

Assessment of Air Pollution in Lucknow

Geetika Saluja*

Centre For Excellence at Varmora Granito Pvt Ltd, Ahmedabad, Gujarat, India

Review Article

Received: 07/02/2017

Accepted: 11/07/2017

Published: 18/07/2017

***For Correspondence**

Geetika Saluja, Head, Centre For
Excellence at Varmora Granito Pvt Ltd,
Ahmedabad, Gujarat, India,
Tel: 090992 02222.

E-mail: geetikasaluja20@gmail.com

Keywords: Particulate matter, Pollution,
Deforestation rate, Industries, Equipments

ABSTRACT

The human behaviour over the last few decades has changed the global atmospheric condition. The emission from automobiles, industrial emission, urban development, intensification of agricultural practices has escalate the levels of the harmful gases like CO₂, CO, SO₂, NO and Particulate Matter(PM) which probably changing the condition of the atmosphere and in turn harming us.

The study aims at assessing the rate of air pollution in Lucknow with the focus on the Particulate Matter 10, Particulate Matter 2.5, Sulphur Dioxide and Nitrogen Dioxide. The study also reveals the major cause of the air pollution in Lucknow; the areas of Lucknow which are severely under pollution threats and monitoring the tracking mechanisms which has been set up; lacking equipments and the reason behind the same and little focus on the implemented awareness method among Lucknow is on air pollution. The study accounts the data of the recent months and the comparison to evaluate the increasing amount of level of pollution from last years.

INTRODUCTION

Lucknow city is the capital of Uttar Pradesh which has a population of 2.82 millions (Municipal Corporation and Cantonment) as per 2011 census. The Pollution means the contamination of the air. As per section 2(a) of Air(Prevention and Control of Pollution) Act,1981 air pollution has been defined as, “ any solid, liquid or gaseous substance (including noise) present in atmosphere in such concentration as may be or tend to be injurious to human being or other living creatures or plants or property of environment”.

The clean air is the prior requirement for the healthy survival of the humans. As a consequence of urban development along with energy sector; vehicular emission too aiding in the rise of particulate matters. Besides these the other most thing found is the increase of the deforestation rate ion Lucknow to build the parks, malls and highways which has increased the rate of Carbon ion the atmosphere. It was stated by the MoEF that if a 50 years old tree is cut it value for 50,000 bugs while if it left standing it will value for 25 lakhs ^[1]. The actual forest cover in Lucknow is about 115 square kilometers i.e., less than 5% of total area of Lucknow (2500 sq km) in 2015. It has been revealed that to build the Agra-Lucknow Greenfield Express Highways; more than 27000 tress had been axed ^[2,3]. There is a large felling of tress along the Raebareli road to widened the roads to accommodate increasing number of vehicles. Since the power plants and industries are stationary source of pollutants affecting air quality but in a limited area while vehicles being mobile in nature pollutes the atmosphere to a larger extent. The gases emitted from the vehicles are Carbon Monoxide, Nitrogen Oxide, Sulphur Dioxides, Suspended Particulate Matters, Hydrocarbons and Lead. In 2013, Lucknow was ranked the top most polluted city of India ^[4,5].

The main causes of air pollution in Lucknow are:-

- Vehicular emissions and day by day increasing private vehicles on road.
- Rapid urbanization on the expenditure of greenery.
- Industries surrounding the city.
- Unconsciousness of government and public toward this problem.

- Burning of woods for fuel purposes.
- Burning of the garbages.

LITERATURE REVIEW

Air Pollution is now one of the most common occurring factor resulting into threatening to human health at great extent.

• Air quality of Lucknow according to analysis of last nine years air quality data shows a more or less stable trend for SO₂ and a declining trend for NO₂, both lying within the NAAQS. For PM₁₀ increasing trend is seen which exceeds NAAQS (As per CPCB,2012 report).

- As per report of WHO, 2014 the annual concentration of PM₁₀ was 219 ug/m³
- As per December, 2015 AQI of Lucknow was 489. The AQI between 401 and 500 is the severe call for the human health hazard [5].

There is a high fluctuation rate in PM_{2.5}. According to the study, it revealed that the fluctuation of the PM depends upon the wind speed and humidity of the area. If the wind speed is less than 0.3 metre/second, it leads to concentration of particulate matter. Similarly, if humidity is high, particulate matter becomes heavy and remains suspended in the air thus causing pollution. As per the record of December 2015 in Talkatora station PM_{2.5} recorded alarmingly at high levels on the intervening night of 9th December, 2015 Wednesday and 10th December, 2015 Thursday [6].

The highest value was 15,080 microgram per cubic metre recorded at 2.30 am on Thursday. At 11.30 pm Wednesday, PM_{2.5} was recorded to be at 12,641 microgram per cubic metre. The national ambient air quality standard for PM_{2.5} is 60 microgram per cubic metre and for PM₁₀ is 100 microgram per cubic metre [7-11] **(Figure 1)**.

Average Pollution Level in 2015 in Lucknow

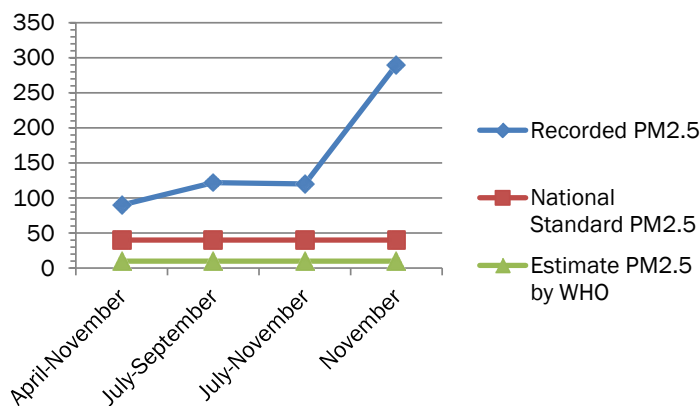


Figure 1. The graph is representing the average PM_{2.5} emission in 2015 in Lucknow. The estimate PM_{2.5} by WHO is 10 while that of Yearly National Standard is 40. And the emission growth is from 90 to 290 which is a sky scraping emission and hazardous to human health.

Particulate Matter 2.5 in microgram per cubic meter of different places of Lucknow

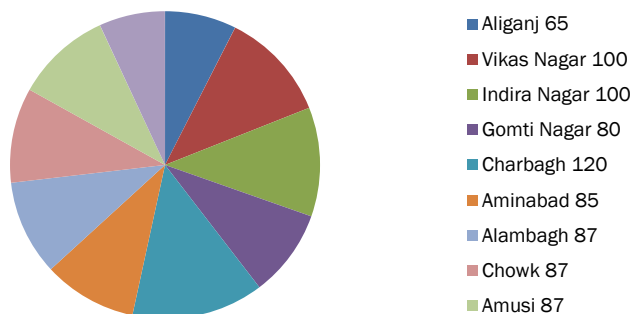


Figure 2. The data of the pie chart is shown as that on 5th June 2015. The pie chart is demonstrating the PM_{2.5} of different places of Lucknow.

Apart from the above mentioned reasons for the increasing rate of air pollution in a city, the other major factor is DIWALI CRACKERS. The fireworks and crackers during the Diwali period is also one of the cause leading to the hike in the PM2.5. As per the rate recorded during the Diwali period the PM2.5 found are as follows (**Figures 2 and 3**).

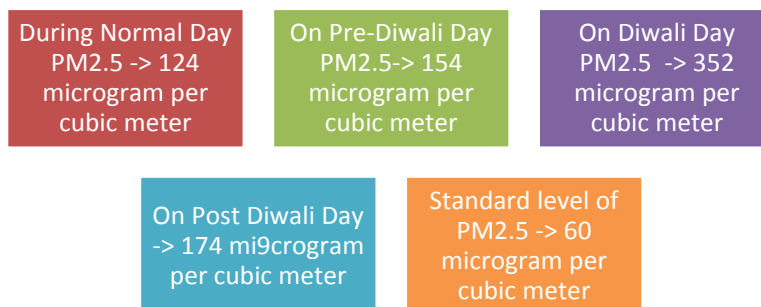


Figure 3. As per the rate recorded during the diwali period the PM2.5 found are represented in the figure.

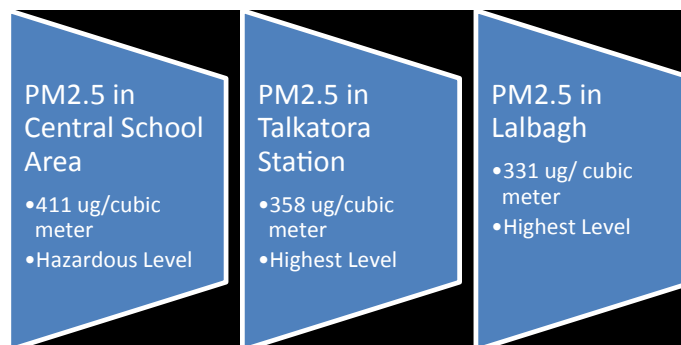


Figure 4. PM2.5 in the three crowded places of Lucknow in December 2015.

The other air pollutants that too detected as hazardous for the human and for the stable functioning of the ecosystem are Ozone, Oxides of nitrogen, Oxides of Sulphur, Carbon Monoxide (**Figure 4**).

Air Quality Index of Different Areas of the Lucknow

Table 1. Lalbagh, West Lucknow, Lucknow: real time area air quality index AQI.

Lalbagh, West Lucknow, Lucknow: Real Time Area Air Quality Index AQI Temp: 29 °C			
Pollutants+Atmospheric Conditions	Recorded Data	Minimum Data	Maximum Data
PM2.5	132 ug/m	57	197
Ozone	4 ug/m	1	298
Nitrogen Dioxide	9 ug/m	4	16
Sulphur Dioxide	3 ug/m	1	4
Carbon Monoxide	9 ug/m	4	19
Temperature	29	25	33
Pressure	1000 atm	996 atm	1000
Humidity	94	72	100

Table 2. Talkatora, Lucknow: real time area air quality index AQI.

Talkatora, Lucknow: Real Time Area Air Quality Index AQI Temp: 29 °C			
Pollutants+Atmospheric Conditions	Recorded Data	Minimum Data	Maximum Data
PM2.5	145	124	191
Nitrogen Dioxide	16	11	26
Sulphur Dioxide	3	2	9
Carbon Monoxide	6	2	19
Temperature	30	25	33
Pressure	754	751	756
Humidity	93	63	99

Central Pollution Control Board (CPCB) has installed online (live) air quality monitoring stations at three locations in Lucknow, Talkatora District Industrial Centre, Lalbagh Lucknow west and Central School, Aliganj. These stations monitor pollutants like particulate matter (10 and 2.5), lead, oxides of sulphur and nitrogen, hydrocarbons and carbon monoxide. AQI is the 24-hour average of the values recorded by all the stations in the city. PM2.5 and PM10 are 'invisible and ultrafine' particles (measured in micro metres) suspended in the air. The frequently measured pollutants are PM10, Sulphur Dioxide and Nitrogen Dioxide (**Tables 1 and 2**)^[12,13].

The table given below shows the Ambient Air Quality of different places in Lucknow. The comparison of 3 months' of data of various pollutants emission has been highlighted (**Tables 3-5**).

April 2016

Table 3. Ambient air quality of different places in Lucknow (April 2016).

Industrial, Residential, Rural and other Areas			Standard Data of pollutants as per NAAQS		PM10		NO2		SO ₂	
Recorded Data			Annually	24 hours	Annually	24 hours	Annually	24 hours	Annually	24 hours
			60	100	50	80	40	80		
			60	100	20	80	30	80		
S.No	Area	Sector	PM10 in ug/m ³		SO ₂ in ug/m ³		NO ₂ in ug/m ³			
1.	Hazratganj	Commercial	231.9		6.8		28.2			
2.	Mahanagar	Residential	228.1		7.0		28.1			
3.	Aliganj	Residential	309.5		6.9		25.6			
4.	Saraya Mauli Kha	Commercial	290.2		7.1		28.6			
5.	Talkatora	Industrial	269.9		8.2		30.4			
6.	Ansal T.C.	Commercial	271.8		6.3		27.2			
7.	Gomti Nagar	Commercial	276.3		7.2		29.1			

May 2016

Table 4. Ambient air quality of different places in Lucknow (May 2016).

Industrial, Residential, Rural and Areas			Standard Data of pollutants as per NAAQS		PM10		NO ₂		SO ₂	
Recorded Data			Annually	24 hours	Annually	24 hours	Annually	24 hours	Annually	24 hours
			60	100	50	80	40	80		
			60	100	20	80	30	80		
S.No	Area	Sector	PM10 in ug/m ³		SO ₂ in ug/m ³		NO ₂ in ug/m ³			
1.	Hazratganj	Commercial	172.2		7.6		28			
2.	Mahanagar	Residential	192.7		6.5		26.9			
3.	Aliganj	Residential	206.8		6.4		26.9			
4.	Saraya Mauli Kha	Commercial	194.1		6.5		25.9			
5.	Talkatora	Industrial	207.3		7.5		27.9			
6.	Ansal T.C.	Commercial	228.5		6.0		25.1			
7.	Gomti Nagar	Commercial	176.7		5.9		26.2			

June 2016

Table 5. Ambient air quality of different places in Lucknow (June 2016).

Industrial, Residential, Rural and other areas			Standard Data of pollutants as per NAAQS		PM10		NO ₂		SO ₂	
Recorded Data			Annually	24 hours	Annually	24 hours	Annually	24 hours	Annually	24 hours
			60	100	50	80	40	80		
			60	100	20	80	30	80		
S.No	Area	Sector	PM10		NO ₂		SO ₂			
1.	Hazratganj	Commercial	140.9		7.0		27.2			
2.	Mahanagar	Residential	129.2		6.8		25.7			
3.	Aliganj	Residential	124.6		6.1		24.4			
4.	Saraya Mauli Kha	Commercial	145.7		7.1		26.5			
5.	Talkatora	Industrial	144.5		6.9		26.2			
6.	Ansal T.C.	Commercial	166.3		6.5		24.6			
7.	Gomti Nagar	Commercial	144.6		6.6		25.1			

According to IS 5182 PART-II; the Sulphur dioxide gas is measured in the ambient air and with IS 5182 PART-1V; the Nitrogen dioxide gas is measured in ambient air by Uttar Pradesh Pollution Control Board.

To aware general folk about the increasing rate of air pollutants in the city, U.P PCB has established the display boards in five different places in Lucknow ^[14].

The equipment to measure PM5 is lacking in Lucknow city. The reply given by the Scientist Dr. Ashok Verma of U.P PCB on questioning about the reason behind the missing of the equipment was "We are still unaware of the standard figure of PM5; so there is no use of its measurement" ^[15-17].

Study Area

The study has been done in the crowded places of Lucknow which includes Hazratganj, Talkatora, Lalbagh, Chowk, GomtiNagar, Indira Nagar.

CONCLUSION

The level of the pollutants have been found increasing from the last year records. The reason found were the increase of the deforestation rate for the construction of highways and for widening roads; increase of the automobiles on road, casual nature of the folk of Lucknow and extension of the industrial sector in the outskirts of Lucknow.

The exiguity of the rules, awareness programmes were found. The board is not taking a serious step towards the pollution control plan.

To make the city cleaner the education among the people is the foremost step that should be taken and the formulation of the strict rules and policies.

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