ASSESSMENT AND IMPACT OF INDOOR NOISE POLLUTION

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ABSTRACT

The menace of Noise pollution is growing in the city day by day due to increase in population, rapid industrialisation, urbanization, commercialization and phenomenal growth in automobiles. Noise pollution in the recent times has been recognised as one of the major trepidations that impact the quality of life in urban areas across the globe. Noise can cause annoyance and aggression, hypertension, high stress levels, tinnitus hearing loss, sleep disturbances and other effects. Furthermore, stress and hypertension, are the leading causes of health problems, whereas tinnitus can lead to forgetfulness, severe depression and at times panic attacks. High noise can contribute to cardiovascular effects. This study evaluates the assessment of pollution indices for indoor noise caused due to outdoor sources in Educational institutions.

Keywords: Indoor Noise Measurement, Noise Assessment, Noise Pollution Indices, Noise Standards.

I INTRODUCTION

Noise when exceeds the recommended level becomes pollution. It has auditory effects and non-auditory effects, causing fatigue, deafness if exposed for a long period, may cause noise interference with communication between 300-500 Hz frequencies which comes out generally with vehicular horns etc., also results in psychological changes, and mental disturbances, irritation etc., it is also increasingly understood as being limited to material pollution. Noise is an inescapable by-product of industrial environment. Even in non-industrial areas, noise from such activities as printing, auto repairs, grinding, affects those living in immediate surroundings.[3]

Man lives in the indoor atmosphere for most time of his life, it may be his home, office, school/colleges, restaurant, cinema halls, malls and many others. The lower noise than limits may not be assured in these indoor elements due to various outdoor and indoor noises.[5]

With growing urbanization related to the enormous growth in transportation and the increased use of new,larger,and more powerful machines everywhere, noise has become and an unavoidable by-product of our mechanized life and a serious hazard to our health. In the past few decades the overall noise levels in the indoor atmosphere across the world has doubled.

It is observed that the problem of indoor noise, is more complex in nature that the outdoor one and hence the abatement and management methods are different. In contrast to many other environmental problems, Noise

pollution continues to grow and it is accompanied by an increasing number of complaints from people exposed to the noise.

The growth in noise pollution is unsustainable because it involves direct, as well as cumulative, adverse health effects. It also adversely affects future generation, and has socio-cultural, esthetic and economic effects.[1]Educational institutions where silence is the prime concern for concentration in studies.[9]

The permissible limits of noise levels for different urban areas prescribed by The Noise Pollution (Regulation and control) Rules, 2000 are given in the Table 1.

Table 1: Noise Pollution (Regulation and Control) Rules, 2000

Sr. No.	Category of Area	Limits in dB (A), L_{eq}	
		Day time	Night time
1	Industrial area	75	70
2	Commercial area	65	55
3	Residential area	55	45
4	Silence zone	50	40

Note:

1. Day time is reckoned from 6 A.M. To 10 P.M.

2. Night time is reckoned from 10 P.M. and 6 A.M.

II NOISE LEVEL MEASUREMENT

In acoustics, the logarithm of sound pressure relative to a reference sound pressure is used as a basis for a sound (and noise) exposure measure the physical quantity sound pressure level expressed in decibel (dB).[8]

In most cases, the sound and noise we hear are not steady. Apart from variation in tones, the magnitude or the sound pressure level of a sound or noise changes with time. The equivalent continuous noise level (Leq) is the sound pressure level of a steady sound that has, over a given period, the same energy as fluctuating sound in question.

It was calculated using following equation

$$L_{eq,T} = 10\log\left(\frac{1}{n}\sum_{i=1}^{n} 10^{\frac{L_i}{10}}\right)$$

Where, L_i = levels observed at 'n' equally spaced times during interval T.

A single noise event is characterized by its sound exposure level. The sound exposure level (SEL) of a noise event, such as the over- flight of an airplane or the passage of a truck, is the equivalent sound level during the event normalized to a period of 1 sec.[8]

In the present study, hourly and day wise Leq has been calculated to compare the results obtained from various locations.

III MATERIALS AND METHODS

The noise pollution monitoring was carried out at seven locations. Noise level measurement was done for every 30 min time interval from 10:00 hrs. to 17:00 hrs. The noise measurements were made at the fast response mode keeping in view the quickly changing nature of noise levels. All themeasurements were done using recalibrated Sound Level Meters (Type II).

3.1Sound level meter

Generally 'Sound Level Meter' is an instrument used for measurement of sound (noise). This instrument measures the sound in approximately same way as human ear perceives it, i.e. in terms of pressure difference.

The sound level meter normally comprise of a microphone, preamplifier, an input amplifier and attenuator weighting networks, an output amplifier and an indicating devices.

Some sound level meters measures the noise as linear Sound Pressure Level (SPL), while some directly as noise equivalent level (L_{eq}). The instrument used for this survey directly measured the sound in terms of L_{eq}.

3.2 Field Measurements

The monitoring was carried out in The Indoor atmosphereof VJTI College at the following places.

1) College Office
2) Class Room
3) Hostel Room
4) Library
5) Laboratory

IV RESULTS AND DISCUSSION

The noise monitoring data was collected in real times. No frequency analysis was done at this point. The parameters which were recorded during the noise monitoring are SPL, Leq, SEL, maxL, minL. These values so obtained are plotted against time on X- axis ie Time vs. dB. The graphs so obtained give the intensity of parameters, which were generally on higher side of guide lines values.

In office area, there was no noise source, but it was a visitor's area. The noise level was found to be 65.6 dB which was more than the guideline value.

The guideline value for the classroom, which comes under the silent zones, is 50 dB Leq daytime by the Noise Pollution (Regulation and control) Rules, 2000 of Government of India. As per WHO guidelines, it should be below 35 dB during the classes but the actual value found at the location was 64.2 dB daytime.

In Hostel rooms, the noise source was road traffic, 15 m away from the façade of the hostel building. The passing vehicles honk horns, breaking noise along with the acceleration of the different vehicles. The noise level was found to be 60.3 dB therefore there was no violation of the limit.

The guidelines value for the Library is same as that of above stated indoor atmosphere. The actual value was 65.6 dB daytime.

In Laboratory, the outdoor source is ground floor canteen where related activities were going on from morning to evening. Also the quadrangle where students often gather during college time. The actual value recorded was 64.2 dB which was more than 50 dB.

The Noise pollution law states that, if Leq value rises above the stipulated value by difference of more than 10 dB, it shall be considered as the violation of norms.

Table 1:Noise level in College Office

	College Office					
Sr.No	Time Interval (min)	SPL	Leq	SEL	Lmax	Lmin
1	10	69.7	63.1	89.5	80.1	53.1
2	10.3	66.1	62.5	92.6	80.1	53.1
3	11	62.5	63.9	98.3	81.3	53.1
4	11.3	69.7	64.2	100.7	88.3	53.1
5	12	71.9	64.5	102.5	88.3	53.1
6	12.3	62.7	64.5	103.5	88.3	53.1
7	1	60.4	64.7	104.7	88.3	53.1
8	2	60.9	66.6	94.6	84.6	55.4
9	2.3	70.5	67.8	99.2	84.6	54.9
10	3	62.5	66.7	101.5	89.7	54.3
11	3.3	58.3	66	102.5	89.7	54
12	4	57.8	65.4	103.4	89.7	53.9
13	4.3	57.2	65.9	105.3	89.7	53.8
14	5	58.1	65.5	105.5	89.7	53.7

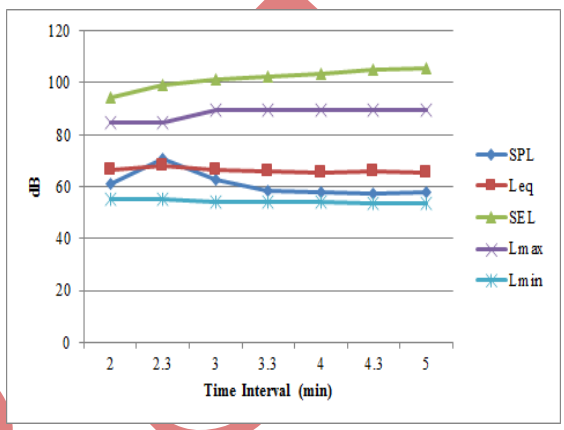

Fig: 2: Noise level variation in College Office

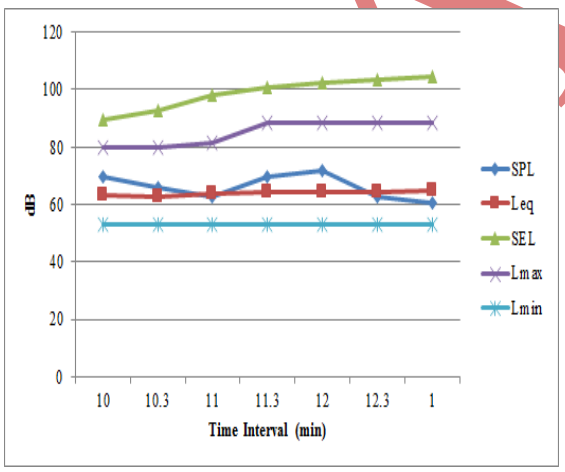

Fig: 1: Noise level variation in College Office

Table 2: Noise level in Class Room

	Class Room					
Sr.No	Time Interval (min)	SPL	Leq	SEL	Lmax	Lmin
1	10					
2	10.3	52.7	57	89.4	79.3	48.1
3	11	54.2	56.2	91.6	79.3	47.1
4	11.3	50.6	55.4	92.6	79.3	47.1
5	12	53.1	57.2	95.7	94.2	46.6
6	12.3	63.7	56.9	96.3	94.2	46.6
7	1	58	57.4	97.4	94.2	46.6
8	2	55.7	57.9	72.2	67.6	50.3
9	2.3	53.1	60.8	93.1	78.3	49.4
10	3	54.6	61.5	96.8	80.3	49.4
11	3.3	61.5	61.9	99.1	82.8	49.4
12	4	60.1	61.5	99.9	82.8	49.4
13	4.3	63	61.8	101.2	82.8	49.4
14	5	54.8	62.4	102.1	82.8	49.4

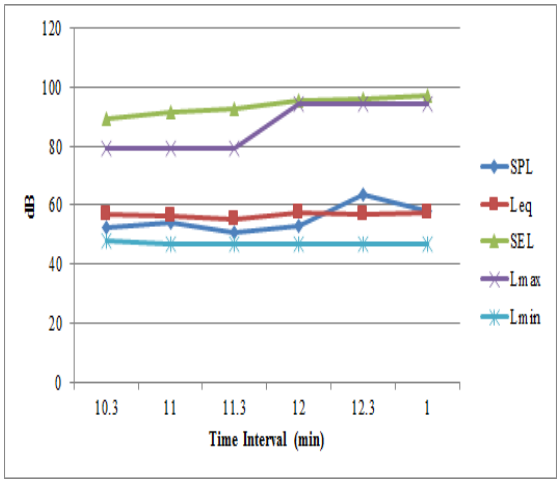

Fig. 3: Noise level variation in Class Room

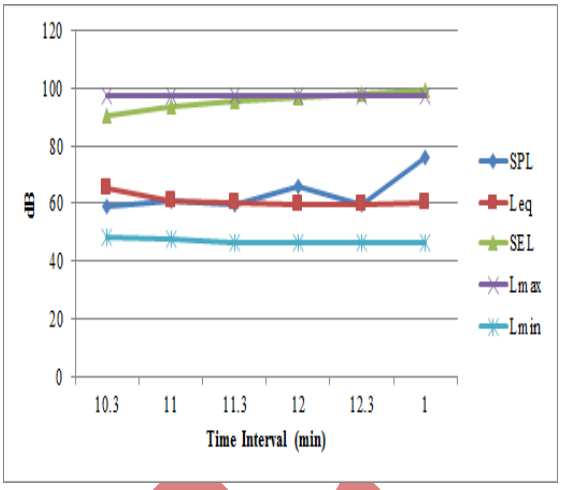

Fig. 5: Noise level variation in Hostel Room

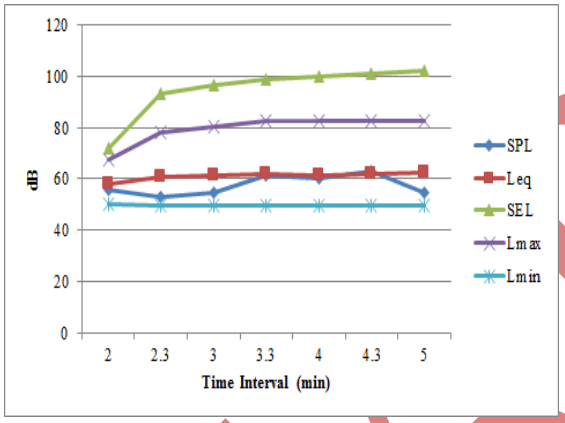

Fig. 4: Noise level variation in Class Room

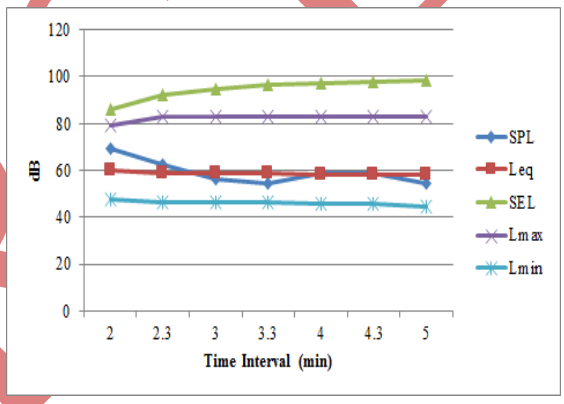

Fig. 6: Noise level variation in Hostel Room

Table 4: Pollution Indices in Hostel Room

	Hostel Room					
Sr.No	Time Interval (min)	SPL	Leq	SEL	Lmax	Lmin
1	10.3	58.8	65.1	90.7	97.3	48.1
2	11	60.9	61	93.6	97.3	47.6
3	11.3	59.4	60.1	95.6	97.3	46.6
4	12	65.7	59.8	97.1	97.3	46.6
5	12.3	59.9	59.7	98.3	97.3	46.6
6	1	76.3	60.3	99.6	97.3	46.6
7	2	69.4	59.7	86.3	78.9	47.8
8	2.3	62.3	59	92.1	83.1	46.5
9	3	56.5	58.7	94.5	83.1	46.3
10	3.3	54.3	58.5	96.4	83.1	46.3
11	4	58.7	58.4	97	83.1	45.9
12	4.3	58.8	58.4	98.1	83.1	45.9
13	5	54.5	58.3	98.7	83.1	44.2

Table 5: Noise levels in Library

	Library					
Sr.No	Time Interval (min)	SPL	Leq	SEL	Lmax	Lmin
1	10	58.2	60.7	86.5	91	48.7
2	10.3	59	60.8	91	91	48
3	11	60.6	65.2	99.7	91	48
4	11.3	64.3	65.1	101.6	91	48
5	12	70.7	65.7	103.6	91	48
6	12.3	60.8	65.6	104.5	91	48
7	1	65.1	65.6	105.5	91	48
8	2	60.4	61.5	89.1	85.4	50
9	2.3	66	61.4	90.6	85.4	50
10	3	65	63.9	98.3	87.1	50
11	3.3	70.3	64.4	100.6	92.4	50
12	4	63.9	64.3	102.1	92.4	50
13	4.3	60.6	64.7	102.8	92.4	50
14	5	56.1	64.4	104.1	92.4	50

Table 6: Noise levelsin Laboratory

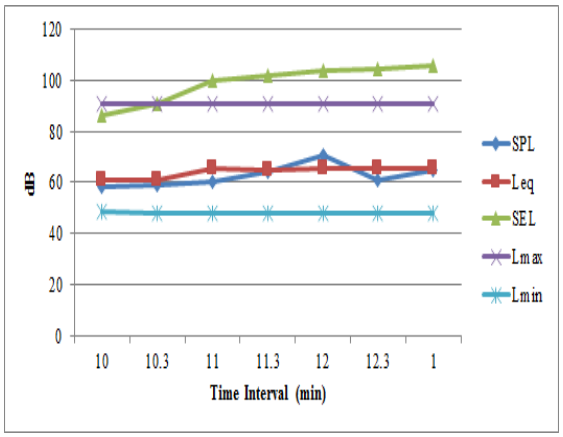

Fig.7: Noise level variation in Library

	Hospital Laboratory					
Sr.No	Time Interval (min)	SPL	Leq	SEL	Lmax	Lmin
1	10.3	64	64.7	87.6	84.9	57.9
2	11	62.2	63.6	93.6	84.9	57.8
3	11.3	59.5	63.4	97.7	84.9	57.3
4	12	63.1	63.5	100.1	85.4	56
5	12.3	60.8	63.2	101.1	88.4	55.6
6	1	64.9	63	102	92.3	55.5
7	1.3	58.2	62.8	102.8	92.3	55.4
8	2	59.8	62.8	103	92.3	55
9	2.3	62	65.5	83.9	80.1	59.9
10	3	68.7	63.2	95.3	85	59.9
11	3.3	58.7	62.8	98.1	88.4	57.1
12	4	79.3	67.5	104.4	99.9	57.1

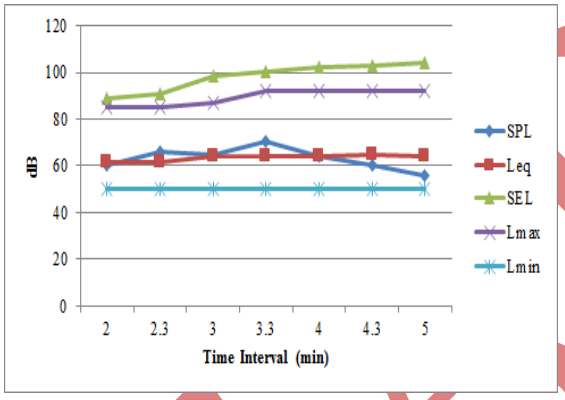

Fig. 8: Noise level variation in Library

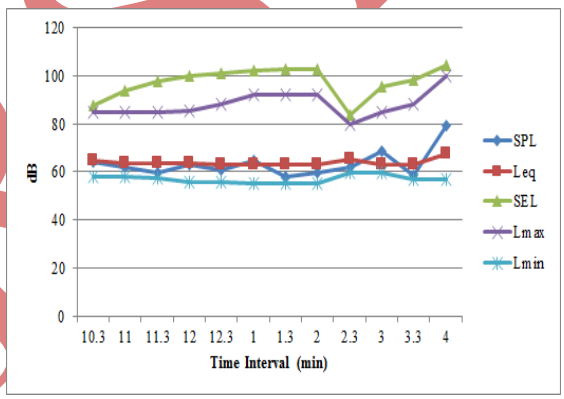

Fig 9: Noiselevel variation in Laboratory

V CONCLUSION

Noise is complicated affair and indoor noise is intricate derivative of noise. Sometimes noise reduction measures do not require a single approach to be used. The analyses revealed that the noise level in college premises was high during working hours in day time.

Following noise control approaches should be adopted.

a) Measures to limit the noise at the source.

b) Noise control within the sound transmission path.

c) Protection at the receiver's site.

d) Land use planning.

d) Public awareness

e) Acoustic treatment.

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