

**REPORT ON SPECIAL MONITORING OF
AMBIENT AIR QUALITY & NOISE LEVELS
AT BHOPAL DURING DIWALI FESTIVAL 2018**



**Central Pollution Control Board
Regional Directorate
Bhopal**



Central Pollution Control Board
Regional Directorate, Bhopal

**Report on Special monitoring of Ambient Air Quality &
Noise Levels at Bhopal during Diwali Festival 2018**

1. **Introduction:** Diwali is one of the most prominent and famous festival on India which celebrated in the autumn season of the year in Indian subcontinent. Diwali is also known as Deepawali in some regions of the country because we lit row of diyas or candle in the night of festival. The spiritual significance of Diwali indicates the victory of light (God) over darkness (evil power). People decorate their house, office, and street with the earthen lamps, diyas or electric lights on the day of Diwali. It is a five days long festival start from Dhanteras followed by Chhoti Diwali and ends on Bhaiduj. There becomes huge rush in the market from few weeks before the main date of festival because people start buying clothes, jewellery, decorative things, electric bulbs, firecrackers, things related to food items, etc.

2. **Bhopal City & Climate:** Bhopal city capital of state Madhya Pradesh has population of 1,995,648 as per the census 2011 spread in the municipal area of 648.24 KM². It is situated in latitude of 23°15'N and longitude of 77°25'E. Bhopal city is one of the fast growing city, where housing, infrastructure, transportation and industrialization in Mandideep industrial area, Govindpura industrial area under projects are in greater swing. This city is well known as 'City of lakes' because of the number of ponds and lakes.

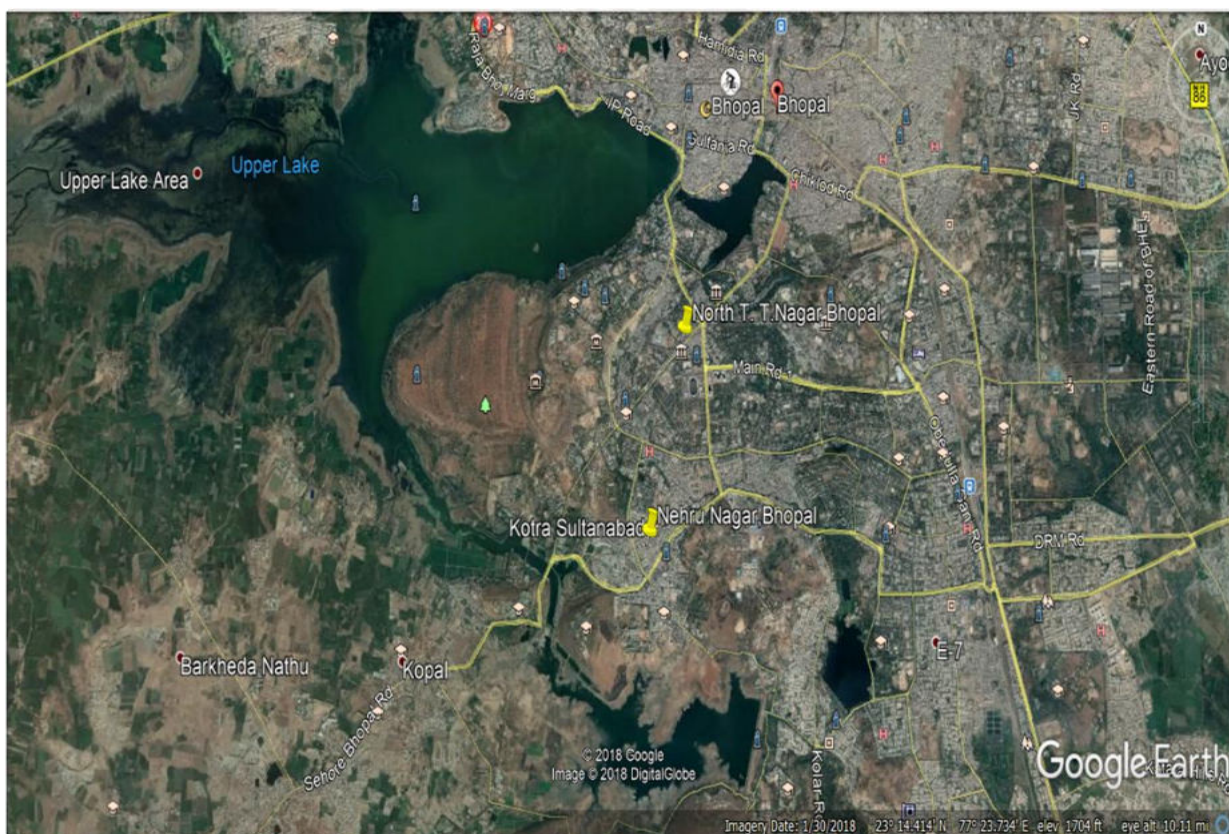
Bhopal has a humid subtropical climate, with cool, dry winters, a hot summer and a humid monsoon season. Summers start in late March and go on till mid-June, the average temperature being around 35°C, with the peak of summer in May, when the highs regularly exceeds 40°C. The monsoon starts in late June and ends in late September. The average temperature is around 28°C and the humidity is moderate. Temperatures rise again up to late October when winter starts, which lasts up to early March. Winters in Bhopal are cool, sunny and comfortable.

- 3. Objective of Ambient Air quality & Noise level monitoring:** With reference to CPCB Head Office letter no A-21016/1/08-Mon/11351 dated 05.10.2018 & 25.10.2018, Regional Directorate (Central), Central Pollution Control Board, Bhopal has Conducted Ambient Air Quality monitoring in Bhopal city during celebration of Diwali festival in the year 2018 from 31.10.2018 to 14.11.2018 for the parameters of PM₁₀, PM_{2.5}, SO₂, NO₂ and selected heavy metals in PM₁₀ & PM_{2.5}. The Ambient Level Noise monitoring performed (pre-Diwali on 01.11.2018 and during Diwali on 07.11.2018) to record the impact of bursting of crackers on environment. Intensive Ambient Air Quality and Ambient Noise level monitoring was conducted at selected two locations in the city. Ambient air quality monitored for 24 hours (6:00AM- 6:00AM) where as ambient noise levels monitored for 6 hours (6:00 PM-12:00mid night). Out of one location the ambient air quality monitoring and analysis is carried out by EPA approved laboratory. Noise level monitoring was carried out by using integrating sound level meters with free-field microphone which meets the accuracy of noise measurement as per IES 804 (BS 6698) grade I or ANSI type I or equivalent IES 61672-1(2002-05) class-I to see the overall impact of bursting of fire crackers on Ambient Noise level. PM₁₀, SO₂, NO₂ and selected heavy metals in PM₁₀ & PM_{2.5} monitored during 31.10.2018 to 14.11.2018.

4. Monitoring locations and its co-ordinates: Ambient air quality was carried out before Diwali, on Diwali & post Diwali day and noise monitoring was carried out before Diwali and on Diwali as per the protocol received from Head Office at the following 02 locations in Bhopal city.

Name of the monitoring location	Description of location	Latitude & Longitude	Activities around locations
North TT Nagar	Commercial	23°14'138"N 77°23'891"E	Vehicle movement, commercial, Civil construction activities and bursting of crackers
Nehru Nagar	Residential	23°12.968"N 77°23.579"E	Road sweeping, traffic movement, Bursting of crackers, MSW burning

5. Google Map showing the monitoring location:



6. Meteorological data during monitoring:

Date	Temperature (°C)		Prominent Wind direction	wind speed (KM/Hrs)	Humidity (%)
	Min.	Max.			
31.10.2018	20	29.3	NE	6.6	53.6
01.11.2018	20	29.9	NE	4.9	51.4
02.11.2018	21.1	30.6	NE	4.7	50.3
03.11.2018	22.7	30.8	SE	3.5	48.8
04.11.2018	22.6	30.7	SE	3.7	49.4
05.11.2018	21.7	30.0	N	5.3	48.4
06.11.2018	19.8	27.9	N	5.8	40.7
07.11.2018	17.0	27.3	N	6.0	41.9
08.11.2018	17.1	27.8	NE	4.2	38.4
09.11.2018	20.2	30.0	N	2.2	47.4
10.11.2018	20.7	30.1	N	3.2	37.6
11.11.2018	19.4	29.2	E	5.0	33.2
12.11.2018	19.2	29.2	E	3.4	32.8
13.11.2018	20.5	29.9	SE	3.1	30.7
14.11.2018	20.0	30.3	SE	2.9	30.7

Note: Data generated by CPCB, RD, Bhopal

7. Status of Ambient Air Quality at 2 locations in Bhopal :

Name of Location : A. North TT Nagar (Commercial)														
Date	Parameters													
	PM ₁₀ (µg/m ³)	PM _{2.5} (µg/m ³)	NO ₂ (µg/m ³)	SO ₂ (µg/m ³)	Heavy Metals in PM ₁₀			Heavy Metals in PM _{2.5}						
					Pb ³ (µg/m ³)	Ni ³ (ng/m ³)	As ³ (ng/m ³)	Pb ³ (µg/m ³)	Ni ³ (ng/m ³)	As ³ (ng/m ³)	Al ³ (µg/m ³)	Ba ³ (µg/m ³)	Fe ³ (µg/m ³)	Sr ³ (µg/m ³)
31.10.2018	59	37	25.93	5.34	0.892	0.192	BDL	0.530	0.083	BDL	BDL	3.18	BDL	0.72
01.11.2018	92	85	23.88	5.94	0.498	0.22	BDL	0.15	BDL	BDL	BDL	3.62	BDL	0.66
02.11.2018	136	56	25.45	7.17	0.87	0.42	BDL	0.81	BDL	BDL	BDL	2.98	BDL	0.92
03.11.2018	116	48	23.61	6.6	0.94	0.92	BDL	0.38	BDL	BDL	BDL	4.62	BDL	0.59
04.11.2018	94	55	25.81	8.79	0.52	0.305	BDL	0.28	BDL	BDL	BDL	1.33	BDL	BDL
05.11.2018	70	56	33.48	10.55	0.98	0.58	BDL	0.55	0.18	BDL	BDL	3.26	BDL	0.48
06.11.2018	77	63	24.38	6.56	0.96	1.26	BDL	0.78	BDL	BDL	BDL	3.08	BDL	2.01
07.11.2018	190	171	37.20	15.52	1.89	0.82	BDL	0.66	1.29	BDL	BDL	5.8	BDL	2.08
08.11.2018	96	89	23.13	8.77	0.58	0.36	BDL	0.21	BDL	BDL	BDL	3.09	BDL	0.88
09.11.2018	126	98	29.47	7.64	0.78	0.43	BDL	0.48	BDL	BDL	BDL	2.39	BDL	1.05
10.11.2018	110	77	30.77	7.55	0.60	0.33	BDL	0.28	BDL	BDL	BDL	3.18	BDL	0.28
11.11.2018	111	71	33.61	7.12	0.77	0.54	BDL	0.44	BDL	BDL	BDL	3.09	BDL	0.43
12.11.2018	106	68	26.07	7.18	0.804	0.66	BDL	0.51	BDL	BDL	BDL	2.16	BDL	0.66
13.11.2018	93	59	19.98	6.32	0.33	0.21	BDL	0.18	BDL	BDL	BDL	1.01	BDL	0.31
14.11.2018	90	48	24.96	5.27	0.406	0.33	BDL	0.26	BDL	BDL	BDL	1.09	BDL	BDL
National Ambient Air Quality Standards – Industrial/Residential/Rural or other areas (24 hourly average in µg/m³) for PM₁₀, PM_{2.5}, SO₂, NO₂ and Lead. *The standard for Nickel and Arsenic are in annual arithmetic mean.								PM₁₀	PM_{2.5}	NO₂	SO₂	Pb	Ni*	As*
								100	60	80	80	1.0	06	20

All values are in 24 hours average, Detection Limit: Pb - 0.05 µg, As - 0.05 ng, Ni - 0.05 ng, Al - 0.05 µg, Fe - 0.05 µg, Sr - 0.05 µg, Ba - 0.05 µg

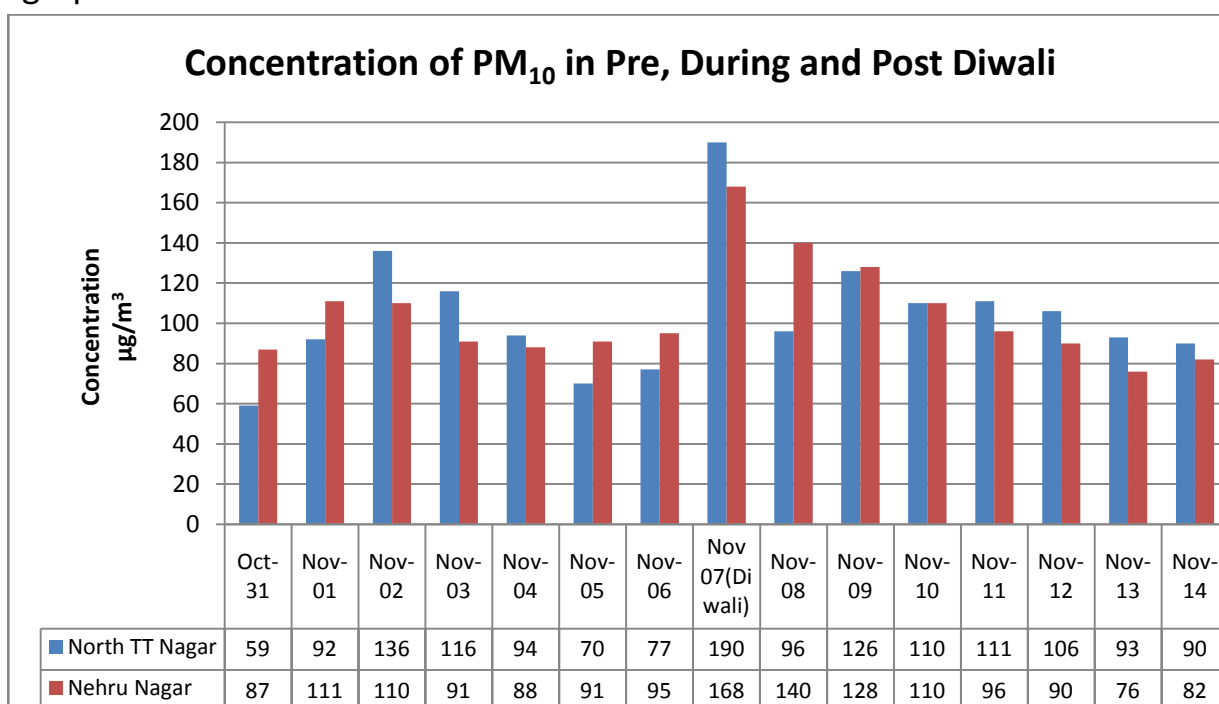
Name of Location : B. Nehru Nagar (Residential)														
Date	Parameters													
	PM ₁₀ ³ (µg/m ³)	PM _{2.5} ³ (µg/m ³)	NO ₂ ³ (µg/m ³)	SO ₂ ³ (µg/m ³)	Metals in PM ₁₀			Metals in PM _{2.5}						
					Pb ³ (µg/m ³)	Ni ³ (ng/m ³)	As ³ (ng/m ³)	Pb ³ (µg/m ³)	Ni ³ (ng/m ³)	As ³ (ng/m ³)	Al ³ (µg/m ³)	Ba ³ (µg/m ³)	Fe ³ (µg/m ³)	Sr ³ (µg/m ³)
31.10.2018	87	57	20.4	6.8	0.59	0.098	BDL	0.37	BDL	BDL	BDL	2.34	BDL	0.54
01.11.2018	111	79	22	6.5	0.98	0.37	0.37	0.67	BDL	BDL	BDL	2.39	BDL	0.42
02.11.2018	110	70	23.7	6.8	0.88	0.36	BDL	0.67	BDL	BDL	BDL	1.37	BDL	BDL
03.11.2018	91	52	22.4	6.6	0.78	0.24	BDL	0.31	BDL	BDL	BDL	1.68	BDL	0.203
04.11.2018	88	54	27.5	9.5	0.68	0.392	BDL	0.36	BDL	BDL	BDL	1.92	BDL	0.37
05.11.2018	91	58	30.4	10.9	0.66	0.087	BDL	0.42	BDL	BDL	BDL	2.04	BDL	BDL
06.11.2018	95	63	27.3	8.4	1.08	0.57	BDL	0.58	BDL	BDL	BDL	4.22	BDL	1.33
07.11.2018	168	93	35	13.4	1.42	0.79	BDL	0.84	BDL	BDL	BDL	3.8	BDL	1.12
08.11.2018	140	99	34.2	11.2	0.71	0.29	BDL	0.37	BDL	BDL	BDL	2.29	BDL	0.46
09.11.2018	128	75	27.2	9.4	0.96	0.57	BDL	0.71	BDL	BDL	BDL	3.39	BDL	1.59
10.11.2018	110	68	23.4	8.4	0.58	0.19	BDL	0.29	BDL	BDL	BDL	2.06	BDL	BDL
11.11.2018	96	52	22.4	9.3	0.85	0.44	BDL	0.58	BDL	BDL	BDL	2.49	BDL	0.33
12.11.2018	90	57	21.6	10.6	0.79	0.52	BDL	0.48	BDL	BDL	BDL	3.06	BDL	0.71
13.11.2018	76	51	20.8	8.4	0.44	0.26	BDL	0.28	BDL	BDL	BDL	0.96	BDL	0.26
14.11.2018	82	49	19.6	7.2	0.51	0.37	BDL	0.29	BDL	BDL	BDL	1.96	BDL	BDL
National Ambient Air Quality Standards – Industrial/Residential/Rural or other areas (24 hourly average in µg/m³) for PM₁₀, PM_{2.5}, SO₂, NO₂ and Lead. *The standard for Nickel and Arsenic are in annual arithmetic mean.								PM₁₀	PM_{2.5}	NO₂	SO₂	Pb	Ni*	As*
								100	60	80	80	1.0	06	20

All values are in 24 hours average, Detection Limit: Pb - 0.05 µg, As - 0.05 ng, Ni - 0.05 ng, Al - 0.05 µg, Fe - 0.05 µg, Sr - 0.05 µg, Ba - 0.05 µg

8. Ambient air quality monitoring Results and discussions:

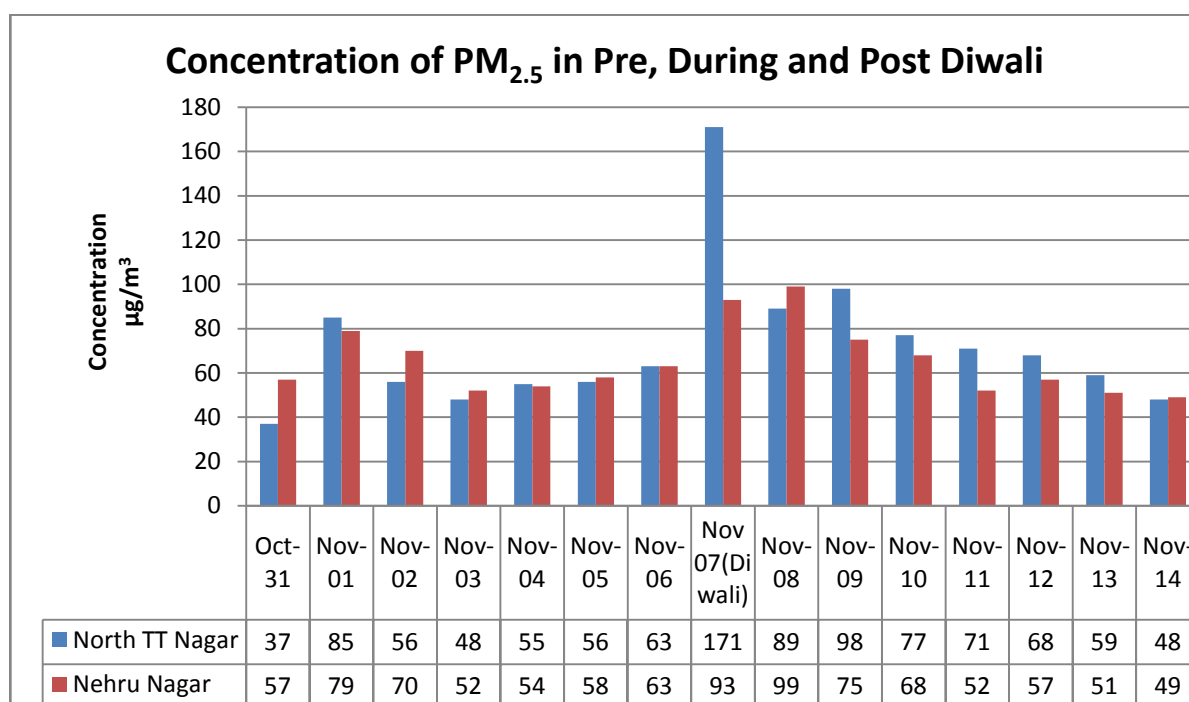
A. Particulate Matter (PM₁₀):

- During pre-Diwali the ambient air quality monitoring carried out from October 31th to November 6th, 2018. The minimum and maximum PM₁₀ values observed at North TT Nagar 59 µg/m³ and 136 µg/m³, Nehru Nagar -87µg/m³ and 112 µg/m³ respectively.
- During the Diwali Day fire crackers bursting was observed and PM₁₀ were found at North T.T Nagar- 190 µg/m³ and at Nehru Nagar - 168 µg/m³.
- During post-Diwali the ambient air quality monitoring carried out from November 8th to 14th, 2018. The PM₁₀ level are decreasing from the festival day and the minimum and maximum PM₁₀ values observed at North TT Nagar 90 µg/m³ and 126 µg/m³, Nehru Nagar -76 µg/m³ and 140 µg/m³ respectively.
- The concentrations of PM₁₀ is exceeding total 7 days out of 15 monitoring at North TT Nagar and total 6 days exceeding out of 15 days monitoring at Nehru Nagar. The average PM₁₀ concentrations are shown below in the graph no.1.



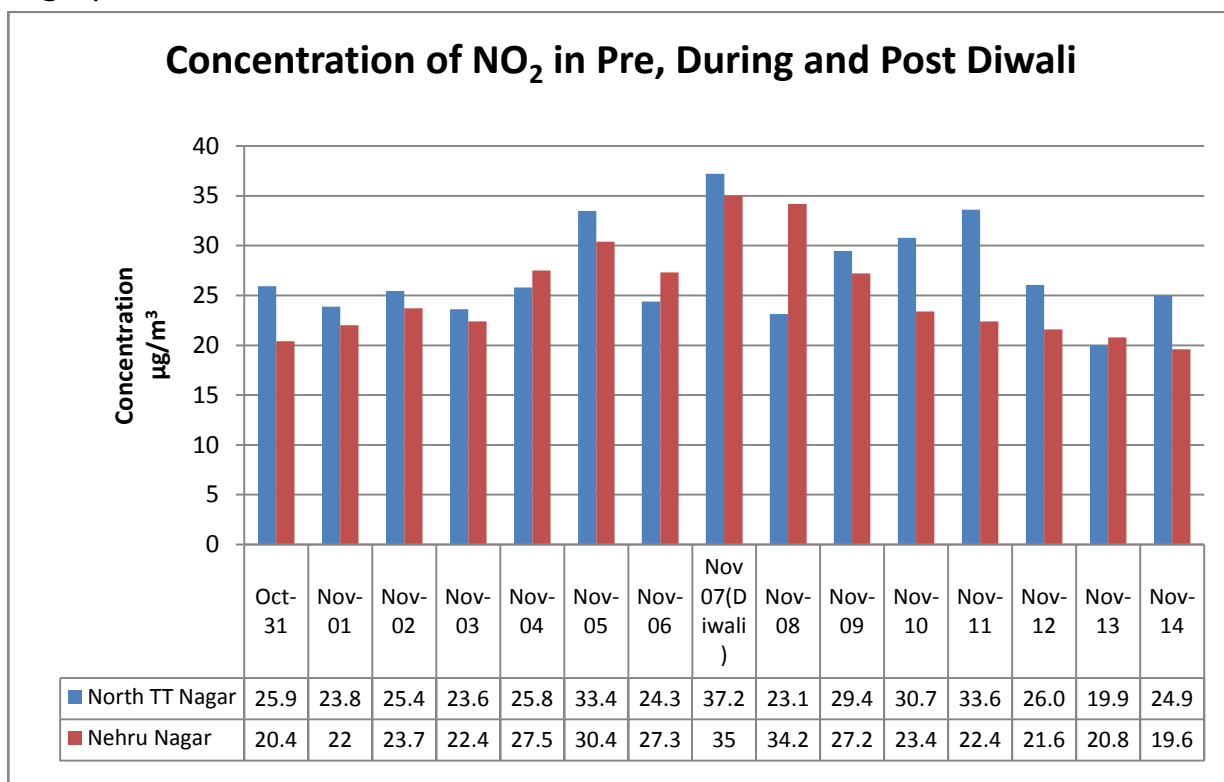
B. Particulate Matter (PM_{2.5}):

- During pre-Diwali the ambient air quality monitoring carried out from October 31th to November 6th, 2018. The minimum and maximum PM_{2.5} values observed at North TT Nagar 37 µg/m³ and 85 µg/m³, Nehru Nagar -52 µg/m³ and 78 µg/m³ respectively.
- During the Diwali Day fire crackers bursting was observed and PM_{2.5} was observed at North T.T Nagar- 171 µg/m³ and at Nehru Nagar -93 µg/m³.
- During post-Diwali the ambient air quality monitoring carried out from November 8th to 14th, 2018. The PM_{2.5} level are decreasing from the festival day and the minimum and maximum PM_{2.5} values observed at North TT Nagar 48 µg/m³ and 98 µg/m³, Nehru Nagar -49 µg/m³ and 99 µg/m³ respectively.
- The concentrations of PM_{2.5} is exceeding total 7 days out of 15 monitoring at North TT Nagar and total 7 days exceeding out of 15 days monitoring at Nehru Nagar. The average PM_{2.5} concentrations are shown below in the graph no.2



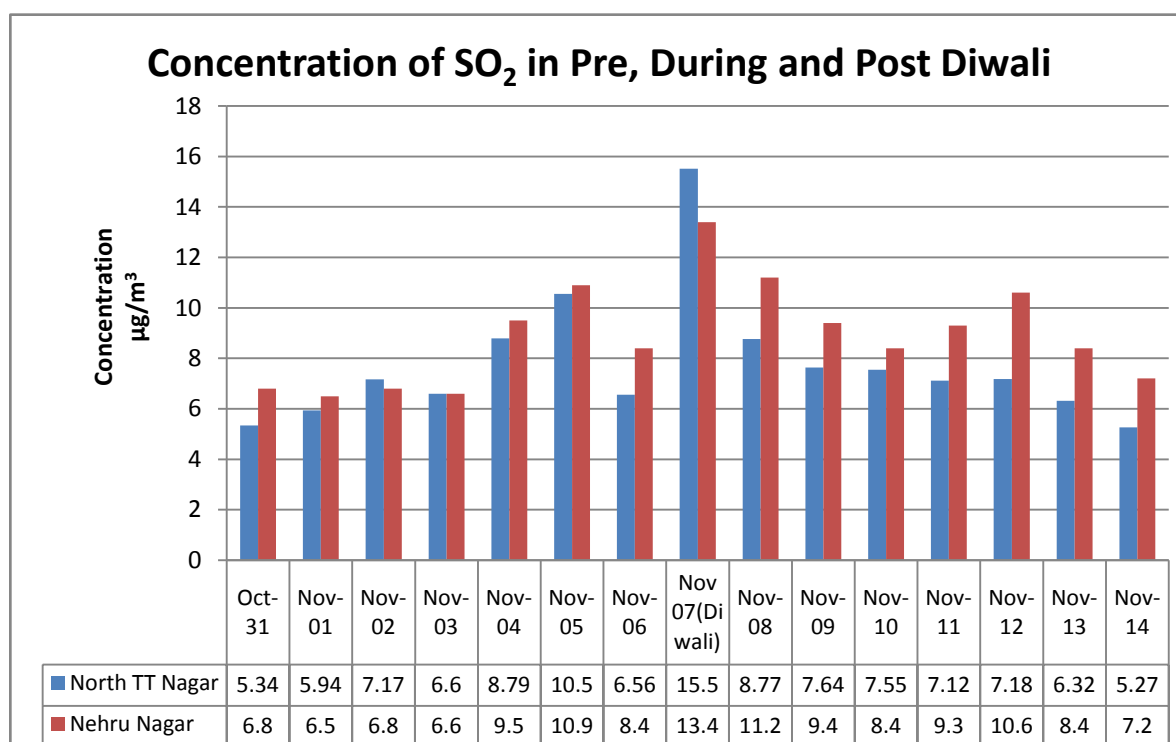
C. Nitrogen Dioxide (NO₂):

- during pre Diwali monitoring (October 31th to November 6th, 2018) monitoring result of NO₂ concentration was detected in the range of 23.61 µg/m³ - 33.48 µg/m³ at North TT Nagar and at Nehru Nagar was observed in between 20.4 µg/m³ - 30.4 µg/m³.
- During the Diwali Day fire crackers bursting was observed and the concentration of NO₂ was detected 37.20 µg/m³ at North TT Nagar & at Nehru Nagar was detected 35 µg/m³.
- During post-Diwali monitoring (November 8th to 14th, 2018) the concentration of NO₂ level are decreasing from the festival day. The concentration of NO₂ was detected in North TT Nagar in between 19.98 µg/m³ – 33.61 µg/m³ and at Nehru Nagar was observed in between 19.6 µg/m³ – 34.2 µg/m³.
- All the NO₂ values during pre, on & post Diwali are within the ambient air quality standards (24 hours average).
- The NO₂ concentrations of both locations are shown below in the graph no.3.



D. Sulphur Dioxide (SO₂):

- The monitoring is carried out from pre-Diwali (October 31th to November 6th) During Diwali (November 7th) and post Diwali (November 8th to 14th). During pre Diwali the concentration was detected in between 5.34 µg/m³ – 10.55 µg/m³ at North TT Nagar and at Nehru Nagar the concentration of SO₂ was detected in between 6.5 µg/m³ – 10.9 µg/m³.
- The maximum concentration of SO₂ was detected at Diwali day during evening time (06:00 PM – 10:00PM) at North TT Nagar i.e. 76.91 µg/m³ due to bursting of fire crackers. The average concentrations of SO₂ found during Diwali day i.e. 13.4 µg/m³ at Nehru Nagar.
- During the post-Diwali day the level of SO₂ were decreased and reached almost pre-Diwali concentrations. The concentration detected at North TT Nagar in between 5.27 µg/m³-8.77 µg/m³, Nehru Nagar 7.2 µg/m³-11.2 µg/m³. All the SO₂ pre, on & post Diwali values are within the ambient air quality standards. The SO₂ concentrations are shown below in the graph no.4



E. Heavy Metals:

The metals derived from road side dust and soil is another potential source of heavy metals. Prior to ban of lead in gasoline, vehicles were the major source of lead so lead may be legacy pollutant in environment. Strontium, Barium etc are element that are create colouring effects red and green respectively.

9. Air Quality Index:

Air Quality Index is a tool for effective communication of air quality status to people which is easy to understand. It transforms complex air quality data of various pollutants into a single number (index value), nomenclature and colour. There are six AQI categories, namely Good, Satisfactory, Moderately polluted, Poor, Very Poor, and Severe. Each of these categories is based on ambient concentration values of air pollutants and their likely health impacts. The AQI of the normal day, Diwali day and post Diwali day are given below:

Air Quality Index	Pollution Category	Related Health Impact
0-50	Good	Minimal Impact.
51-100	Satisfactory	May cause minor breathing discomfort to sensitive people.
101-200	Moderate	May cause breathing discomfort to people with lung diseases such as Asthma and discomfort to people with heart disease Children and older adults.
201-300	Poor	May cause breathing discomfort to people on prolonged exposure and discomfort to people with heart diseases.
301-400	Very Poor	May cause respiratory illness to the people on prolonged exposure. Effect may be more prolonged exposure in people with lung and heart disease.
>401	Severe	May cause respiratory effects even on healthy people and serious health effect on people with lung/heart diseases.

9.1 Air Quality Index of pre Diwali day, during Diwali day and post Diwali day are as given below:

Date	Location					
	North TT Nagar			Nehru Nagar		
	AQI	Category	Prominent Parameter	AQI	Category	Prominent Parameter
31.10.2018	61.13	Satisfactory	PM ₁₀ , PM _{2.5}	94.91	Satisfactory	PM ₁₀ ,PM _{2.5}
01.11.2018	182.84	Moderate	PM ₁₀ , PM _{2.5}	158.97	Moderate	PM ₁₀ , PM _{2.5}
02.11.2018	124.10	Moderate	PM ₁₀ , PM _{2.5}	131.69	Moderate	PM ₁₀ , PM _{2.5}
03.11.2018	110.90	Moderate	PM ₁₀ , PM _{2.5}	91.00	Satisfactory	PM ₁₀ , PM _{2.5}
04.11.018	94.00	Satisfactory	PM ₁₀ , PM _{2.5}	89.85	Satisfactory	PM ₁₀ , PM _{2.5}
05.11.2018	93.23	Satisfactory	PM ₁₀ , PM _{2.5}	96.60	Satisfactory	PM ₁₀ , PM _{2.5}
06.11.2018	107.82	Moderate	PM ₁₀ , PM _{2.5}	107.82	Moderate	PM ₁₀ , PM _{2.5}
07.11.2018 (Diwali)	339.35	Very Poor	PM ₁₀ , PM _{2.5}	207.82	Poor	PM ₁₀ , PM _{2.5}
08.11.2018	196.48	Moderate	PM ₁₀ , PM _{2.5}	228.28	Poor	PM ₁₀ , PM _{2.5}
09.11.2018	224.87	Poor	PM ₁₀ , PM _{2.5}	148.74	Moderate	PM ₁₀ , PM _{2.5}
10.11.2018	155.56	Moderate	PM ₁₀ , PM _{2.5}	124.87	Moderate	PM ₁₀ , PM _{2.5}
11.11.2018	135.10	Moderate	PM ₁₀ , PM _{2.5}	96.00	Satisfactory	PM ₁₀ , PM _{2.5}
12.11.2018	124.87	Moderate	PM ₁₀ , PM _{2.5}	94.91	Satisfactory	PM ₁₀ , PM _{2.5}
13.11.2018	98.29	Satisfactory	PM ₁₀ , PM _{2.5}	84.91	Satisfactory	PM ₁₀ , PM _{2.5}
14.11.2018	90.00	Satisfactory	PM ₁₀ , PM _{2.5}	82.00	Satisfactory	PM ₁₀ , PM _{2.5}

- PM₁₀ and PM_{2.5} was found prominent parameter out of monitored 4 parameters i.e. PM₁₀, PM_{2.5}, SO₂ & NO₂.
- The AQI values found during pre Diwali in the range of 61.13 – 182.84 at North TT Nagar and 91 - 158.97 at Nehru Nagar.
- The air quality index on Diwali is found very poor i.e. 339.35 at North TT Nagar and at Nehru Nagar found poor i.e. 207.82.
- The AQI values found during post Diwali in the range of 90.0 – 224.87 at North TT Nagar and 82 – 228.28 at Nehru Nagar

As per AQI it is observed that normalization of air quality came within 6 days in both the areas, however air quality normalization rate was found more (5 days) in commercial area than (3 days) in residential area.

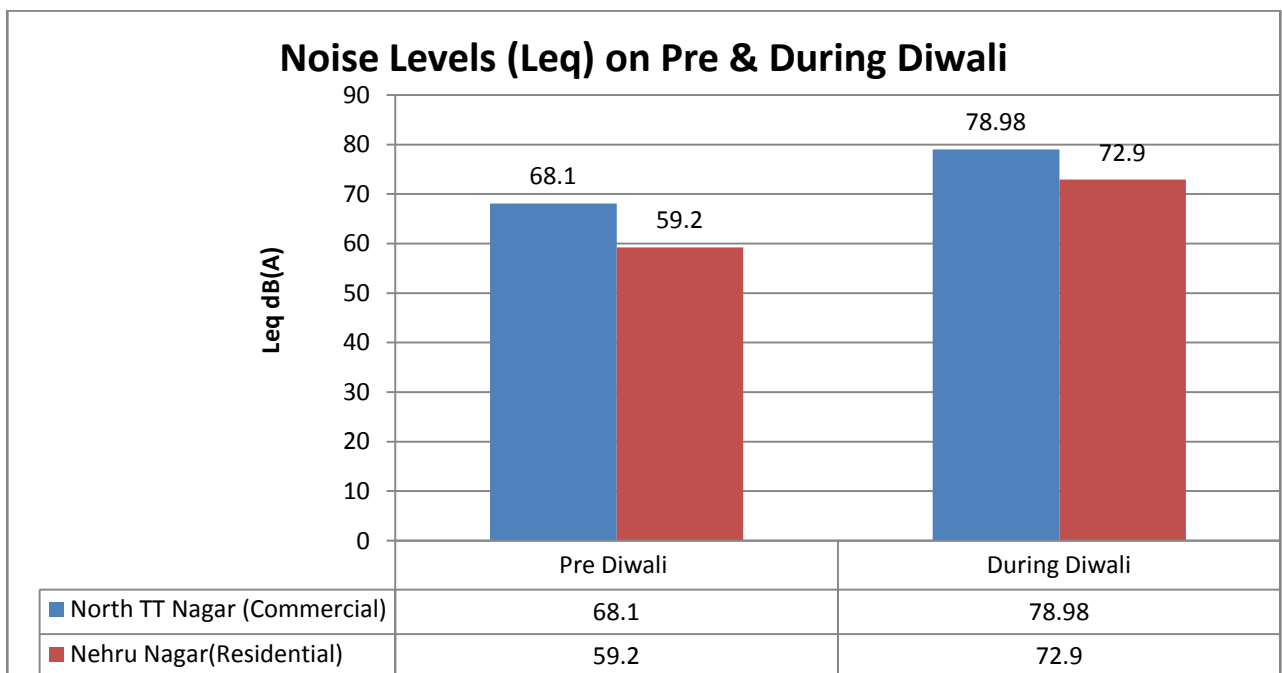
10. Monitoring of Ambient Noise levels:

The sound which pleases the listeners is music whereas which causes pain and annoyance is termed as noise. Noise is generally defined as the undesirable sound. We can measure individual sounds that may damage human hearing, but it is difficult to monitor cumulative exposure to noise. The effect of noise pollution is multifaceted and inter related can lead to decrease in work efficiency, lack of concentration, fatigue, increase in blood pressure, temporary deafness, even could lead to abortion etc. Noise is measured in decibels dB(A). 'A' symbol indicates a measurement of a logarithmic scale.

The objective of this monitoring is to assess the problem being faced by the residents when the noise level in their surroundings exceeds the permissible limit especially at Diwali due to bursting of fire crackers.

The noise level measurement during before and on Diwali day was carried out using Delta OHM HD2110L instrument. Monitoring was carried out from 18.00hrs to 24.00hrs as per the prescribed protocol for L_{eq}, L_{min}, L_{max}, L₅₀ & L₉₀ parameters.

Location	Time Duration	Pre Diwali (01.11.2018)					During Diwali (07.11.2018)				
		L50	L90	Lmin	Lmax	Leq	L50	L90	Lmin	Lmax	Leq
North TT Nagar (Commercial)	18:00hrs-19:00hrs	64.4	57.8	57.9	85.9	70.1	65.8	62.8	48.7	84.8	67.9
	19:00hrs-20:00hrs	67.6	64.4	57.2	88.2	69.3	71.0	51.1	47.1	98.6	80.5
	20:00hrs-21:00hrs	66.4	63.5	66.1	79.2	67.8	59.8	51.5	43.4	102.3	75.0
	21:00hrs-22:00hrs	65.2	62.3	54.8	82.5	67.0	74.6	59.2	50.1	101.5	83.7
	22:00hrs-23:00hrs	65.1	61.4	53.1	82.5	66.6	65.9	62.0	56.7	105.0	78.3
	23:00hrs-24:00hrs	61.8	58.3	52.3	82.3	64.7	63.1	57.6	50.1	100.3	73.5
	Average(18:00hrs-24:00hrs)					68.10	Average (18:00hrs-24:00hrs)				
Nehru Nagar (Residential)	18:00hrs-19:00hrs	53.9	49.2	47.0	79.3	60.8	48.5	45.4	44.1	89.2	68.3
	19:00hrs-20:00hrs	53.1	49.0	46.8	81.6	60.1	53.5	47.6	39.8	93.5	64.8
	20:00hrs-21:00hrs	52.8	48.6	45.8	79.4	58.6	65.1	58.1	52.1	101.2	73.9
	21:00hrs-22:00hrs	52.1	47.5	45.7	76.4	58.6	71.7	63.2	61.7	102.4	77.8
	22:00hrs-23:00hrs	50.5	48.0	45.3	84.1	58.3	69.2	67.1	57.2	106.7	72.3
	23:00hrs-24:00hrs	53.6	47.8	46.6	79.6	58.8	66.9	65.3	50.4	99.3	68.2
	Average (18:00hrs-24:00hrs)					59.2	Average (18:00hrs-24:00hrs)				



Note:

1. All the above noise values are in dB(A).
2. Noise limits in Residential area in Leq dB(A)—day:55, Night:45
3. Noise limits in commercial area in Leq dB(A)—day:65, Night:55

10.1 Noise monitoring Results and discussions:

- During pre-Diwali and during Diwali the noise level monitoring was carried out from (18:00 hrs to 24.00) hrs at North TT Nagar and Nehru Nagar. During pre-Diwali the Lmax level was found during 20:00 hrs to 21:00 hrs at North TT Nagar & Nehru Nagar i.e. 102.3 dB(A) to 79.2 dB(A) respectively.
- The average Leq values observed on pre-Diwali day at North TT Nagar 68.10 dB(A) and at Nehru Nagar 59.20 dB(A) was observed.
- On the Diwali day due to bursting of crackers the Lmax level was found during 22:00 hrs to 23:00 hrs at North TT Nagar & Nehru Nagar i.e. 105.0 dB(A) to 16.7 dB(A) respectively.
- Due to bursting of fire crackers the average Leq value was found at North TT Nagar i.e. 78.98 dB(A) and at Nehru Nagar i.e. 72.9 dB(A) that is above the prescribed residential limit.

10.2 Noise Level Meter Calibration Result

Location	Calibration Result	Date				Instrument Make & Model
		01.11.2018		07.11.2018		
		94 dB at 1000 Hz	114 dB at 1000Hz	94 dB at 1000 Hz	114 dB at 1000Hz	
North T.T. Nagar	Initial	94.0	114.0	94.0	114.0	Delta QHM & HD2110L (3)
	Final	93.9	113.9	93.9	113.8	
Nehru Nagar	Initial	94.0	114.1	94.0	113.9	Delta QHM & HD2110L (5)
	Final	93.9	114.0	93.8	113.7	

11. Observations:

1. On the Diwali day bursting of crackers were started after 8 PM and there was very less crackers busting after 10 PM.
2. The smoke emitted by the burning of fire crackers on Diwali augments the level of gases and pollutants in the air there by adding to air pollution. It impacts the environment adversely. This festival falls just before the beginning of the winter season. The atmosphere around this time is misty. The smoke released by fire crackers gets trapped in the mist and this augments the impact of pollution.
3. Weather was clear and no rainfall was observed from the monitoring period (October 31th to November 15th, 2018). Due to which the air dispersion took place as a result the ground level concentration of air pollution levels for PM₁₀, SO₂ and NO₂ decrease at Nehru Nagar as compared with last year Diwali. But at North TT Nagar increase the PM₁₀ concentration and changes of SO₂ and NO₂ level slightly.
4. Vehicular movement, traffic jam, Aazan, crackers and playing Dhol-Nagada during festival are the main attributes responsible for the high noise level. The attraction of customers towards the crackers has played a significant nuisance in noise level and ambient air quality deterioration.
5. It is observed that this year Diwali festival was celebrated with less crackers bursting as compared with Diwali-2017 at Nehru Nagar as a result the concentration of ambient air quality pollutants i.e PM₁₀, SO₂ and NO₂ were reduced as compared with last year concentration on Diwali Day but Particulate Matter 10 & 2.5 level are above the limit from the standard.
6. The average PM₁₀ & PM_{2.5} values are increased from pre Diwali day to Diwali day is 2 times and 3 times at North T.T. Nagar which falls under commercial area and almost 2 times and 1.5 times at Nehru Nagar (residential area) respectively.

7. It is observed that the concentration of PM₁₀ decreased from 213 µg/m³ to 168 µg/m³ at Nehru Nagar from Diwali-2017 to Diwali-2018 that area in residential category. The PM₁₀ concentration increased from and 169 µg/m³ to 190 µg/m³ at North TT Nagar (commercial area) from Diwali-2017 to Diwali-2018, due to heavy traffic and commercial activity observed.
8. The NO₂ and SO₂ values are increased from pre-Diwali to Diwali Day due to bursting of crackers. Whereas the post-Diwali day levels of NO₂ & SO₂ values were reached almost pre-Diwali concentration.

12. Mass Awareness Activities during Diwali 2018

Generally it is observed that during the fire crackers bursting the ambient noise and air quality levels were found above the prescribed limits during Diwali festival. As per the direction of the Hon'ble Supreme Court the state and central Governments have to give wide publicity to stop the bursting of fire crackers upto 10:00 PM and ill effects of fireworks. To encourage teachers for convincing their students, local people about the bad effects of fire crackers, schools where given priority for mass awareness.

In compliance of the above, CPCB Regional Directorate Bhopal jointly with MPPCB, Bhopal have conducted various programs during October 26 -17, 2018 to create awareness among public and to give wide publicity on ill-effects of fire crackers. Efforts were made by the office to educate and sensitize the children, parents; public that sound and air pollution harm their health.

Under the mass awareness programme various activities i.e. public talk shows, demonstration of RDS & noise level meter and environmental quiz among the school children have been organized to deliver the message of Eco-friendly Diwali. Mass awareness programme were organised in school namely Maharana Pratap Govt H.S. School, Govt. Girls H.S. School, and Govt Boys H. S. School in Bhopal. The photographs are shown below

MASS AWARENESS ACTIVITY IN SCHOOL



Maharana Pratap H. S. School, Police Line, Bhopal



Govt Girls H. S. School, Jahangirabad, Bhopal



Govt Boys H. S. School, Kotra, Bhopal

In addition to local awareness programme print media was observed for advertisement was also released on behalf of CPCB & MoEF&CC to make Eco-friendly Diwali in colour format in leading Hindi Newspaper Dainik Bhaskar edition in Bhopal (MP), Jaipur (Raj.) & Raipur (CG) on 07.11.2018 (Diwali Day). The Regional Directorate Bhopal is continuously making efforts to ensure that people enjoy a safe Diwali through awareness programme and inspiring and motivated the students not to burn firecrackers for safety of environment & health



दीपावली के पावन पर्व पर जन-सामान्य द्वारा आतिशबाजी का उपयोग किया जाता है। आतिशबाजी/पटाखों के प्रयोग से ध्वनि एवं वायु प्रदूषण के साथ पर्यावरण पर भी प्रतिकूल प्रभाव पड़ता है जिसके कारण मानव स्वास्थ्य भी प्रभावित होता है। आतिशबाजी के फलस्वरूप धुआँ, सूक्ष्म जहरीले कण एवं विभिन्न प्रकृति के रसायनों का उत्सर्जन होता है जिससे परिवेशीय वायु गुणवत्ता प्रभावित होती है एवं स्वास्थ्य संबंधी निम्नलिखित समस्याएँ उत्पन्न होती हैं:-

1. श्वसन संबंधी बीमारियों बढ़ जाती हैं
2. आंखों एवं शरीर के दूसरे अंगों को नुकसान होने की संभावना बढ़ जाती है
3. सुनने की क्षमता पर प्रतिकूल प्रभाव पड़ता है
4. अनिद्रा, उच्च रक्तचाप, तनाव, धड़कन बढ़ना आदि समस्याएँ होने लगती हैं
5. पालतू पशु-पक्षियों सहित अन्य जीव-जन्तुओं पर भी प्रतिकूल प्रभाव पड़ता है

अतः पर्यावरण, वन एवं जलवायु परिवर्तन मंत्रालय एवं केन्द्रीय प्रदूषण नियंत्रण बोर्ड जन-सामान्य से सुरक्षित एवं पर्यावरण अनुकूल दीपावली उत्सव मनाने का अनुरोध करता है।

 **केन्द्रीय प्रदूषण नियंत्रण बोर्ड**
पर्यावरण, वन एवं जलवायु परिवर्तन मंत्रालय
भारत सरकार

(Praveen Kumar Jain)
Senior Scientific Assistant
CPCB, RD, Bhopal

(Dr. R.P.Mishra)
Sci 'D' & Lab Head
CPCB, RD, Bhopal

(Dr. P.K. Behera)
Regional Director
CPCB, RD, Bhopal

-----***-----