



Positive Aspect of COVID-19

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Introduction

Motivation

- 90% of the global population breathes unsafe air
- Air Pollution causing seven million more deaths per year
- In 2018, USA linked to nearly 10,000 additional deaths
- More than 3/4 of annual greenhouse gases gets produced by transportation, industry, and power generation
- COVID-19 has brought the earth to a stand still

Objective

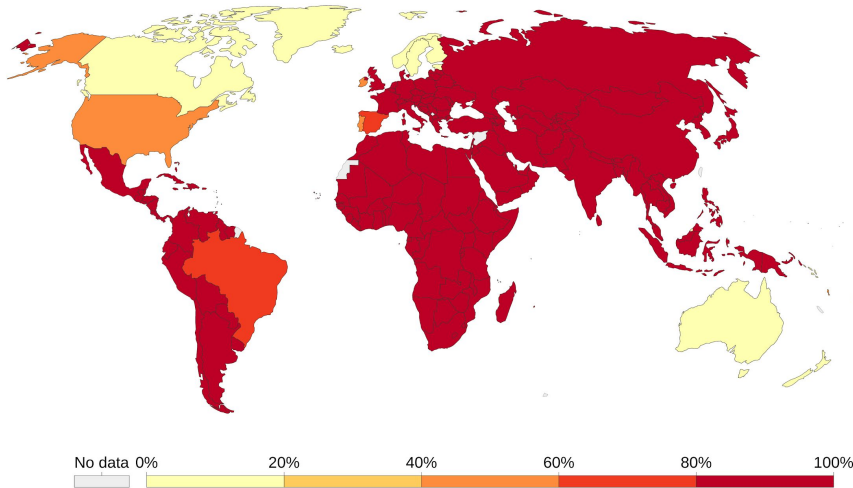
- Analysed the dataset of air travel , traffic on roads and industrial production along with the concentration of air pollutants in various cities
- Main objective is to capture this unprecedented event vividly and make predictions for near future.

Problem Statement

Share of the population exposed to air pollution levels above WHO guidelines, 2016

Our World
in Data

The share of the population exposed to outdoor concentrations of particulate matter (PM_{2.5}) that exceed the WHO guideline value of 10 micrograms per cubic meter. 10µg/m³ represents the lower range of WHO recommendations for air pollution exposure over which adverse health effects are observed.

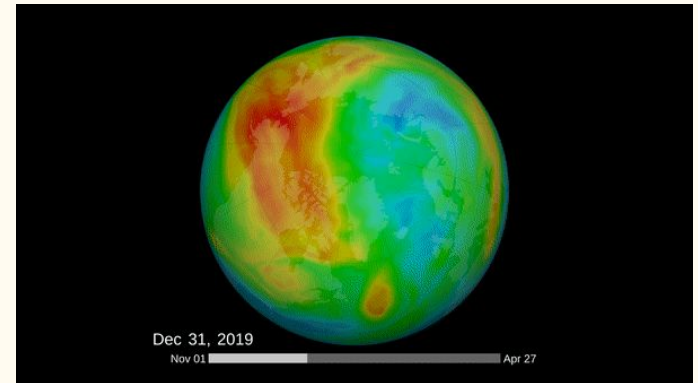


Source: World Bank

OurWorldInData.org/outdoor-air-pollution • CC BY

Impact of Air pollution

- Deaths
- Ozone depletion
- Low Immunity



Project Scope

Impact of various parameters

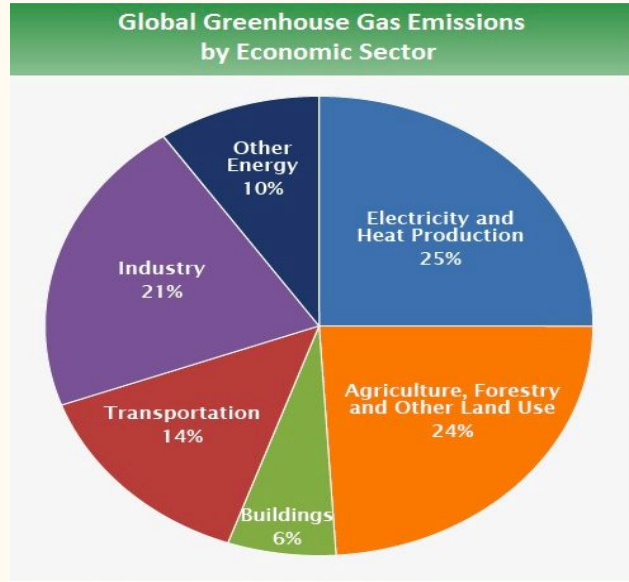


Image Source: <https://www.epa.gov/ghgemissions/global-greenhouse-gas-emissions-data>

Major contributor to air pollution(PM2.5)

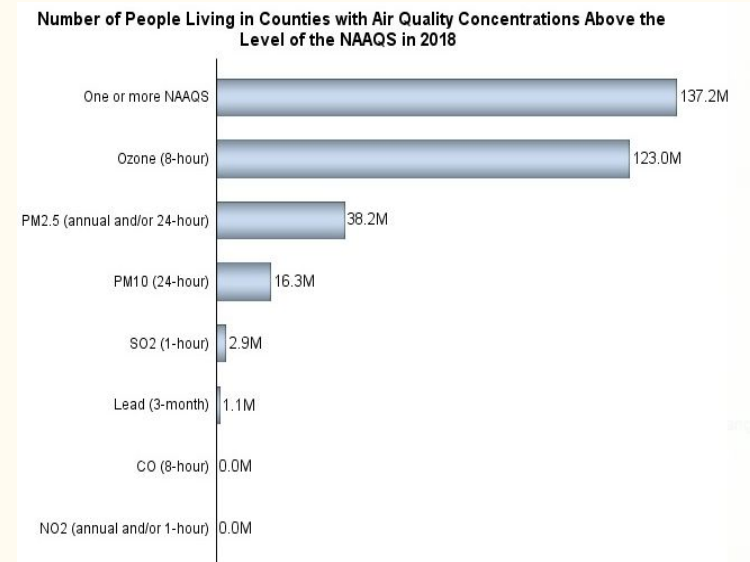


Image Source: <https://www.epa.gov/pm-pollution>

Dataset

WAQI(Major)

- Official EPA air quality dataset collected globally
- **Format :** .csv
- **Size:** Past four year daily data of air pollutants
- **Features:** PM2.5, PM10, O3, NO2, SO2, CO

CityMapper Mobility Index

- Road traffic data collected from transit authorities
- **Size:** Year 2020 daily data across countries

OAG

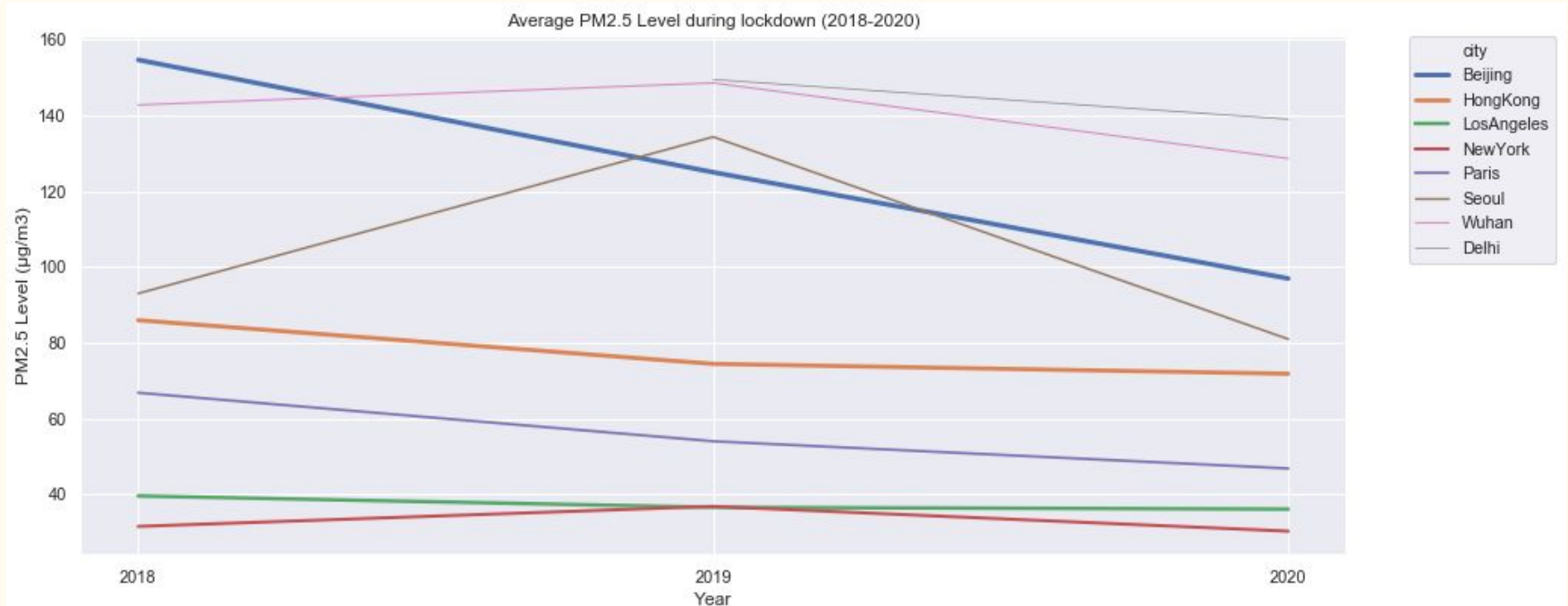
- Global digital flight and travel data
- **Size:** Last two year data across 15 countries

Federal Reserve System

- Operational Industrial data
- **Size:** Monthly data for USA 2018 onwards spanned across 835 sectors

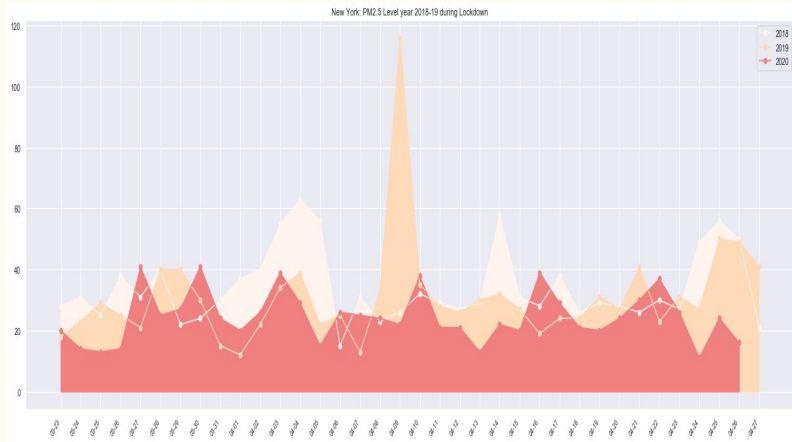
Statistical Analysis

Average PM2.5 Level comparison cities globally [2018-2020]: ▼ 17% (2020)

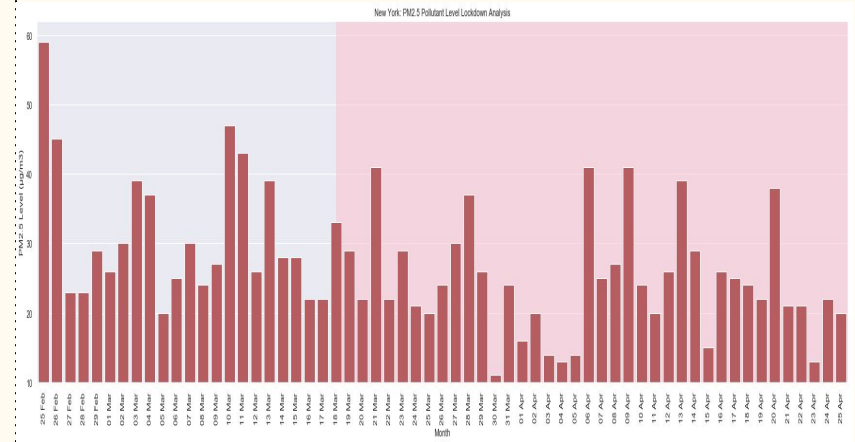


Statistical Analysis(Cont..)

▼ 21% Pollutant level during lockdown
[2018-2020]: New York

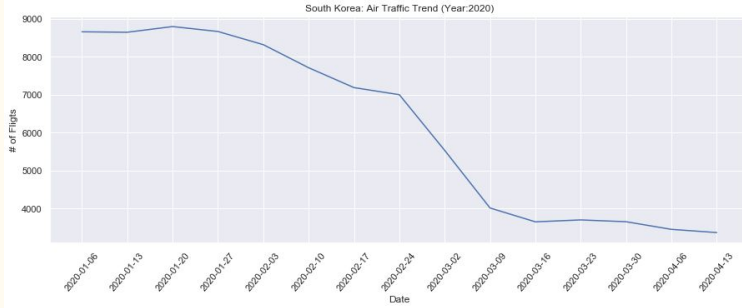


▼ 22%: Impact of lockdown
(Highlighted Area):New York

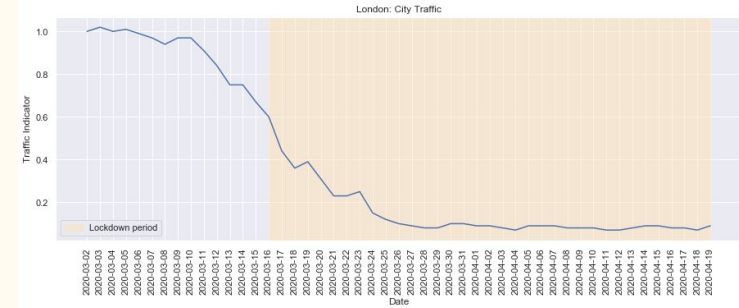


Statistical Analysis(Cont.): Measures

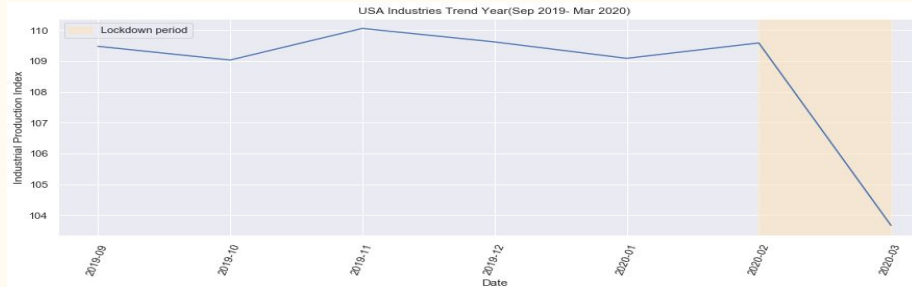
Air Traffic(South Korea): ▼ 52%



City Traffic(London): ▼ 85%

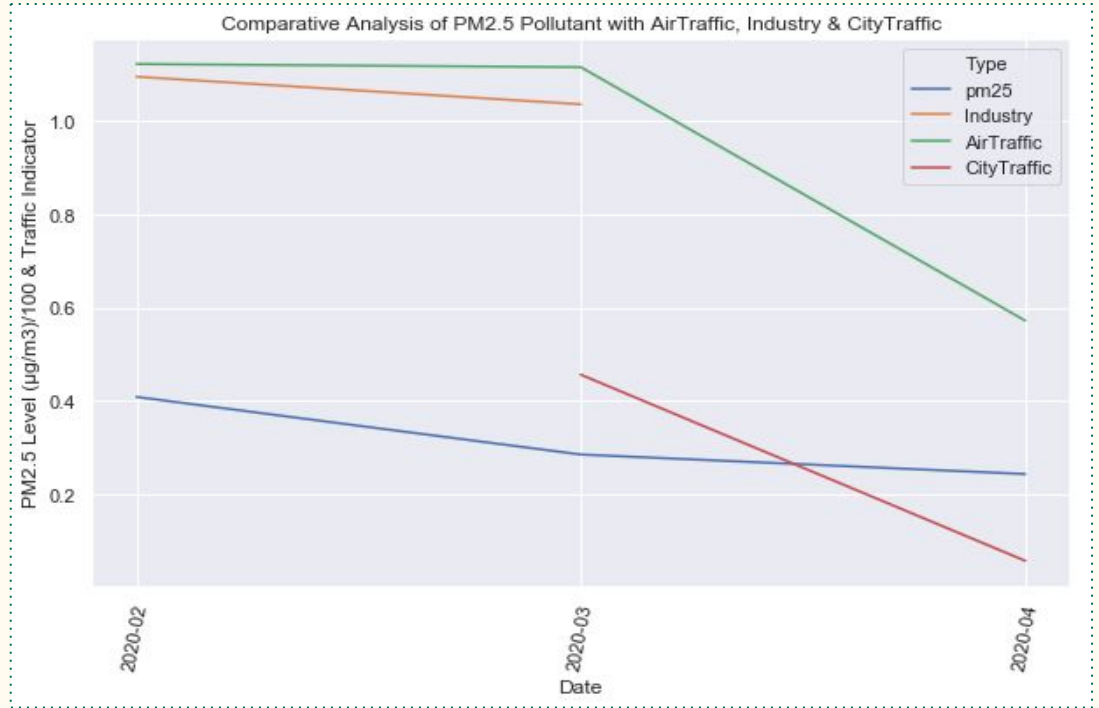


Industrial Operations Trend(USA): ▼ 5%

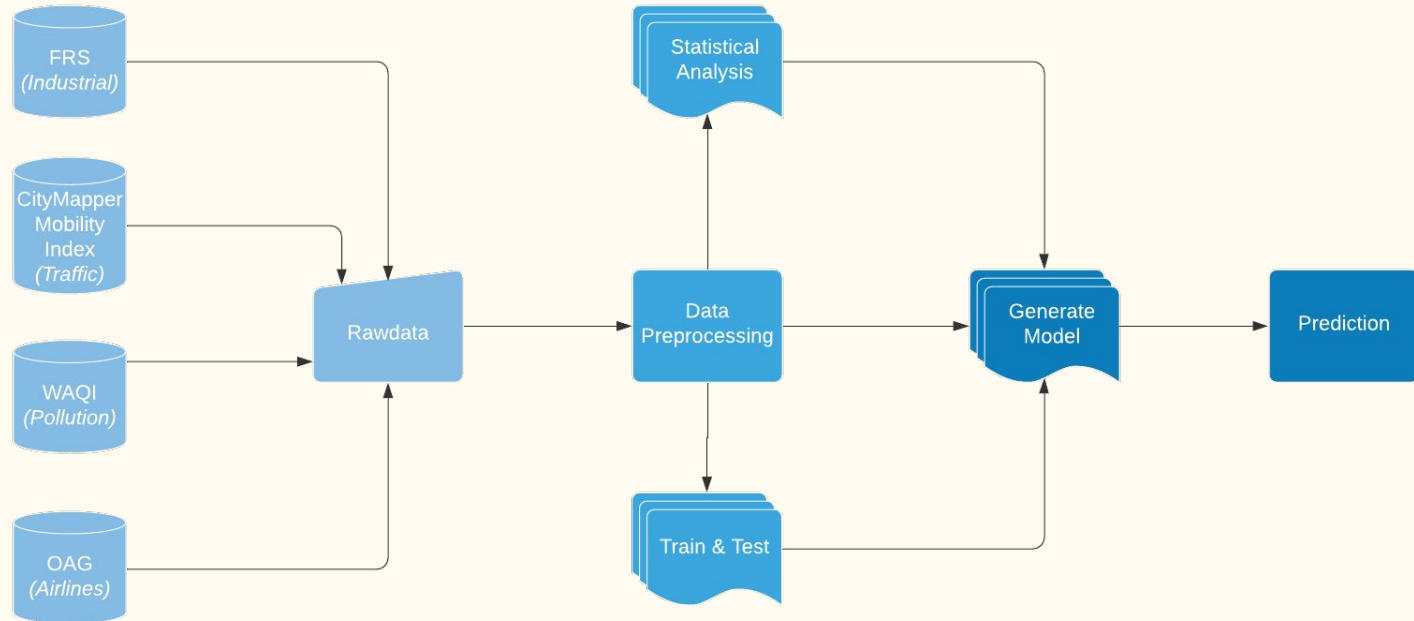


Results :Comparative Analysis

Successfully correlated that decline in flights operation, vehicles and industries **positively** contributed to environment health.



Architecture



Algorithms

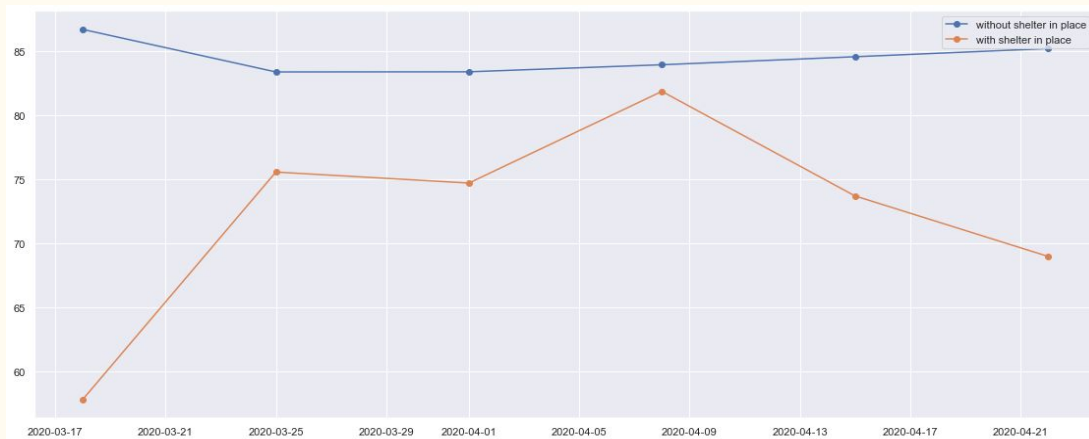
1. **Auto Regression(AR):** The process is basically a linear regression of the data in the current series against one or more past values in the same series.
2. **Moving Average(MA):** MA is a technique to get an overall idea of the trends in a data set; it is an average of any subset of numbers.
3. **Seasonal Autoregressive Integrated Moving Average(SARIMA):** Extension of ARIMA that explicitly supports univariate time series data with a seasonal component.

Data Preprocessing

- Handle blank values
- Daily data conversion to weekly data(where applicable)
- Stationarity of data checked using Kwiatkowski-Phillips-Schmidt-Shin (KPSS) and Augmented Dickey–Fuller(ADF)
- Data conversion to strict stationary using Differencing and Log transformation
- Differencing: To get rid of the varying mean
- Log Transformations : To stabilize the non-constant variance of a series

Evaluations

- Dataset was split into Training Data and Test Data.
- Given data was split into the period before shelter in place started and after it
- Time Series Prediction: AR, MA & SARIMA
- Mean PM 2.5 concentration without Shelter In place came out to be 93 ppm versus actual current value of 62 ppm for New York.



Things that work

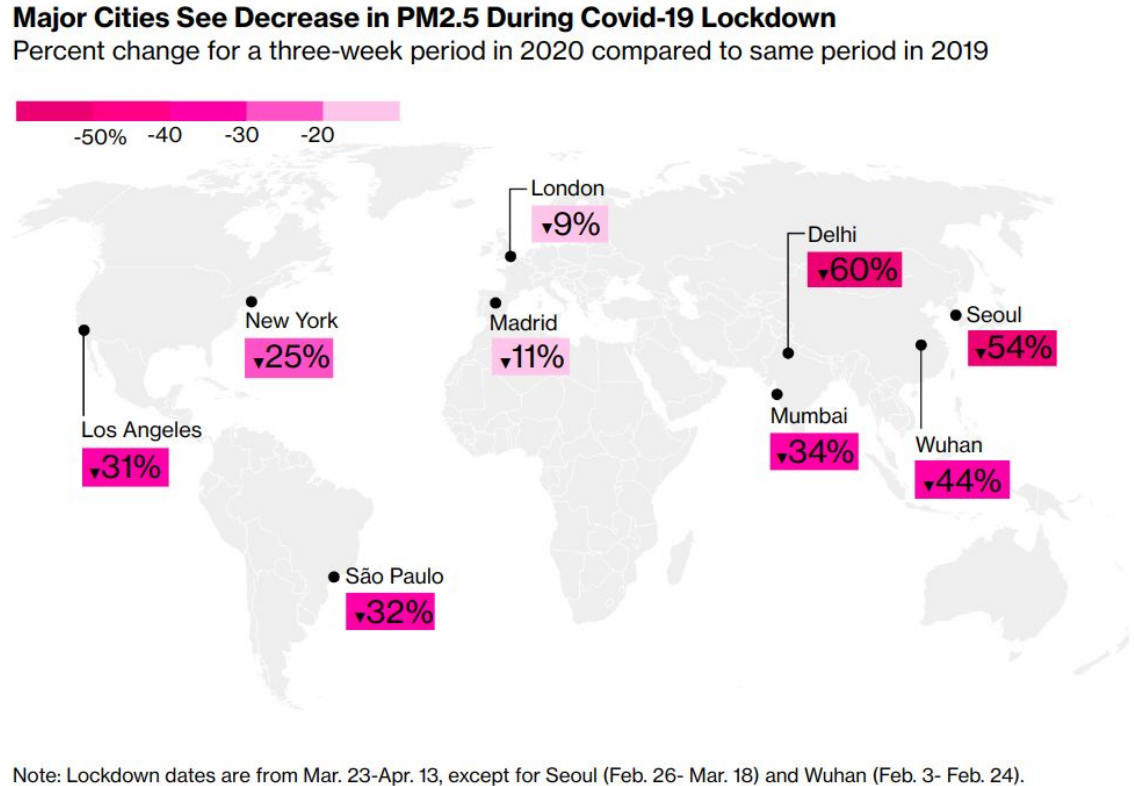
- Use of lockdown timeline to understand the data and find out a trend
- Averaging of pollution data weekly to handle the unexpected spikes occurred due to people's collective reactions to news and alerts.

Things that didn't work

- Dataset had outliers which needed to be weeded out.
- Some cities did not show a drastic change in pollution which was unexpected, researching about them it was found out that they had good environmental policy in place all year round
- Data set for African countries was not abundant.

Conclusions

- Just 1 microgram per cubic metre corresponded to a 15% increase in Covid-19 deaths. So we can safely say that this quarantine period has indeed been more life saving than life threatening.
- All true, perhaps. But falling emissions driven by economic distress are rarely sustainable, and easily reversible. Enforced systems change, imposed without public consent, will never last.



Future Suggestions

- **Electric Vehicles:** Make electric vehicles the new normal and outnumber the conventional cars.
- **Renewable Power:** Sink tax dollars and resources into clean-energy subsidies.
- **Afforestation:** Regrow enough trees to cover India Twice.
- **Carbon Tax:** Charge polluters \$75 for every metric ton of CO₂ they produce.
- **Nuclear Power:** Mandate government handouts to source 11% of energy production through nuclear fuel.

Following these measures allow us to attain +2°C earth's temperature by year 2100!!!



Thank you
&
Feel free to ask questions