Report on Air Quality in Suzhou over the first quarter in 2019

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1.1.Background information of Suzhou city

Suzhou is a city in Jiangsu, China, located 31.30 latitude and 120.60 longitude. It is a major economic center and the second largest city in the province. (Where is Suzhou)

Climate: As one in subtropical zone, Suzhou has monsoon maritime climate, with mildly cold, cloudy, damp winter and hot, humid summer. The annual temperature of Suzhou is around 15.7℃.

Population

Suzhou has a population of 4.33 million in its city proper, and a total resident population (as of 2013) of 10.58 million in its administrative area. (Suzhou Wikipedia)

Transportation

Suzhou possesses developed transportation network.

Besides the four railway stations and four long-distance bus terminals in Suzhou, there are 3.5million private cars in the city, ranking 5th in the whole country. (2017 苏州统计年鉴)

Surroundings:

Suzhou is located at Yangtze River Delta, surrounded by Cities like Shanghai, Nanjing, Hangzhou, etc. It is one of the most developed areas in China, with a huge population and high level of urbanization and industrialization.

1.2.AQI measure in Suzhou over the last quarter

1.2.1. Overall trend

From over one hundred data sets of Suzhou that I collected throughout the quarters, we finally plotted a graph as below.

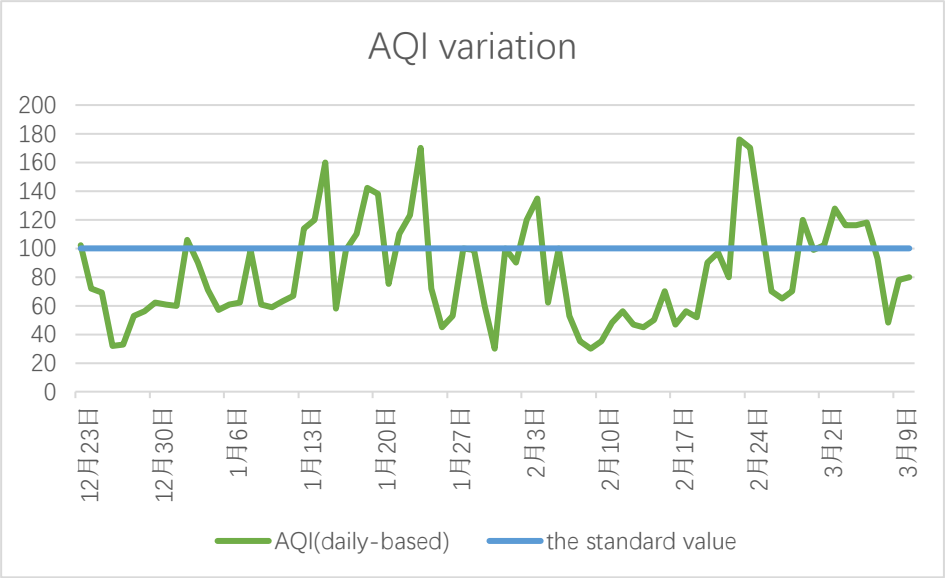

Table 1. AQI in Suzhou over the last quarter.

The graphs shows the variation of AQI value in Suzhou over the last quarter, with an average AQI of 83, and standard deviation of 35.

1.2.2. Variation between different months

In order to show a clearer presentation and find a patter, by categorizing relative data into four months, we managed to get this graph that summarizes the variation of AQI on monthly basis.

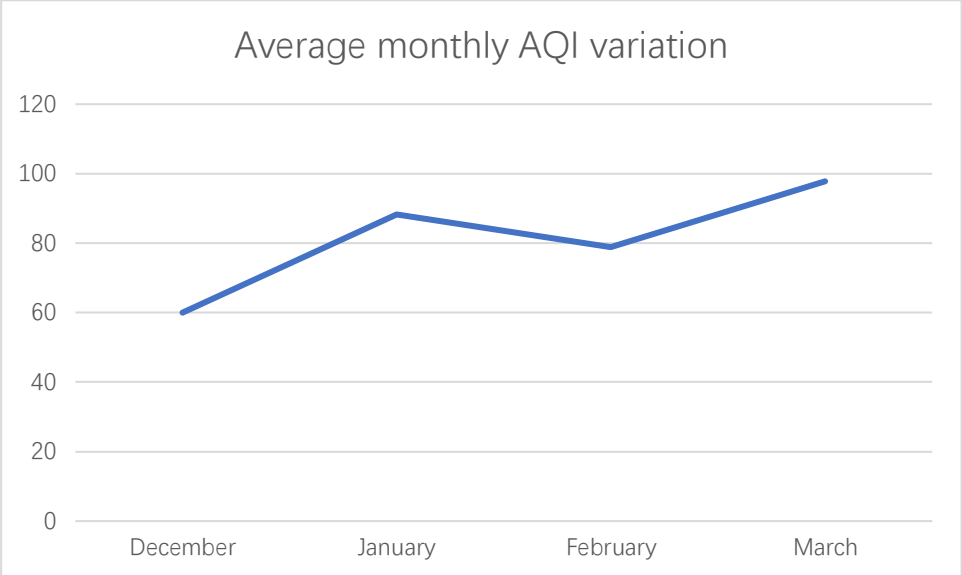

Table 2. Average monthly AQI variation

As the graph shows, all the average value is below 100, the national standard value. However, the trend keeps increasing over the four months, implying a not quite optimistic future trend.

We notice that during February, which is Chinese New Year, the air quality improves a lot. That might contribute to the growing government control of fireworks during holidays; also, all the factories are off during the New Year, so that shall be less pollutant released in the air, and thus improve the air quality. However, when it comes to March, workers go back for work and the pollution starts to rise again.

1.2.3. Concentration and Composition of air pollution

I manually collected many sets of data in different areas in Suzhou over the three months, including PM2.5, PM1.0, SO2, NO2, O3, CO.

1.2.3.1. Variation with different substances

Since there are not sufficient data for a daily-based presentation of data, the data below are averages of different times within the certain month.

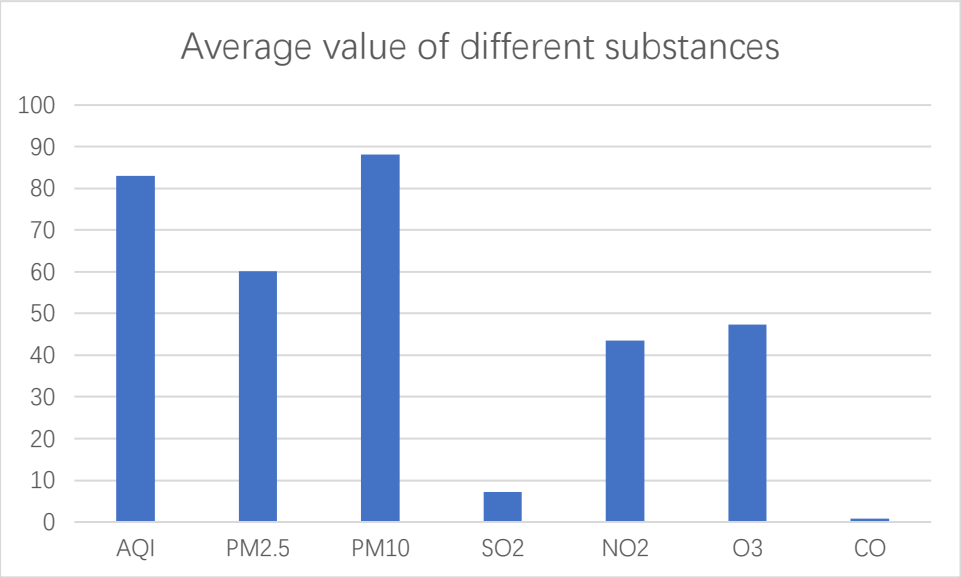

Table 3. average value of different substances.

We first compare PM2.5 with PM1.0 and find that PM1.0, even though seems to be less well-known by the general public compared with PM2.5, actually has higher values and thus implying a larger impact on air quality.

Also, comparing SO2 with NO3 and O3, it has relatively low volume and thus less impact.

1.2.4. Variation with location

There 8 locations being chosen to collect the data, and the 8 places are Xiangchen District 相城区，the steel mill 轧钢厂，Suzhou Industrialized Park 苏州工业园区，Caixiang 彩香，Suzhou New District 苏州新区，Northern

Gate 南门，Wuzhong District 吴中区 and Shangfang mountain 上方山.

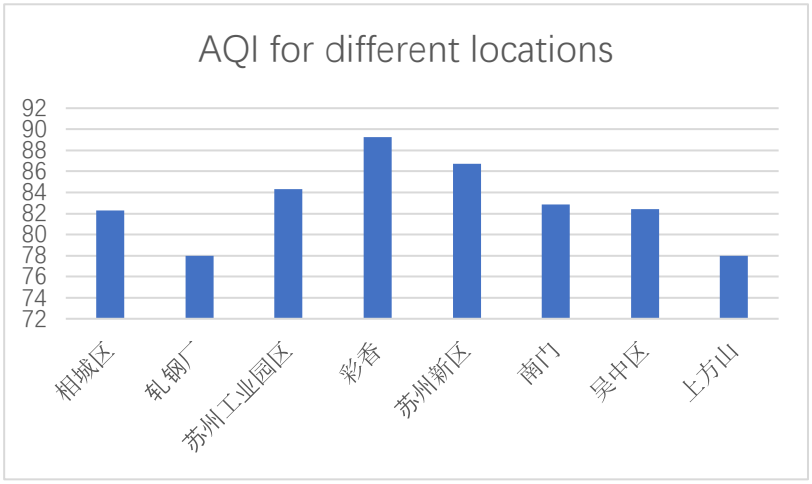

table 4. AQI for different locations

From the graph, we learned that the AQI is highest for Caixiang, while lowest for steel mill. It is surprising to see that yet a possible explanation is the government's increasing strict regulations for factory gas emission, which strictly decrease the pollution level in factory areas.

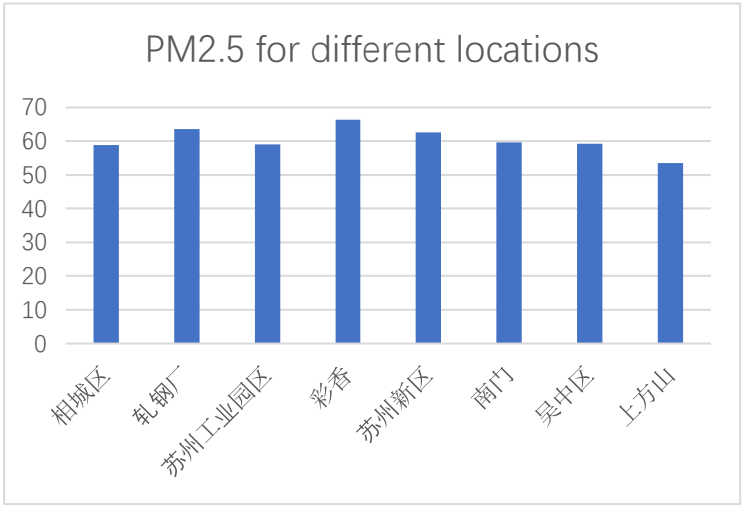

table 5. PM2.5 for different locations.

PM2.5 for all these places are almost equal, indication that PM2.5 may not be largely affected by that and the spread of PM2.5 is really fast and covers a huge

area, which is in correspondence with what I learned through literature phase.

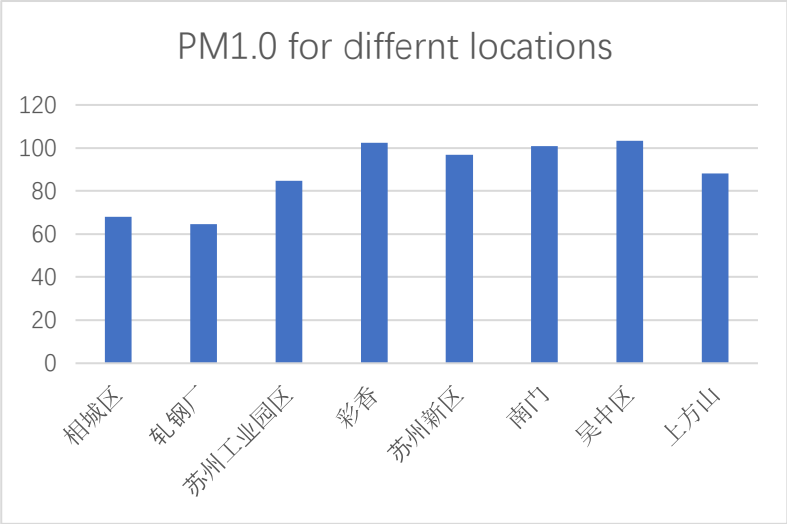

Table 6. PM1.0 for different locations

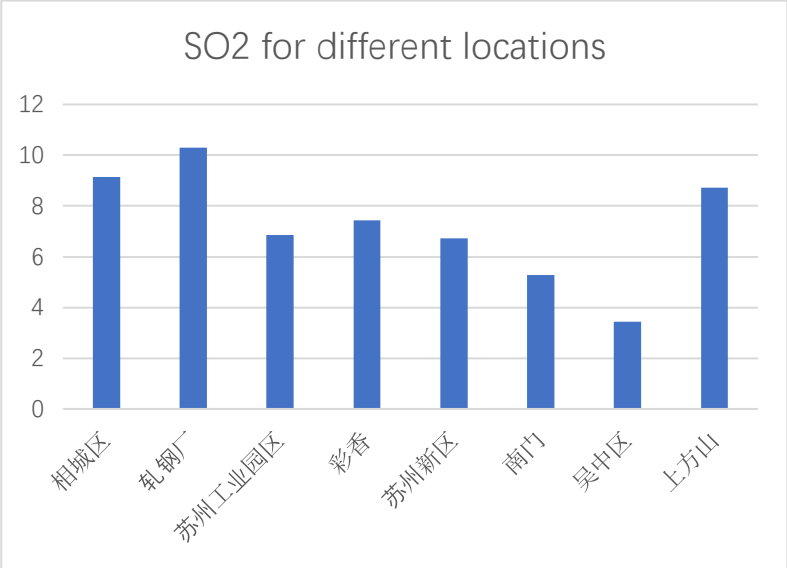

Table 7. SO2 for different locations

SO2 is highest for the steel mill, and relatively low for other places. Because SO2, as a toxic gas, should be rarely produced in daily life except for car emission and other little gas outputs; while it is the main component of factory emissions and thus results in a graph just like above.

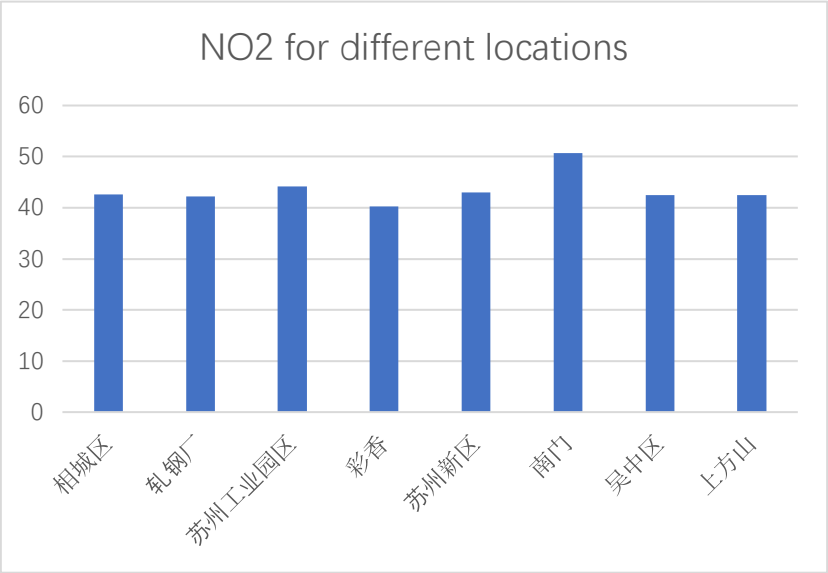

Table 8. NO2 for different locations.

NO2 is almost evenly distributed around Suzhou area because of its high motibility.

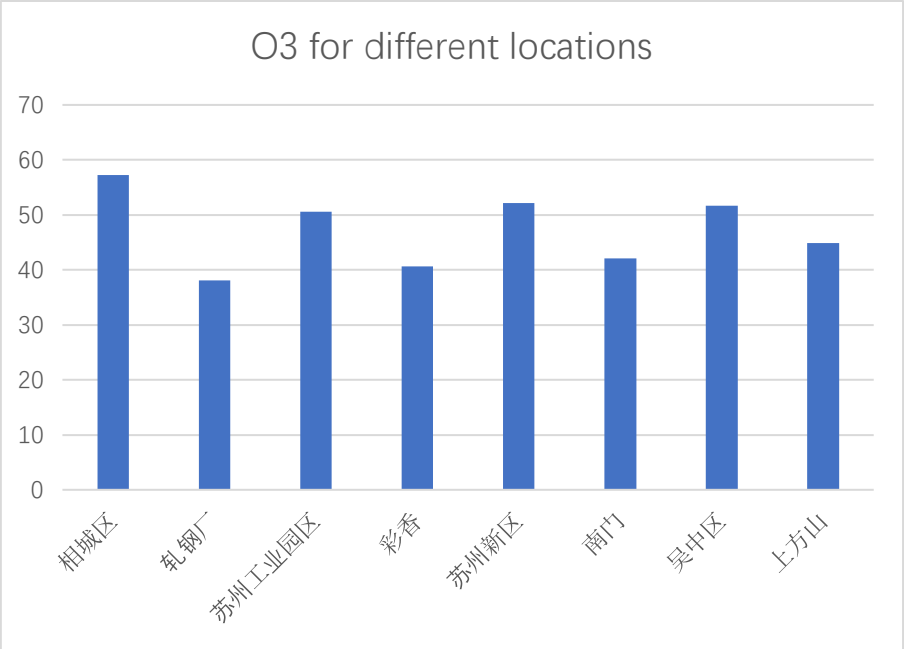

Table 9. O3 for different locations

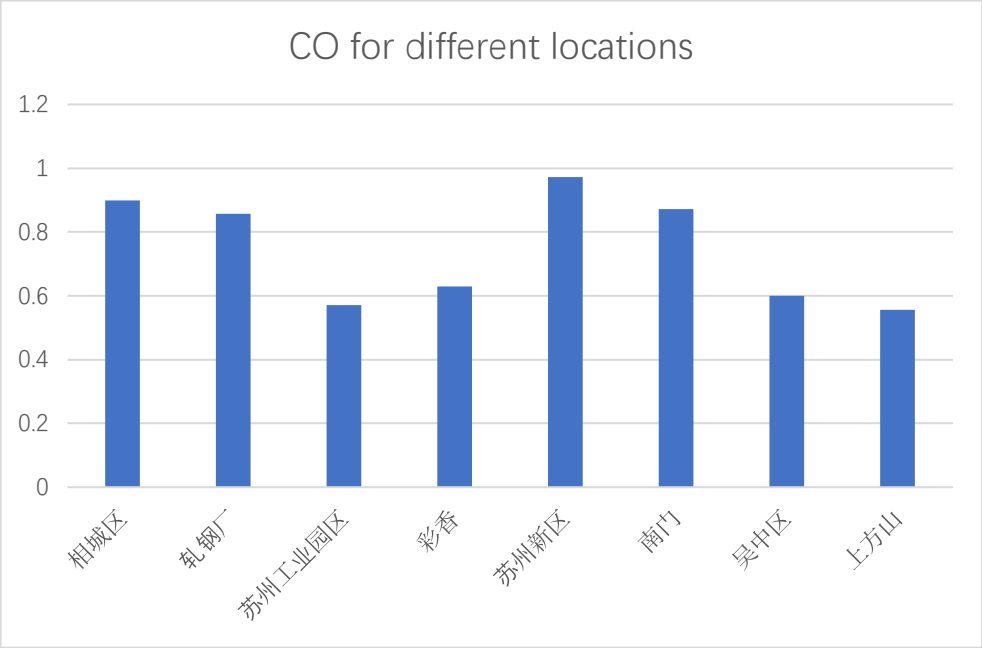

Table 10. CO for different locations

CO, similar to SO2, is a toxic gas that can be largely produced in industrialized areas like steel mill and Xiangcheng District. However, we find the most urbanized and industrialized area, Industrial Park District, has the lowest CO emission, one possible reason for which can also the extremely strict government intervention.

Conclusion

From the data analysis, the conclusion can be drew that

(1) the variation of air pollution is not linear, so there cannot be simple prediction of the trend and instead requires complex mathematical models that is far beyond high school level;

(2) different pollutants have different effect as well as spread around a certain area, and

the specific featured still need further investigation;

(3) some government measures of preventing air pollution is effective as we can see from the pattern of some toxic chemicals.

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