

ASSESSMENT OF TRAFFIC NOISE POLLUTION IN BANEPA, A SEMI URBAN TOWN OF NEPAL

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ABSTRACT

Noise pollution is an interfering air-pollutant which possesses both auditory and a host of non-auditory effects on the exposed population. Since there is no medicine to cure hearing loss prevention to overt exposure is the only alternative left. The study reports community noise levels measured during day time in a fast developing semi-urban area of Nepal. The noise levels were measured following standard procedure using calibrated sound pressure level meter at many places predominated by both commercial and residential tenements at Banepa town particularly reflecting motor vehicular traffic prone areas. A small exercise of noise generated by different vehicles that frequent on the arterial roads has also been carried out. To delineate the perception about the noise and its significance on health of community a representative sample of public has been interviewed using a questionnaire. The results indicate high noise levels, surpassing on many occasions to the prescribed levels. Overall minimum and maximum noise levels for the Main Road are 60.1dB (A) and 110.2 dB (A). Bus parks and Bus stops had minimum and maximum noise levels were 63.9 dB (A) and 110.2dB (A). The picture near residential tenements also had substantial levels of noise, a minimum of 59.11dB (A). The noise levels produced by different motor vehicles ranged from 121 to 91.2 dB(A), which was substantial. The study observes motor vehicles as main source in the town. The perception survey indicate high prevalence of head aches, lack of concentration, sleep. Since levels lie much above the prescribed limits there is an imminent health risk to the exposed population and the study suggests control measures to be instituted on a priority.

Key words: Environment, noise pollution, health hazard, sub-urban, Nepal

INTRODUCTION

One of the most undesirable side effects of improperly planned industrialization is the pollution of our environment and consequent degradation of the quality of life (*Kudesia et al., 1993*). Noise pollution is a significant environmental problem in many rapidly urbanizing areas. This problem is properly not recognized despite the fact that it is steadily growing in developing countries (*Barboza et al., 1995*). It is well established now that noise is a potential hazard to health, communication and enjoyment of social life. It is becoming an unjustifiable interference and imposition upon human comfort, health and quality of modern life (*Ahmad, K., 1998*).

Traffic noise in Banepa

Population density of Banepa is about 2,846 persons/km²; there are more than 3295 registered motor vehicles in Banepa at present. The number and type of vehicle populated in Banepa for December 2006 is shown in Table 1.

Table 1. Registered Motor vehicles in Banepa in 2006

Type of vehicle	Number
Scooters and motorcycles	2000
Tractors and trailers	350
Buses	245
Trucks and mini-trucks	200
Auto rickshaws and other three wheelers	150
Private cars	100
Jeeps, land-rovers and station wagons	50
Miscellaneous vehicles	200
Total no. of vehicles	3295

*Source: Kavre Bus Woners Association, 2007

The Map of Banepa shown in figure 1 depicts the Main Road, a highway and the link Road. Most the houses, shops and other important commercial offices of Banepa are located along the Highway. On the other hand, the link road passing towards/through the old settlements of the city, connects Banepa with the surrounding two municipalities of the districts. The location of Banepa town itself is characteristic in the sense that to approach the surrounding two municipalities' one has to cruise through Banepa.

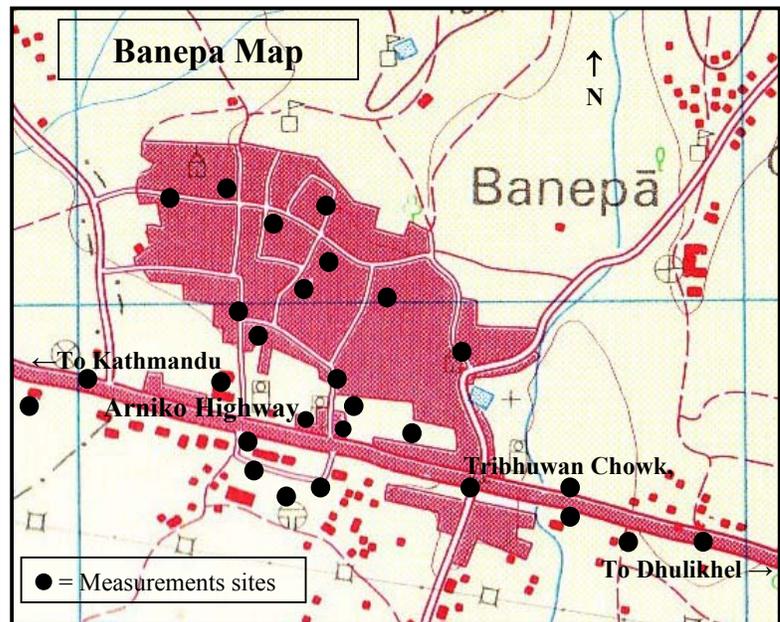


Figure 1 Locations Map of Banepa are showing of noise Measurements sites

The average traffic load in the central junction of Banepa is shown Table 2.

Table 2. Average Traffic Load in Tribhuwan Chowk, Banepa

Type of vehicle	Traffic Load (per hours)
Motorcycles	480
Buses	160
Trucks	130
Microbus	120
Jeeps(mobile)	110
Mini-trucks	86
Private cars	80
Tractors and trailers	76
Motor Van	70
Taxicabs	35
Total	1347

The main objective of the study was to measure the environmental noise levels and assess the noise pollution in the Banepa Valley predominantly due to traffic mobility. This exercise also gave an opportunity have an comparative assessment of noise level associated near houses and the main road/highway. Besides the environmental noise measurement public opinion survey was conducted about traffic noise pollution and its health effect.

MATERIALS AND METHODS

Study area

Banepa is the most important municipal city, situated 26 kilometers in the east of capital city Kathmandu, along with Arniko Highway. It is the first municipality out of three in the Kavre district. It has an area of 5.56 km². From past Banepa was an important station on the trade route to Tibet and the town is a main stop for trucks and buses traveling from Kathmandu to China and vice versa. Besides this Banepa is a trading center of the three municipalities of the Kavre district. The density of the population is higher than other two municipalities of the district. Most of the new houses are lined up on either side of highway. There is a surge in population in recent years. The projected population of Banepa in the year 2016 will be 24,282 from the present population of 15,822. Air, water, soil and noise pollution are common scenario of the city.

Methods

The noise levels were measured with the help of a portable precision digital sound level meter (Model-CEL-231, made in England). This instrument is shown in figure 2. This instrument is primarily designed for community noise surveys. A large digital display gives a single value indication of the maximum 'A' weighted RMS (root mean square) sound pressure level measured during the previous second. It is equipped with high sensitivity Bruel and Kjaer Prepolarized Condenser Microphone Type 4176. Measurements from 30 to 135 dB (A) can be carried out with this instrument.



Figure 2 Portable digital sound level meter (Model-CEL-231)

The instrument calibration was achieved using manufacturer supplied pistaphone calibrator capable of producing known sound pressure level.

The details of measurement sites and their number spread over Banepa municipality is shown in the following Table.

No.	Measurement location	Number of spots of measurement	Remarks
1	Arniko Highway	10	At each of the spot a minimum of 5 and a maximum of 19 noise measurements were taken. On each spot the measurements were taken at three different times during day time (between 8.30 am to 7 PM)
2	Main Road	10	
3	Lnik Road	10	
4	Residences	10	
5	Commercial shops	6	
6	Bus park	6	
Total number of spots		42	

Noise measurements were taken following the prescribed procedure stipulated in the manual of the manufacturer of Sound Pressure Level meter. The results were filled in at the spot of measurement in pre-designed formats.

The interpretation of noise levels and the cut-off level to which the measured noise levels were compared is 70 dB(A) as prescribed as basic noise level during day-time at United Kingdom since Nepal as of now does not possess prescribed standards for the traffic noise. The noise levels as prescribed is shown in the following Table.

Table. Tolerated noise levels on the main roads for United Kingdom (Lohani, 1984)

Type of noise	Tolerance limit, dB (A)	
	Day	Night
Basic noise level	70	65
Frequent peaks	80	70
Infrequent peaks	90	80

RESULTS AND DISCUSSION

The traffic noise measured at the spots along highway areas is shown in Table-3. There were in all 10 locations which are commercial in nature and as such form the commercial hub of Banepa town. The minimum and maximum noise levels observed at the highway are 60.1dB (A) and 110.2 dB (A) respectively. The source is predominantly attributable to motor vehicular traffic. The permissible level for road traffic noise is 70 decibels dB (A). Out of 126 trials in 10 locations near in the Arniko Highway, in all the trials the noise level has surpassed the permissible limit. However it should be noted that the exceedance was during the day time. The departure from prescribed limit is substantial and with this level on a chronic measure of time can casue definitive health problems to the exposed population.

Table 3. Traffic noise In Banepa along the Main Road (Arniko Highway)

S.No.	Location	N	Sound pressure levels, dB (A)	
			Min	Max
1.	Bus park, Entry point of main (ward no 10)	12	68.0	110.2
2.	Central Junction (Tribhuwan Chowk)	18	65.5	107.2
3.	In font of Banepa Police Bit	12	61.2	102.5
4.	Pulbazzar (Chowki Area)	12	63.2	101.3
5.	Tindobato(Bajaj showroom)	12	62.6	99.9
6.	Pulbazzar (Pragati Pravat High School)	9	60.1	99.4
7.	Exit point of main Bus park (word no 6)	12	69.5	99.3
8.	Bus Stop(Chardobato)	15	67.3	98.6
9.	Rainbow photo studio	12	67.7	98.3
10.	Ganesh Bazzar	12	62.1	95.0

N= number of observations

In order to investigate the effect of noise levels along the main road on the nearest residential areas, we measured the noise level for the 10 nearest house from the main road which data is given in Table 4. This exercise was to have an idea of noise exposure level for the general residents of the area. The picture at this area also is not very different from that noted at commercial area indicating that residents who are located near commercial places also have a very high exposure. Near the guest house and police sub-station, and a few residences the levels were beyond 100 dB(A). Overall noise levels measured at the nearest residences located in the vicinity of main road ranged from 59.1 to 104.2 dB(A). There was little difference observed in noise level between highway and nearest houses from the highway. Measurements were taken at a distance of 8-10 meter between highway and the nearest houses. The source was traffic density of vehicles and all the residents have an imminent health hazard from the overt noise levels.

Table 4. Traffic noise level in the nearest house from the main road

Serial	Location	N	Sound pressure levels, dB (A)	
			Min	Max
1.	Majkaji Pradhan	12	63.3	104.2
2.	Banepa Police Bit	9	61.2	102.5
3.	Chadani Guest House(opposite of Buspark)	12	69.0	102.2
4.	Mohan Baidya	9	59.1	99.4
5.	Tika Bhakta Bhochhibhoya	15	65.5	97.9
6.	Rabi Shakya	6	66.5	97.3
7.	Durba Raj Karmacharya(Bajaj)	9	63.0	97.1
8.	Gopal Bhochhibhoya	12	65.3	95.7
9.	Bhomi Cafe	12	67.3	94.3
10.	Rajesh Hardware	12	60.0	92.1

The link roads were sub-ways leading to and from the highway. However, measurement of noise was carried out beyond the highway to reflect levels directly attributable to such link roads. The noise levels at such 10 locations along the link road in Banepa are shown in the Table 5. The minimum and maximum noise levels for the Link Road was 52.7dB (A) and 100.1dB (A) respectively, indicating relatively lesser compared to highway locations but beyond the recommended prescribed limit of 70 dB(A) suggesting again health risk to the residents at link road.

Table 5. Traffic noise in Banepa along the Link Road

Serial	Location	N	Sound pressure levels, dB (A)	
			Min	Max
1.	Dachhu Tole	12	59.5	100.1
2.	Tindobato(Entry of Nala)	12	65.0	91.7
3.	Naladobato	12	58.9	85.5
4.	Thunla Marg(Behind Municipality)	9	55.4	85.4
5.	Thunla Marg(Near Ganesh Mandir)	9	52.5	84.7
6.	Woku Tole	12	58.4	85.0
7.	Karuna Marg	12	54.1	84.7
8.	Tindhara	12	52.7	82.0
9.	Godam Chowk	9	59.4	81.5
10.	Kobahal	6	58.2	74.3

The environmental noise levels directly emanating from the bus park was measured to have an idea of the main source of noise to the entire surroundings of bus park. Interestingly even the Banepa Municipality is located in the Bus park. Therefore during the day hours heavy human as well as buses arrive and go from this place. There are many commercial shops also located in the bus park who are chronically exposed to the noise levels as depicted in the Table-6. The bus park also has in its vicinity many residences. Thus this area is a mixed zone of the town. A maximal noise level of 110.2 dB(A) is observed in the bus park which is quite high compared to the prescribed limit of 70 db(A). There is a definitive risk of health impairment to the population, particularly for the shop-keepers and permanent residences in and around the bus park.

Table 6. Traffic noise level inside Bus Park/Bus Stop

Serial	Location	N	Sound pressure levels, dB (A)	
			Min	Max
1.	Entry point of main Bus park (word no 10)	12	68.0	110.2
2.	Main Bus park	12	64.5	102.6
3.	Bus Stop (Chardobato, Towards Panauli)	12	69.3	99.3
4.	Exit point of main Bus park (word no 6)	12	69.5	99.3
5.	Bus Stop (Chardobato, Towards Dhulikhel)	12	63.9	98.5
6.	Main Bus park (near Municipality)	12	69.5	95.3

The exercise to point out the type of vehicle and its contribution to environmental noise brought out interesting findings. The intent of measuring the noise levels firstly was to have an estimate of its individual contribution to the environmental noise and secondly to reflect the maintenance levels of the vehicles prevalent in the area. The levels are depicted in the Table-7. It can be observed that cargo carrying trucks [110.6 dB(A)] followed by minitrucks [101.6 dB(A)]. Motorcycles and public buses were associated with 99.8dB(A) and Buses produced a noise level of 98.3dB(A); even tractors, taxicabs, motor vans and minibuses liberated noise levels beyond 90dB(A); private cars and jeeps were associated with noise levels beyond 85dB(A). Regarding noise levels during air-horning spells it can be noted that maximal levels [121.0 dB(A)] followed by; the tractors and trailer hauling vehicles also possessed high noise levels [(111.6 dB(A))]; the mini trucks, taxi cabs, motor vans and minibuses also liberated noise levels beyond 100 dB(A). The findings of individual contribution of vehicles towards noise pollution when compared to the traffic noise limit of 70dB(A) the departure was high. The findings suggest institution of immediate regulatory measures to minimise and control high motor-emanated environmental noise levels in Banepa town.

Table 7. Episodic and Impulsive Noise levels by the Air-Horn of Motor vehicles in Banepa

Serial	Type of vehicle	Number of experiment	Sound pressure level, dB (A)	
			Minimum	Maximum
1.	Buses	12	98.3	121.0
2.	Trucks	10	110.6	117.6
3.	Tractors and trailers	5	96.2	111.6
4.	Mini-trucks	6	101.6	110.1
5.	Motorcycles	13	99.8	107.3
6.	Taxicabs	5	94.8	102.4
7.	Motor Van	14	91.2	101.3
8.	Microbus	12	90.0	100.5
9.	Private Cars	8	85.0	92.3
10.	Jeeps, land-rovers and Pajero	11	87.6	91.2

Perception Study

The noise perception survey carried out by a questionnaire administered to 50 individuals in Banepa indicated that most of the people including vehicle drivers were aware about Noise pollution but their health significance was not fully realized. 60% respondents were not satisfied about the noise level in their place. Headache, bad temper, hearing problem, loss of concentration were some of the significant effects manifested by noise pollution. 43%

respondents identified headache as the main health effect of noise pollution and 47% respondents visited to doctors for treatment of health problems. 92% of students reported that their studying was disrupted by frequent air-horns of vehicles. The general public strongly supported actions from the government to reduce noise pollution, many supporting the ban the hydraulic horn, improved traffic control, banning very old vehicles, banning high-noise creating industries such as stone crushing machines right inside urban areas, zoning town-areas according to noise ranges, and banning usage of public audios line sound amplifying mikes for processions, advertising, and election campaigns.

CONCLUSION

This study was carried out to evaluate the environmental noise pollution in the city of Banepa valley due to traffic noise. Very high environmental noise levels due to traffic of vehicles were observed during the study causing disturbance and even some health problems. Basing on the study findings it can be inferred that there is an urgent need to set up noise standards in the country to control the noise pollution. A focused study of examining hearing loss and health survey is warranted.

The highlights in brief and severity of noise pollution at Banepa was disseminated by a popular article submitted for national and local news papers, The news media carried the findings of the study and this effort facilitated to create an awareness among common public residing in the town.

Some other suggestions such as planting trees on both sides of the road, banning hydraulic horns, improvement and streamlining of roads and parking system, discouragement of high sound producing vehicles, industries and public awareness would also be helpful in reduction of the present noise level in Banepa. The role of NGOs, researchers and professionals, media and concerned individuals is significant in minimizing the environmental hazard of noise pollution.

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