

Assessment of Sound Level at Different Locations of Rajshahi City

Pronob Das*, Zikrul Haque, Md. Shamim Akhter

¹Department of Mechanical Engineering, Rajshahi University of Engineering & Technology,
Rajshahi-6204, Bangladesh

E-mail:pronobdasruet@gmail.com

Abstract

Now a day's noise level has been increased due to increasing of urbanization, industries and vehicles. Like many other mega cities of developing countries, noise pollution in Rajshahi of Bangladesh is becoming more and more acute along with other pollutions like Air, Water, Odor, Waste etc. The increasing rate of sound pollution may cause various harmful effects such as deafness and mental breakdown and so on. Therefore, the primary objective of this research is to quantify the exceeded noise level above the permissible level at selected types of sources when compared to the standards. For this purpose a survey on sound level was performed at different locations of Rajshahi city including hospitals, residential areas, school and colleges with the help of a sound level meter from 9AM to 12PM during the working days. From the observation it was seen that for all the times the measured sound level at almost all the locations exceeded the acceptable limits, recommended by the DoE (Department of Environment). This paper also suggests the necessary measures those may be taken to keep the sound level within the acceptable limit.

Keywords: Noise Pollution, Sound Level Meter, Acceptable Limits, Harmful effects, Mitigation.

1. Introduction

Noise can be defined as unwanted sound judged to be unpleasant, loud or disruptive to hearing. Noise is an unwanted or damaging sound that may damage one's hearing ability and cause other health effects such as stress, hypersensitivity to noise, increased blood pressure and increased heart rate. In experimental sciences, noise can refer to any random fluctuations of data that hinders perception of an expected signal [1]. The urban environmental quality of developing countries has been depreciated by an unlimited increase of vehicles, infrastructure, and population. As a result, the continuous increased intensity of traffic noise level due to the population has corrupted urban quality of life. Road traffic noise is the big challenge for urban planners and environmental engineers to overcome road traffic noise in cities [2]. Noise is a part of daily life although when surpassed the acceptable limit, becomes pollution. Noise pollution is the disturbing noise with harmful impact on the activity of human or animal life. As a matter of fact, while people are familiar with air or water pollution, people are little aware of sound pollution or its harmful effects. The source of outdoor noise worldwide is mainly caused by machines and transportation systems, motor vehicles engines and trains. The noise pollution is due to the contribution of modern civilization, the main causes of which are urbanization, mechanized means of transport and new devices of recreation and entertainment. Various kinds of sources of sound pollution is displayed in fig-1. The noise, unwanted sound has penetrated almost every aspect of modern life. It is potentially a serious signal and grave threat to the environment and health. It may cause deafness, nervous breakdown, mental disorder, heart troubles and high blood pressure, head-aches, dizziness, inefficiency and insomnia [3]. Noise pollution is increasing day by day Along with the increasing degree of air and water pollution. The level of noise pollution is increased with urbanization and motorization. Motorized traffic is the major source of creating noise in urban areas among the various sources such as industries, construction works and uncritical use of loud speakers etc. Another major sources of noise pollution are automobiles, industrial sources, trains, aircrafts, construction works, radio and microphones, instruments, bomb blast etc. During the 70s and early 80s, noise pollution was not a major concern for the dwellers of Rajshahi City [4]. The problem has become acute with the increased number of motorized vehicles in the city. The increased level noise reasons unadorned stress on the auditory and nervous system. The acceptable noise levels for different areas recommended by Bangladesh Department of Environment (DOE) are shown in Table 1. According to the report of DoE, hearing ability of the inhabitants of the City has reduced during the last ten years. About five to seven percent of the patients admitted to the Rajshahi Medical College and Hospital are suffering from permanent deafness due to noise pollution [5]. Disturbances created by noise may cause hypertension, headache, indigestion, peptic ulcer, pharyngitis, atherosclerosis, bradycardia and ectopic beat [6]. The paper aims at studying the level of sound pollution in Rajshahi City and analyzing its level of severity. It analyses the variation of noise near the roadsides,

hospitals, schools and colleges, and residential areas. The paper also recommends several techniques to minimize the noise level in Rajshahi city.

Table 1: Acceptable noise level for different areas (Ashish et al., 2015)

Description of area	Noise Level (dB)	
	Day Time	Night Time
A Sensitive Area where quietness is of primary importance such as schools, colleges, hospitals, Mosques, Temple etc.	45	35
Residential Areas	50	40
Mixed Areas, which are used as Residential Areas as well as Commercial and Industrial Purposes	60	50
Commercial Areas	70	60
Industrial Areas	75	70

1.1 Methodology:

Rajshahi is a metropolitan city in Bangladesh and a major urban, commercial and educational centre of North Bengal. Its coordinates is 24022N 88036E. The city has a population of over 763,952 residents [7]. However, being a divisional city it is mainly connected with different districts, divisions and capital by road network. Huge numbers of motorized vehicles are passing everyday through the city. Motorized vehicular sound is considered to be a major source of noise in Rajshahi City. A study was performed measuring sound level at different locations of Rajshahi city including noisy places at road sides, hospitals, residential areas, and school & colleges with the help of a sound level meter from 9AM to 12AM during the working days.

1.2 Sampling Locations

The site selection is done in such a way that almost all important road intersection can be covered considering maximum vehicular passing, surrounding locality, important institutions, junction, commerce and offices, etc. so that the scenario of sound pollution of important road intersection in Rajshahi city could be reflected. Sound levels have been measured at twenty one locations at road sides in Rajshahi city during 9AM to 12 AM on working days. The study incorporates most of the major locations of the city, which include Shaheb Bazar, Railway Station, Railgate, Laxmipur, Talaimari, Vodra junction, Rajshahi College Road (RCR), Govt. Laboratory High School (GLHC), RMCH Road, Newmarket, Alupotti Junction, Islami Bank Medical College (IBMC), Rajshahi Collegiate School (RCS), New Govt. degree college (NGDC), Rajshahi Govt. City College (RGCC), Govt. P.N. Girls High School (GPNGHS), Laxmipur Girls High School (LGHC), Khademul Islam Govt. Girls Primary School (KIGGPS), Shaheed Nojmul Huq Girls High School (SNHGHS), Rajshahi Govt. Women College (RGWC), Shiroil High School (SHS), Railway Station Govt. Primary School (RSGPS), Rajshahi Adorsho High School (RAHS), Rajshahi University School (RUS), Baliya Pukur Biddya niketon (BPBN), Varendra University Northern(VUN), Varendra University Kajla (VUK), Muhammadpur Tikapara Govt. Primary School (MTGPS), Helenabad-1 Govt. Primary School (HGPS), Raninagar Govt. Primary School (RGPS), Rajshahi Cantonment (RC), Binodpur, RCC, Bornali Junction, Shohid Kamaruzzaman Stadium (SKS), Bondhogate, Shiroil High School, Bangladesh Bank, Horagram, The Varendra Research Museum (VRM), Kazla and Sopura. Sound level have been measured at the roadside as well as at distances away from the roadside. A survey was also performed at different hospitals such as Rajshahi Medical College Hospital (RMCH), Rajshahi Metropolitan Hospital Limited (RMHL), Islami bank Medical College hospital (IBMCH), Barindo Medical College Hospital (BMCH), Rajshahi Royal Hospital (RRH), CDM Hospital, Human Care Hospital (HCH), M.R.I. Hospital, Makka Eye Hospital (MEH), Rajshahi Model Hospital (RMH), Doctor Kauchar Rahman Chowdhury Hospital (DKRCH), Rajshahi Shishu Hospital (RSH) in Rajshahi city during 9AM to 12AM. Sound is also measured at residential areas at different locations in Rajshahi city. A portable digital sound level measuring instrument is used to record the continuous highest and lowest sound levels. The highest and lowest sound levels are recorded at every minutes interval in decibel unit. The average of maximum and minimum noise levels with their standard error are calculated and plotted in normal graph paper. Table 2 shows different sampling locations in Rajshahi city.

Table 2: Location of sampling stations in Rajshahi City.

Location	Latitude	Longitude
Saheb bazer zero point	24 21'53.43"	88 36'00.37"
Laxmipur mor	24 22'18.29"	88 34'56.97"
Rail Gate	24 22'28.32"	88 36'14.00"
Rail Station	24 22'29.67"	88 36'30.35"
Talimari Mor	24 21'44.39"	88 37'35.06"
Bornali mor	2422'32.88"	8835'34.80"
C & B More	24 22'05.70"	88 34'50.99"
Alopurtti More	24 21'41.36"	88 36'46.90"
New market	2421'36.10"	8835'38.04"
Bondhogate	2422'36.25"	8835'23.19"

1.2 Sound Measuring Instrument

A digital sound level meter is used in this study. It is an instrument to measure sound pressure level in decibels (dB). This meter is featured with wide measuring range from 30 dBA to 130 dBA with accuracy level of ± 1.5 dB, digit and resolution of 4 digits and 0.1 dB, frequency response of 31.5 Hz-8.5 KHz, sampling rate of 2 times/s, automatic backlight display, maximum value hold, low battery indication, auto power off, power supply by 9V battery operation. The country of origin is China. This is a portable instrument easy to use and handle for sound intensity measurement. This equipment has been designed to meet the measurement requirement of safety engineers, health, industrial safety offices and sound quality control in various environments, which include factory, office, traffic, family and audio system. It is also used in noise pollution studies.

2. Data Collection and Analysis:

Sound level data were collected from the study zone using noise meter directly in decibel (dB). The maximum and minimum sound levels recording and vehicle counting at road sides are started at morning from 9 AM for every 15 minutes intervals to 12 AM. The values obtained are shown in fig. 1.

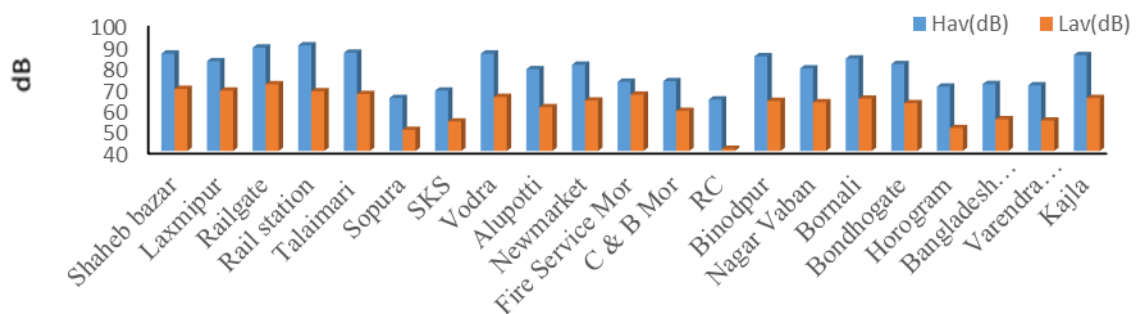


Fig. 1: Highest and lowest average value of sound level at different places at road sides

From fig.1 it is seen that the noisiest places in Rajshahi city is Rajshahi Rail Station (89.9dB). Also Shaheb bazar, Laxmipur, Railgate, Talaimari, Vodra, Alupotti, Newmarket, Fire Service Mor, C & B Mor, Binodpur, Nagar Vaban, Bornali, Bondhogate, Bangladesh Bank, and Kajla are in under of sound pollution. Sound level was also observed at different noisy hospitals in Rajshahi city during the period 9AM to 12AM at 15 minutes interval. The values were taken inside the hospitals. The observed sound levels are shown in fig. 2. From fig.2 it can depict that RMCH (Rajshahi Medical College Hospital) is the noisiest hospital in Rajshahi city. All the other hospitals shown in fig.2 are also under risk of sound pollution. Sound levels were also measured at twenty five schools and colleges situated near road sides in Rajshahi city during the period 9am to 4 pm. The values were taken inside the classrooms and outside of the classrooms. The inside values are shown in fig.3 and the outside values of these educational institutions are shown in fig.4. From fig.3 it is seen that Varendra University (Kajla) is the noisiest educational institution (inside classroom). Although the permissible value is 45 dB all the educational institutions exceeds the permissible values. All outside values of these institutions are also exceeded the permissible limit and Varendra University Northern Mor (VUNM) is the most blaring places outside the classroom. It is most necessary to measure the sound level in residential areas. The sound levels of residential areas are shown in fig.5. Though the permissible maximum limit is 50dB, almost all residential areas in fig.5 exceeds the permissible limits and under danger of sound pollution.

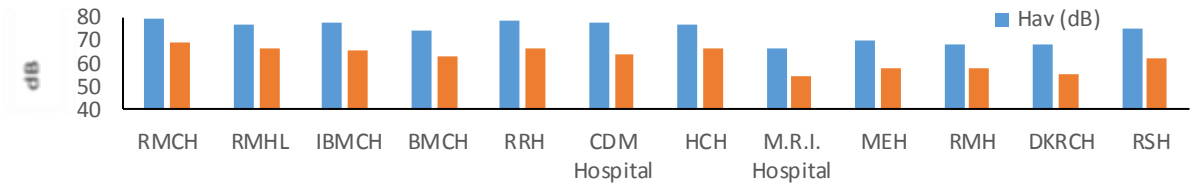


Fig. 2: Highest and lowest average values of sound level at different hospitals in Rajshahi city

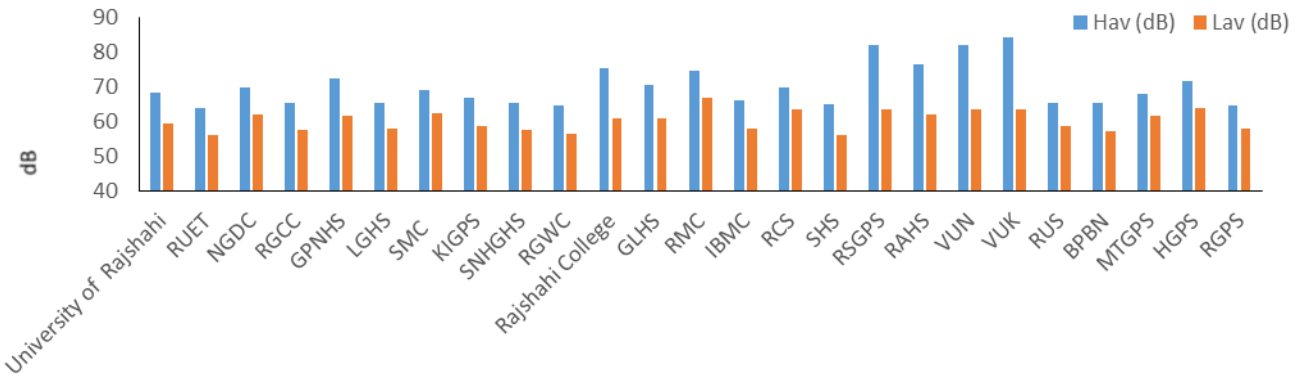


Fig. 3: Highest and lowest average values of inside sound level for educational institutions in working day

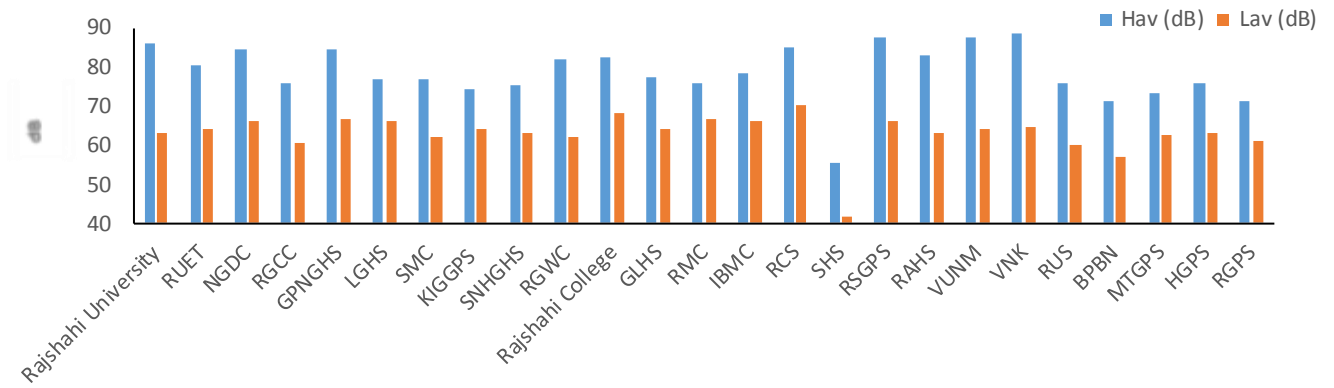


Fig. 4: Highest and lowest average values of outside sound level for educational institutions in working day

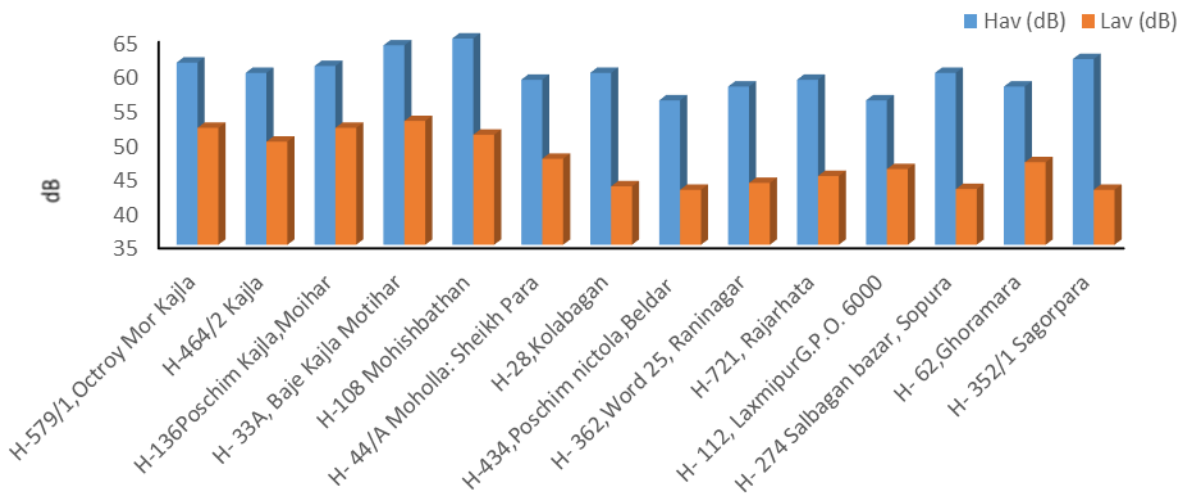


Fig. 5: Highest and lowest average values sound level at residential areas in Rajshahi City Corporation.

Though the permissible maximum limit is 50dB, almost all residential areas in fig.6 exceeds the permissible limits and under danger of sound pollution.

3. Impacts of Noise Pollution

According to the DOE noise causes mental and physical illness among people [4]. When we expose to prolong intense sound cells of the inner ear are damaged and hearing deteriorates each time. The most horrible thing in noise-induced hearing loss is that it is permanent and incurable [8]. Some effects of noise pollution on different ages of people are shown in Table 3.

Table 3: Effect of noise pollution on different ages of people

<i>People</i>	<i>Age Range</i>	<i>Sound Level</i>	<i>Probable Deficiency</i>	<i>Reference</i>
Child	Below 3 years	100 dB	Loss of auditory power	[5]
Child	Below 6 years	Above 75 dB	Somatic effects	[9]
Pregnant mother	Any age		crippled, deformed and immature children	[5]
Any people	Any age	Above 67-70 dB	Hypertension	[10]
Any people	Any age	50 dB	Myocardial infarction	[11]
Any people	Any age	100 dB	Permanent deafness	[12]

Children are the most vulnerable to noise pollution. In Rajshahi streets with the noise level twice and even thrice the tolerable level is extremely harmful for the children. Besides, the loud music children listen to on stereos, sometimes through earphones or while watching television, or at concerts where the volume is usually extremely loud, impair hearing and harm their ability to concentrate.

4. Mitigation of Sound Pollution:

Noise control or noise mitigation is a set of strategies to noise pollution. The noise pollution can be controlled at the source of generation itself by employing the techniques specified in fig.6.

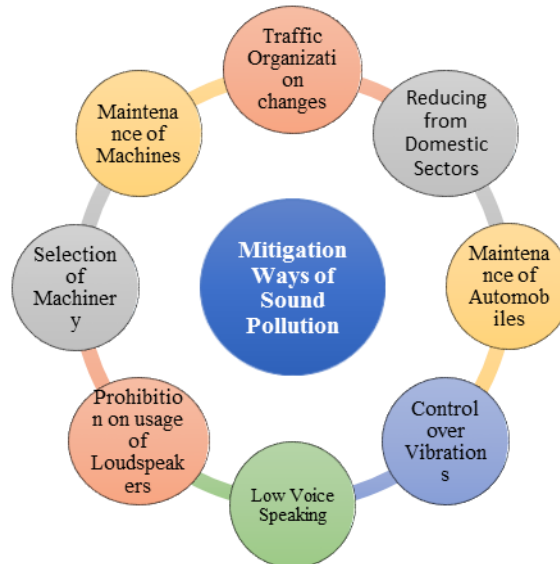


Fig.6: Mitigation Ways of Sound Pollution

Noise pollution also can be mitigated by using some other ways such as speed limits, noise reducing pavement, tonnage limit, embankments, coordination of traffic light at intersection in order to liquidate traffic, resurfacing, construction of new sections of roads, tree plantation, new window frames, etc.

5. Conclusion

Noise pollution is becoming a great threat in urban areas of Bangladesh with the increase of industrialization and urbanization. As a mixed area Rajshahi city is seriously affected by this phenomenon. Rajshahi city is becoming extremely crowded. The city area is endowed with educational institutes, residential areas, hotels, community centers, restaurants, banks, pharmacies, office building, health clinics, etc. but these have been

developed in an unplanned way. This study exposes the current position of noise pollution as well as susceptibility due to it. From the study it is seen that without some places almost places exceeds the optimum maximum level of sound pollution ranged from 70-90 dB. It is also seen that the values of sound level at all hospitals (ranged from 65-80 dB), schools & colleges (ranged from 64-85 dB), and residential areas (ranged from 55-65 dB) exceeds the maximum permissible values. Consequently, fatal diseases like from deafness to heart attack caused by uncontrolled noise have become common. Noise is inducing different types of health hazards and creating more dangerous situations for the people who spend much time near. So, everyone should be careful about sound pollution and immediate necessary steps must be taken by the authority to control the sound pollution in Rajshahi city.

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