Study of Air Pollution Data for Comparing Air Pollution in Pimpri-Chinchwad Area for use in Deep-Learning based Prediction Algorithm

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Abstract comparing
"India tops world in bad air quality"[1][2]as per the WHO reports,the reason to emphasis on the air pollution. This paper concentrates on the air quality of PCMC(Pimpri Chinchwad MunicipalCorporation) area in last five years, compares the air pollution using air quality Respirable Suspended Particulate Matter (RSPM), Sulphur dioxide (SO2) and Oxides of Nitrogen (NOx) from the data collected from MPCB(Maharashtra Pollution Control Board)site with the help of CPCB (Central Pollution Control Board).Air quality of the city is analysed to get the differentlevels when the air pollution is high and try to ascertainits effects on human and environmental health. Further this paper focuses on need of air pollution control and use of deep learning prediction algorithms to control it.

Index terms:
Artificial Intelligence, Deep Learning, Air Pollution, Air quality Index

I.INTRODUCTION

The cumulative effects of air pollution have been considered as rising problems in recent years, according to special report on "State of global air 2018" ofHealth Effects Institute [3]The harm caused by air pollution has been largely demonstrated from the impacts on human health and well-being, which may lead to short term &long-term health issues.As per GadekarJaysing (2018) [4] much of that air pollution SO2, Nox and RSPM comes from factories, vehicles, power plants and the like. In other words, we think it comes from industry and technology.

All think of technology as a reason of pollution, but at the same time it can be used to stop & overcome the problem. The research paper aims to come up with new ways to use technologies of Deep Learning to address the growing air pollution problem and predict the air pollution status well in advance which will help to plan and execute the corrective majors appropriately to reduce the air pollution [5].

In this paper researcher collected the 5 years data for air pollution from the Pimpri and Bhosari area from PCMC And Air quality Index of the city is analysed to get the different time zones when the air pollution is high and try to ascertain its reasons. Further it focuses on need of air pollution control and use of deep learning algorithms to control it.

II.YEAR WISE AIR POLLUTION AVERAGE

For the comparison the daily updated data from January 2014 to December 2018 is considered and analysed to draw the conclusions. All the data collected from secondary source website of MPCB, cleaned and analysed to create tables and graphs and compared to the standards to generate the assumptions made in this paper. Following table and graphs describes the average figures of each pollutant which are derived from the available data.
Data Source: MPCB environment data [6][7]

Table 1: Average SO2, NOx and RSPM of Pimpri area.

Pimpri	SO2	NOx	RSPM
2014	22.45	41.02	92.19
2015	23.85	50.52	98.77
2016	29.23	68.04	94.69
2017	22.8	58.27	84.29
2018	35.78	64.23	80.4

Graph 1: Average SO2, NOx and RSPM of Pimpri area.

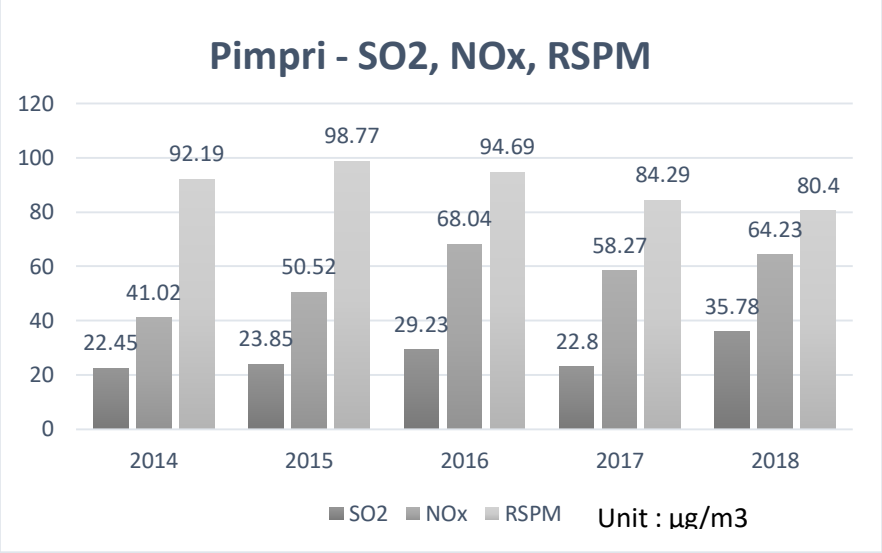
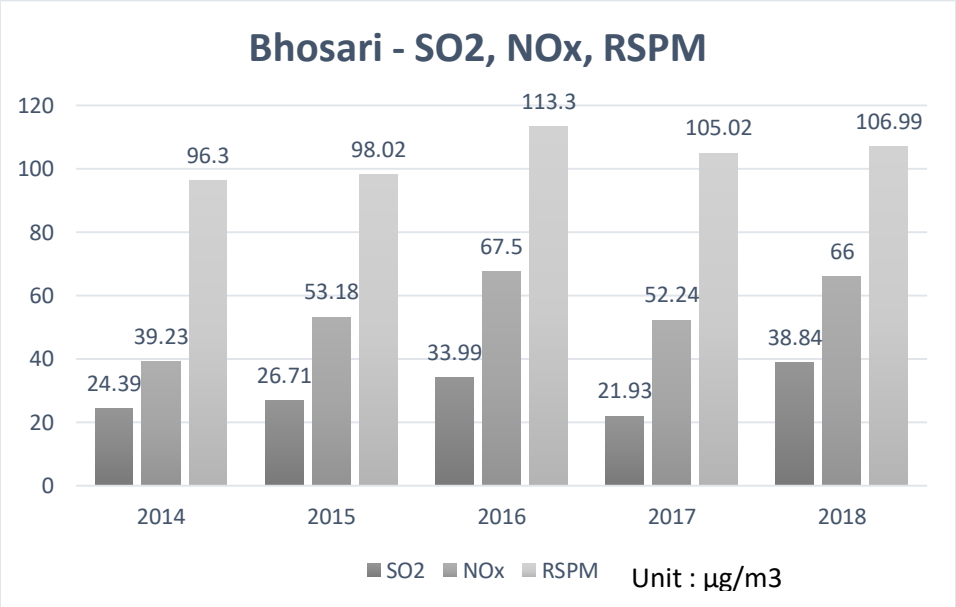


Table 2: Average SO2, NOx and RSPM of Bhosari area.

Bhosari	SO2	NOx	RSPM
2014	24.39	39.23	96.3
2015	26.71	53.18	98.02
2016	33.99	67.5	113.3
2017	21.93	52.24	105.02
2018	38.84	66	106.99

Graph 2: Average SO2, NOx and RSPM of Bhosari area.



III.COMPARISON OF THE AIR POLLUTION IN LAST FIVE YEARS

In the comparison, the actual data of last five years from Pimpri and Bhosari are consolidated and compared to check in the increase of each air pollutant.

If we consider the above Table 1 and Graph1 for comparison. In Pimpri area SO2 which was at level of 22.45 µg/m3 in the 2014 has increases to 35.78 µg/m3 in the year 2018. Oxides of nitrogen has increased from 41.02 µg/m3 to 64.23 µg/m3. And RSPM pollutants are slightly decreased from 92.19 µg/m3 to 80.4 µg/m3.

Whereas, by considering Table 2 and Graph 2, in Bhosari area, SO2 which was at level of 24.39 µg/m3 in the 2014 has increases to 38.84 µg/m3 in the year 2018. Oxides of nitrogen has increased from 39.23 µg/m3 to 66 µg/m3. And RSPM pollutants are increased from 96.3 µg/m3 to 106.99 µg/m3.

Table 3: Standard level of SO2, NOx and RSPM

	SO2	Nox	RSPM
Standards	80	80	100

Graph3: Standard level of SO2, NOx and RSPM

By looking at the standards of the pollutants in the Table 3, Graph 3,Table 1 and Table2. It can be observed that, Gradually the air quality is going to be severe in the coming years. In both the areas SO2 and NOx air pollutants are moderate. Still they are increasing and may cross the standard level with in few years. And for RSPM air quality is near standard level in Pimpri and has already crossed the standard level in Bhosari. Considering above observations, the factor that should be concentrated earliest is RSPM. And also think of a way to maintain the levels of SO2 and NOx.

IV.CAUSES AND NEED FOR THE CONTROL

A person can live without food for few days, without water for few hours but Can't live without air even for few minutes. Controlling air pollution is the need of time.

Causes of SO2 are thermal power plants and industries, Industrial boilers and processes, coal-burning stoves, heaters. NOx pollution is caused by vehicles, industrial boilers, power plants, commercial and residential heaters and coal burning stoves whereas RSPM pollution is caused by transportation, stone crushing units and automobile industries [7] [4].

The RSPM with aerodynamic diameter of less than 2.5 micrometre are the pollutant that can be inhaled through nasal passage in to the throat or even into the lungs leads to respiratory and cardiovascular diseases [8], reduces lungs functioning and Heart attacks. Effects of SO2 include respiratory illness, visibility impairment, acid rain and aesthetic damage. Nitrogen dioxide irritates the nose and throat, and it appears to increase susceptibility to respiratory infections. All these pollutantsare hazardous to human health, and reason for the environmental and global problems (like acid rain, global worming etc.)[7][9][10].

V.USE OF DEEP LEARNING-BASED PREDICTION ALGORITHMS TO CONTROL AIR POLLUTION

Recently Deep Learning and machine learning algorithms are appreciated by many researchers and academicians for predictions. Deep learning algorithms are the multilayer architecture to extract information layer by layer giving the better results[11]. By using deep learning-based algorithm respective air pollutantsdata can be extracted without prior knowledge, and can give much better predictions.These predictions help to anticipate the bad air condition and to take preventive actions to maintain the air polluting factors with in the acceptable level. Deep learning algorithms are able to forecast pollution many future hours with accuracy [5].

VI.CONCLUSION

In this research paper the air pollution of SO2, NOx and RSPM for last five years is compared and analysed. The result shows the condition of air quality in Pimpri-Chinchwad area is getting severe. The levels of SO2 and NOx are increasing gradually and cross the standard limits within few years. The level of RSPM is alarming andit isabout to reach standard level in Pimpri area and had already crossed standards in Bhosari area. Paper discussed the causes of air pollution due to SO2 NOx and RSPM and the effects on human health and environment are conversed and found to be severe. The government and citizens should pay concern regarding air pollution because it affects human health and environment. Deep learning-based prediction algorithms are proven to be good solution for anticipation of air quality and can be used to take preventive measures against air pollution.

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