

**ATTITUDES OF COMMUNITY TO URBAN TRAFFIC NOISE IN MOROGORO, TANZANIA  
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**Abstract**

*Traffic noise is a major environmental source of pollution both in developed and in developing countries. This study was carried out in Morogoro municipality, located about 200 km west of Dar es Salaam the business capital of Tanzania. Total of 16 measuring points were selected along main roads and A-weighted continuous equivalent sound level meters was used for measurement of noise level. The average noise equivalent level at measured points varied between 51.1 to 75.1 dBA. The results established the fact that noise levels are more than the acceptable limit of 55 dBA, which is the daytime governmentally prescribed noise limit for residential-commercial areas. This study also describes the reaction of the Morogoro residents to environmental noise pollution. A total of 200 questionnaires were processed. The results of the interview questionnaire revealed that the main isolated noise source was traffic (51%) and street noise (29%). About 45% of the respondents classified the noise in their street as "high"; and that noise bother 77% of the respondent more in daytime. The main impacts of exposure to noise were reported to be headache, hearing problem, sleeplessness, difficulty to concentrate and conversation disruption. This study recommends raising community awareness on noise pollution, structural management, traffic management and enforcement of laws and regulations so as to control noise pollution.*

**Keywords:** Noise pollution, Vehicles, Annoyance, Urban public, Diurnal variation

**Introduction**

Noise in cities is considered by the World Health Organization (WHO) to be the third most hazardous type of pollution after air and water pollution (WHO, 1999). Vehicles traffic which are a very significant part of the urban environment, are also the main source of urban noise emission, contributing about 55% to the total noise (Pandya 2002; Sinha and Sridharan, 2003). The growing vehicle population gives rise to unrestrained noise pollution and associated health effects and can cause psychological and physiological disorders. The effects of noise are seldom catastrophic, and are often only transitory, but adverse effects can be cumulative with prolonged or repeated exposure. Noise effects have various impacts on mental and physical health and disturbance in daily activities. It may affect sleep, conversation, leading to perception of annoyance and causes hearing loss, cardiovascular problems as well as affecting task performance (Canter, 1996;

Piccolo *et al.*, 2005; Banerjee and Chakraborty, 2006).

Researchers in Tanzania and other countries have been motivated to study the noise pollution problem and its impact on the community (Abdel-Raziq *et al.*, 2000; Zannin *et al.*, 2001; Minja *et al.*, 2003; Mbuligwe, 2004; Piccolo *et al.*, 2005; Samagwa *et al.*, 2009). In Morogoro Municipality the noise levels have increased due to an increase in population and in the number of circulating vehicles. The Municipality is estimated to have a population of 270,000 in 2008 and embraces about 80% of the urban population, being the most developed and largest municipality of Morogoro region (URT, 2010). The present study was undertaken to assess the noise pollution level and its impact on the community in Morogoro Municipality. The results were obtained from a questionnaire social survey and noise measurements.

### Materials and Methods

For assessment of road traffic noise due to vehicular movement the sampling, analysis and interpretation tools were selected to give most realistic results. The study area, Morogoro Municipality, situated 200 km west of Dar es Salaam the economic capital of Tanzania, and consists of 19 administrative wards; out of which 10 wards were selected as sampling locations. A Digital Sound Level Meter, (Model DT-85A) with measuring range between 30 and 130 dB was used for the study. All readings were taken on the 'A-Weighting' scale, at a height of about 1.5 meters from ground level and on the 'Fast' range time weighting. The 'A' weighting characteristic and 'Fast' range is simulated as 'Human Ear Listening' response. The measurements were taken at four major points along major roads beginning from Monday morning and ended on Sunday evening. The measuring points were selected at a distance of 2 meters from the nearest driving lane (bus and taxi stands and stops) where the passengers passed by or waited to catch up the commuter bus commonly called "Daladala", taxi or other means of transport. Other criteria were congestion of people in residential or commercial areas and proximity of roadways to important areas like hospital and learning institutions. The measurements were carried out on March 2011 during the daytime time which runs from 8.00 am to 5.00 pm because the traffic density is higher at this period than that at other hours. For the proper assessment and analysis of the results A-weighted equivalent sound level ( $L_{Aeq}$ ), minimum ( $L_{min}$ ) and maximum ( $L_{max}$ ) noise indices were measured during sampling.

In order to know the opinion of the community about how the noise levels have affected their daily life in the areas, a structured questionnaire was administered to a

total of 200 Municipal residents between January and February 2011. The questionnaire had four parts drafted in an intricate fashion to detect the degree of tolerance and awareness of the public to road traffic related noise. The first part had questions on the respondent identity such as sex, age and educational level. The second part aimed at obtaining information about noise levels and its effects on people's habit. The last part had questions used to evaluate the main noise types and variation with time. The respondents participating in the survey were randomly selected on a two-person per family basis at the residential areas of the main roads or connecting streets.

### Results

#### Urban noise levels

Table 1 shows noise levels for  $L_{Aeq}$ ,  $L_{min}$  and  $L_{max}$  at measurement points in four main down town roads. The results showed that noise equivalent level varied between 51.1 to 75.1 dBA at these measurement points. The minimum and maximum values were 33.8 and 86.7 dBA, respectively. From an overview of the results in Table 1, it shows that the average noise level have a maximum value of 75.1 dBA, which exceed the Tanzania Bureau of Standard (TBS) of 55 dBA allowable limit value for mixed residential with some commercial and entertainment area (TBS, 2005). However, Sokoine University of Agriculture (SUA) main campus, Morogoro regional hospital and Solomon Mahlangu university campus measurement points were the quiet areas whereas Masika square being the noisy area. Masika area is one of the busy places located along the Lumumba road and the major road to the town centre. The measured noise levels (Table 2) also shows that this Lumumba road has high noise levels than other surveyed roads.

Table 1 Average, minimum and maximum noise levels (dBA) during the study period in Morogoro Municipality.

Measurement Site	L <sub>Aeq</sub>	Std. Dev.	L <sub>min</sub>	L <sub>max</sub>
<b>Dodoma-Lumumba Road</b>				
Kihonda industrial area	64.8	1.1	56.6	86.7
Msamvu mini-bus stand	71.3	1.0	70.3	80.4
Mtawala primary school	71.4	0.8	66.3	78.9
Masika square	75.1	0.8	65.6	84.8
<b>SUA* Road</b>				
SUA* main campus	53.4	1.6	43.3	73.3
SUA* main gate	65.3	5.4	60.1	78.4
Misufini round about (Calvary)	66.7	2.8	62.0	78.8
Morogoro main market	60.9	0.6	58.4	71.5
<b>Bigwa road</b>				
Main town bus stand	70.4	6.2	61.8	81.8
Morogoro regional hospital	55.4	5.8	52.6	77.4
Kilakala secondary school junction	64.7	2.1	62.4	76.1
Bigwa mwisho	57.2	4.7	53.1	70.9
<b>Mazimbu road</b>				
Morogoro fire station	70.8	0.4	69.6	80.7
Iringa road junction-Tumbaku	72.0	0.7	61.5	79.3
Mazimbu primary school	60.7	6.9	54.1	76.4
SUA-SMC*	53.1	4.5	33.8	78.6

Std. Dev. = Standard deviation  
 SUA\* = Sokoine University of Agriculture  
 SMC\* = Solomon Mahlangu Campus

Table 2 Average, minimum and maximum noise levels (dBA) at different surveyed roads.

Site	L <sub>Aeq</sub>	Std. Dev.	L <sub>min</sub>	L <sub>max</sub>
Dodoma-Lumumba road	70.7	0.9	64.7	82.7
SUA* road	61.6	2.6	56.0	75.5
Bigwa Road	61.9	4.7	57.5	76.6
Mazimbu Road	64.2	3.1	54.8	78.8

SUA\* = Sokoine University of Agriculture

**Community reaction to urban noise**

Table 3 shows the social demographic characteristics of residents in Morogoro Municipality who participated in this study, and also their response to questions from the questionnaires. Among the interviewed residents about 52% were male and 48% were female. The majority had primary education with age below 35 years old. The residents who had affirmed that they had been living in the same house or location for about 1 to 5 years pointed out that the noise pollution in

their houses was "high" (45%), and distressful especially between 12 noon and 6 pm. About 91% of the residents were aware of the noise pollution and 86% had the knowledge that noise pollution is associated with some health problems. The frequency distributions of the residents concerning the noise types in their houses and residents suggestions to the Morogoro Municipal Council (MMC) required to reduce and control the problems of noise pollution are also presented in Table 3.

The types of negative impacts and health effect encountered by the respondents due to

noise are shown in Figures 1 and 2. Majority of respondents (50.6%) pointed out that traffic noise was the major noise source and 29% of the noise is from the street and 20% from construction activities. No doubt traffic is a continuous noise source, as well as street and construction in many cases (Ouis, 2001). Related to noise health and negative impacts

52% of the residents reported to have encountered headache, (30.5%) hearing problem, (27.6%) sleeplessness, (28.9%) conversation disruption, and (24.7%) difficulty to concentrate. As far as treatment is concerned, 39% of the residents reported to have consulted the specialist for ear problem.

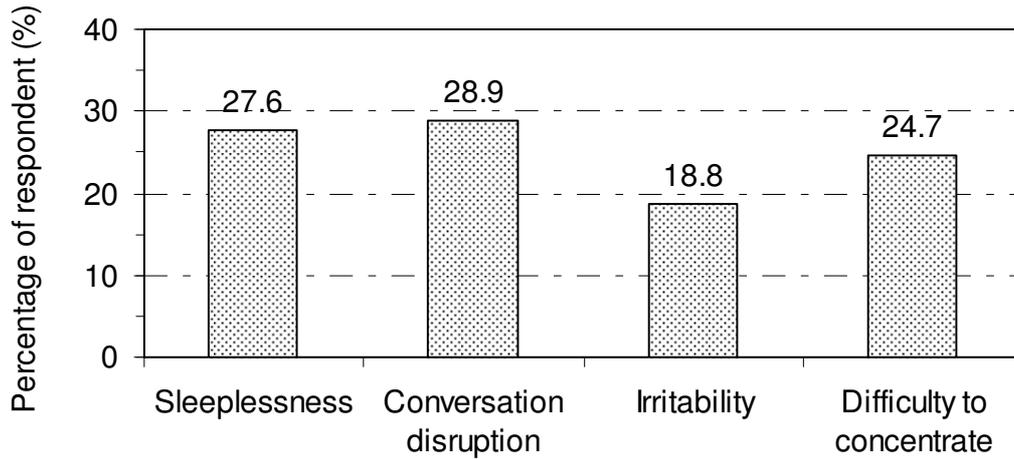


Figure 1 Frequency distribution of answers concerning types of noise negative effects.

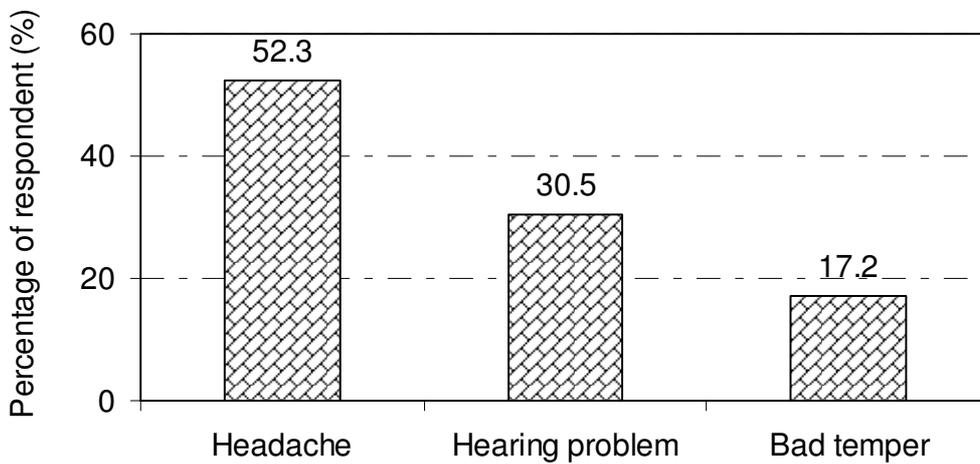


Figure 2 Frequency distributions of the health effects encountered by the respondents.

Table 3 Social characteristics and frequency distribution of Morogoro municipal residents on the assessment of road traffic noise pollution.

Characteristics	Respondents (N)	Percentage (%)
Sex		
Male	124	51.9
Female	115	48.1
Age		
< 35	145	60.7
35 - 45	36	15.1
> 45	58	24.3
Education		
No formal education	12	5.0
Primary	102	42.7
Secondary	91	38.1
University and above	34	14.2
How long living in the same home/location		
Less than 1 year	53	22.2
1 to 5 years	101	42.3
More than 5 years	85	35.6
Kind of noise		
Traffic	121	50.6
Street	70	29.3
Construction	48	20.1
Most important source of noise		
Motorcycles	66	27.6
Commuter buses	36	15.1
Air-horn noise of cars	73	30.5
Cars	39	16.3
Trucks	25	10.5
Comment on the noise in the house		
Very high	78	32.6
High	107	44.8
Normal or medium	54	22.6
Time when noise is more bothersome		
Morning (6-11 am)	76	31.8
Afternoon (12 noon – 6 pm)	110	46.0
Night (7-11 pm)	53	22.2
Visit Ear specialist doctors		
Yes	94	39.3
No	145	60.7
Support actions from MMC* to reduce noise		
Yes	226	94.6
No	13	5.4
Kind action to be taken		
Improved traffic control	85	35.6
Ban very old vehicles	50	20.9
Ban of hydraulic horn	104	43.5

MMC\* = Morogoro Municipal Council

## Discussion

The measured noise levels in the present study ranged between 33.8 and 86.7 dBA with high  $L_{Aeq}$  of 75.1 (dBA). About 78% of residents believed that noise disturbed them more in the daytime and 22% in the nighttime, as is also reported by other researches (Uris and Cervera, 2001). The study showed that the traffic noise was the most important source of noise pollution followed by street and construction noises.

The results are also interesting with regard to the physical and psychic annoyance levels and the nature of the noise source. It was clear that among the respondents who felt annoyed by the noise in their homes/work place; nearly 51% pointed out the traffic noise was the main source of annoyance, 29% the street noise. Findings of the study showed that traffic noise has negative impacts on human health, as reported by others authors (Mato and Mufuruki, 1999; Georgiadou *et al.*, 2004) and some effects of noise over urban inhabitants include irritability and difficulty to concentrate (Maschke, 2001). It has been observed that most respondents "annoyed by traffic noise" had affirmed that they felt at least one of the effects related to the ones mentioned above.

## Conclusion

The noise assessment presented in this study has revealed that in an urban growing town such as Morogoro, road traffic noise is high than the limits set by the Tanzania Bureau of Standards. The well built up area with residential apartments, shopping areas, have higher noise level due to frequent use of the roads alongside it by all types of public, commercial and private transport vehicles. This suggests that the local community is exposed to high noise levels, whose main source is road traffic. Based on the noise level survey it was observed that immediate mitigation measures are required to control the road traffic noise problem. Suggestive control methodologies include the design of the building incorporating the use of suitable door and/or window will reduce the noise levels, discouragement of high sound producing vehicles, industries, raising the awareness among local community and strict enforcement

of laws and regulations in areas that link to pollution. The present survey also indicates that noise affects individuals in several ways including annoyance, interference with speech communication, sleeplessness and performance effects. However, public education to be given by the government and NGOs, researchers and professionals, media and concerned individuals can play a significant role in noise pollution prevention and control.

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