Air Pollution Bulletin
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Highlights

1. *The 24 hour average concentration of particulate matter (PM2.5) for each monitoring station exceeded the national standard, and at instances were 16 times higher than the prescribed limits, with figures noted as high as 981 μg/m^3.*
2. *981 μg/m^3 is the maximum concentration of particulate matter (PM2.5) observed at the monitoring station of Delhi Technological University (DTU), located near Bawana industrial area on November 5th, 2016 during high pollution smog-days in Delhi.*
3. *6% of the days recorded severe levels of particulate matter (PM2.5), where PM2.5 values were over 300μg/m^3*
4. *89% of the days recorded either very poor air quality or poor air quality i.e. PM2.5 values exceeded 120 μg/m3, which is double the standard prescribed by CPCB of 60 μg/m^3.*
5. *Even the minimum PM concentration recorded at ITO, DTU, Dwarka, Punjabi Bagh and Anand Vihar exceeded the CPCB standards.*
6. *Monthly average Particulate Matter (PM2.5) concentration was recorded to be highest in the month of November at all monitoring station except at ITO and Dilshad Garden.*
7. *CEED under the #HelpDelhiBreathe Campaign has been carrying out various awareness activities and outreach events for almost a year with the agenda to aware people about the health risks involved with air pollution. During the course of our campaign, we managed to reach out to around 200,000 people. CEED also conducted a community dialogue at Ghazipur landfill area in February that raised an overall concern on the miserable situation of the residents in the region, along with decreased immunity among children due to poor air quality.*
8. *We believe that health advisory from the Government of NCT of Delhi will not only inform residents of the quality of air, but shall also spread awareness around the associated health effects that might be of concern, along with the measures that can be taken at an individual level to mitigate air pollution.*

Background

Urban ambient air pollution is the result of emissions from multiple sources, mainly stationary, industrial and domestic fossil fuel combustion, and petrol and diesel vehicle emissions. Fossil fuels being the primary source of energy consumption, are the greatest source of ambient air pollution; producing oxides of sulphur and nitrogen, dust, soot, smoke, and most importantly particulate matter. These pollutants pose a significant threat to human health, the environment and the quality of life of millions of people in some of the world's largest cities. Most Asian cities are unable comply with the WHO air quality guidelines; exceptions are cities in more

developed countries such as Singapore, Taiwan, and Japan. Several Asian cities in China, India and Vietnam have the highest levels of outdoor air pollution in the world. Many cities need to take action to enhance their institutional and technical capabilities to monitor and control air quality and implement preventive actions in order to reduce.

The World Health Organization estimates that around the world air pollution contributes to approximately 800,000 deaths and 4.6 million lost life years annually.[1] Developing nations are particularly affected by air pollution; as many as two-thirds of the deaths and lost life years associated with air pollution on a global scale occur in Asia. To date, estimates of the health effects resulting from exposure to air pollution in Asia have relied largely on the extrapolation of results.

The Air (Prevention and Control of Pollution) Act was enacted by the Central Government in 1981 with the objective of arresting the deterioration of air quality. The act mentions the main functions of the Central Pollution Control Board (CPCB) and empowers it to set standards for the quality of air. Subsequently, the current National Ambient Air Quality Standards were notified on November 18th, 2009 by the CPCB.[2]

The standards cover twelve pollutants, namely particulate matter (PM10), particulate matter (PM2.5) ozone, sulfur dioxide, nitrogen dioxide, carbon monoxide, lead, arsenic, nickel, benzene, benzo-pyrene and ammonia.

Further, a new National Air Quality Index (AQI) was launched on October 2014 to disseminate information on air quality in an easily understandable form for the general public. The measurement of air quality is based on eight pollutants, namely, PM_{10}, $PM_{2.5}$, NO_2, SO_2, CO, O_3, NH_3, and Pb for which short-term (up to 24-hourly averaging period) National Ambient Air Quality Standards are prescribed and the worst reading in these pollutants represents the AQI for that city.[3]

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[1] World Health Organization, "World Health Report 2002: Reducing risk, Promoting healthy life" Available from www.who.int/whr/2002/en/

[2] http://www.envfor.nic.in/legis/air/air1.html

[3] http://pib.nic.in/newsite/PrintRelease.aspx?relid=110654

Delhi being one of the twenty four cities where NAQI was implemented, there are in total 15 monitoring stations that record real time air quality data out of which 10 measure PM2.5 concentration.

Table 1: Monitoring stations along with the area category in Delhi

S. no.	Monitoring Station	Monitoring periods	Category
1	ITO (Income Tax Office)	Nov-Feb	Busy traffic cross-section
2	DTU (Delhi Technological University), Bawana	Nov-Feb	Institutional area
3	Siri Fort	Nov-Feb	Residential area
4	Shadipur	Nov-Feb	Busy traffic cross-section
5	Mandir Marg	Nov-Feb	Commercial area and office complexes
6	Anand Vihar	Nov-Feb	Railway terminal
7	R K Puram	Nov-Feb	Residential area and office complexes
8	Punjabi Bagh	Nov-Feb	Residential area and busy traffic cross-section
9	Dwarka	Nov-Feb	Residential area
10	IHBAS (Institute of Human Behaviour and Allied Sciences), Dilshad Garden	Nov-Feb	Institutional area

Findings

I. Trend of monthly mean of particulate matter ($PM_{2.5}$) concentration in Delhi during winter months (i.e. Nov-Feb)

The particulate matter is continuously monitored at 10 out of 15 monitoring stations installed by CPCB all over the city, as mentioned above. The monthly mean values of the period of study (November- February) demonstrate a general downward trend from December to February. The

concentration is noted to be the highest for the month of November due to the smog which was experienced in the first week. The reason for which is still being investigated; however, the majority of analysis sources hint towards colder weather, and stagnant winds trapping the various sources of smoke. Primary sources of smoke are from the burning of crop stubbles, lit garbage and road dust. This period also coincided with the Indian festival of *Diwali* that witnesses massive burning of firecrackers.

The average concentration of particulate matter in November month was calculated as 282.7 µg/m^3, while the monthly mean concentrations were 224.57 µg/m^3, 172.7 µg/m3 and 140.74 µg/m3 for the months of December, January and February respectively.

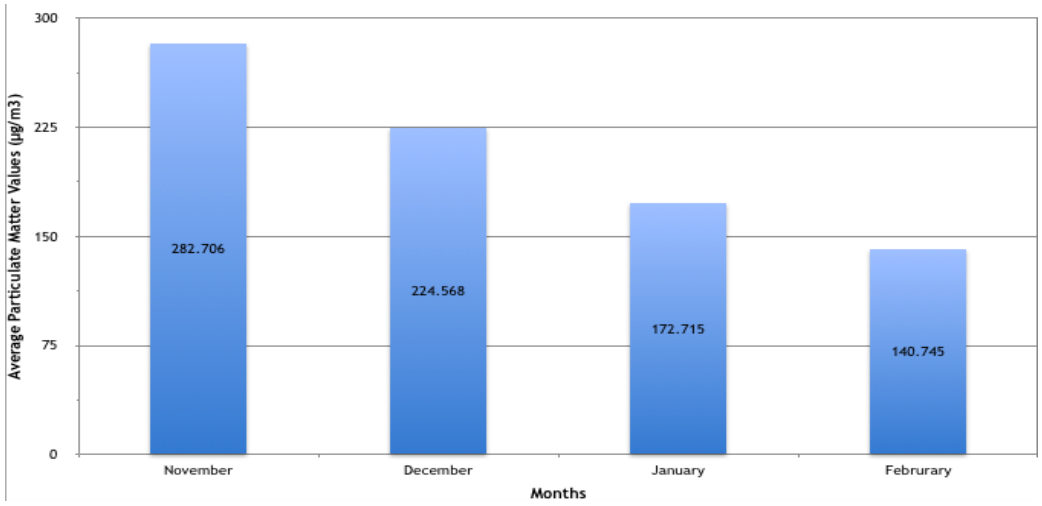

Figure 1: The average monthly concentration of PM2.5 for Delhi

II. Overall air quality of Delhi

According to the category demarcation done under Graded Response Action Plan (GRAP), which is notified by the Honourable Supreme Court of India, the number of days with varied air quality based on particulate matter (PM2.5) concentration vis à vis their date are elaborated in the chart.

It was observed that none of the days during the observed winter months recorded Good air

quality, and only 7 days were noted under the Moderate category. Overall, the majority of days (89%) have relatively high levels of pollution with the air quality under Very Poor category. 6% of the total days monitored have witnessed Severe air quality.

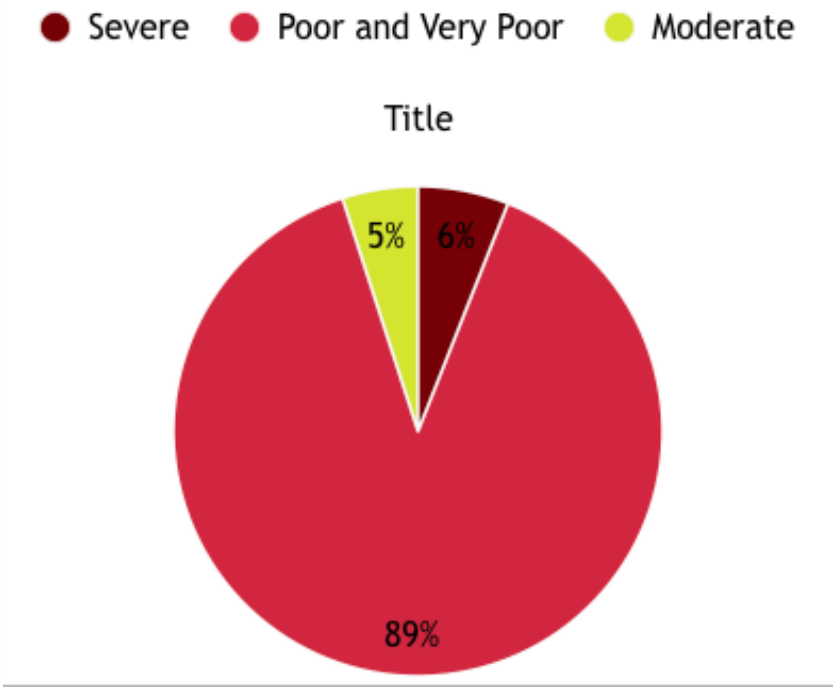

Figure 2: Air quality days for winter months as per the GRAP

Table 2: Air Quality Index demarcation according to GRAP

PM2.5 Concentration	**Air Quality Index**
300 µg/m3 and above	Severe + Emergency
250-300 µg/m3	Severe
120-250 µg/m3	Very Poor
90-120 µg/m3	Poor
60-90 µg/m3	Moderate
60 µg/m3 and below	Good

Steps to be taken to combat air pollution in a state of severity

Already taken:

1. Shutting down Badarpur power plant, critical industries like brick manufacturing, stone crushing, etc.
2. Strict restrictions on crop stubble and waste burning
3. Vacuum cleaning and water sprinkling of roads to avoid resuspension
4. Restriction on construction site till the period of emergency persists

Additional Measures

1. Residents should be informed via Newspapers, TV and Radio commercials, and possibly mobile applications on air quality for specific days. Steps ought to be taken on an individual basis to reduce their exposure with the help of a health advisory based on air pollution.
2. Public information methods should be enhanced so that the people are well-informed.
3. The government should take steps to improve the public transport system, followed by which the parking fee can be increased 4-5 times during high pollution days.
4. Promoting Integrated Public Transport System to ensure smooth passenger mobility and last mile connectivity through various mode of transports.
    a. Common ticketing system
    b. Encourage carpool practices
    c. Improving traffic management schemes
5. Congestion tax should be collected on commercial vehicles during high pollution days in the city. For example, in London charges for road space and parking are varied according to the usage during peak days.
6. Empowering local authorities like District Magistrate and Municipal Commissioners to not only levy pollution taxes but also issue advisories to reduce public exposure and enhance public communication techniques.
7. Strict vigilance to avoid source due to waste burning and dust suspension.

III. 24 hour average concentration of Particulate matter

On a daily scale, the 24 hour average concentration of PM2.5 has generally been above the National Air Quality Standard of 60 µg/m^3. The maximum daily average concentration of PM2.5 was noted on 7th November 2016, when the recorded value was 558 µg/m^3 due to post Diwali pollutant build-up; while the maximum daily average concentration of PM2.5 in December was on 24th December 2016, with a concentration of 300 µg/m^3, caused due to cold weather accompanied with steady wind conditions. January and February witnessed highest peaks on 1st (225 µg/m^3) and 28th February (215 µg/m^3) respectively.

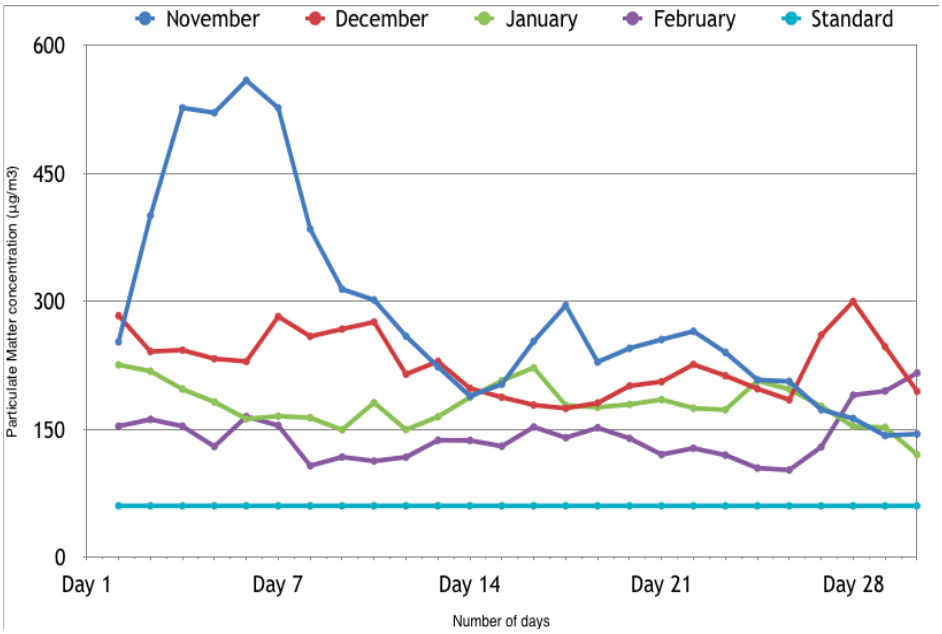

Figure 3: The air quality trend for winter months for Delhi

IV. Station-wise monthly average

The maximum average PM2.5 concentration was recorded at Anand Vihar and DTU (Bawana), the recorded values were found to be consistently higher throughout the winter months. A plausible reason attributed to the higher particulate matter concentration at Anand Vihar monitoring station is the proximity to the railway junction in addition to presence of Ghazipur landfill dumping site.

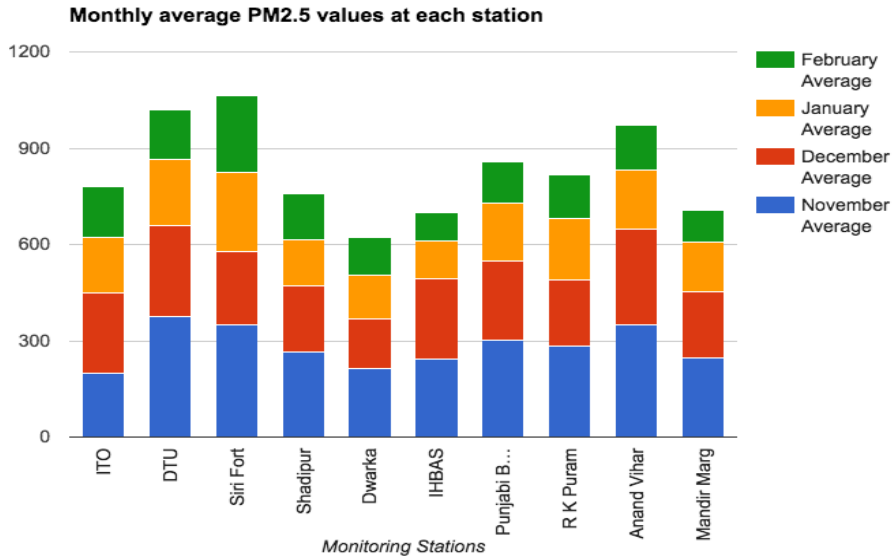

Figure 4: Cumulative PM2.5 concentration at various monitoring sites in Delhi for winter months

The other site with highest recorded concentration is Punjabi Bagh, where the pollutant build-up can be attributed to the vehicular emission as it is a busy traffic cross-section.

About CEED

Centre for Environment and Energy development (CEED) is a solution driven non-profit organization that works towards creating inspiring solutions to maintain a healthy, rich and diverse environment. CEED is dedicated to finding solutions for Climate and Energy, hazardous free future and for Clean and safe water.

The idea of CEED was conceived by a group of young professionals with vast amount of experience in the field of environment. CEED was registered in November 2012 as non profit organization under section 25, Companies Act, 1956.

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