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Assessment of noise pollution at various locations of Gorakhpur

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Abstract

Noise pollution is one of the major concerns in big cities as well as in the crowded area of small cites, Gorakhpur is fast-growing city and has many locations with high noise levels. Various crossroads and intersections have traffic issues this causes high noise level. In this study, three locations were selected for noise level assessment, nearby areas of Gorakhnath Temple, BRD medical college and MMMUT. These locations are educational (silent) and low noise level zone but because they situated near traffic roads, which cause high noise levels around them. In this study outside periphery of educational institutions noise level increases due to traffic. Noise level is found to be high due to large number of human activities.

Keywords: Noise pollution, Gorakhpur, traffic, silent zone.

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1. Introduction

Noise pollution is a major concern in cities, and it is not causing only irritation, stress and deafness but also causing coronary heart diseases (Datta et al. 2006; Babisch 2014; Peña, Montero, and Rodríguez 2019; European Agency for Safety and Health at Work 2005; Tobías et al. 2015; Münzel et al. 2014), cardiovascular diseases(Ndrepepa and Twardella 2011; Babisch 2008) and cerebrovascular diseases (Fujino, Iso, and Tamakoshi 2007). Daily exposure of noise responsible for mental health and sleeping disorder (Sygna et al. 2014). Noise pollution is increasing problem in India due to high rate of urbanization, road traffic, building and factory's noise. Due to increased risk associated with noise pollution it cannot be ignored compared to the other major pollution, noise pollution is major problem it should be consider and major pollution in India and needs to come up with proper solutions.

1.1 Noise Pollution In Some Cities of India:

*Noise pollution levels in Visakhapatnam city (India):*Sagar and Rao (2006), studied noise level in Visakhapatnam city at RCD hospital, Lawson's Bay Colony, Jagadamba junction, APSRTC Complex junction and Seethammadhara junction and Seaport. All the above zones locations classified as silent, residential, traffic and industrial zones. The researcher finds 44 to 53 dBA noise level in day time near RCD hospital, noise level finds 5 to 10dBA more than prescribed by the CPCB limit. In residential area noise

level sometimes cross to 77dBA, otherwise normally it founds in between 45 to 50 dBA(Vidya Sagar and Nageswara Rao 2006). At traffic locations it crosses the 90 dBA and ranges between 70 to 90dBA.

Noise pollution in the city of Kolhapur; Rajeev and Yogesh 2012, conducted noise level assessments in city of Kolhapur Maharastra. The researcher included various zones, Ambai square, University Road area as educational zone, Rajarampuri area as industrial cum residential zone, Rankala lake and New palace area as silent zone. Maximum Leq recorded was 63.71 dBA between 2.00-3.00 pm, while it was minimum (42.51 dBA) during night from 10.00- 11.00 pm. The daytimeLeq observed in educational zone was greater than the prescribed CPCB limits during day time, which is 50 dBA. Industrial-cum residential zone (Mixed zone) has 72.25 dBA which is below industrial limit but above the residential limit (Hunashal and Patil 2012).

Noise Pollution of Surat city, India; Tandel and Macwan (2011) assess the noise pollution conditions in Surat city (Tandel, Macwan, and Ruparel 2011), researchers find that in educational areas noise limits were varying from 112 to 118dBA, which is much higher from the prescribed limit of pollution norms.

Noise Pollution in Guwahati City; Alam, 2011 done GIS-based assessment of Noise pollution of Guwahati city (Alam 2011), Some commercial locations like Paltan Bazar, Guwahati Club, Ganeshguri, Khanapara, MaligaonCharilali showed higher noise levels (more than 80 dB(A)) than other commercial places as these places are always crowded with all type of vehicles, narrow roads and poor traffic management system. Residential areas were also exceeding the limits and roadside residential areas were crossing the level of 75dBA. Alam finds serious concern in silence zones, 50dBA is limit for the educational zones but in the city it crosses limit due to heavy traffic. Noise Pollution in Meerut, Moradabad, heavy traffic nearby silence zones in various cities of India is one of the major reasons for the high noise level. Singh and Joshi 2010 monitor the noise level in Meerut city(D. Singh and Joshi 2012) during Deepawali festival, surprisingly during deepawali festival residential area shastri nagar find upto 85dBA which is higher than the commercial zone of Meerut (83dBA). In silence zones of city noise level is around 70dBA. Chauhan, Pawar et. al, assess the noise level in Moradabad city (Chauhan et al. 2010), residential zones of the city have noise level variations from 76dBA to 102 dBA in day time, in night time it varies from 55 to 80 dBA. Commercial zones have much higher noise up to 105 dBA during daytime. Industrial zones have highest noise level of 118 dBA, Silence zones of city also cross the limit given in norms.

Almost all cities suffering from noise pollution, big and unplanned cities have major problems of noise pollution.(Khaiwal et al. 2016; Marathe 2012; Goswami and Swain 2017; Garg and Maji 2016; Subramani and Sivaraj 2012; Zannin and Sant'Ana 2011; Pucher et al. 2005) In unplanned cities various small-scale industries, educational institutes, hospitals and heavy load of traffic are getting combined and increasing noise. In planned city noise pollution problems reduces due different area allowed for different zones. In this study noise pollution level at different locations was assessed with guidelines of CPCB

2. Study Area

Gorakhpur is a big and fast-growing city of the Uttar Pradesh, India. Gorakhpur district has a population of 44.41 lakhs (4.44 million) and city area population is about 7 lakhs. All major institutions and universities are established in city areas. In this study three locations are selected which are very important places in Gorakhpur. MMM University of Technologyand BRD Medical College is educational institutions, and third one is Gorakhnath Temple. These locations are important because they are situated near to heavy traffic road specially Gorakhnath Temple and BRD Medical College.

In this study, the following three locations of Gorakhpur city is chosen-

[1] MMM University of Technology	**[2] BRD Medical College**	**[3] Gorakhnath Temple**
⇩	⇩	⇩
Ambedkar Hostel	Near Pharmacy	Main temple
Raman Hostel	Outside OPD	Pond area
WorkShop	Outside X-ray room	Outside main temple
Faculty Colony	Near orthopedic	Digvijaynath Temple
University Gate	Hospital Main Gate	Temple Main gate
Academic Block		

Colleges, Hospitals and Universities is consider as Silent Zone according to CPCB guidelines, locations of study come under silent zone (Pathak, Tripathi, and Mishra 2008).

3. Instrument and Method

Bruel and Kjaer, Denmark 2232 (B&K 2232) sound level meter is used for the measurement of noise level, it is a digital electronic device and suitable for the Community and industrial noise measurements, Checking compliance with noise rating, recommendations, Traffic noise measurements and Front-end for other equipment. B&K 2232 has a digital liquid crystal display with 0.1 dBA display resolution. Overload, under range and low battery warning. B&K 2232 is lightweight (460 gram) and easy

handling operating device with high precision. B&K 2232 has range of measurement in between 34 dB to 130dBA, this range is divided in two sub ranges 34 to 94dB and 70 to 130 dBA.

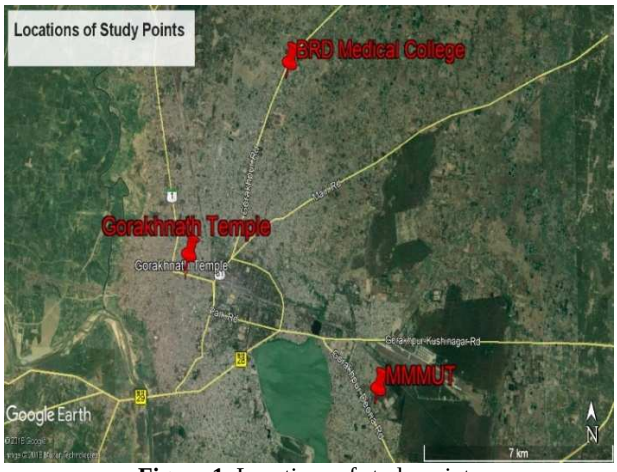

Figure 1. Locations of study points

Figure 2. Noise Level meter Make Bruel and Kjaer, Denmark 2232

While the measurement of noise level using B&K 2232 it is important to keep instrument 1.2 to 1.5 meters above to the ground as well as instrument should be 1 meter away from the chest to avoid error in measurement(Bruel& Kjaer 1964; Kumar, Pandey, and Mishra 2014; Krueger et al. 2003; P. K. Singh et al. 2016; Moussa et al. 2013).

The time duration has been selected to cover the most active part of the day, from 9:00 am morning to follow by noisy day. For measurement of sound level in particular hour we evaluated continuously for 5 minutes and taken reading after every 15 seconds so in 5 minutes total 20 reading is taken and then later calculations is done by following formula

$$L_{eq} = 10\log_{10} \sum_{i=1}^{n} L_i / 10 \times T_i \quad (1)$$

where,

n = total no of sound samples

L_i = noise level of any i^{th} sample

T_i = time duration of i^{th} sample expressed as a fraction of total time sample

4. Results and Discussion

Graphs are plotted between sound/noise level and time duration of daytime for all locations. According to the Central pollution control board (CPCB) (Garg et al. 2016) 50dBA is limit for the silent zones. In BRD medical college noise level at various locations fluctuates with daytime, maximum noise activity occurs in orthopedic areas and main gate of medical college. Noise level high nearby orthopedic is due to large human activities. Almost all places in medical college is crossing CPCB limit mostly because of large number of human activities as well as because of traffic noise, noise level find high at those places where less human activities because of locations were not far away from road and road noise can be heard very clearly.

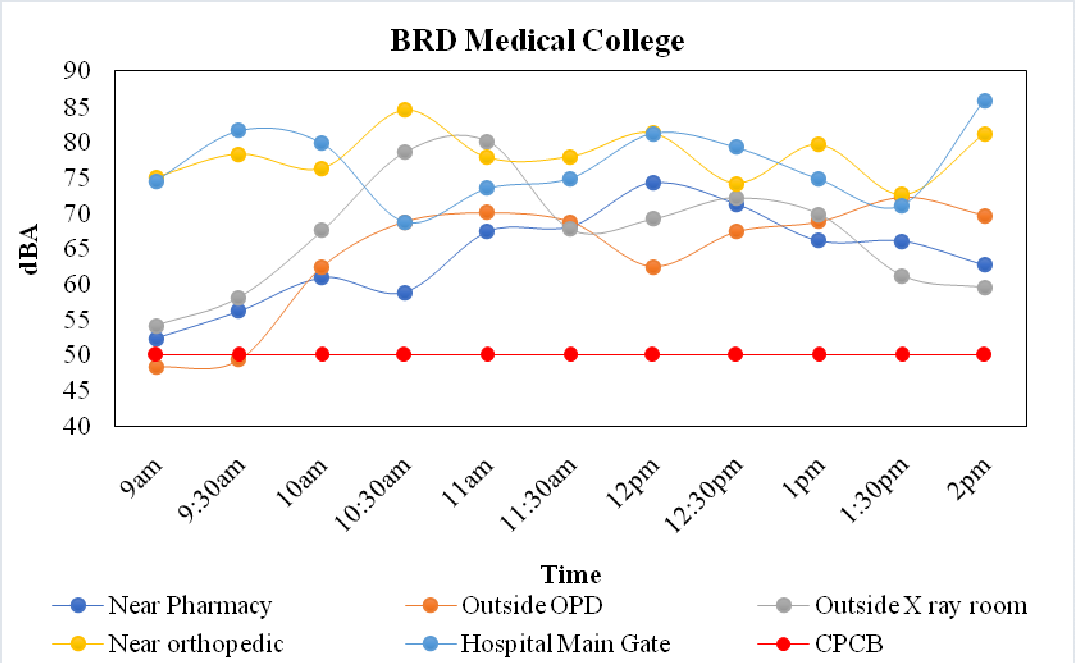

Figure 3. Noise level variation at BRD medical college

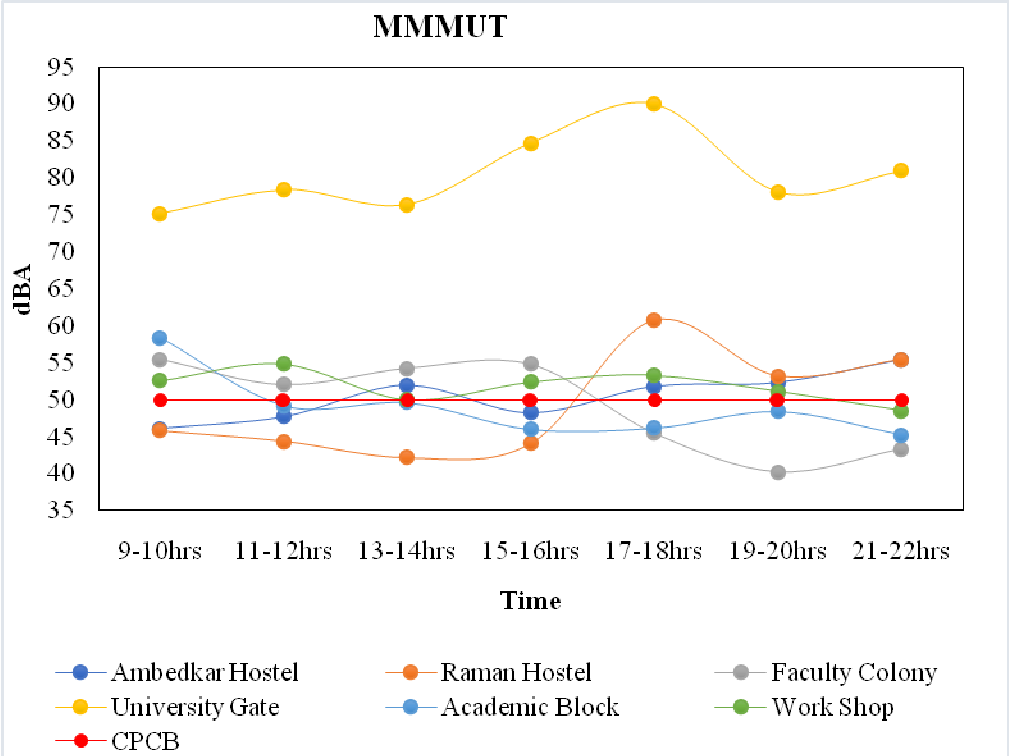

Figure 4. Noise level variation at MMMUT

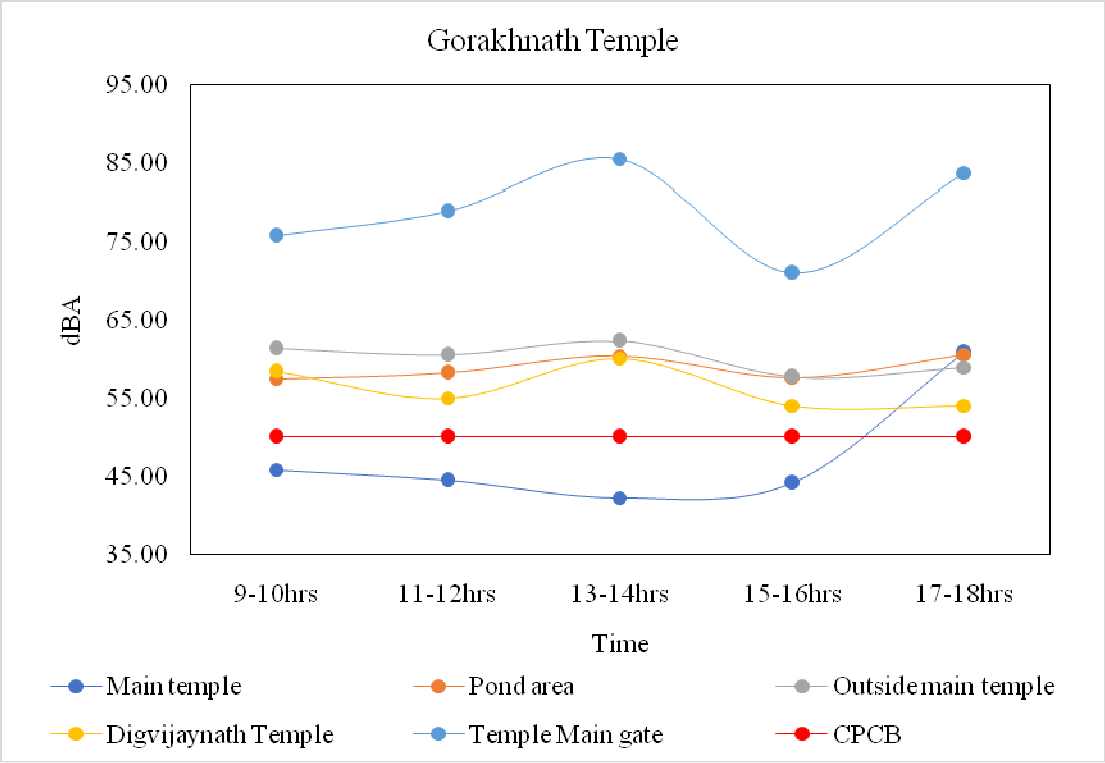

Figure 5. Noise level variation at Gorakhnath temple

In MMMUT noise level varies from 40 dBA to 90dBA, minimum noise finds in faculty colony and maximum noise occurs at main gate of university. Noise level in university varies around 50dBA, here also maximum noise observed at main gate due to traffic noise. In Gorakhnath temple were high human activities occurs but due proper sequencing of people noise level doesn't go much higher, comparing to the medical college and temple, temple have much higher human activities but noise level is low. Outside traffic at all places were high but temple and faculty colony were much away from the road, maybe one of the possible reason for low noise.

4. Conclusions

Noise level finds to be high at locations nearby to the road. Main gate, which is near to road, finds maximum noise all three locations. locations away from the roadside finds to be less noise, universities and colleges are in silent zone but during studies it is realises that roadside traffic have potential impact on these areas. This study shows that need of proper noise level assessment with respect to distance from roadside for silent zone area. Locations which comes under the silent zones and near to the heavy traffic roadside they need to assess and need to find actually how much noise impact of traffic on silent for keeping safeguard towards noise pollution.

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Biographical notes

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