iJRASET
International Journal For Research in Applied Science and Engineering Technology

INTERNATIONAL JOURNAL FOR RESEARCH

IN APPLIED SCIENCE & ENGINEERING TECHNOLOGY

Volume: 9 **Issue:** IV **Month of publication:** April 2021

DOI: https://doi.org/10.22214/ijraset.2021.33569

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International Journal for Research in Applied Science & Engineering Technology (IJRASET)
ISSN: 2321-9653; IC Value: 45.98; SJ Impact Factor: 7.429
Volume 9 Issue IV Apr 2021- Available at www.ijraset.com

Monitoring and Study of AQI during Lockdown in Delhi

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Abstract: ***Humans have not only betrayed humans by being the major source of air pollution but have also betrayed to all other living beings on the earth.***
In response to the COVID-19 pandemic the government of India imposed a 27 days lockdown in the whole country which led to the shutting down of power plants, transportation and other industries. Though the corona virus came as the curse for the social and economic development of the country but proved to be a boon for the India's air quality. New Delhi, the capital city of India is not only ranked as one of the most populated cities but also the most polluted ones and hence now it is the high time to take appropriate measures to combat this problem.
The restrictions imposed resulted in the drastic decrease in the pollution levels across the city which allured discussions regarding lockdown to be the effectual alternative measures to be implemented for controlling air pollution.
The present article eventually worked on studying and comparing the concentration levels of the parameter 2.5PM (μg/m^3) to look upon the air quality scenario during the lockdown period with special reference to the megacity Delhi. But to deal with problem of air pollution we need a better plan as pollution will rise again when the COVID-19 pandemic is over and daily life returns to normal.
Keywords: Lockdown, Air quality index, Correlation coefficient, Air pollution

I. INTRODUCTION

Air pollution is one of the greatest afflictions in today's generation because of its threatening impacts not only on the environment as well as on the human beings. Emissions through large-scale human activities such as the use of industrial machinery, power-producing stations, combustion engines, and automobiles are the major sources which contribute to air pollution with automobiles estimated to be responsible for approximately 80% of today's pollution[1].There are many pollutants responsible for the increase in morbidity and mortality.

One such pollutant is Particulate matter (PM) which are very small in size but if enters the respiratory system may cause respiratory and cardiovascular diseases, reproductive and central nervous system dysfunctions, and cancer.[2] New Delhi, the capital territory of India is considered as one of the most polluted cities in the world[3] and is having the highest ambient particulate matter pollution exposure in the country[4] hence monitoring of ambient concentrations of various air pollutants as well as quantification of the dose inhaled becomes quite important, especially in view of the fact that in many countries, policy decisions for reducing pollutant concentrations are mainly taken on the basis of their health impacts.

The air pollution status in Delhi has undergone many changes in terms of the levels of pollutants and the control measures taken to reduce them.

The new corona virus disease 2019 (COVID-19) rooted from Wuhan, China, in late December 2019 emerged as a serious threat to the entire humankind and consequently on one hand the whole world experienced a gigantic socio-economic devastation while on the other hand it came as the silver lining for the environment.[5]

The 27 day lockdown in Delhi, India led to shutting down of power plants, transportation and other industries which resulted in drastic decrease in concentration levels of harmful air pollutants thereby improving the quality of air and has provided us with the opportunity to develop preventive and primitive measures for management and mitigation of air pollution.

The National Air Quality Index (AQI) launched in New Delhi, India on April 6, 2015 under the Swachh Bharat Abhiyan is a tool for effective communication of air quality status to people in terms which are easy to understand. This paper represents the study of the impact of lockdown on air quality in Delhi (India) by monitoring the air quality index data recorded during this adverse time.

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II. METHODOLOGY

For the purpose of understanding the effect of lockdown on the AQI, the parameter selected for study is 2.5 PM (µg/m^3). Initially to begin the study its checked if there is any trend that is followed in AQI along the years. It's found that in past 5 years there is a strong correlation between (0.7 spearman correlation coefficient), and a proper trend is also visible graphically as shown in fig 1.

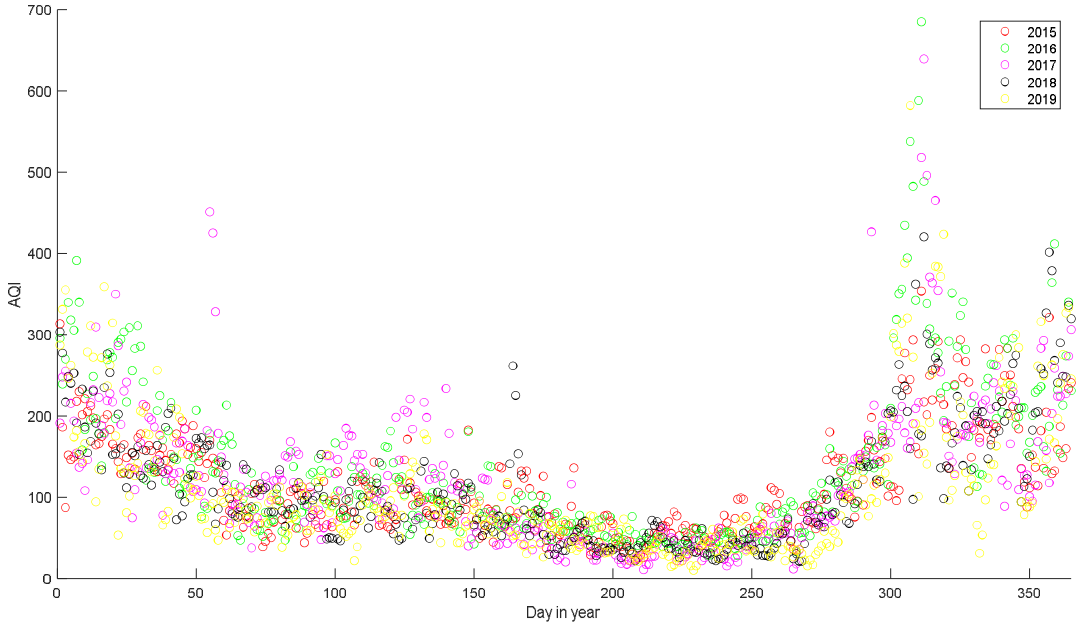

Fig 1. PM 2.5 Trend in past 5 Years

As seen above the 2.5 PM follows a pattern quite well over a course of past 5 years. The following can be set in regression with input as day number though its unconventional, but the data supports the same. Fitting the data with 0.5 R-squared value we get:

$$2.5PM(Day) = 0.006x^2 - 2.1x + 237.52$$

Same is shown in Fig 2.

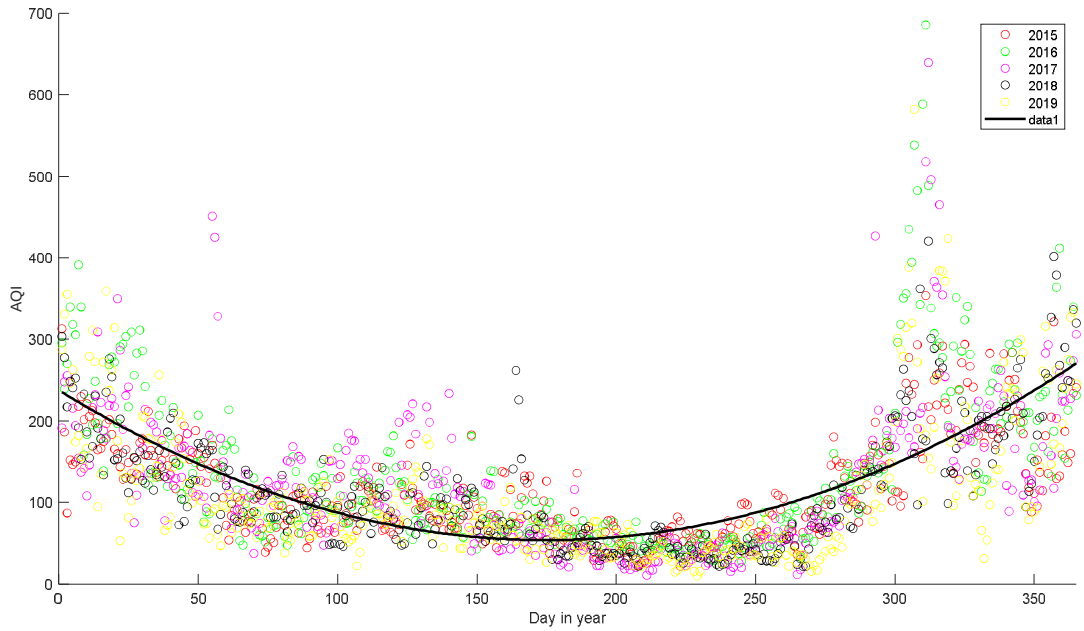

Fig 2. PM 2.5 Trend Line

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In year 2020 till the lock down was imposed (March 25, Day:85) the variation of Air quality follows well along the trend as shown in figure below, but after lockdown in end of march the values of 2.5 PM stays below the trend as shown in Fig 3.

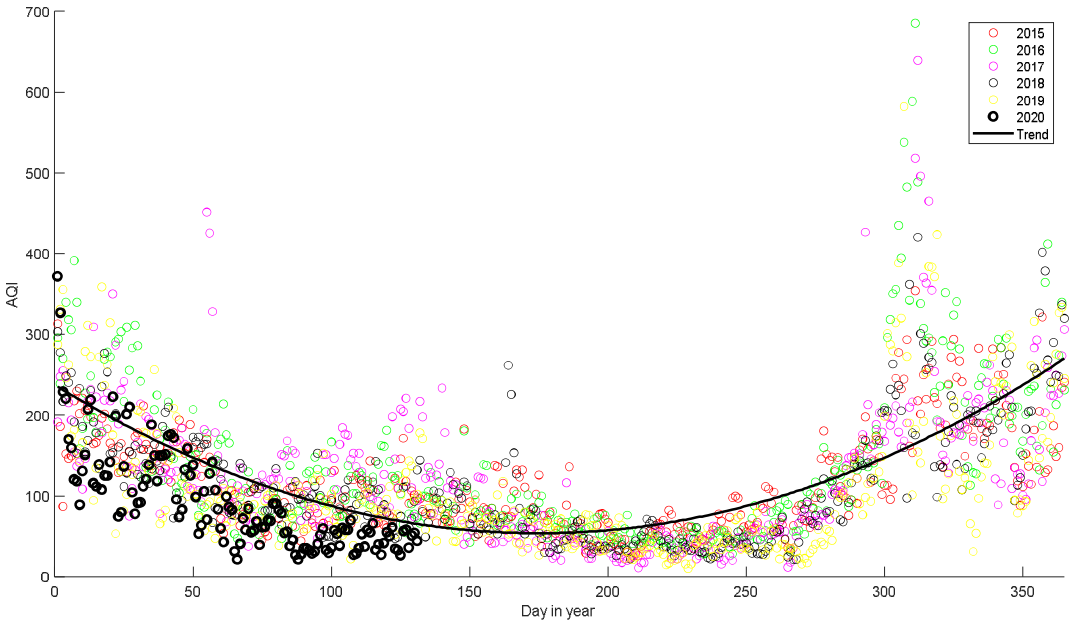

Fig 3. Comparison of General trend to Lockdown

The fall in 2.5 PM is also visible when compared to previous 5 years value:

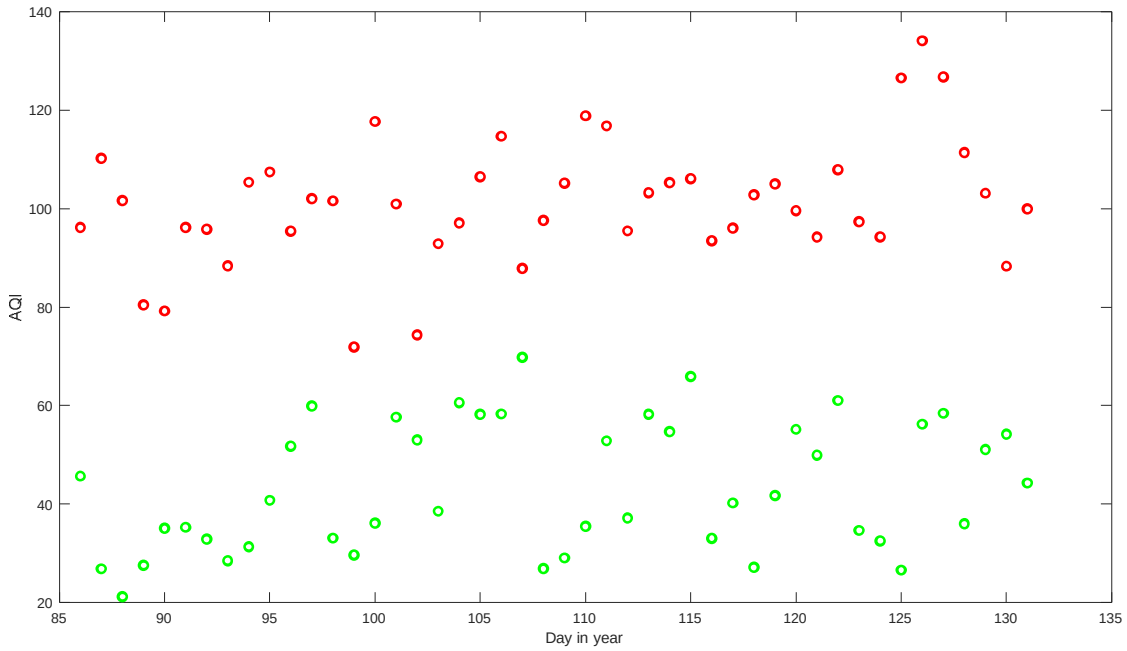

Fig 4. Comparison of Numerically modeled Values to Lockdown Period

The mean deviation between them is 60.09 which is quite considerable. Though from the pattern its evident that though the 2.5PM fall below the regular value, the minimum value at datum is hardly getting effected. This shows that the pollution in Delhi can be control very effectively with proper means till that value of about 50.

Further studies can be done to understand the parameters affecting 2.5PM of DELHI as the variation is seen to be varying in a well pattern. The parameters in further study can be Temperature, Vehicle numbers, Industries and Moisture Content.

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III. CONCLUSION

Following conclusions can be drawn from the above studies:

A. The average PM2.5 value was well below the general trend in Delhi showing that Lockdown had a considerable effect on the Pollution.
B. The Pollutants follow a constant trend for past 5 years and the expected value can be numerically modeled.
C. The Pollution can be effectively controlled over course of time as the efficiency of lockdown effect was quite high.

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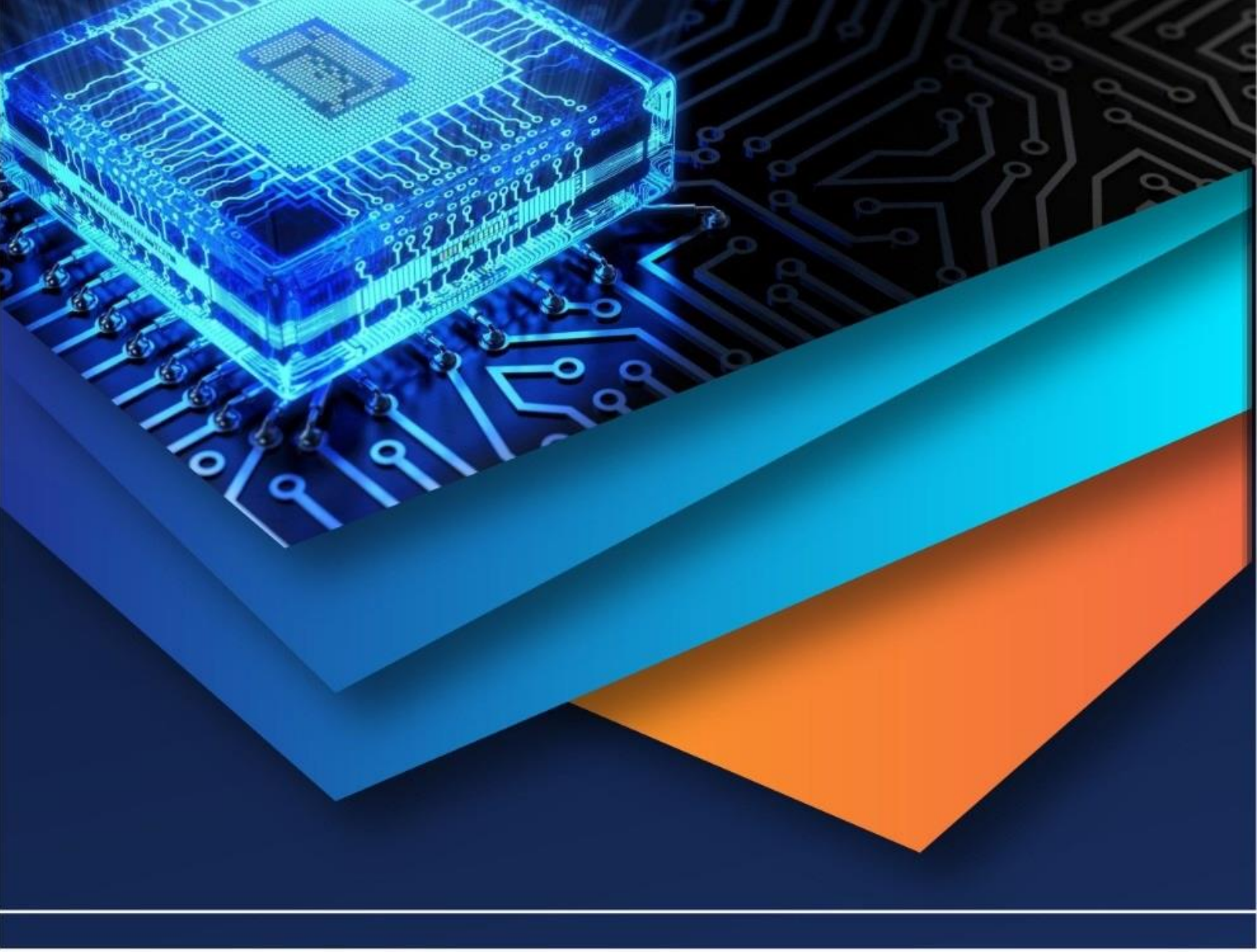

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