

Central Pollution Control Board, Delhi

Ministry of Environment, Forests & Climate Change, Govt. of India
"Parivesh Bhawan" East Arjun Nagar, Delhi-110 032

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Ambient Air and Noise Pollution Levels -Deepawali 2014

Deepawali, the festival of lights is also synonyms as festival of crackers. Like previous years, the Central Pollution Control Board, Delhi besides being associated with awareness programs on the evils of crackers, maintained a close watch on the data and carried out comprehensive monitoring of ambient noise and air quality during October 15 to October 23, 2014. This year the festival was celebrated on October 23, 2014.

Comprehensive monitoring and close vigil on the monitoring data were taken up for: **(1)** 05 (Five) Continuous Air Quality Monitoring at Dilshad Garden, Shadipur, Dwarka, East Arjun Nagar and Pragati Maidan; while **(2)** manual monitoring was conducted at 03 (Three) locations, namely Pragati Maidan, Pitampura and Janakpuri; **(3)** ambient noise monitoring was carried out at 06 (six) locations, namely AIIMS (Ansari Nagar), Connaught Place, Mayur Vihar Phase-II, Kamla Nagar, Pitampura & Janakpuri; while **(4)** data from continuous noise level monitoring was taken from 05 (Five) stations located at Pragati Maidan, East Arjun Nagar, Dwarka, Dilshad Garden and Bawana.

The pre-Deepawali (considering as a normal activity day) and Deepawali (Festival day),

The **findings of the monitoring** are summarized below:

At all locations of Continuous Air Quality Monitoring Stations, air quality data have been compiled and presented at **Table-I(a) to I(e)** for the period from October 15, 2015 to October 23, 2014. The following are the observations:

- The average values for **PM₁₀** were ranged between 184 and 481 $\mu\text{g}/\text{m}^3$. The maximum value of 481 was reported at Shadipur on October 20, 2014 (3 days before the festival).
- The concentration range for **SO₂** was reported between 3.3 and 133 $\mu\text{g}/\text{m}^3$. The maximum value was reported to East Arjun Nagar on October 23, 2014 (Festival day).

- The concentration range of **NO₂** was noted to be 11 and 254 µg/m³. The maximum concentration reported at Pragati Maidan on October 20, 2014 (a non-festival day).
- The concentration range of **CO** was recorded between 377 and 4328 µg/m³. The maximum concentration reported at Pragati Maidan on October 22, 2014 (one day before the festival).
- The concentration range of **Ozone** was recorded between 22 and 157 µg/m³. The maximum concentration reported at Pragati Maidan on October 23, 2014 (Festival day).
- The concentration range of **Ammonia** was recorded between 3 and 87 µg/m³. The maximum concentration reported at Pragati Maidan on October 22, 2014 (one day before the festival).
- The concentration range of **Benzene** was recorded between 2 and 22 µg/m³. The maximum concentration reported at East Arjun Nagar on October 20, 2014 (three days before the festival)

The ambient air quality monitoring data as carried out on October 15, 2014, October 22, 2014 and October 23, 2014 at above said manual monitoring stations reveals (**Table-II-a & II-b**). The data reveals the following:

- The concentration range of **SO₂** was found to be 4-5 µg/m³ on normal day and 8-32 µg/m³ on festival day. The values were noted to be same on the normal day as compared to 2013. On the festival the concentration was noted to be less as compared to 2013 data.
- The concentration range of **NO₂** was found to be 42-85 µg/m³ on normal day and 53-82 µg/m³ on festival day. The values were noted to be less on the normal day as compared to 2013. On the festival the concentration was noted to have increased as compared to 2013 data.
- The concentration range of **PM₁₀** was found to be 115-152 µg/m³ on normal day and 442-756 µg/m³ on festival day. The values were noted to be less in concentration on the normal day as compared to 2013. On the festival day, the concentration was noted to be again less as compared to 2013 data.
- The **PM_{2.5}** concentration revealed increased pollutants concentration during pre-Deepawali days.

Noise Monitoring

The data of noise monitoring at six locations as was carried out on October 15, 2014 (as normal day) and October 23, 2014 (as festival day) (**Table-III**). The data reveals:

- The **normal day** noise level [Leq.dB(A)] range was noted to be 53 to 71. There has been increase in noise level at Ansari Nagar and Mayur Vihar Phase-II as compared to the values of 2013.
- The **festival day** noise level [Leq.dB(A)] range was noted to be between 71 and 83. There has been increase in noise level at Connaught Place as compared to the values of 2013.

The data of continuous ambient noise level from five locations for the period from October 15, 2014 to October 23, 2014 are tabulated in **Table-IV**. On examination of the data, the following may be concluded:

- The noise level [Leq.dB(A)] at **Pragati Maidan** exceeded the respective prescribed standards for both day & night time for the entire period.
- The Noise level [Leq.dB(A)] at **East Arjun Nagar** exceeded the prescribed standard for day time mostly during the entire period. The night time levels were within the prescribed norm till October 19, 2014 & there after the levels have exceeded the norm till the festival day.
- The Noise level [Leq.dB(A)] at **Dilshad Garden** were within the prescribe norms till October 20, 2014 for day & night, while the night time values were noted to have exceeded after October 20, 2014.
- The Noise level [Leq.dB(A)] recorded have exceeded the norms for all the days at **Dwarka**. The day time Noise level at **Bawana** exceeded the prescribed norm for the entire period except on October 18-19, 2014, however night time values were found to exceed.

Meteorological Condition

With a view to understand the pollutant-concentration, a close watch on the meteorological conditions was maintained during October 15, 2014 to October 23, 2014. The meteorological data is presented in **Table-V**.

The salient features of meteorological conditions reveals:

- The ground level **Wind Speed** remained within the range of 0.2 to 0.6 m/s (calm condition) having a prevalent wind direction of NW.
- The ambient **temperature** remained within the range of 19⁰C to 32⁰C. The maximum temperature of 32.4⁰C reported on October 23, 2014 (Festival day).
- The average % **Relative Humidity** remained within the range of 41 to 90 having an average of 60.
- The average 24-hourly **atmospheric mixing height** (boundary layer) was noted to be 637m with the range of 490-767m. The range of the same during day time period (6AM to 6PM) was found to be 762 to 1244m, and night time the same was to have increased from 142 to 219m, resulted increased atmospheric boundary layer or ventilation coefficient.

Discussion: Ambient Air & Noise Pollution Levels – Deepawali 2014

The overall increased impact of Noise level [Leq.dB(A)] was mostly due to pre-Deepawali activities attributed to plying large no of vehicles on the Road including at Mayur Vihar Phase-II.

The concentration of ambient pollutants profile is largely governed and dependent on the emission and it's dispersion. The festival of Deepawali is celebrated at the onset of winter, wherein the wind direction changes from SE is shifted to NW, resulting decreased humidity, increased pressure along with declined temperature. Thus the festival is celebration in transitional period of climatic conditions.

With a view to understand the pollutant-concentration, a close watch on the macro-meteorological conditions was maintained during October 15, 2014 to October 23, 2014. The meteorological data is presented in **Table-V**.

The average atmospheric pressure recorded during October 08, 2014 to October 23, 2014 was around 759 mmHg (Range: 758 to 764), while wind speed was between 1- 7 Km/hr. It was observed that atmospheric pressure got built up since October 10, 2014 and simultaneously the temperature and relative humidity are also declining, except during October 14-15, 2014 as an after effect of HUDHUD. Forecast of meteorology also predicts the wind speed remained between 3-8 Km/hr having pre-dominant wind direction from WNW and pressure around 762 mmHg, RH 21-34% & temperature profile ranged between 21 and 33 degree Celsius. The existing

high pressure indicated that the pollutants would disperse in a quickly resulting decreased concentration of pollutants as after effect of the festival.

The overall micro meteorological condition at ground level has influenced lesser dilution effect resulting increased ambient air pollution in pre-Deepawali days, while dilution effect due to increased ventilation coefficient measured as mixing height particularly during night of Deepawali and increased wind speed has resulted quick dispersion of pollutants of Deepawali in 2014.

Date Tables

Table I(a) : Air pollutants profile : IHBAS Dilshad Garden					
Dates	Pollutants (Conc. in $\mu\text{g}/\text{m}^3$)				
	PM ₁₀	SO ₂	NO ₂	CO	Ammonia
15.10.2014	204.43	12.46	10.57	418.80	3.18
16.10.2014	184.01	12.85	10.79	377.20	4.96
17.10.2014	193.36	14.13	15.21	407.21	8.13
18.10.2014	217.30	9.97	18.85	519.88	6.76
19.10.2014	203.12	8.57	17.38	535.33	3.88
20.10.2014	215.4	8.9	20.7	611.2	4.5
21.10.2014	202.2	10.4	13.7	726.1	13.7
22.10.2014	283.36	11.95	24.25	746.79	5.42
23.10.2014	310.15	20.79	15.81	859.66	26.40

Table I(b) : Air pollutants profile : DMS Shadipur						
Date	Pollutants (Conc. in $\mu\text{g}/\text{m}^3$)					
	PM ₁₀	SO ₂	NO ₂	CO	Ozone	Benzene
15.10.2014	296.86	14.42	74.52	1118.28	60.67	5.13
16.10.2014	280.12	18.78	77.44	1089.96	76.86	4.70
17.10.2014	381.77	27.01	99.22	1044.10	55.18	7.31
18.10.2014	376.11	20.35	112.76	1226.21	53.51	11.74
19.10.2014	321.26	18.38	107.93	1149.47	51.17	10.43
20.10.2014	481.11	25.76	118.44	1331.86	45.26	9.86
21.10.2014	415.7	34.6	91.8	1060.5	31.8	8.2
22.10.2014	224.1	51.2	78.13	1107.73	22.05	4.23
23.10.2014	321.6	177.23	17.86	17.41.3	40.86	1.72

Table I(c) : Air pollutants profile : NSIT Dwarka						
Date	Pollutants (Conc. in $\mu\text{g}/\text{m}^3$)					
	PM ₁₀	SO ₂	NO ₂	CO	Ozone	Benzene
15.10.2014	227.58	11.43	47.56	516.80	77.56	4.21
16.10.2014	218.45	10.85	45.78	498.26	98.24	3.97
17.10.2014	237.37	12.05	51.06	745.16	74.15	3.40
18.10.2014	290.61	22.01	64.88	1062.13	72.93	2.24
19.10.2014	276.78	26.57	70.60	1209.54	78.16	2.53
20.10.2014	213.15	22.25	84.86	1069.99	85.17	2.91
21.10.2014	261.3	22.1	77.5	1065.4	85.4	3.10
22.10.2014	374.19	31.40	106.6	1365.67	86.23	3.19
23.10.2014	370.87	34.3	87.4	941.8	91.3	3.09

Table I(d) : Air pollutants profile : East Arjun Nagar (DOAS)				
Date	Pollutants (Conc. in $\mu\text{g}/\text{m}^3$)			
	SO ₂	NO ₂	Ozone	Benzene
15.10.2014	17.1	53.4	67.1	8.6
16.10.2014	22.1	44.5	88.5	12.3
17.10.2014	34.8	61.6	89.1	13.2
18.10.2014	20.6	81.8	83.8	17.9
19.10.2014	19.0	81.9	81.0	17.6
20.10.2014	19.0	91.2	74.0	22.3
21.10.2014	37.6	77.6	83.8	17.4
22.10.2014	66.6	86.0	80.0	13.6
23.10.2014	132.7	64.9	90.1	8.1

Table I(e) : Air pollutants profile : Pragati Maidan					
Date	Pollutants (Conc. in $\mu\text{g}/\text{m}^3$)				
	SO ₂	NO ₂	CO	Ozone	Ammonia
15.10.2014	3.9	-	2214	-	-
16.10.2014	3.9	58	2413	71	25
17.10.2014	3.7	45	2388	65	32
18.10.2014	3.4	56	4149	80	31
19.10.2014	3.6	207	3428	59	37
20.10.2014	3.7	254	3922	65	30
21.10.2014	3.5	196	3332	57	40
22.10.2014	3.4	196	4328	83	87
23.10.2014	3.3	122	2861	157	76

Date	Pragati Maidan (Conc. in $\mu\text{g}/\text{m}^3$)				Pitampura (Conc. in $\mu\text{g}/\text{m}^3$)				Janakpuri (Conc. in $\mu\text{g}/\text{m}^3$)			
	PM10	PM2.5	SO2	NO2	PM10	PM2.5	SO2	NO2	PM10	PM2.5	SO2	NO2
15.10.2014 Normal Day	129	97	05	85	115	82	04	45	152	62	04	42
22.10.2014 Pre-Deepawali Day	307	-	05	106	348	150	06	82	304	123	18	92
23.10.2014 Deepawali Day	442	323	08	82	756	678	10	67	648	510	32	53
Standards	100	60	80	80	100	60	80	80	100	60	80	80

S.No.	Monitoring Location	Deepawali Day 2014				Deepawali Day 2013			
		PM10	PM2.5	SO2	NO2	PM10	PM2.5	SO2	NO2
1	Pragati Maidan	442	323	08	82	1097	-	11	52
2	Pitampura	756	678	10	67	952	-	18	31
3	Janakpuri	648	510	32	53	969	-	56	35

S.No.	Monitoring Station	2014						2013					
		Normal Day (15.10.2014)			Deepawali Day (23.10.2014)			Normal Day (29.10.2013)			Deepawali Day (03.11.2013)		
		Lmin	Lmax	Leq dB(A)	Lmin	Lmax	Leq dB(A)	Lmin	Lmax	Leq dB(A)	Lmin	Lmax	Leq dB(A)
1	AIIMS (S)	57	96	71	66	100	80	49	90	56	74	99	81
2	Connaught Place (C)	55	101	67	54	113	80	62	84	69	64	95	74
3	Mayur Vihar Ph-II (R)	60	85	69	53	116	83	42	88	60	59	105	83
4	Kamla Nagar (R)	44	88	59	52	105	80	44	95	63	46	109	81
5	Pitam Pura (R)	44	79	53	59	94	71	55	80	61	61	99	73
6	Janakpuri (R)	52	92	63	63	96	78	-	-	-	-	-	-

Date	Day Time	Night Time
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	Lmin	Lmax	Leq dB(A)	Lmin	Lmax	Leq dB(A)
Pragati Maidan (C)						
15.10.2014	67	76	73	66	73	69
16.10.2014	68	76	75	67	76	70
17.10.2014	68	74	71	66	75	73
18.10.2014	66	76	74	63	73	67
19.10.2014	68	76	75	67	76	71
20.10.2014	50	105	73	48	76	73
21.10.2014	68	74	71	66	75	73
22.10.2014	71	105	79	73	77	74
23.10.2014	74	83	79	70	82	75
Standards	65			55		
East Arjun Nagar (C)						
15.10.2014	56	70	66	46	63	53
16.10.2014	56	70	66	46	63	54
17.10.2014	55	69	66	46	61	55
18.10.2014	56	69	66	45	62	54
19.10.2014	54	66	63	48	62	55
20.10.2014	54	70	66	48	63	56
21.10.2014	55	99	72	46	68	57
22.10.2014	58	72	69	50	72	62
23.10.2014	60	82	69	52	82	69
Standards	65			55		
NSIT Dwarka (S)						
15.10.2014	53	60	55	51	57	55
16.10.2014	53	58	55	49	54	52
17.10.2014	53	60	56	48	57	52
18.10.2014	53	59	56	50	58	53
19.10.2014	52	60	55	49	57	53
20.10.2014	54	104	68	49	61	55
21.10.2014	56	64	59	51	63	57
22.10.2014	56	64	59	54	63	57
23.10.2014	54	75	63	50	76	63
Standards	50			40		
IHBAS Dilshad Garden (S)						
15.10.2014	44	60	50	42	51	45
16.10.2014	45	59	50	42	48	45
17.10.2014	45	55	49	43	54	47
18.10.2014	45	54	49	43	60	49
19.10.2014	45	55	49	44	54	48
20.10.2014	46	56	50	43	50	46
21.10.2014	45	105	67	43	59	48
22.10.2014	49	65	56	46	61	53
23.10.2014	50	82	65	46	83	67
Standards	50			40		
DCE Bawana(S)						
15.10.2014	44	62	53	40	54	46
16.10.2014	44	65	53	40	47	44
17.10.2014	45	61	51	41	47	43
18.10.2014	46	55	49	42	49	44
19.10.2014	45	57	48	43	48	45
20.10.2014	46	105	67	43	55	47
21.10.2014	49	61	54	46	55	49
22.10.2014	49	60	53	46	61	51
23.10.2014	47	77	60	45	77	63
Standards	50			40		

Table V : Meteorological profile in Delhi during October 15 – 23, 2014.

Date	Wind Speed (m/sec.)	Wind Direction	Temperature (°C)			RH (%)			Mixing Height (m)		
			Min.	Max.	Avg.	Min.	Max.	Avg.	Avg.	Day Avg.	Night Avg.
15.10.2014	0.60	NW	21.09	29.30	24.91	51.83	89.85	70.30	767	1244	290
16.10.2014	0.64	NW	20.78	29.33	24.85	44.66	68.89	57.54	701	1144	258
17.10.2014	0.49	NW	19.63	30.11	25.04	40.66	71.74	55.12	729	1160	298
18.10.2014	0.42	NW	19.30	29.23	24.43	45.83	76.09	60.58	677	1127	228
19.10.2014	0.53	NW	21.04	30.50	25.33	42.40	69.74	56.33	670	1106	233
20.10.2014	0.51	NW	21.80	31.2	26.1	42.8	74.3	57.6	564	938	191
21.10.2014	0.43	NW	21.00	32.3	26.2	43.6	82.3	61.0	578	980	175
22.10.2014	0.34	NW	20.00	28.98	24.07	44.5	73.2	59.1	560	978	142
23.10.2014	0.24	NE	20.64	32.40	26.24	44.68	90.14	66.79	490	762	219
<i>Note : Day time : 6.00 am – 6.00 pm,</i>						<i>Night time : 6.00 pm – 6.00 am</i>					

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