mexico City is known for poor air quality
- New York is typically within human health standards
- PM2.5 is most dominant in Mexico City

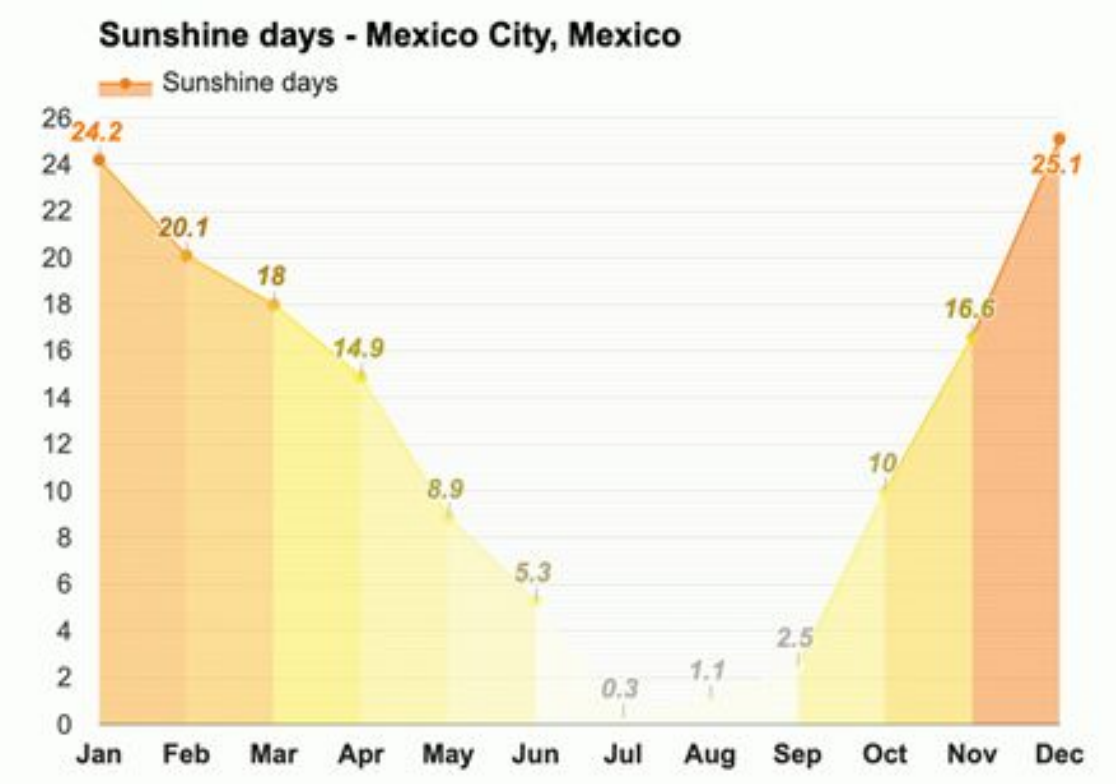
What We Know About PM2.5…

- Airborne liquid and solid particles <2.5 microns
- Primary sources
  - Direct from power plants, factories, cars/trucks, or fires
- Secondary Sources
  - Precursor pollutants: SO2, NOx, and secondary organic aerosols
- Smaller size is a health concern
  - 4.1 million premature deaths globally
  - Concerning for those with Asthma

What We Know About Each City…

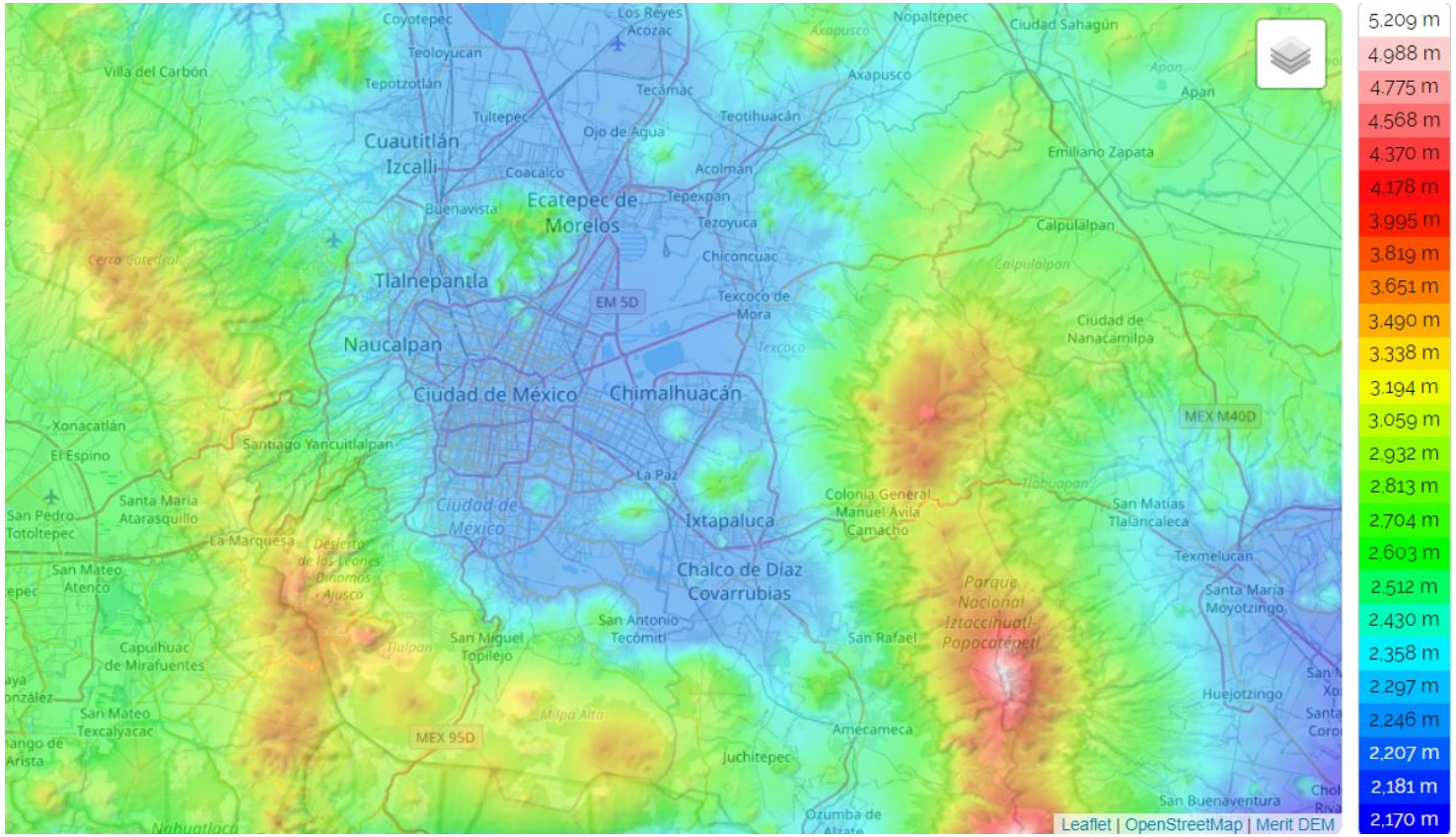
- Mexico City
  - Winter months are highest for pollution
  - Extreme variation in sunshine
- New York City
  - Pollution higher in summer/winter months
  - More consistent sunshine

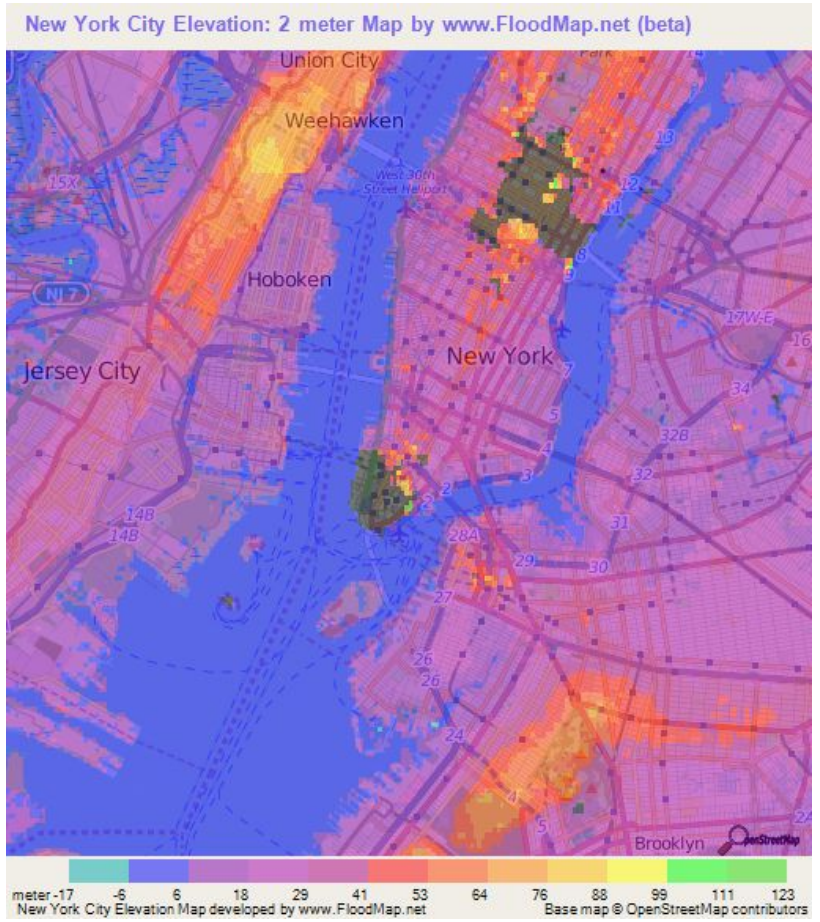




What We Know About Each City…

- Mexico City
  - Elevation of 7,349 ft
  - Surrounded by Mountains
- New York City
  - Elevation of 33 ft
  - Open Topography



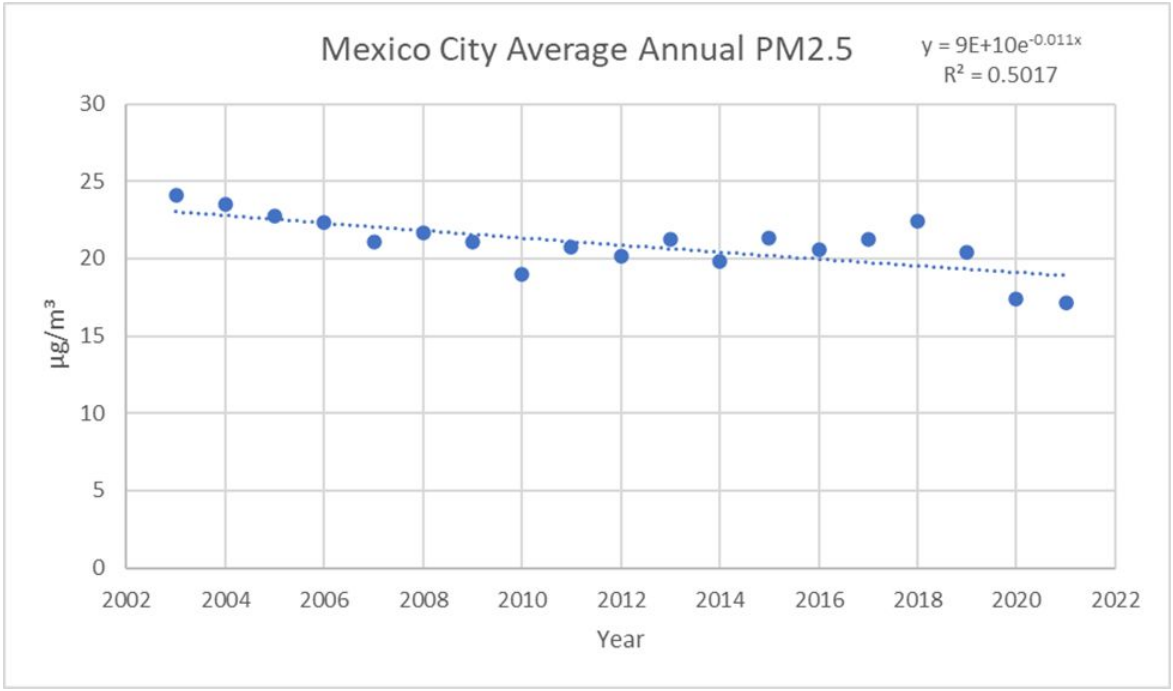


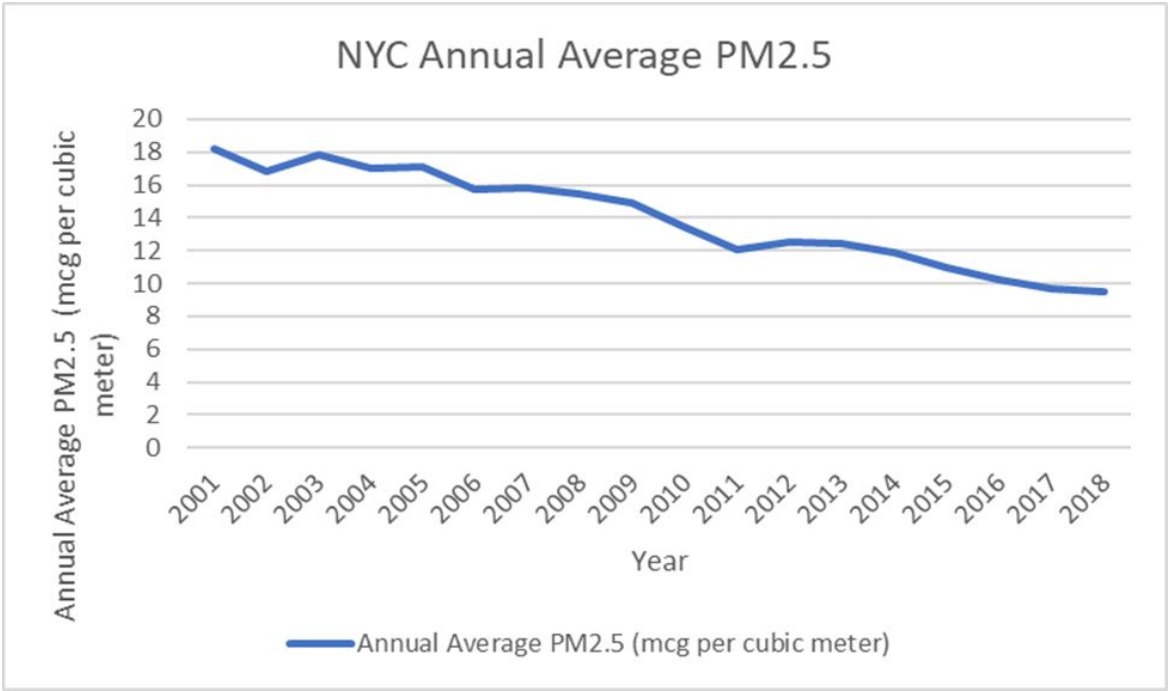
Our Hypothesis...

- Our prediction is that both New York City and Mexico City will have a downward trend in PM2.5 levels. To compare the cities, NYC is predicted to have less PM2.5 pollution than Mexico City because of their vehicle and public transportation habits and lower amounts of precursor pollutants in the atmosphere.

PM2.5 Comparison

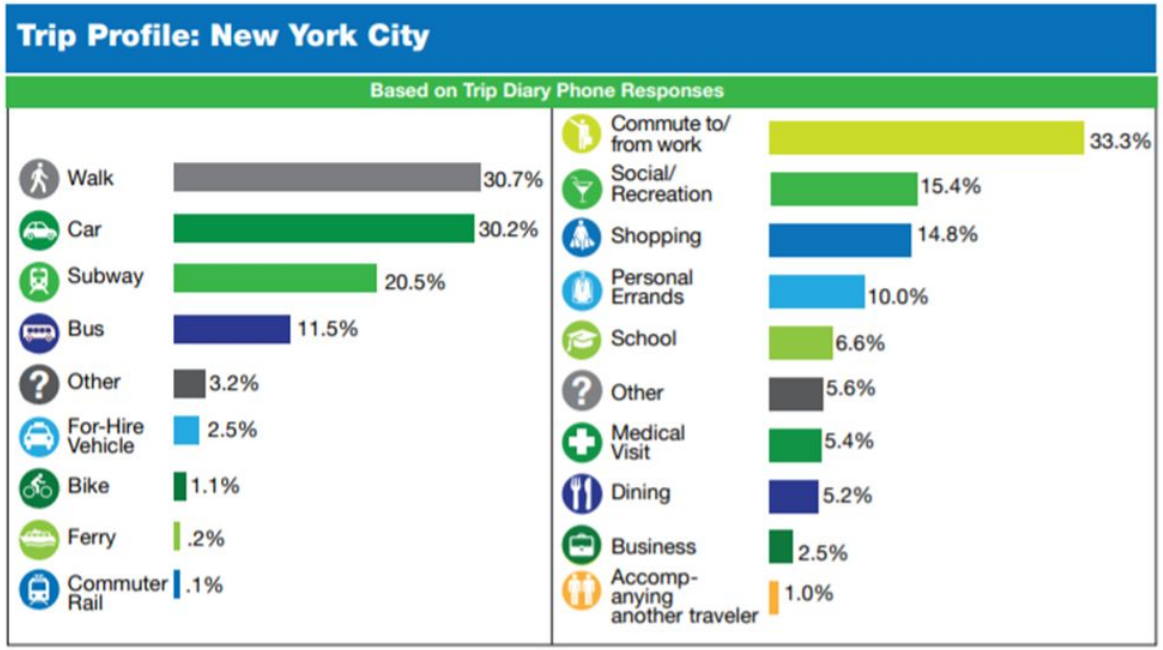
- WHO annual standard is 10µg/m³ (annual) and 25µg/m³ (24-hour)
- Mexico City running average: 20.94µg/m³

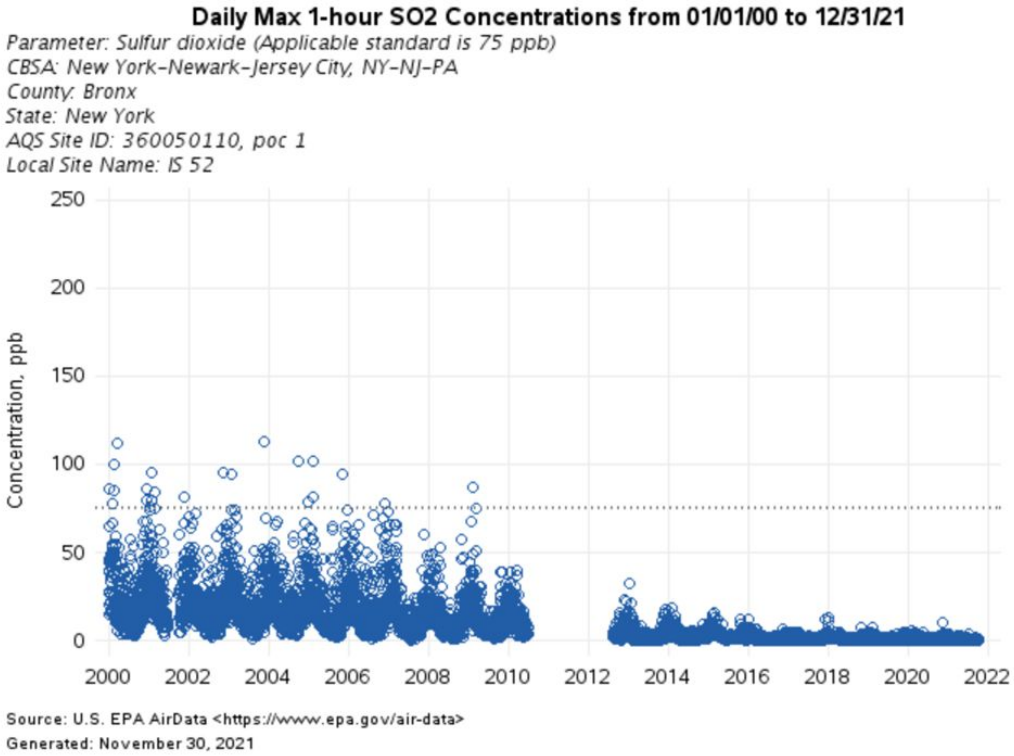




SO2 and Precursor Pollutants

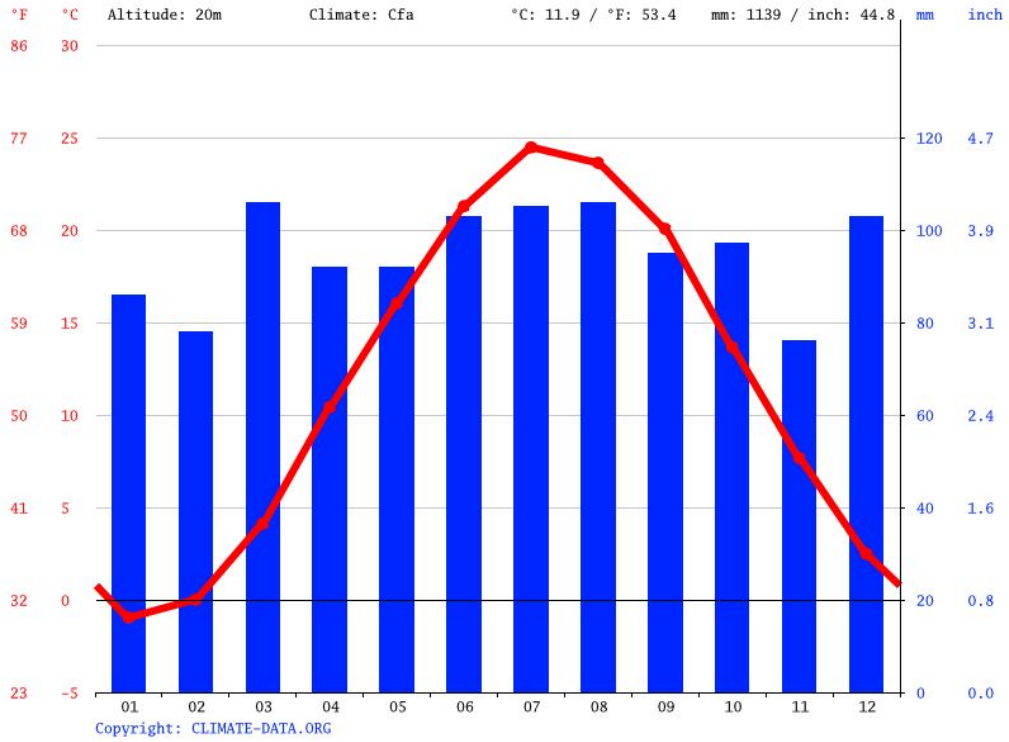
- Changes to industry result in downward trend
- SO2 likely not the problem for Mexico City



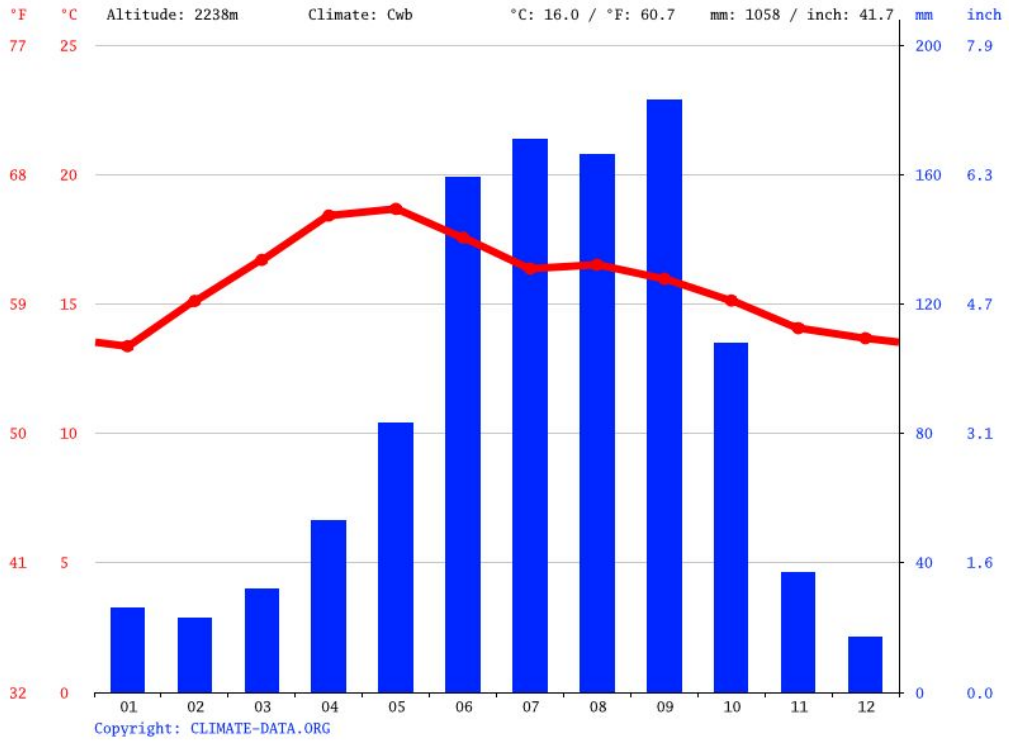


Climate Data

New York

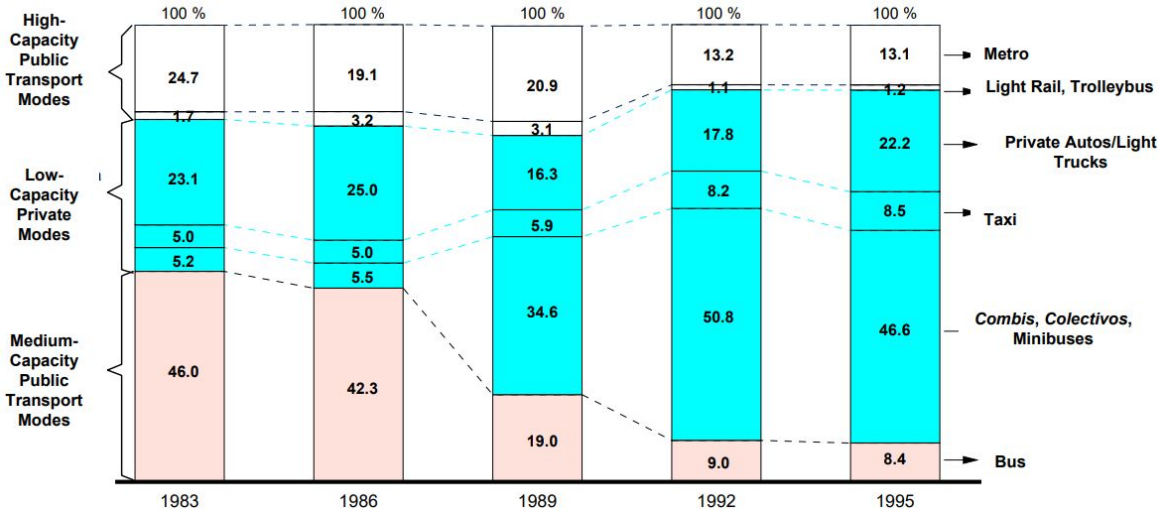


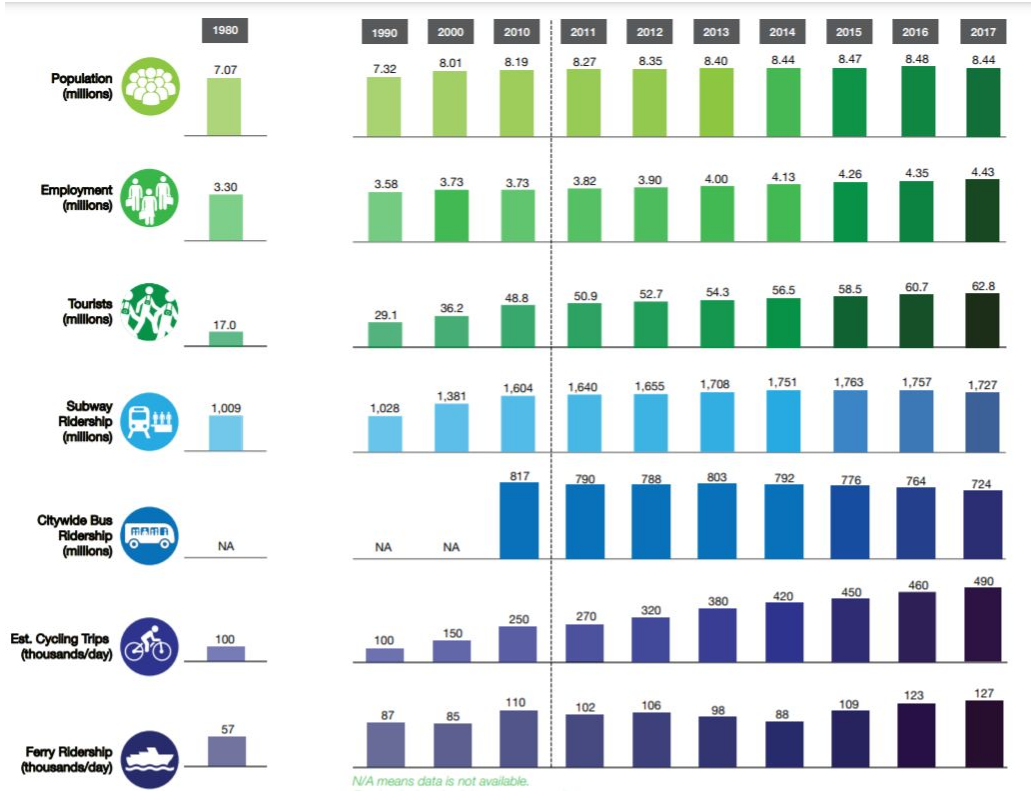
Mexico City



Transportation Comparison

- NYC has become more efficient
- Mexico City has done the opposite





Colectivos

- Minibuses (4-25 people each)
- Product of neo-liberal governing in Mexico
- Public and private bus companies went under
- Boosted NOx and auto emissions

Putting It All Together

- The data supports our hypothesis
- Both cities trend down over time
- NOx are the main precursor in Mexico City
  - Proven further by the pandemic
- New York has a geographical advantage

The Future

- PM2.5 will continue to trend down
- Likely fewer hospitalizations/deaths
- Mexico City must focus on private auto emissions
- Global warming will complicate pollution forcasting