

A Study of noise pollution at the campus of Madan Mohan Malaviya University of Technology Gorakhpur, Uttar Pradesh (India)

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Abstract- Noise Pollution leads to the lack of concentration of people, as a result, they will be spending longer time for completing the work than that which would be done in a quiet environment, and In addition they feel more tired in the noisy area. This study was carried out at the Madan Mohan Malaviya University of Technology, Gorakhpur (UP) India to show the level of noise pollution in this educational area, by using a Noise Level Meter with a range of 40.2-90.0 dB(A). The areas chosen for the study were 6 in numbers these areas cover most portion of the university including four corners of the university campus. The source of most of the noises was traffic noise due to state highway no. 1 nearby the campus, crowding and gathering of students both inside the buildings of the colleges (corridors) and in the field of the campus of the university, even after many of them having finished their classes and duties in their colleges.

Keywords- Noise pollution, Equivalent noise level, Traffic noise, Site, Silent zone.

1. Introduction

The word "noise" is derived from the Latin word "nausea" meaning seasickness. Noise, defined as unwanted or excessive sound, is an undesirable by-product of our modern way of life. Noise can be defined as "disagreeable or undesired sound" or other disturbance. From the acoustics point of view, sound and noise constitute the same phenomenon of atmospheric pressure fluctuations about the mean atmospheric pressure, the differentiation is greatly subjective. What is considered a sound by somebody can be considered a noise by another person. In common use, the word noise means any unwanted sound in both analog and digital electronics; noise is unwanted perturbation to a wanted signal. Noise can block, distort or interfere with the meaning of a message in human, animal and electronic communication. We experience noise in a number of ways. On some occasions, we can be both the cause and the victim of noise, such as when we are

operating noisy appliances or equipment. There are also instances when we experience noise generated by others just as people experience second-hand smoke. While in both instances, noises are equally damaging. Second-hand noise is more troubling because it has negative impacts on us but is put into the environment by others, without our consent. The air into which second-hand noise is emitted and on which it travels is common, for all people. It belongs to no one person or group, but to everyone. The recognition of noise as a serious health hazard is the result of development of the modern era. Modern industry and multitude of sources have accelerated noise-induced hearing loss. Amplified music also has its contribution to noise in modern life. While amplified music may be considered as sound (not noise) and even may give pleasure to many people, but considered as excessive noise by others (Lawrence *et al.*, 2005).

Noises health effects are the health consequences of elevated sound levels. Elevated noise can cause hearing impairment, hypertension, heart disease, annoyance and sleep disturbance. Changes in the immune system and birth defects have been attributed to noise exposure but evidence is limited. Elevated noise levels can create stress, increase workplace accident rates, and stimulate aggression and other anti-social behavior. It is clear that noise is not the only industrial hazard to hearing, exposure to certain chemicals such as toluene and trichloroethylene can produce hearing loss, also the reactions to certain drugs. Most importantly is the interaction between noise and chemicals may produce more hearing loss than expected by either one alone, i.e. the two factors act synergistically in causing the damage

Types of noise

Noise may be classified according to the way they vary with time into:

1. Steady noise

Steady noise is a noise with negligibly small fluctuation of sound pressure level within the period of observation; it is

a constant continuous sound, Example, Pumps and Electric motor.

2. Non-Steady noise

A noise is called non-steady when its sound pressure levels shifts during the period of observation. This type of noise can be divided into:

a. Intermittent noise, which is characterized by a constant but intermittent sound, example, Air compressor and Automatic machinery during a work cycle.

b. Fluctuating noise, which is characterized by one or two single frequencies, fluctuating noise may consists of:
 *Periodically Fluctuating Pulses ex: Surface grinding
 *Non-periodically repeated impulses ex: Manual work
 *Single impulse ex: Hammer blow and
 *Repeated impulses like Automatic press.

2. Materials and method

2.1 Study area

The present district of Gorakhpur, 265 km east of capital Luck now, on National Highway -28, lies between at 26°132N and 27°292 N and Long. 83°052 E and 83°562 E situated on the basin of rivers Rapti and Rohini; the geographical shape of the Gorakhpur city is of bowl. The University is located on Gorakhpur - Deoria road, about 9 Kilometers from Gorakhpur Railway Station as well as from main Gorakhpur Roadways bus-station. For the present study six locations were selected taking into account its different activities like academic, office, civic amenities (Banking and Medical), and residential. The study area selected is such that it includes all the four corners of the university which are as follows.

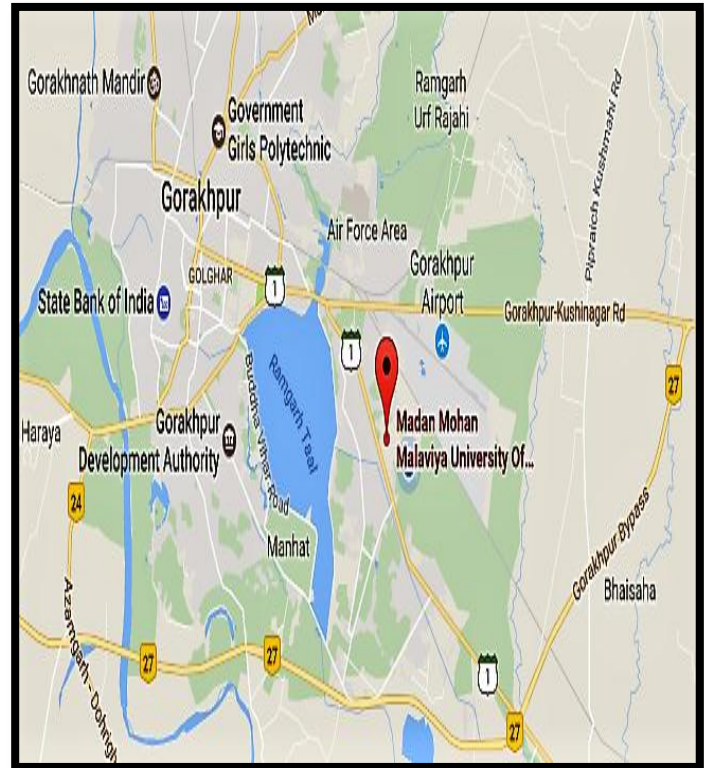


Figure 1: Map of Gorakhpur showing MMMUT campus location (Source: Google map)

Table 1: Name of locations

| S. NO. | Name of the location |
|--------|------------------------|
| 1 | Ambedkar bhavan hostel |
| 2 | Raman hostel area |
| 3 | Faculty colony |
| 4 | College gate |
| 5 | Academic Block |
| 6 | Workshop |

2.2 Instrument

Noise level is being measured by a digital electronic instrument called Noise Level meter (Make Bruel and Kjaer, Denmark 2232). Type 2232 is an instrument for making community noise surveys and less demanding acoustic measurements the meter is robust, compact and lightweight (460 g), and is suitable for environmental health inspectors and other personnel concerned with maintaining acceptable noise levels in industrial and residential locations. Its basic parts include a microphone, amplifier, weighting network and a display reading in decibel (1/10th part of “bel”, unit of sound). The reading was taken in such a way that following two conditions should be fulfilled.

1. Instrument was 1.2 to 1.5merte above the ground level.
2. Instrument was 1metre away from chest



Figure 2: Noise level meter (Brüel and Kjaer, Denmark 2232)

The present study is carried out on different week’s days in month of December 2016. Timing of taking the reading is such that whole day timing is covered including morning, afternoon and the evening time too, 9-10 A.M.,11-12 P.M.,1-2P.M., 3-4P.M., 5-6P.M., 7-8P.M.,and 9-10P.M. the reading is taken for the duration of 5minutes with interval of 15seconds all the location selected.

2.3 Noise Indices

The parameters used to evaluate and analysis of noise levels are equivalent sound pressure level (Leq), Noise climate (NC) and Noise pollution level (Lnp). The equivalent sound pressure (Leq) level has been used most widely to measure the noise level which represents the continuous noise level that would have produced the same effects as the varying sound. Noise climate (NC) shows the

fluctuation of vehicles depicted in dB (A) and noise pollution (Lnp) indicates the noise pollution level, represents short tern variation of (Leq). The variations of noise levels in the present study are assessed from the statistical distribution of noise levels in the environment. The Sound levels exceeding 10%, 50% and 90% of the total time intervals during a particular period are designated as L₁₀, L₅₀, and L₉₀ respectively. These noise measures are defined as

Equivalent sound level is given by

$$Leq = 10 \times \text{Log} \sum_{i=1}^n 10^{Li} / 10 \times ti$$

Where Li is ithsound pressure level

Or $Leq = L_{50} + ((L_{10} - L_{90})^2 \div 60)$
 Noise pollution level, $Lnp = Leq + (L_{10} - L_{90})$
 Noise Climate, $NC = (L_{10} - L_{90})$

3. Result and discussion

The present study shows that each and every sampling site are facing noise level more than the prescribed limit suggested by central pollution control board, India (CPCB) for the prescribed area category as shown in table 2. Being an educational institution Madan Mohan Malaviya University falls under the silence zone and the permissible noise limits for this category zone are maximum 50dB(A) during day time(6am-10pm) and maximum 40dB(A) during night time(10pm-6am).

Table 2: Noise standards as given by the Central Pollution Control Board, India (CPCB, 1998)

| ZONE CODE | ZONE NAME | LIMIT IN dB(A)Leq | |
|-----------|-------------|-------------------|------------|
| | | DAY TIME | NIGHT TIME |
| A | INDUSTRIAL | 75 | 70 |
| B | COMMERCIAL | 65 | 55 |
| C | RESIDENTIAL | 55 | 45 |
| D | SILENT | 50 | 40 |

- Ambedkar bhavan hostel is most far location from the point of view of traffic noise because UP SH 1 (Gorakhpur-Deoria highway) is approximately 2km from it so major source of noise is noise from nearby colonies located outside the campus, construction noise. In morning time the noise level is within the permissible limit but in evening time it slightly crosses the permissible limit given by CPCB as shown in chart 1.

- Raman hostel area is within the permissible limit in morning as well as afternoon time but the noise level in evening time is exceeded from CPCB limit and the major factor of this is playground nearby this hostel, students from different hostels used to gather here to play in evening as shown in chart 2.
- Faculty colony is noisy in morning and afternoon time but quite in evening, noise level is exceeded in morning and afternoon but in evening time it is within the permissible limit given by CPCB as shown in chart 3.
- College gate is noisiest area of the campus and the major reason is traffic noise due to state highway adjacent to it, it exceeds the permissible noise as shown in chart 4.
- Academic block exceeds the permissible limit just in morning 9-10 A.M. due to rush of the students in morning time after that it is the quietest location as shown in chart 5.
- Workshop always exceeds the permissible limit of noise given by CPCB except in afternoon 1-2 P.M. because it is the lunch time and minimum noise is produced during this time as shown in chart 6.

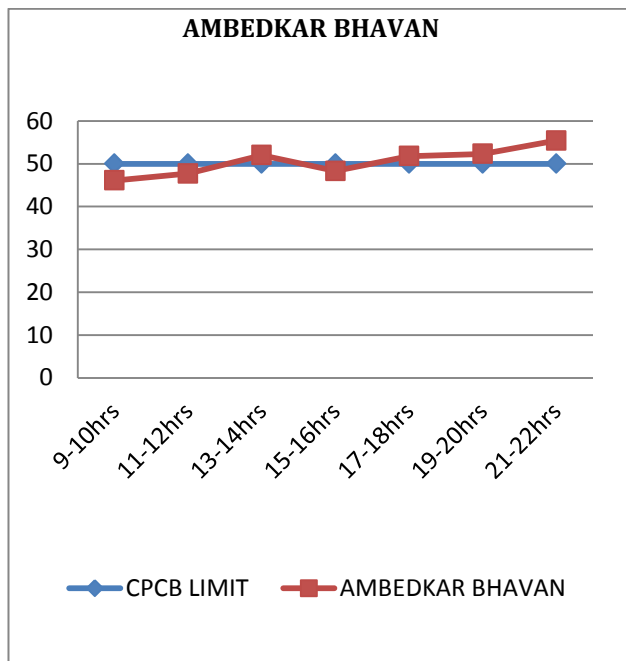


Chart 1: Noise level of Ambedkar Bhavan

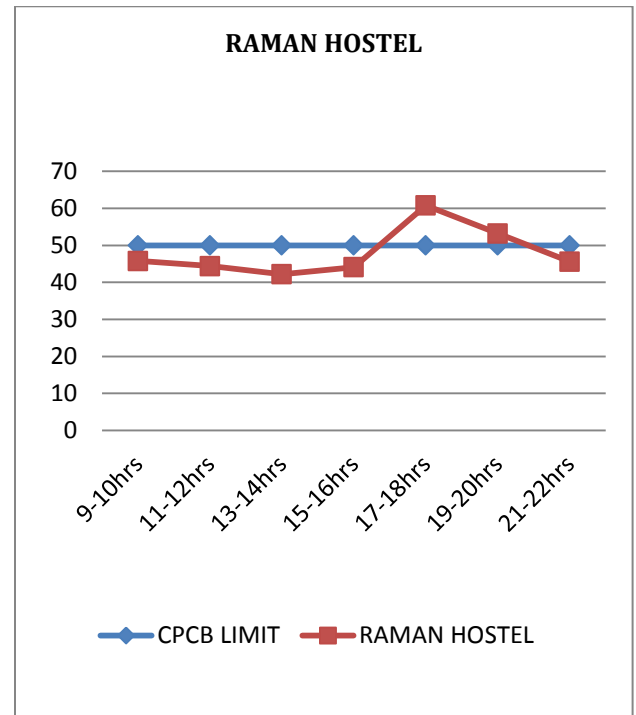


Chart 2: Noise level of Raman hostel

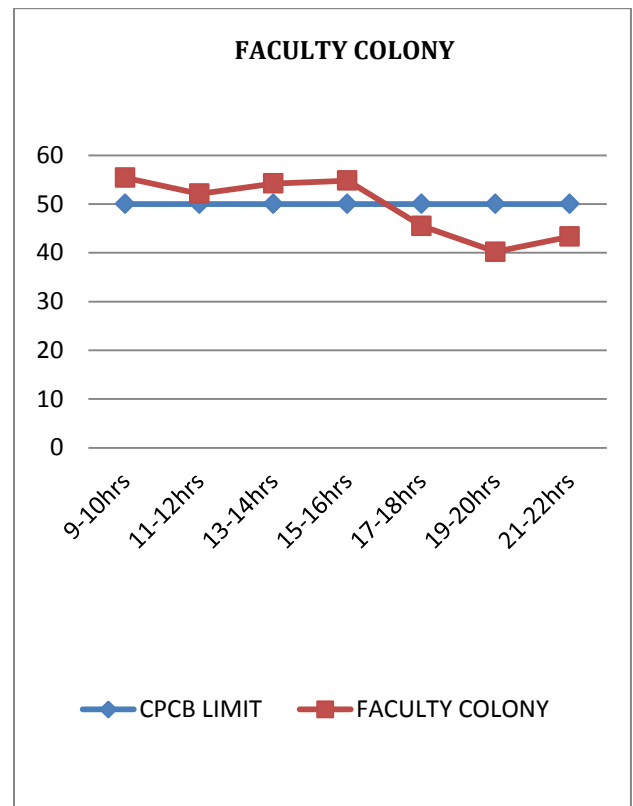


Chart 3: Noise level of Faculty colony

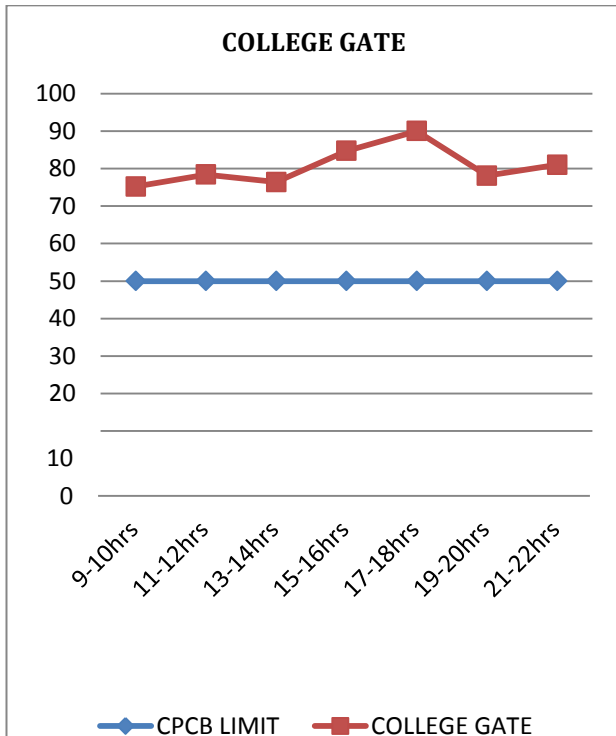


Chart 4: Noise level of college gate

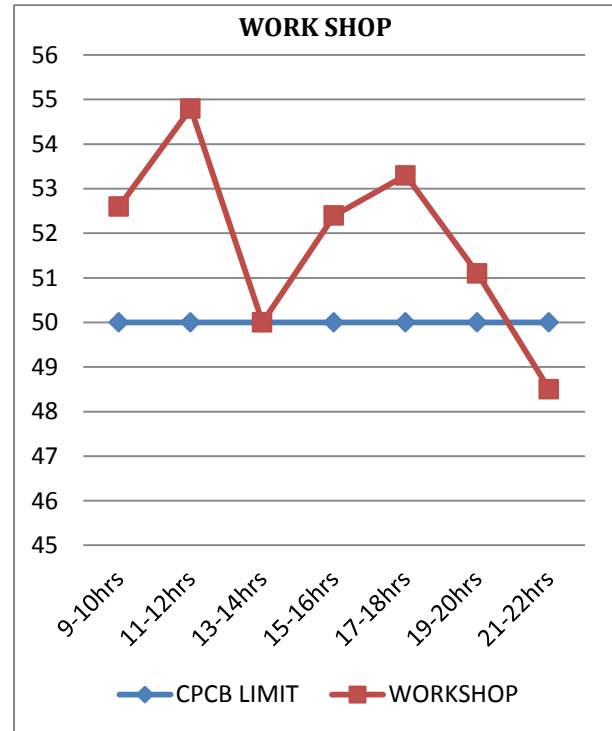


Chart 6: Noise level of Workshop area

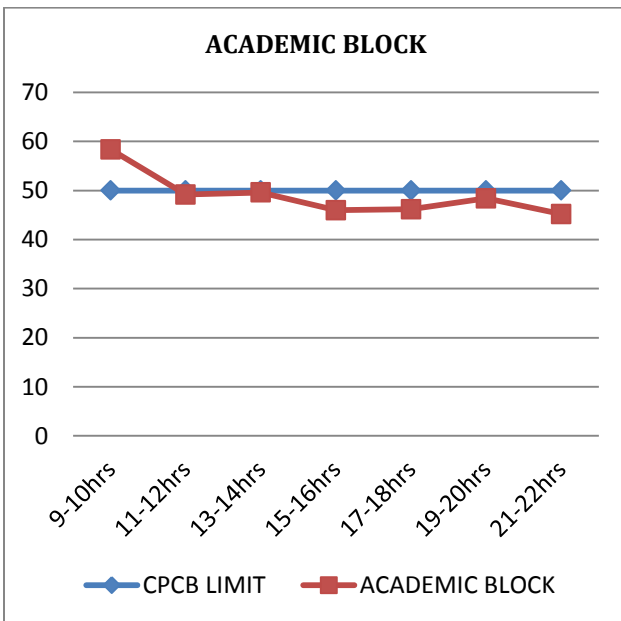


Chart 5: Noise level of Academic block

4. Conclusion

In today's era Noise pollution is emerging as a dangerous environmental problem. The permissible limit of noise pollution for educational building according to CPCB in day time (6A.M. to 10P.M.) is 50dB so, from the study it is seen that the area above 50dB are considered to be noisy area. Since the high noise levels could affect the students concentration, installing noise barriers and relocating the university to areas 'free from noise pollution', is a good solution apart from this Reduction of noise levels to some extent may be possible by plantation of trees especially shrubs on both sides of the road. The best solution to this problem would be a bypass road. State Highway no.1 is mostly responsible for all these nuisances and noise in the university campus as highways are always liable to have large numbers of vehicles of various kinds running throughout the day time.

5. Acknowledgement

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