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Assessment of Noise Pollution in Different Hatbazars of Butwal City, Rupandehi, Nepal

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Abstract: *The study was carried out to ascertain the level of noise pollution at five different hatbazars (periodic markets) of Butwal Sub-Metropolitan city by using Dick Smith Digital Sound Level Meter Q 1362 in the specific time from 4:00 PM to 5:00PM in the month of June 2016 on a hatbazar day and a usual day. The result shows that the heighest L_{eq} of 79.8 dB(A) was observed on hatbazar day at Butwal hatbazar. However, on non hatbazar day the highest L_{eq} of 71.9 dB(A) was observed at Purano bus park hatbazar. The lowest L_{eq} of 64.9 dB(A) and 54.6 dB(A) were respectively observed on hatbazar day and non hatbazar day at Majhagaun hatbazar. The study shows that the noise level was found to be higher on hatbazar day as compared to non hatbazar day in all sampling sites. The commercial activities, crowd of people, unnecessary advertisement of goods, blasting of horns increase noise levels in hatbazars.*

Key-words: *Noise pollution, Noise level, Decibel, Hatbazar.*

1. INTRODUCTION

Noise is an unwanted acoustic phenomenon. The word noise is derived from Latin word 'nausea' simply means an unpleasant sound that causes discomfort. Sound becomes unwanted when it either interferes with normal activities or diminishes the quality of life. Noise is the disturbing or harmful sound that impairs or interferes with hearing, causing stress, hampers concentration and work efficiency. It is an environmental pollutant that is increasing rapidly as a result of improvement in commercial, industrial and social activities (Anomohanran, 2013).

Unwanted and excessive sound which harms living being is called noise pollution. It is regarded as the technology generated problem. The major cities of the world are now facing problems of increasing noise pollution due to very high population, transportation, congestion and associated commercial and industrial activities (Chauhan, 2008). Noise pollution is the consequence of urbanization and industrialization. It is the major problem for quality of life in urban areas all over the world (Ozer et.al., 2009). The noise pollution is increasing day by day along with increase in traffic flow. The traffic noise is considered as one of the important sources of noise pollution in urban areas.65%of the population is exposed to unhealthy levels of transportation noise in the European common market (Carlos,1999).

Noise pollution is not only an aggravation but also a serious health risk. Acoustic noise beyond a level is harmful. Some of the major health hazards induced by noise pollution are permanent hearing loss, high blood pressure, muscle tension, migraine, headaches, higher cholesterol level, gastric ulcers, irritation, insomnia, increased aggression and psychological disorder (Miller, 1998). High noise level can contribute to cardio vascular effects in humans and increased coronary artery disease. The noise pollution can cause mental problem. There is a high rate of admittance of people to the mental hospital of noisy area (Abey Wickrama, 1969).

The noise level measurement is carried out in many places of the world. The noise level measurement in commercial zones of three major cities of Kerala, India showed that noise levels are higher than the limits prescribed by Government of India (Sampth et.al. 2004). The noise level measured in Deharadun, India showed that noise level varied from maximum 102.7 dB(A) to minimum 47.7 dB(A) at selected places which are above the prescribed standard values (Ziaudin et.al. 2007). The busy ITO junction in Delhi registered around 74 dB(A) of sound on typical day, almost 10 dB(A) more than limit for commercial areas. In New York City, maximum noise level measured 106 dB on sub way plat forms and 112 dB inside cars. These noise levels exceed the recommended exposure limits (Gershon et.al.2006).The study of noise level at different locations in Dhaka city showed that the average noise level at every location varied within the range of 80 to 90 dB(A) which is above the safe limit of 60 dB(A) (Hassan and Alam, 2013). Assessment of outdoor and indoor noise pollution carried

out in commercial area of Gorakhpur city, India found that the noise level are beyond the limit of 65 dB(A) (Pritam et.al. 2014).

The survey of noise level carried out by Nepal Health Research Council and WHO in commercial area of Kathmandu valley showed maximum level of 77 dB(A) at Kupondole and minimum level of 58 dB(A) at Tribhuwan University gate. Krishnamurthi *et. al.* 2007 reported that noise level in Banepa city of Nepal varied from 60.1 dB(A) to 110.2 dB(A). The study of noise level status in Siddharthanagar, Nepal carried out by L.N Bhattarai (2014) showed that the maximum L_{eq} of 81.9 dB(A) at bus park and minimum 54.5 dB(A) at Medical College. This study shows that the noise level at each location exceeds the limit prescribed by Government of Nepal and WHO.

2. MATERIALS AND METHODS

The noise pollution is measured in decibel (dB). The intensity level of sound in decibel is defined as,

$$\text{Intensity level } L(dB) = 10 \log_{10} (I/I_0)$$

Where, I is the intensity o f sound and $I_0 = 10^{-12}$ W/m^2 is the threshold of hearing.

A decibel meter is also called sound meter which is designed to measure accurately and objectively the noise level present in the environment. The sound level can be measured in two weightings 'A' and 'C'. 'A' weighting resembles the audible response of human ear. Sounds of frequencies ranging from 800 to 3000 Hz are in 'A' weighted scale. However, 'C' weighting measures for flat response of same amplitude over the frequency range. The intensity of sound level at a point or place can be described by noise level indices. The commonly used noise level indices are L_{eq}, L_{max}, L_{min}, etc. The equivalent sound level as used by Olayinka et.al. (2010) is given by,

$$L_{eq} = 10 \log_{10} ({}^{0.1\,Li})$$

Where, N= total number of data observed and fi = fraction of time for that sound level in the ith interval which is 1 second in slow mode of sound level meter.

The study of noise level was carried out by using a portable digital Sound Level Meter (Dicksmith Digital Sound Level meter Q-1362). This device is primarily designed for community noise surveys. This meter can record the maximum and minimum sound level with an accuracy of ± 2 dB and resolution 0.1 dB. The measurements were carried out for 'A' weighting of selected locations at 4 PM to 5 PM in the month of June 2016. The sound level meter was taken in hand at a height of 1 meter and at a distance of 5 meter from the center of hatbazars. During each sampling site, 10 readings of noise levels were recorded at an interval of 30 seconds in a period of 5 minutes. The maximum and minimum noise levels were also recorded. The field survey was carried out under normal atmospheric condition having no rainfall and high wind speed. The collected data was tabulated, processed and analyzed. Hatbazar is a place where the trading of daily human needs like foods, vegetables, fruits etc, takes place. It is a periodic market held on one or more days of each week and on same days of the week. Hatbazars are quite noisy and belong to commercial zones. Noise levels were measured at five hatbazars of Butwal Sub Metropolitan city. The selected sites were Butwal hatbazar, Purano buspark hatbazar, Deepnagar hatbazar, Devinagar hatbazar and Majhagaun hatbazar.

3. RESULT AND DISCUSSION

Various standards are being used in different countries regarding the acceptable levels of noise depending on situation. The Government of Nepal has established noise level standard for different areas. The noise level standard of some countries is shown in table1.

Table 1: Noise level standard of some countries and organization

Countries / Organization	Noise level in dB(A)							
	Silent zone		Residential Area		Commercial Area		Industrial Area	
	Day	Night	Day	Night	Day	Night	Day	Night
Nepal	50	40	55	45	65	55	75	70
India	50	40	55	45	65	55	75	70
Japan	45	35	50	40	60	50	60	50
US	45	35	55	45	60	50	70	60
WHO	45	35	55	45	55	55	65	65

The average maximum noise levels L_{max} observed at various sites of study area is given in table 2. Figure 1 depicts the L_{max} observed at different hatbazars of Butwal city. The observed data shows that noise level of all sites on hatbazar days are more than noise level on non hatbazar days. The highest noise level of 85.9 dB(A) was observed at Butwal hatbazar line and the lowest of 71.9 dB(A) was observed at Majhagaun hatbazar during hatbazar day. However, the maximum noise level of 72 dB(A) was noticed at Purano bus park hatbazar and minimum 59.8 dB(A) was also observed at Majhagaun hatbazar on non hatbazar day.

Table 2: Average maximum noise level L_{max} in dB(A) at various sites

S. N.	Sampling sites	Hatbazar day	Non hatbazar day
		L_{max} dB(A)	L_{max} dB(A)
1	Butwal Hatbazar	85.9	71
2	Purano Bus park Hatbazar	79	72
3	Deepnagar Hatbazar	78.9	71
4	Devinagar Hatbazar	78	63
5	Majhagaun Hatbazar	71.9	59.8

Source: Field survey 2016

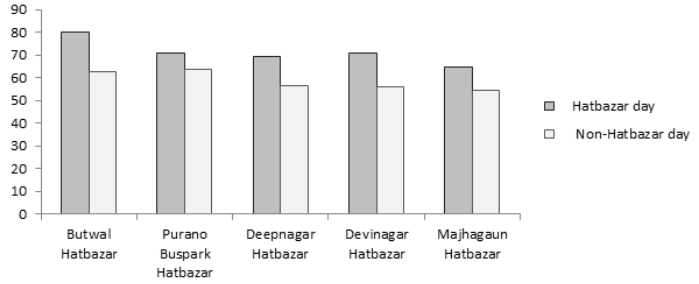

Figure 1: Average maximum noise level L_{max} at various sites

The equivalent sound levels (L_{eq}) observed at the study areas are listed in table 3. Figure 2 illustrates the L_{eq} observed at various sites of Butwal city. The result shows that in most of the sampling sites the noise level exceeds the limit prescribed by Government of Nepal and WHO. Figure 2 shows that the highest L_{eq} of 79.8 dB(A) was observed at Butwal hatbazar on the market day. This hatbazar is the biggest hatbazar and it lies near the main commercial centre of Butwal city. The blasting of horns by vehicles, crowd of people, commercial activities and unnecessary advertisement of goods increase the noise level in this hatbazar.

Table 3: Equivalent noise level (L_{eq}) in dB(A) at various sites

S.N	Sampling sites	Average equivalent noise level Leq in dB(A)	
		Hatbazar day	Non-Hatbazar day
1	Butwal Hatbazar	79.8	62.5
2	Purano Buspark Hatbazar	70.8	63.8
3	Deepnagar Hatbazar	69.1	56.4
4	Devinagar Hatbazar	70.9	56
5	Majhagaun Hatbazar	64.9	54.6

Source: Field survey 2016

The maximum L_{eq} of 63.8 dB(A) was found at Purano bus park hatbazar on non hatbazar day. This is a wholesale market of fruits and vegetables. It is near from the highway. The observed maximum noise level is due to the high traffic flow and gathering of people at this hatbazar. The lowest L_{eq} of 64.9 dB(A) and 54.6 dB(A) were respectively observed on hatbazar day and non hatbazar day at Majhgaun hatbazar . It is due to the fact that this hatbazar is away from highway. It lies near Tinau river. The area covered by this hatbazar is small as compared to other hatbazars. ThSe crowd of people and the vehicular flow is low in this hatbazar.

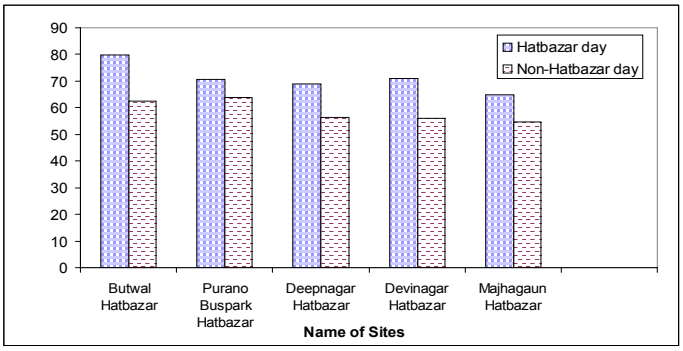

Figure 2 Equivalent noise levels at various sites of Butwal city

4. CONCLUSIONS

Butwal hatbazar is the noisiest hatbazar with L_{eq} of 79.8 dB(A) and Majhagaun hatbazar is the quietest hatbazar with L_{eq} of 64.9 dB(A). The noise levels of 80% of study areas exceed the limit recommended by Government of Nepal and WHO. The noise level on hatbazar day is found to be greater

than that of non hatbazar day. The commercial activities, crowd of people, unnecessary advertisement of goods and blasting of horns cumulate the noise level in hatbazars. The high noise level in hatbazars of Butwal city can cause health hazards. The awareness of general public can play an important role to reduce noise pollution.

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