

## Studies on temporal variation of sound level on long time scale in Burdwan town – A Case Study from West Bengal, India

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### Abstract

Noise pollution is recognized as one of the major fear that affects the quality of life in urban areas across the globe. Burdwan, a district headquarter (100 km away from Kolkata) is one such town where noise pollution is very frequent. For assessing the noise pollution trend on long term scale noise data were collected from various places of the town by sound level meter with a duration of 30minutes/location during specified time like 6.00am, 10.00am, 1.00pm, 4.00pm and 6.00pm during 2002, 2008 and 2014. From the tabulated data of successive three years it was found that sound level lies within the range of 64-85dB or above in different time at different places. Statistically noise level in all these zones differ significantly at their peak hours. Results from the respective three years reveal that the regular increment in the sound pressure levels. This study may help to disseminate awareness about noise pollution among the people, by which they will be able to take required precautionary measures to save themselves from the adverse effects of noise pollution and to improve the quality of the environment.

**Keywords:** Noise pollution, Scenario, Monitoring

### 1. Introduction

Every environmental pollution problem has roots in the past be it water, air or noise pollution and all these problems are becoming critical in the recent years due to rise in the use of modern technologies. Noise is an unwanted sound that may cause some psychological and physical stress to the living as well as non-living objects exposed to it. Noise can be defined as an unwanted or undesired sound whereas environmental noise is any unwanted or harmful outdoor sound created by human activities that is detrimental to the quality of life of individuals. So noise pollution may be defined as unwanted sound, which gets dumped into the atmosphere without taking care to the adverse effect it may be having.

A survey by central pollution control board (CPCB) showed that in Delhi, the noise level in most places exceeded the permissible limit. Similarly, a study by NEERI had revealed that noise levels in residential, commercial and industrial areas and silence zones of Delhi and towns of National Capital Region (NCR) far exceeded the prescribed standards.

The average noise level in Delhi is 80dB while the ambient limit is 55dB. Mumbai too suffers from high levels of noise pollution. For example, Shetye *et al* [1] had estimated that noise level in crowded location in Mumbai was almost double that of residential standards adopted by most countries (45dB during day and 35dB at night).

Ravichandran *et al*[2], measured noise levels at selected place of Pudukkottai, Tamilnadu, found that vehicular traffic and pressure hours are the main cause of noise pollution in the city. The noise levels prevailing in commercial areas of Jabalpur city had been investigated by Pandya and Shrivastava [3]. It is found that the noise level data in commercial locations observed normal distributions with an average value of 75, 74, 88dB in morning, afternoon and evening respectively. The high noise levels are associated with higher population density, human activities, traffic density and lack of greenery. Santra [4] made a comparison of noise level of selected sites of Kolkata as recorded during winter 1990 and winter 1995. From the survey, it was concluded that the level of noise in Kolkata city is much higher than the prescribed limit

as fixed up in the standard mentioned in the Acts relating to noise pollution. Santra [4] gave the noise levels of selected cities of the world. Noise pollution of densely populated city of Buenos Aires was recognized by Bogo *et al* [5].

Miedema and Oudshoorn [6] presented a model of the distribution of noise annoyance with the mean varying as a function of the noise exposure. Various workers have studied effects of noise pollution on human health. According to De [7] 65dB noise level at a distance of one meter affects human heart while 125dB gives the sensation of pain in the ear and 150dB might kill a human being. Sharma [8] also highlighted that the permanent loss of hearing at 100dB. According to Santra [9] high frequencies or ultrasonic sound above the normal audible range can affect the semicircular canals of the inner ear and cause nausea or dizziness.

Tripathy and Patnaik [10] reported various impact of noise stress on human health for e.g. hearing impairment like temporary/permanent loss of hearing, trinitities, physiological impacts like cardiovascular constriction, gastro intestinal modification, respiratory modification, skin resistance alteration, headache, muscular tension, neurological disorder, paling of skin; task interference like reduced work efficiency, increased proneness accidents and lastly personal behavior like annoyance, anxiety, fatigue and fear. The present study was aimed towards assessment of level of noise pollution on time scale.

## 2. Materials and Methods

### 2.1 Study site

Burdwan, located in the state of West Bengal, is situated at a distance of 100km from Kolkata and is a district head quarter. Burdwan is a developing town with good facilities for education, medical, market for grain and other commercial commodities. Population according to 2001 census is around 2,86,058. Noise pollution is very frequent in this town. Burdwan town is not an industrial area; therefore, noise mainly arises from the transportation system.

### 2.2 Methodologies opted

For monitoring noise level seventeen (17) different important locations of Burdwan town were selected on the basis of zone specific. According to Environmental Protection Rules, 1986 (Schedule- III) in respect of noise, most of these locations are in the category of commercial zone, silence zone and heavy traffic zones. Sound level meter (Model LUTREN, SL-4001) were used for ten (10) measurements of noise data/location with 30 minutes duration during some specified time around 6.00am, 10.00am, 1.00pm, 4.00pm and 6.00pm for three years of considerable time span. Sound level meter works on the principle of

evaluation of sound pressure on a linear or weighted scale. It normally indicates the rms value of the sound. The basic parts of most sound level meters include a microphone, amplifiers, weighting networks and display meter reading in dBs.

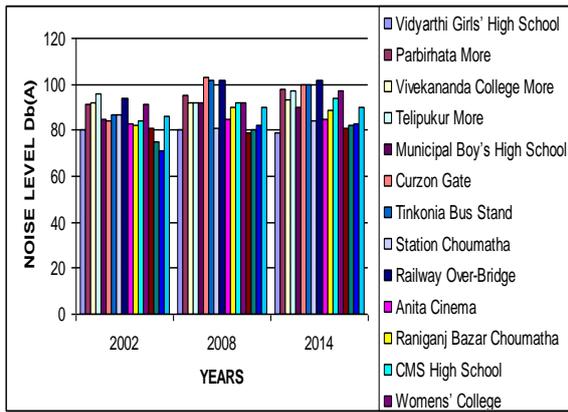
### 2.3 Statistical analysis

The values were expressed as mean values of triplicate observations and statistical significance were tested at 5% level. Cluster analyses of the study variable were done through MINITAB 13.1 version software.

## 3. Results and Discussion

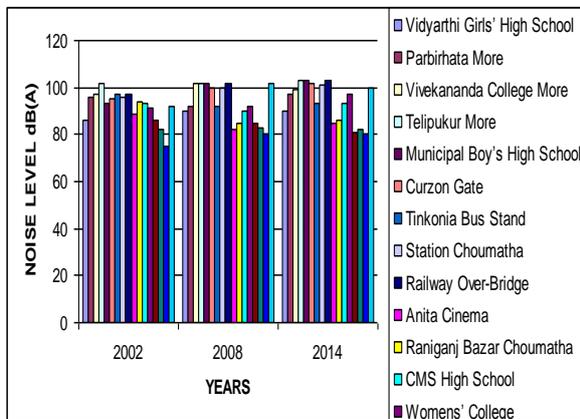
The noise survey of Burdwan town reveals that noise environment is not satisfactory in terms of both national and international standards. The scenario is deteriorating day by day on long term time scale. The present investigation reveals that the main contributors of noise in the Burdwan town are transportation (rail and road), community and religious activities. The characteristics of such noise are mainly peak pressure, pulse duration, time duration etc. The results obtained of increased noise levels due to transportation (rail and road), community and religious activities during 2002, 2008 and 2014 reveals an increasing level due to increasing urbanization rate. Urban noise, or environmental noise pollution, however, is not a recent phenomenon. Presently, in however, it is predicted that in the near future the frequency of noise complaints will increase significantly because of rapid increase in population, business activities and industrialization. Previously, several researchers worldwide have studied the urban noise pollution [11-13].

Overall trend of the research papers show that noise pollution is becoming a severe problem in the urban environment, and Burdwan town is no exception to it. The noise data were collected from different study sites at different time in order to assess the changing noise level at various study sites on long term temporal scale. Data collected during 6am at the morning reveals that CurZon gate, Tinkonia bus-stand and railway over bridge showed a progressive increase in the noise level during successive years of management which might be attributed towards higher rate of urbanization as well as higher influx of people from outside into burdwan town through different transportation mode. (Figure 1) Moreover inappropriate traffic management, lack of parking space and poor road condition has contributed a lot to the noisy environment of the city. [14]



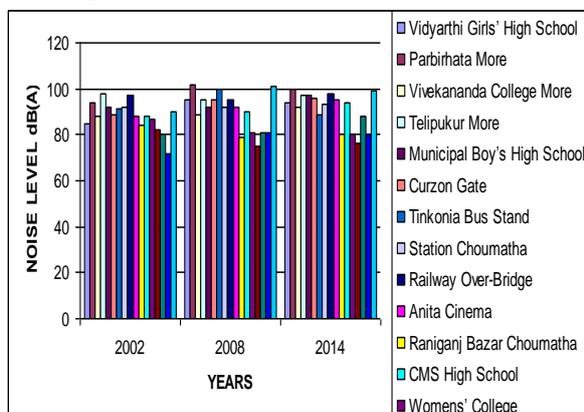
**Figure 1: Noise level at 6 am at different study sites for three years**

Analyzing the data at 10 am we found that there is a progressive increase in the noise level at Vivekananda college more, Telipukur more and municipal boys high school area. (Figure 2)



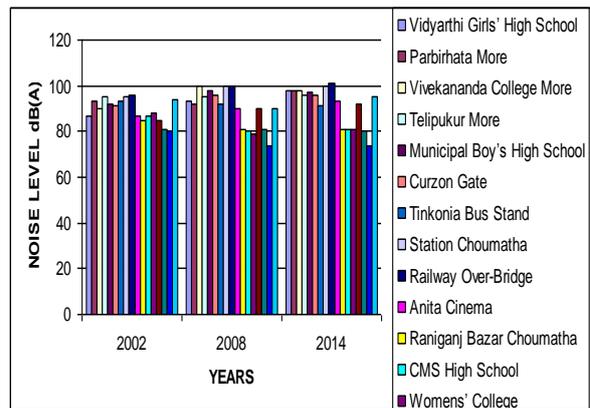
**Figure 2: Noise level at 10 am at different study sites for three years**

This might be attributed towards more influx of students and other people with official work at the concerned study site promoted the noise level on long term time scale. Other factors include presence of G.T. Road, offices and banks in front of school. Data represented in figure 3 revealed increasing trends in noise level for Parbirhata more, CMS high school during 1pm.



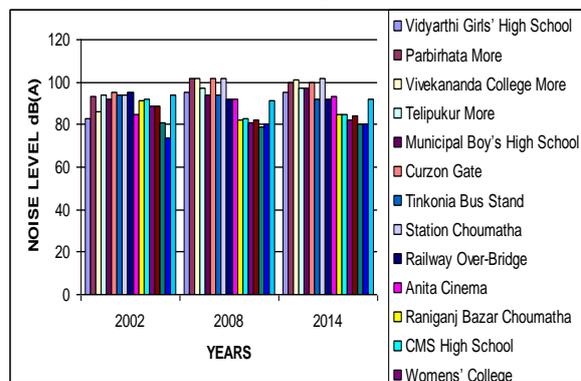
**Figure 3: Noise level at 1 pm at different study sites for three years**

As the time of measurement was mid day for the concerned study sites rapid influx of cycles, rickshaws, motorcycles, scooters, cars and people passing through the area create noise pollution in all these areas. Parbirhata More is one such crossing where three main roads dissect each other. Electric horn, engine of vehicles, collision of tyres exert tremendous noise. Burdwan town having high pressure of passengers and transportation systems. Sources of the sound are engine of vehicle, electronic horn, crowding of people, sirens, barking of dogs, hawkers, shops, advertising agencies, miking etc. In case of overcrowded railway over bridge main noise contributing factors are horns and high frequency sound emitted from trains, buses, trucks, motorcycles, rickshaw etc. Vidyarthi Girls high school, Parbirhata more, railway overbridge, station choumatha revealed increasing trend from 2002 to 2008 to 2014 during 4pm reflecting gradual increase in noise generating sources associated with transportation, population pressure and higher rate of urbanization (Figure 4).



**Figure 4: Noise level at 4 pm at different study sites for three years**

Locations like Parbirhata more, Vivekananda College more, Telipukur more, Station Choumatha, reflected gradual increment in noise level over the years of observation which might be attributed towards higher transportation rate from Burdwan town to outskirts by the people while returning home after their full day official work (Figure 5).



**Figure 5: Noise level at 6 pm at different study sites for three years**

Data represented in fig 6 revealed maximum variations in noise level was found at Golapbag more which is one of the busiest place of the town due to location of Burdwan university campus, distance education building which promotes rapid influx of students and other people throughout the day for the entire time period.

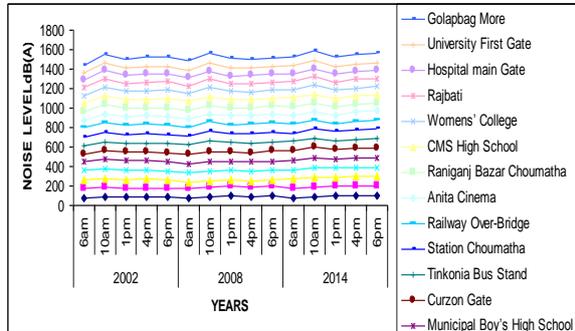


Figure 6: Temporal variation of noise level at different study sites for three years

Cluster analysis of the tabulated data reflected numerous small clusters of study sites. Two main clustering of study sites were observed among the 17 study sites. Cluster 1 comprises of Municipal Boy's high School, Golapbag more, Parbirhata more, Telipukur more, Curzon gate, Station Choumatha, Tinkonia Bus-stand, and railway overbridge (Figure 7). Cluster two comprises of Vidyarthi girl's high school, Anita Cinema, RanigaunZ bazaar Choumatha, women's College, Rajbati, and CMS High School. Vivekananda College more formed a separately distant cluster as it is located at the outskirts of Burdwan town.

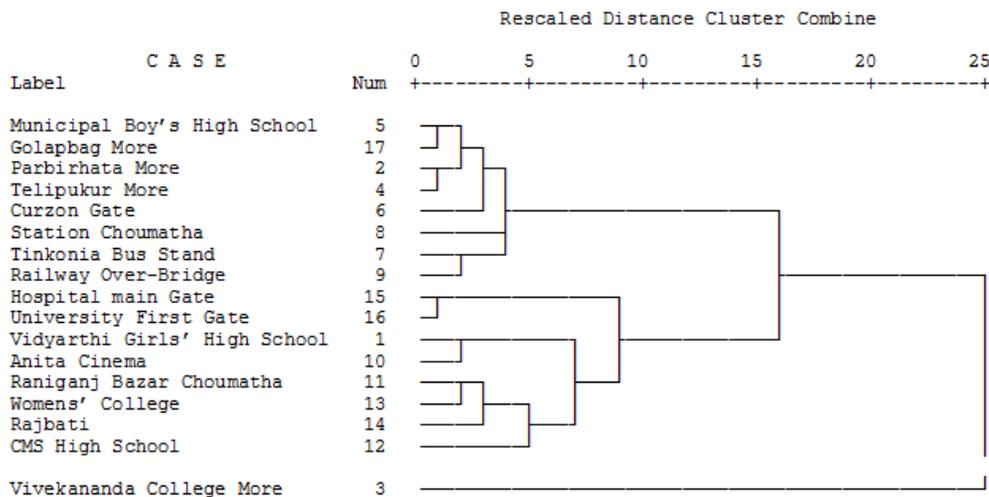


Figure 7: Cluster representation of study sites with respect to noise level for three years.

4. Conclusion

Present study reveals the alarming situation of increasing level of noise pollution on long term time period. Analyzing the above figures, it is clear that there is a large increment in the noise levels on different study sites in and around Burdwan Town and the values are above the limits as prescribed by the Central Pollution Control Board (CPCB). Under the sonic circumstances of the town, some measures should be taken for acoustic welfare of the people as well as society. The time has come when an individual should become aware about the noise pollution they are creating during maintaing their daily activities so that they can take precautions to save themselves and the Environment from the adverse effects of noise pollution and choose Environmental Quality as the priority. Here are many legal provisions to control or check the noise pollution. Many laws and

acts have been amended to prevent he noise pollution but implementation of these laws is in vein. Noise pollution is tremendously high in some points of Burdwan. Even in residential zone sound pollution is frequent. Legal measures under section 20, 21J, 41, 68(I), 70, 90, 111A of Environment Protection Act (1986) as well as various technological methods should be adopted to control this pollution.

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