

Report on Ambient Air Quality & Noise on Deepawali 2020



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Deepawali Monitoring

CPCB carried out ambient air quality and noise level monitoring on selected pre-Deepawali day (09.11.2020) and on Deepawali day (14.11.2020) in Delhi like previous years. Ambient Air Quality was monitored at 40 locations (3 manual stations and 37 real-time stations). Ambient Noise level was monitored at 16 locations (06 manual and 10 real-time noise monitoring stations). Three continuous air quality stations (operated by CPCB, NABL accredited) have been used for comparison with last five years' data. Noise level and air quality (both manual and Real time) on Pre-Deepawali day (09.11.2020) and Deepawali day (14.11.2020) are presented in this report for assessment of impact of Diwali celebration. As the meteorology is also important to interpret air quality, CPCB also measured meteorological parameters at Parivesh Bhawan, East Arjun Nagar.

Results and Discussion:

Noise Level

(A) Manual Monitoring Data: 06.00 p.m. to 12.00 mid night

The Pre-Deepawali monitoring was conducted on 09.11.2020, which is almost a week before Deepawali to capture impact of the festival. The pre-Deepawali location-wise data for past five years (2016–2020) is given in Table 1a. Pre-deepawali day's values are only indicative background when noise making activities (Fireworks) are not affecting ambient noise level. This year noise level (measured as Leq dB(A), decibels) was found declined at three out of six locations (Lajpat Nagar, Mayur Vihar Phase-II, Janakpuri), slightly increased at one location (Pitampura), and same at two locations (Kamla Nagar and Okhla) as against the previous year i.e. 2019. The highest level was recorded at Kamla Nagar this year on pre-deepawali day.

Table 1a: Ambient Noise Level data on during **Pre-Deepawali Days (2016-2020)**

\$. No.	Monitoring Stations	Pre-Deepawali Day				
		24.10.16	12.10.17	01.11.2018	21.10.2019	09.11.2020
1	Lajpat Nagar (R)	55	62	62	63	60↓
2	Mayur Vihar Phase-II (R)	59	62	68	63	60↓
3	Pitam Pura (R)	43	55	43	49	55↑
4	Kamla Nagar (R)	60	61	59	62	62=
5	Janakpuri (R)	59	59	55	57	56↓
6	Okhla (I)	74	76	61	59	59=

Note: All values are in Leq dB(A)

The values reported in Table 1a should not be compared with prescribed noise level standards for designated areas as the time period for measurement (6 p.m. to 12 mid night) do not match with the period specified in the prescribed standards (day time: (06 a.m. to 10 p. m., and night time: 10 p.m. to 6 a.m.).

Data for noise level on Deepawali day for last five years are presented in the Table 1b. The data reveal that at three (Lajpat Nagar, Mayur Vihar Phase-II, Janakpuri) out of six locations noise level increased on Deepawali night compared to 2019, while it remained same at one location (Kamla Nagar) and decreased at two locations (Pitampura and Okhla).

Table 1b: Ambient Noise Level data on during **Deepawali Days (2016-2020)**

S.No.	Monitoring Stations	Deepawali Day				
		30.10.16	19.10.17	07.11.2018	27.10.2019	14.11.2020
1	Lajpat Nagar (R)	76	74	69	69	71↑
2	Mayur Vihar Phase-II (R)	80	75	74	68	72↑
3	Pitam Pura (R)	ID	69	75	68	57↓
4	Kamla Nagar (R)	74	69	74	70	70=
5	Janakpuri (R)	75	67	75	71	72↑
6	Okhla (I)	86	83	68	66	62↓

Note: All values are in Leq dB(A), ID = indicates Insufficient data

The values reported in Table 1a should not be compared with prescribed noise level standards for designated areas as the time period for measurement (6 p.m. to 12 mid night) do not match with the period specified in the prescribed standards (day time: (06 a.m. to 10 p. m., and night time: 10 p.m. to 6 a.m.).

(B) Real-time Noise Monitoring Data:

Round the clock (24X7) noise level monitoring at ten locations in Delhi is being conducted by CPCB. The data of selected pre-Deepawali day (09.11.2020) for five years is tabulated at Table 2a. The data reveal that day time noise levels have decreased in 2020 as compared to pre-deepawali day of 2019 at seven out of 10 locations. Only NSIT Dwarka, R. K. Puram and ITO stations have recorded slight increase in day time noise. The night time noise found increased at Anand Vihar and ITO only (both traffic area).

Table 2a: Online Ambient Noise Level data during **Pre-Deepawali (2016-2020)**

S. No.	Monitoring Stations	Pre-Deepawali Day (All values are in Leq dB(A))									
		24.10.2016		12.10.2017		01.11.2018		21.10.2019		09.11.2020	
		Day Time	Night Time	Day Time	Night Time	Day Time	Night Time	Day Time	Night Time	Day Time	Night Time
1	Anand Vihar (C)	66	62	68	64	64	61	66	63	65↓	78↑
2	Punjabi Bagh (R)	59	49	60	59	59	52	60	50	56↓	50=
3	CPCB HQ (C)	66	57	66	56	63	59	67	59	66↓	54↓
4	Civil Lines (C)	61	59	61	57	61	58	62	58	60↓	57↓
5	DCE, Bawana (S)	54	50	55	50	57	53	60	58	51↓	50↓
6	Dilshad Garden(S)	54	49	53	53	62	62	85	79	74↓	74↓
7	ITO (C)	71	66	73	68	74	71	73	70	74↑	74↑
8	Mandir Marg (S)	60	45	55	46	62	57	70	53	49↓	48↓
9	NSIT, Dwarka (S)	57	53	57	54	57	56	56	55	58↑	54↓
10	R.K. Puram (S)	61	51	60	52	64	56	62	66	69↑	65↓

Notes : Day Time – 0600 hrs to 2200 hrs and Night time – 2200 hrs to 0600 hours

Area Designation (C) – Commercial, (R) – Residential, (S) – Sensitive

Prescribed Standards in Leq dB(A) : (C) – 65 (Day time) 55 (night time); (R) – 55 (Day time) 45 (night time) and (S) – 50 (Day time) 40 (night time)

The noise level data of five years recorded at 10 real-time monitoring stations in Delhi on Deepawali days is given at Table 2b. The data show that at 7 out of 10 locations, noise levels have increased on Deepawali night this year compared to 2019. Only three stations (ITO, Anand Vihar and Dilshad Garden have recorded slight decline in night time noise on Deepawali day, 2020 compared to last year Deepawali day. Day time noise had also similar trend.

Table 2(b): Online Ambient Noise Level data during **Deepawali Days (2016-2020)**

S.No.	Monitoring Stations	Deepawali Day (All values are in Leq dB(A))									
		30.10.2016		19.10.2017		07.11.2018		27.10.2019		14.11.2020	
		Day Time	Night Time	Day Time	Night Time	Day Time	Night Time	Day Time	Night Time	Day Time	Night Time
1	Anand Vihar (C)	68	68	68	68	64	66	67	65	64↓	63↓
2	Punjabi Bagh (R)	60	58	56	54	57	57	56	55	61↑	61↑
3	CPCB HQ (C)	64	61	64	59	64	62	65	63	68↑	67↑
4	Civil Lines (C)	61	62	59	60	60	60	60	60	63↑	63↑
5	DCE, Bawana (S)	56	55	53	52	55	57	60	58	63↑	61↑
6	Dilshad Garden (S)	57	55	53	53	62	62	75	76	74↓	74↓
7	ITO (C)	70	67	71	68	72	70	71	69	66↓	65↓
8	Mandir Marg (S)	54	51	51	48	68	50	57	55	62↑	61↑
9	NSIT, Dwarka (S)	58	57	57	57	58	70	56	58	64↑	63↑
10	R.K. Puram (S)	61	57	59	53	77	61	76	60	64↓	63↑

Area Designation (C) – Commercial, (R) – Residential, (S) – Sensitive

Prescribed Standards in Leq dB(A): (C) – 65 (Day time) 55 (night time); (R) – 55 (Day time) 45 (night time) and (S) – 50 (Day time) 40 (night time)

Day Time – 0600 hrs to 2200 hrs and Night time – 2200 hrs to 0600 hours

Ambient Air Quality

(A) Data of manual monitoring: 06.00 a.m. to 06.00 a.m.

The station-wise data for comparison of air quality on Pre-deepawali and Deepawali days are presented in the Table 3a, Table 3b and Table 3c. It is observed that if compared with 2019 pre-deepawali day (21.10.2019) concentrations of NO₂, PM₁₀ and PM_{2.5} were found to be much higher on pre Diwali day (on 09.11.2020) at all the monitored locations, while SO₂ concentrations were at similar level. It may be inferred that higher pollution levels in comparison to previous year are due to meteorological conditions and perennial issue of deteriorated air quality during November in Delhi-NCR, and

not on account of fire-cracker bursting. On Deepawali day (14.11.2020), almost all the pollutants reported higher values as compared to 2019 Diwali day. Pitampura recorded increase in PM and SO₂ indicating impact of firecracker bursting on Deepawali day.

Table 3a: Ambient Air Quality Status during Pre-Deepawali & Deepawali Day, ITO										
Year and Dates →	Pre-Deepawali day					Deepawali day				
	2016	2017	2018	2019	2020	2016	2017	2018	2019	2020
Parameter↓	Oct 24	Oct 10	Nov 01	Oct 21	Nov 09	Oct 30	Oct 19	Nov 07	Oct 27	Nov 14
SO ₂	09	07	09	04	04=	16	11	5	5	4↓
NO ₂	83	87	100	63	109↑	77	74	50	69	96↑
PM ₁₀	203	208	284	151	654↑	878	438	470	383	533↑
PM _{2.5}	104	-	221	105	645↑	797	180	322	291	454↑

Table 3b: Ambient Air Quality Status during Pre-Deepawali & Deepawali Day, Pitampura										
Year and Dates →	Pre-Deepawali day					Deepawali day				
	2016	2017	2018	2019	2020	2016	2017	2018	2019	2020
Parameter↓	Oct 24	Oct 10	Nov 01	Oct 21	Nov 09	Oct 30	Oct 19	Nov 07	Oct 27	Nov 14
SO ₂	10	13	20	04	04=	16	28	29	18	25↑
NO ₂	58	73	130	45	61↑	43	61	82	51	79↑
PM ₁₀	368	226	296	160	833↑	1297	690	990	617	953↑
PM _{2.5}	102	147	257	40	700↑	1238	677	831	511	865↑

Table 3c: Ambient Air Quality Status during Pre-Deepawali & Deepawali Day, Janakpuri										
Year and Dates →	Pre-Deepawali day					Deepawali day				
	2016	2017	2018	2019	2020	2016	2017	2018	2019	2020
Parameter↓	Oct 24	Oct 10	Nov 01	Oct 21	Nov 09	Oct 30	Oct 19	Nov 07	Oct 27	Nov 14
SO ₂	16	06	18	06	05↓	45	43	44	12	13↑
NO ₂	71	62	100	53	75↑	65	73	73	64	101↑
PM ₁₀	213	193	290	186	781↑	902	706	1076	582	589↑
PM _{2.5}	96	109	202	107	676↑	842	638	988	513	535↑

(B) Data of Real Time monitoring: 06.00 a.m. to 06.00 a.m.

The air quality on Pre-deepawali and Deepawali days for 2016-2020 of CAAQMS installed at IHBAS (Dilshad Garden), DMS (Shadipur) and NSIT (Dwarka) are presented in Tables 4a to 4c. Most of the parameters including PM_{2.5} at all three CAAQMS were observed to be more on both Pre-deepawali and Deepawali days compared to 2019.

Table 4(a): Ambient Air Quality Status at **IHBAS**, Dilshad Garden during Deepawali Day

Pollutants	Pre-Deepawali Day					Deepawali Day				
	2016	2017	2018	2019	2020	2016	2017	2018	2019	2020
	Oct 24	Oct 10	Nov 01	Oct 21	Nov 09	Oct 30	Oct 19	Nov 07	Oct 27	Nov 14
PM _{2.5}	119	147	177	105	423↑	602	183	334	307	468↑
SO ₂	5	12	28	16	16=	40	24	36	10	17↑
NO ₂	85	66	62	56	142↑	94	54	67	64	143↑
CO	1119	1413	780	1071	2421↑	983	1423	1441	1347	2411↑

Note : All values are in $\mu\text{g}/\text{m}^3$

Table 4(b): Ambient Air Quality Status at **DMS**, Shadipur during Deepawali days

Pollutants	Pre-Deepawali Day					Deepawali Day				
	2016	2017	2018	2019	2020	2016	2017	2018	2019	
	Oct 24	Oct 10	Nov 01	Oct 21	Nov 09	Oct 30	Oct 19	Nov 07	Oct 27	Nov 14
PM _{2.5}	62	123	207	73	348↑	474	421	437	232	202↓
SO ₂	16	12	21	10	13↑	94	42	40	12	17↑
NO ₂	63	25	91	92	160↑	102	58	94	73	150↑
CO	1148	1383	2000	1062	3227↑	1596	1789	1573	1488	2155↑

Note : All values are in $\mu\text{g}/\text{m}^3$

Table 4(c): Ambient Air Quality Status at **NSIT, Dwarka** during Deepawali Days

Pollutants	Pre-Deepawali Day					Deepawali Day				
	2016	2017	2018	2019	2020	2016	2017	2018	2019	
	Oct 24	Oct 10	Nov 01	Oct 21	Nov 09	Oct 30	Oct 19	Nov 07	Oct 27	Nov 14
PM _{2.5}	118	79	175	111	107↓	457	373	341	205	120↓
SO ₂	21	8	29	12	12=	11	23	19	20	15↓
NO ₂	33	43	36	42	59↑	35	41	39	36	55↑
CO	660	844	1120	939	1718↑	908	1291	769	857	1245↑

Note : All values are in $\mu\text{g}/\text{m}^3$

Comparison of Meteorology

Comparative meteorology on pre-deepwali day and deepawali day observed during last five years (2016, 2017, 2018, 2019 and 2020) is presented in Table 5.

It reveals that average mixing height on pre-deepawali day as well as Diwali day were lowest this year (2020) This is due to falling of Diwali in mid November when the winter starts impacting decline in temperature and inversion starts.

On Deepawali day mixing height was 300 m, however, the minimum mixing height (in night hours) was recorded as low as 60 m. The

maximum mixing height was recorded as 1170 m on Deepawali day, 2020.

Mean wind speed at Parivesh Bhawan was 1.3 m/sec (3.4 Km/hour) on Deepawali day which is lowest in last five years creating unfavourable dispersion condition.

Parameters	2016		2017		2018		2019		2020	
	Pre-Diwali	Diwali	Pre-Diwali	Diwali	Pre-Diwali	Diwali	Pre-Diwali	Diwali	Pre-Diwali	Diwali
	24.10.16	30.10.16	12.10.17	19.10.17	01.11.18	07.11.18	21.10.19	27.10.19	09.11.20	14.11.20
Mixing Height (m)	657	492	622	481	468	574	779	544	335	300
Wind Speed (m/s)	2.6	1.3	1.1	1.5	1.5	1.6	2.6	2.3	1.2	1.3
Temperature (°C)	28.4	24.8	29.5	29.8	25.0	21.8	26.3	26.1	22.4	22.2
Relative Humidity (%)	38.9	56.9	44.3	47.1	55.9	41.6	48.4	51.9	52.5	51.1

Overall Observation

This year Deepawali was celebrated in mid-November, which, has unfavorable meteorological conditions for dispersal of pollutants in comparison to 2019 when the festival was in the last week of October. The surface temperature was recorded lowest, which might have attributed to more inversion condition with lowest average mixing height, which limits vertical dispersion. It was among lowest in last five years. Wind speed in both pre Diwali and Diwali day was similar. As such, impact of meteorology in air pollution levels during festival season is evident.

As observed from real-time monitoring network (37 CAAQM stations), the hourly average concentration of PM_{2.5} started increasing since 11 PM on 14th November, it reached peak in most of the stations at around 1 am and continued at higher levels till 5 am. The city level average calculated for PM₁₀ and PM_{2.5} concentrations on Deepawali day (14.11.2020) were 645 µg/m³ and 483 µg/m³ respectively.

Contribution of stubble burning on PM_{2.5} (Source: SAFAR, IITM) was 32% on Diwali day (14.11.2020) compared to 38% on pre Diwali day (09.11.2020). The contribution of stubble burning on both pre Diwali (12 % on 21.10.2019) and Diwali day (19 % on 27.10.2019) in 2019 was less. Therefore, it may be inferred that elevated PM_{2.5} concentrations in 2020 in comparison to previous year had enhanced contribution of stubble burning and same is also reflected in elevated levels of CO and NO₂.

In 2019 the PM₁₀ was increased by 70% on Diwali day compared to Pre Diwali day. PM_{2.5} was increased by 149% on Diwali day over Pre Diwali day. In 2020, on Diwali day decrease in PM₁₀ and PM_{2.5} was observed compared to Pre Diwali day by about 16% and 18%. This reduction is perhaps due to about 6% reduction in contribution of stubble burning this year.

Overall, this year Deepawali has witnessed higher background levels of pollutants during pre-diwali days and further addition of particulates during night from firecrackers.