

Report on Ambient Air Quality and Ambient Noise Monitoring on Diwali, 2008

Himachal Pradesh State Pollution Control Board has conducted ambient noise and ambient air quality monitoring on the occasion of Diwali festival, 2008 to study the impact on ambient air quality due to bursting of crackers and other related activities on 27.10.2008 to 29.10.2008. Ambient air monitoring w.r.t Suspended Particulate matter (SPM), Respirable particulate matter (RSPM), Sulphur dioxide (SO₂) and Oxides of Nitrogen (NO_x) was carried out at Shimla, Parwanoo, Jassur, Paonta Sahib, Kala Amb and Barmana for 24 hours a day. Noise level monitoring was conducted at Shimla, Parwanoo, Bilaspur, Kullu and Una. The data of the ambient air quality observed in the said locations for RSPM, SPM, SO₂ and NO_x are summarized in Table I, II and data of Noise level observed are summarized in Table III as below:

Table I – Data of RSPM & SPM

Area and Location	Time of sampling	Date					
		27.10.08	28.10.08	29.10.08	27.10.08	28.10.08	29.10.08
Shimla, Ridge (Sensitive area)	24 Hour Std	75 µg/m³			100 µg/m³		
	6AM-2PM	21.77	89.5	39.86	55.33	104.74	125.69
	2PM-10PM	52.77	38.26	45.71	69.11	58.72	110.01
	10PM-6AM	22.76	45.63	59.11	36.41	68.92	113.83
	24 hour Avg.	32.36	57.79	48.22	53.61	77.46	116.51
Shimla, Bus Stand (Residential area)	24 Hour Std	100 µg/m³			200 µg/m³		
	6AM-2PM	60.02	81.39	54.62	124.38	113.7	109.81
	2PM-10PM	71.90	46.88	67.52	101.42	73.02	218.8
	10PM-6AM	45.03	114.85	34.1	84.99	128.5	86.81
	24 hour Avg.	58.98	81.04	52.04	103.59	105.07	138.3
Parwanoo, Sector 4 (Residential area)	24 Hour Std	100 µg/m³			200 µg/m³		
	6AM-2PM	91.12	83.33	94.54	171.97	134.93	184.01
	2PM-10PM	80.56	168.59	103.50	191.89	285.52	219.48
	10PM-6AM	79.17	64.21	69.67	103.97	180.96	143.56
	24 hour Avg.	83.62	105.38	89.24	155.94	200.47	182.35
Jassur (Residential area)	24 Hour Std	100 µg/m³			200 µg/m³		
	6AM-2PM	96.06	60.80	48.17	154.36	124.55	88.35
	2PM-10PM	108.13	83.80	51.55	168.59	136.61	145.17
	10PM-6AM	73.18	54.31	38.64	110.57	84.14	80.40
	24 hour Avg.	92.66	66.30	46.12	144.51	115.11	104.64
Paonta Sahib (117) Y Point (Residential area)	24 Hour Std	100 µg/m³			200 µg/m³		
	6AM-2PM	43	88	113	159	222	181
	2PM-10PM	132	411	94	202	457	149
	10PM-6AM	136	182	156	190	245	205
	24 hour Avg.	104	227	121	184	308	178
Kala Amb (Trilokpur) (Residential area)	24 Hour Std	100 µg/m³			200 µg/m³		
	6AM-2PM	-	-	-	-	-	-
	2PM-10PM	142	223	187	210	294	252
	10PM-6AM	175	213	211	257	271	287
	24 hour Avg.	159	218	199	234	283	270
Barmana (AAQMS Station)	24 Hour Std	100 µg/m³			200 µg/m³		
	6AM-2PM	76.5	74.1	64.8	-	-	-
	2PM-10PM	139.6	170.3	121.6	-	-	-
	10PM-6AM	100.0	81.9	83.1	-	-	-
	24 hour Avg.	105.36	108.76	89.83	-	-	-

Table II – Data of SO₂ & NOx

Area and Location	Time of sampling	Date			Date		
		27.10.08	28.10.08	29.10.08	27.10.08	28.10.08	29.10.08
Shimla , Ridge (Sensitive area)	24 Hour Std	SO₂ in µg/m³ 30 µg/m³			NOx in µg/m³ 30 µg/m³		
	6AM-2PM	2.0	2.0	2.0	4.5	16.9	4.5
		2.0	4.4	2.0	4.5	15.1	4.5
	2PM-10PM	2.0	2.0	2.0	4.5	16.0	9.6
		2.0	4.9	2.0	14.6	12.8	4.5
	10PM-6AM	2.0	2.0	2.0	13.7	12.8	4.5
		2.0	2.0	2.0	23.8	13.3	4.5
24 hour Avg.	2.0 (BDL)	2.88 (BDL)	2.0 (BDL)	10.93	14.49	5.35 (BDL)	
Shimla, Bus Stand (Residential area)	24 Hour Std	80 µg/m³			80 µg/m³		
	6AM-2PM	2.0	9.2	2.0	21.0	16.0	4.5
		2.0	4.9	2.0	26.5	22.9	4.5
	2PM-10PM	5.3	2.0	2.0	15.5	26.0	4.5
		2.0	2.0	2.0	16.0	20.6	9.14
	10PM-6AM	2.0	2.0	2.0	14.6	26.5	4.5
		5.82	2.0	2.0	16.0	23.8	12.8
24 hour Avg.	3.18 (BDL)	3.69 (BDL)	2.0 (BDL)	18.25	22.64	6.65 (BDL)	
Parwanoo Sector 4 (Residential area)	24 Hour Std	80 µg/m³			80 µg/m³		
	6AM-2PM	5.67	6.8	2.0	4.5	16.09	12.68
		9.06	2.0	2.0	13.65	17.56	9.26
	2PM-10PM	5.08	9.63	2.0	10.24	21.46	11.22
		7.93	10.2	2.0	14.15	27.31	11.71
	10PM-6AM	6.23	5.67	2.0	12.68	22.93	11.70
		9.07	6.2	2.0	15.12	19.02	9.75
24 hour Avg.	7.17	6.75	2.0 (BDL)	12.43	20.73	11.21	
Jassur (Residential area)	24 Hour Std	80 µg/m³			80 µg/m³		
	6AM-2PM	2.0	2.0	2.0	13.11	12.11	24.67
		2.0	2.0	2.0	4.5	19.29	4.5
	2PM-10PM	2.0	2.0	2.0	4.5	15.70	4.5
		2.0	2.0	2.0	4.5	4.5	4.5
	10PM-6AM	2.0	6.6	5.5	4.5	13.01	4.5
		2.0	2.0	2.0	4.5	4.5	4.5
24 hour Avg.	2.0 (BDL)	2.77(BDL)	2.58 (BDL)	5.93 (BDL)	11.52	7.86 (BDL)	
Paonta Sahib (Residential area)	24 Hour Std	80 µg/m³			80 µg/m³		
	6AM-2PM	2.0	2.0	2.0	12.70	13.10	12.70
		2.0	2.0	2.0	13.10	13.61	13.10
	2PM-10PM	2.0	2.0	2.0	13.61	14.02	13.61
		2.0	2.0	2.0	14.02	16.76	14.02
	10PM-6AM	2.0	2.0	2.0	12.70	14.53	13.61
		2.0	2.0	2.0	12.19	13.61	12.70
24 hour Avg.	2.0 (BDL)	2.0 (BDL)	2.0 (BDL)	13.0	14.0	13.0	
Kala Amb (Residential area)	24 Hour Std	80 µg/m³			80 µg/m³		
	6AM-2PM	-	-	-	-	-	-
		-	-	-	-	-	-
	2PM-10PM	2.0	2.0	2.0	13.61	14.53	14.02
		2.0	2.0	2.0	14.02	15.44	14.93
	10PM-6AM	2.0	2.0	2.0	13.10	13.61	13.61
		2.0	2.0	2.0	12.70	13.10	13.10
24 hour Avg.	2.0 (BDL)	2.0 (BDL)	2.0 (BDL)	13.0	14.0	14.0	
Barmana (AAQMS Station)	24 Hour Std	80 µg/m³			80 µg/m³		
	6AM-2PM	2.0	2.0	2.0	-	-	-
		2.0	2.0	2.0	-	-	-
	2PM-10PM	6.0	4.5	7.3	-	-	-
		2.0	2.0	2.0	-	-	-
	10PM-6AM	2.0	2.0	2.0	-	-	-
		2.0	2.0	2.0	-	-	-
24 hour Avg.	2.66 (BDL)	2.45 (BDL)	2.88 (BDL)	-	-	-	

Table III – Data of Noise level

Area	Zone	location	Date					
			27.10.08	27.10.08	28.10.08	28.10.08	29.10.08	29.10.08
			Day	Night	Day	Night	Day	Night
			Noise level in dB(A) Leq		Noise level in dB(A) Leq		Noise level in dB(A) Leq	
Shimla	Commercial	Standard limit	65	55	65	55	65	55
		Ridge	53.8	46.2	62.9	55.9	56.3	44.2
Parwanoo	Residential	Standard limit	55	45	55	45	55	45
		Observed value	58.9	51.7	66.1	56.7	60.4	52.9
Bilaspur	Residential	Standard limit	55	45	55	45	55	45
		Observed value	50.6	34.6	58.0	35.5	52.9	31.7
	Commercial	Standard limit	65	55	65	55	65	55
		Observed value	62.5	37.9	66.3	40.1	51.7	33.6
	Silence Zone	Standard limit	50	40	50	40	50	40
		Observed value	43.06	28.75	45.0	34.0	46.6	28.9
Kullu	Commercial	Standard limit	6PM – 11PM		6PM – 11PM		6PM – 11PM	
			65	55	65	55	65	55
		Observed value	77.5		103.5		114.2	
Una	Residential	Standard limit	55	45	55	45	55	45
		Observed value	<50	<50	<50	<50	<50	<50

Findings of Ambient air quality monitoring are as per location are :

SHIMLA at RIDGE and BUS STAND

24 hour average RSPM concentration in Shimla at **Ridge** was observed with in the prescribed standards of 75 µg/m³ for 24 hour from 27.10.08 to 29.10.08. However concentration of SPM was observed above the prescribed standard of 100µg/m³ on the day after Diwali indicating the impact of fire crackers on the ambient air quality.

24 hour average RSPM and SPM concentration in Shimla at **Bus Stand** was observed with in the prescribed standards of 100µg/m³ and 200 µg/m³ during Diwali and after Diwali.

The concentration of the RSPM and SPM was more in the morning hours on Diwali day at Ridge and Bus Stand compared to previous day. The results of RSPM/SPM indicates that there was an impact on the ambient air quality due to bursting of fire crackers on Diwali festival.

The concentration of SO₂ and NO_x at Ridge and Bus stand was observed far below the prescribed standards of 30µg/m³ for Ridge and 80µg/m³ for Bus Stand. The concentration of SO₂ was below detection limit in the ambient air at both the location. However 24 hour avg. NO_x concentration 14.49µg/m³ at Ridge and 22.64µg/m³ at Bus Stand has been observed on the Diwali day and the concentration of NO_x decreased after Diwali day to the average of 5.35µg/m³ and 6.65µg/m³ at Ridge and Bus Stand respectively.

PARWANOO, SECTOR -4

24 hour average RSPM and SPM concentration at Parwanoo was observed above the prescribed standards of 100 µg/m³ and 200µg/m³ for 24 hour on Diwali day. The impact of bursting of crackers during Diwali (2PM-10PM) has been observed and RSPM and SPM was observed as 168.59µg/m³ and 285.52µg/m³ respectively. The impact of bursting of fire crackers on the ambient air quality was high during Diwali in comparison to the air quality on a day before Diwali.

During Diwali average concentration of NO_x observed as 20.73µg/m³ which was with in the prescribed standards of 80 µg/m³ and the concentration of NO_x decreased to 11.21µg/m³ on the next day. The Average Conc. of SO₂ was 6.75µg/m³ on Diwali day and after Diwali it was below detection limit.

JASSUR

24 hour average RSPM and SPM concentration at Jassur was observed with in the prescribed standards of 100 µg/m³ and 200µg/m³ for 24 hour respectively. No significant impact of bursting of fire crackers on the ambient air quality during Diwali was observed. The concentration of SO₂ and NO_x was observed well below the prescribed standard of 80µg/m³ respectively.

PAONTA SAHIB

24 hour average RSPM concentration at Paonta Sahib was observed above the prescribed standards of $100 \mu\text{g}/\text{m}^3$ for 24 hour during all the three monitoring days. RSPM was observed as $411 \mu\text{g}/\text{m}^3$ during Diwali (2PM – 10PM) clearly indicating high impact of bursting of crackers on the ambient air quality. SPM concentration was observed above the prescribed standards of $200 \mu\text{g}/\text{m}^3$ for 24 hour on Diwali day. The air quality improved on the next day after Diwali.

The concentration of SO_2 and NO_x was observed within the standards of $80 \mu\text{g}/\text{m}^3$ respectively. There was no significant variation in the concentration of NO_x during Diwali. The concentration of SO_2 was below detection limit in the ambient air.

KALA AMB

24 hour average RSPM and SPM concentration at Kala Amb was observed above the prescribed standards of $100 \mu\text{g}/\text{m}^3$ and $200 \mu\text{g}/\text{m}^3$ for 24 hour respectively during all the three monitoring days. 24 hour average RSPM was observed as $218 \mu\text{g}/\text{m}^3$ during Diwali in comparison to $159 \mu\text{g}/\text{m}^3$ on the previous day clearly indicating impact of bursting of crackers on the ambient air quality. There was slight improvement in the ambient air quality after Diwali. The concentration of SO_2 and NO_x was observed within the standards of $80 \mu\text{g}/\text{m}^3$ respectively. The concentration of SO_2 was observed below detection limit.

BARMANA

24 hour average RSPM concentration at Barmana was observed above the prescribed standards of $100 \mu\text{g}/\text{m}^3$ for 24 hour on the day before Diwali and on Diwali day. The impact of bursting of crackers during Diwali from 27.10.2008-29.10.2008 between 2PM-10PM with respect to Respirable Particulate Matter was observed as $139.6 \mu\text{g}/\text{m}^3$, $170.3 \mu\text{g}/\text{m}^3$ and $121.6 \mu\text{g}/\text{m}^3$ respectively. There was slight improvement in the ambient air quality after Diwali. The concentration of SO_2 was observed within the standards of $80 \mu\text{g}/\text{m}^3$ and was observed below detection limit.

Finding of Noise level monitoring

B) Ambient Noise Monitoring:

SHIMLA at Ridge

Ambient noise level was monitored at Ridge on 27.10.2008 to 29.10.08. The ambient noise level observed during day time for 27.10.2008, 28.10.2008 and 29.10.2008 as 53.8, 62.9 and 56.3 dB (A) respectively which was within the limit of **65 dB(A)** prescribed for day time (6.00AM to 10.00PM) for commercial area. The ambient noise level at night observed as 46.2, **55.9** and 44.2 dB(A) which exceeded the prescribed limit of **55 dB(A)** for night hours (10.00PM to 6.00AM) for commercial area on 28.10.2008. The impact of bursting of crackers on the ambient noise level can be seen as it exceeded the limit of **65 dB(A)** prescribed for day time between 5.00PM to 10.00PM during Diwali and exceeded the limit of **55 dB(A)** prescribed for night hours between 10.00PM to 12.00PM indicating that there was bursting of crackers even after 10.00PM on Diwali day. The maximum impact was observed between 9.00 PM to 10.00PM on 28.10.08 and noise level of **78.1 dB (A)** was observed during Diwali.

PARWANOO at Sector 4

Ambient noise level was monitored at Parwanoo on 27.10.08 to 29.10.08. The noise level exceeded the prescribed limit of **55 dB(A)** for day time in Residential area and **45 dB(A)** for night hours in residential area on all the monitoring days. The impact of bursting of crackers on the ambient noise level was observed as **66.05 dB(A)** during day time and **56.70 dB(A)** during night time respectively on Diwali day. However, as per data the impact of bursting of fire cracker was maximum between 8.00 PM to 9.00PM on 28.10.08 and noise level of **78.2 dB(A)** was observed during Diwali.

BILASPUR

Ambient noise level was monitored at Bilaspur on 27.10.08 to 29.10.08 in Residential, Commercial and Silence zone. The impact of bursting of crackers was observed on Diwali day as the ambient noise level was observed as **58.0 dB(A)** during day time in Residential area and **66.3 dB(A)** during day time in Commercial area which was above the prescribed limit of **55 dB(A)** and **65 dB(A)** respectively. However, As per data the impact of bursting of fire cracker was observed maximum between 7.00 PM to 10.00PM during Diwali.

KULLU

Ambient noise level was monitored at Kullu on 27.10.08 to 29.10.08 between 6PM to 11PM. The noise level exceeded the prescribed limit of **65 dB(A)** for day time prescribed for Commercial area. The impact of bursting of crackers was observed on Diwali day and day after Diwali as the ambient noise level was observed as **103.5 dB(A)** and **114.2 dB(A)** respectively.

UNA

Ambient noise level was monitored at Una on 27.10.08 to 29.10.08. The most of the values observed were below **50 dB(A)** except between 6PM-12AM where the instant values varied from **51.8 dB(A)–64.6 dB(A)** on 27.10.2008, **55 dB(A)–89 dB(A)** on 28.10.2008 and **55 dB(A) –75 dB(A)** observed on 29.10.2008.

CONCLUSION

The RSPM / SPM and noise level in the ambient air observed on the Diwali day was comparatively more than the values observed on the day prior to Diwali festival which indicates the impact of bursting of fire crackers on the ambient air quality and ambient noise. During Diwali the concentration of RSPM and SPM was observed exceeding the standard at Parwanoo, Paonta Sahib, Kala Amb and Barmana. The gaseous concentration of NO_x and SO₂ was observed within standard limit for all the monitoring stations. The noise level was also observed exceeding the prescribed limit at Parwanoo, Bilaspur, Kullu during Diwali. The values of RSPM and SPM during Diwali 2008 were observed less than the values observed during Diwali 2007 in all the monitoring stations except at Paonta Sahib (Graphs attached). The bursting of cracker release pollutant and generate noise in the ambient air which has adverse impact on the general health of the living beings. The increasing concentration of pollutant in the atmosphere during Diwali can affect the respiratory system of the human being and increasing level of noise causes irritation, hearing loss.

RECOMMENDATIONS:

- Noise level of the crackers to be checked before allowing to be sold.
- Noise Pollution (Regulation & Control) Rules, 2000 and other rules to curb the menace of noise notified by the State Govt vide. END(S&T)-A(3)1/2000 dated 1.5.01 and END(S&T)-A(3)1/2000 dated 31.10.03 are required to be implemented in letter & spirit and officers responsible under the said rules shall be made responsible to take action stop the violation of the standards.
- Noise level monitoring instruments shall be purchased by respective departments for their authorities/officers who are notified for the control of noise pollution for effective monitoring and implementation of the rules.
- A surveillance team constituting the officials from the police and other departments responsible as per said rules and notification shall be constituted for patrolling and compounding the offence on the eve of festivals like Diwali, Dusshera, State level fairs/functions etc. for maintaining the ambient air quality level.