

A study of ambient air quality and noise pollution in Nainital city

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Abstract

Nainital is a hill tourist place. It is famous for its natural beauty. Therefore, thousands of tourists from all over India and abroad come to visit this place. The environment of Nainital is fragile and sensitive, so it was intended to study the ambient air quality of the city. The present study includes the evaluation of ambient air quality and noise level. Ambient air monitoring has been conducted for suspended particulate matters, sulphur di-oxides and oxides of nitrogen at mall road (near Nagar Palika Library) and bus station (Tallital). The noise level monitoring was also conducted at different points of the city characterising commercial, residential area and silence zone. At other sites of silence zone, the values were usually beyond the prescribed limit. At all sites taken in commercial, areas, the values were beyond prescribed limit. The main sources of noise pollution in the city of Nainital is vehicular movements and the noise generated due to the use of horns of the vehicles. Similarly, the vehicular emissions are cause of air pollution. The SPM value at Nainital ranged from 88 to 366 $\mu\text{g}/\text{m}^3$, sulphur dioxide remained in the range of 10.2 to 25 $\mu\text{g}/\text{m}^3$ and NO_x ranged between 13 and 86 $\mu\text{g}/\text{m}^3$. The study revealed that the SPM and NO_x are beyond the limit prescribed for sensitive areas.

Keyword :- Ambient, Leq, L Avg, SPM and Silence Zone

Introduction

Nainital is the head quarter of Kumaon division and location of many academic institutions. It is located at 1938 meter above mean sea level in between 29° 24'N latitude and 79° 28'E longitude. It is a major tourist resort mainly due to its geographical location and natural beauty. In the heart of the city, Nainital lake further enhances the beauty of the place and therefore, thousands of tourists from far distances are attracted every year. Roadways bus stand and taxi stands are situated at Tallital from where only light vehicles like two wheelers and four wheelers (taxi,

car,jeeps) pass through the Mall road to Mallital. Mall road is the main road of the Nainital city where several shopping complexes and Hotels are situated. Within five kilometers radius, in a cup shaped valley, a number of renowned schools, university campus, courts, a Zoo, hospitals, offices and residential areas are situated on the hills around Nainital lake. All these activities alongwith heavy traffic increases the sound pressure level of the city to a great extent.

A number of studies on ambient Air quality and noise pollution have been performed at various cities in India (Pandey 1992, Shastry *et al.* 1996, Ram Chandran *et al.* 1997, Tondon and Pandey 1998 and Edison *et al.* 1999). However, no such study is available from important city like Nainital. Therefore, in order to fill in the gap of knowledge and providing valuable database for the city of Nainital, the present study has been performed from April, 2001 to June, 2001.

Material and methods

The present study includes :-

- (i) Monitoring of sound Pressure level at various place in Nainital city.
 - (ii) Monitoring of ambient air quality such as SPM, RSPM, SO₂ and NO_x at a number of place at Nainital city.
- 1)** Sound Pressure level was monitored during day time in "A" weightage using a sound pressure level meter, make Quest technology Model No. 1900 (U.S.A). It is highly sensitive instrument with computer added programmes. The values have been recorded in the form of LMax., L Min., L Avg. etc.

Noise level monitoring was conducted at different points of city characterizing as commercial, residential area and silence zone which cover following places.

(I) Commercial area

a) **Tallital Road ways bus stand** : Tallital is the place where Roadways bus stand and private taxi stand are located. For noise monitoring this place was selected to assess the exposure of traffic noise.

b) **Near Shalimar Hotel** : Most of the hotels of Nainital are located on the Mall road, the main road of the city. Shalimar hotel is one of them. Main sources of noise is vehicular movements on the Mall road.

c) **Near Jama Masjid** : Jama Masjid is situated at Mallital where noise is created due to vehicular movements and human activities.

d) **Mallital park** : It is situated behind the Naina Devi Temple, the Main temple of the Nainital city. Here, private buses, Taxies, Jeeps and two wheelers are parked.

(ii) Residential Area

(a) **Rajbhawan Campus** : Due to restricted number of visitors. It is supposed to be calm place. Its situation on hill top at height is also responsible for its being away from noisy activities.

(b) **Nainital Club** : A conference hall and a number of guest houses, flats and rooms are situated here. Owing to the human activities and vehicular movements, this place was selected for noise monitoring.

(c) **Aiyar Pata** : It is situated at height. However, the noise generated on the main road has its impact at this place.

(iii) Silence Zone

(a) **Nagar Palika Library Hall** : The library is located on Mall Road. This is characterized by the frequently use of horns by the vehicles moving on Mall road. This site was selected to assess the sound pressure level inside the reading hall of library.

(b) **Nagar Palika School** : This school is also situated on Mall Road. The noise here is generated mainly due to the vehicles.

(c) **Zoo** : The zoo is situated at height of above 2000 meter from mean sea level on top of hills towards Mall road. It is the most important tourist site.

In Nainital city, the main sources of Air Pollution is vehicular emissions and DJ Sets. Ambient air monitoring was conducted in front of Nagar Palika Library on Mall road and Tallital Bus/Taxi stand during day time for suspended particulate matter, Respirable suspended particulate matter, SO₂ and Oxides of nitrogen (NO_x) using a high volume sampler (Model 415) and Respirable dust sampler (Model 451) Envirotech make. Eight hourly samples for SPM, RSPM were collected using Glass fibre filter papers. Four hourly gaseous samples for SO₂ and NO_x were also collected using absorbing media TCM (Tetra Chloro Mercurate) for SO₂ and 0.1 N NaOH for NO_x. However, monitoring and analysis work was done as per methods of Central Pollution Control Board, New Delhi.

Results and Discussion

The ambient air quality standards with reference to noise and air set by Central pollution Control Board for different areas are given in Table-1. The ambient air quality data are presented in Table-2. The Sound pressure level values are given in Table-3.

During the monitoring period the values of SPM ranged from 88 to 366 $\mu\text{g}/\text{m}^3$. RSPM observed between 66 to 106 $\mu\text{g}/\text{m}^3$, Sulphur Dioxide (SO_2) varied between 10.2 to 25 $\mu\text{g}/\text{m}^3$ and Oxides of Nitrogen (NO_x) ranged between 13 to 86 $\mu\text{g}/\text{m}^3$. Higher values of SPM (366) and NO_x (86) were found during summer season. This may be attributed to the influx of tourists from far distances. Traditionally owing to the cold climate of the city the maximum number of visitors are attracted during summer months.

The table-2 shows that the SPM values were usually higher at Tallital. This may be due to maximum number of vehicles at this site. As per data of sound pressure level given in Table-3.

The sound pressure level in the Nainital city ranged between 31.6 dB (A) leq. at Rajbhawan Campus and 88.0 dB(A) leq. near Shalimar Hotel. Slightly higher values of average Noise level have been recorded as 90 dB (A) in New Delhi and 95 dB (A) in Bombay (Singh, 1984).

Environment Protection Act (1986) defines the silence zone as an area of 100 meter around hospitals, educational institutions, Courts, and eminent temples. However, in the present study, the zoo has been treated as a silence zone because the birds and wild animals are very sensitive to the noise. Many birds, for example leave the place when it becomes too noisy. There is a decrease in migratory birds to a place if it is subject to noise (Kudesia and Tiwari, 1994).

As far as the silence zone is concerned the sound pressure level was recorded as 65.5 dB(A) leq. near Nagar Palika Nursery School, 57.8 dB (A) leq. at B.D. Pandey Hospital premises, 52.1 dB(A) leq. at zoo. Inside the Nagar Palika Library hall SPL ranged 41.7 to 76 dB(A) and average value obtained 56.2 dB(A) leq. Noise level in hospitals has been reported to range from 50 to 75 dB(A) by Singhal (2000). All the values are above the limit of 50dB(A) leq. prescribed as silence zone.

Nagar Palika School is just close to the Mall road and exposed to the incessant noise generated by movement of the vehicles and use of pressure horns. The patients of B.D. Pandey Hospital are also bound to tolerate the higher level of noise. The hospital is also close to the road. Slightly lower values of SPL at zoo may be attributed to its situation and location at high altitude at the top of the hill. It is away from the main road and devoid of rush.

Ambient Air Quality

In Rajbhawan Campus, during the study the SPL values ranged between 31.6 to 78.9 dB(A) leq. The average of SPL values was obtained 50.3 dB(A) Leq. which is well within the limit prescribed for residential area. However, the values were usually higher 75.8 dB(A) Leq. at Nainital Club, the low value of SPL at Rajbhawan may be attributed to its situation/location and thick green belt cover around it. Restricted number of vehicles pass through this area. On the contrary the higher values at Nainital club are due to vehicular movement, use of pressure of horns and human activities.

At Tallital Bus stand, the SPL varied from a minimum 65.0 dB(A) to maximum 81.0 dB, the average value of the SPL was recorded as 70.6 dB(A) leq. At another commercial area near Shalimar Hotel, the values of SPL ranged from 45.3 to 88.0 dB(A). The average values obtained near Jama Masjid and Mallital park are 70.1 dB(A), and 80.4 dB(A) respectively. Sound pressure level at the residence of Mr. P. Pandey, Ayaar Pata observed 48.1 to 77.9 and average value was found as 55.6 which is slightly higher as compared to standard prescribed for residential area.

At all the selected sampling points, the average obtained at commercial & residential area values are beyond the limit of 65.0 dB(A) leq. prescribed for commercial area and 55 dB(A) leq. prescribed for residential area respectively.

Blowing of pressure horns, movement of vehicles and human activities are responsible for the higher level SPL values at all the sites. The persons exposed to this level of noise pollution for long time may suffer the menace of noise pollution. It is obvious that the shop owners, office bearers and a number of workers stay there for very long period.

Rajbhawan and Zoo area may be assumed as the safe place as far as noise pollution is concerned. Hospital, School and Library like sensitive areas are subject to higher level of noise pollution.

Conclusion

Blowing of pressure horns, movement of unmaintained vehicles and DJ Sets are the main reasons for high noise level in Nainital city. Consequently, the patients in Hospitals and students in School/Colleges, Office bearers and shop owners are exposed to very high noise level. This will cause adverse health effects on patients and or aggravate their illness in Hospitals and students in school/colleges will also be distracted from these high noise levels. Residential areas are not exceptional from the exposure to high noise levels. Thus, it is the duty of authorities to take the following necessary action to prevent this important city from the menace noise and air pollution.

1. Strict enforcement to ban the use of air horns inside the town.
2. Restrict the movement of vehicles inside the city of Nainital.
3. Prevent use of loudspeaker and bursting crackers.
4. DJ Sets should be provided with acoustic enclosures.
5. Use of loudspeakers on various occasions may be banned.

Table 1: The ambient air quality standards with reference to Noise and air

Standard in respect of Noise				Standards in respect of ambient air quality					
S.No.	Category of Area	Limits in dB(A) Leq.		S.No.	Category of Area	Parameters unit in mg/m ³			
		Day time	Night Time			SPM	RSPM	SO ₂	NO _x
1.	Industrial Area	75	70	1.	Industrial Area	500	150	120	120
2.	Commercial Area	65	55	2.	Residential Area	200	100	80	80
3.	Residential Area	55	45	3.	Sensitive Area	100	75	30	30
4.	Silence Zone	50	40						

- Note:** (a) Day time is reckoned from 6 A.M. to 9 P.M.
- (b) Night time is reckoned from 9 P.M. to 6 A.M.
- (c) Silence zone is defined as areas upto 100 meters around premises as hospitals , Educational institutions , courts and eminent temples . Use of Vehicular horns, loudspeakers and bursting of crackers shall be banned in these zones

Table 2: Ambient air quality data at Nainital City

S.No.	Station	Month	SPM	RPM	SO ₂	NO _x
1.	Tallital Bus Stand	April-2001	188	85	17	27
		May-2001	290	106	23	42
		June-2001	366	96	25	86
2.	Nagar Palika Library	April-2001	88	66	10.2	13
		May-2001	224	72	13	32
		June-2001	206	92	20	42

NOTE:- All values are in $\mu\text{g}/\text{m}^3$
 RPM - Respirable Particulate Matter (<10 μm size)

Table 3: Values of Sound pressure level at different places in the city of Nainital

S.No.	Sampling site	Category	Sound Pressure level dB(A) Leq.		
			L min.	L.Max.	L.Avg.
1.	Mall road- Hotel Shalimar	C	45.3	88.0	69.6
2.	Inside library hall (Nagar Palika library)	S	41.7	76.0	56.1
3.	Jama Masjid	C	50.5	85.8	70.1
4.	Mallital Parks	C	63.7	98.0	80.4
5.	Bus Stand-Tallital	C	65.0	81.0	70.6
6.	Nainital club	R	44.7	100.0	75.8
7.	Nagar Palika-Nursery School	S	52.6	76.4	65.5
8.	Rajbhawan	R	31.6	78.9	50.3
9.	Zoo-Inside the Zoo	S	37.2	68.1	48.3
10.	Zoo-at main gate	S	33.2	69.4	52.1
11.	B.D.Pandey hospital	S	50.1	98.2	57.8
12.	Ayar Pata- P.pandey	R	48.1	77.9	55.6

Note :- C-commercial area
R- Residential area
S- Silence Zone

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