

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 |
|------|----------|------------|
|------|----------|------------|

| | 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> | | | | | |

For further details, please contact:

Dr. A. B. Akolkar
Member Secretary
Cell#9911110236

Dr. Dipankar Saha
In-charge, Air Laboratory
Cell#9717166653