

## 1. Introduction

- Properties of SO<sub>2</sub>
  - SO<sub>2</sub> one of the major pollutant.
  - SO<sub>2</sub> is a colorless, bad-smelling and toxic gas which is part of a larger group of chemicals.
- Sources of SO<sub>2</sub>
  - SO<sub>2</sub> is emitted by the burning of fossil fuels - coal, oil, and diesel etc.

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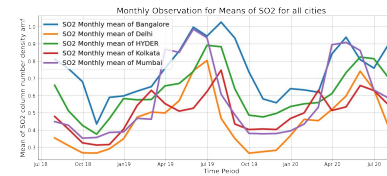
## Cont'd...

- Effects of SO<sub>2</sub>
  - SO<sub>2</sub> can contribute to respiratory illness by making breathing more difficult.
  - It combines with water vapour present in the atmosphere to form sulphuric acid that causes acid rain.

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## 2. SO2 Monthly data set analysis across cities

### 2.1 Monthly Means



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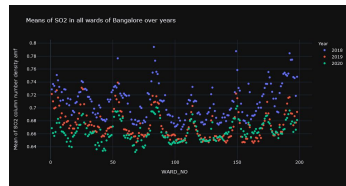
### 2.4 Observations from the monthly data

1. Mean values of SO<sub>2</sub> are considerably high in summers than in monsoons and winters.
2. This is due to the fact that the rise in usage levels of air-conditioners and refrigerators which are the major sources of SO<sub>2</sub>.
3. A seasonal trend is observed in the levels of SO<sub>2</sub>.

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## 3. Ward Wise SO2 levels

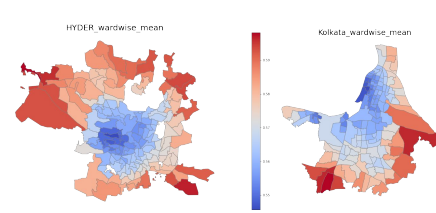
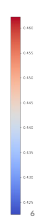
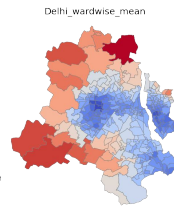
### 3.1 Bangalore



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## 4. Choropleth Map:

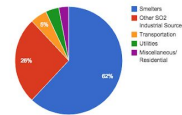
- Thematic map in which a set of predefined areas is colored in proportion to a statistical variable that represents an aggregate summary of a geographic characteristic within each area.
- Here, statistical variable is SO<sub>2</sub> column number density amf and the areas are wards of respective cities.



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## Inference from Choropleth maps:

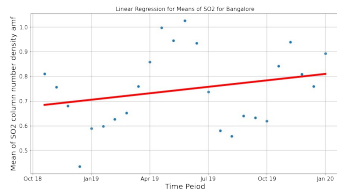
1. Major sources of SO<sub>2</sub> are smelters.
2. We can notice a considerable reduction in levels of SO<sub>2</sub> in the center hubs of major cities over the past 2-3 years.
3. This is because people over there are getting aware of the effects of rising levels of SO<sub>2</sub> and started inclining towards CNG which reduced the emissions of SO<sub>2</sub> from automobiles in the cities.
4. So the levels of SO<sub>2</sub> in the outskirts of cities, where the smelters are high in number, remained high.



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## 5. Regression of SO2

### 5.1 Bangalore



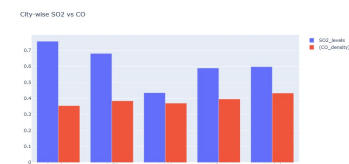
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### 5.6 Inferences from Regression analysis

1. Since the trends of SO<sub>2</sub> depends on various parameters, there is no concrete conclusion that can be drawn from the linear regression analysis.
2. But the noticeable observation that can be seen is that the levels of SO<sub>2</sub> had been rising over the years due to rise in usage of sources that emits SO<sub>2</sub>.

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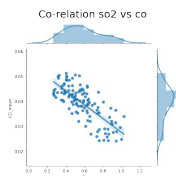
### 6.2 City-wise CO vs SO<sub>2</sub>



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### 6.3 Correlation b/w SO<sub>2</sub> vs CO

- Correlation coefficient
  - $\text{Corr}_c = \text{pearson}(\text{SO}_2, \text{CO}) = -0.76$
- From this it can be inferred that SO<sub>2</sub> and CO are negatively strongly correlated.



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## 6.6 Heat Map

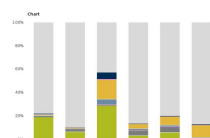
- Here heat map is used to analyze the correlation coefficients across the variables.
- It can be noticed that SO<sub>2</sub> mean values are strongly correlates with CO levels than pollution levels.



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## 6.7 Inference from Heat Map

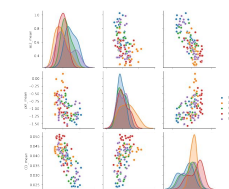
- CO is strongly positively correlated with pollution than SO<sub>2</sub>.
- This is due to the fact that CO contributes more than Sulphur oxides for air pollution.



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## 6.8 Pair Plot

- We used Pair plot to plot the multiple pairwise bivariate distributions in our dataset.
- Here analysis between SO<sub>2</sub> means, CO means and pollution means are done across all the major cities.



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## 7 Conclusion

- Climate change is not a myth.
- Government should bring strict regulations to reduce the levels of SO<sub>2</sub> like
  - Monitoring coal-burning power plants sulphur emission activities.
  - By making powerplants to install scrubbers that remove SO<sub>2</sub> from gases leaving the smokestack.
  - By conducting awareness campaigns to educate people about the hazards of increase in levels of SO<sub>2</sub>.

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