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A study on traffic noise of two campuses of University, Balasore, India

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Abstract

Noise pollution is a significant environmental problem in many rapidly urbanizing areas of Orissa, India. Transportation sector is one of the major contributors to noise in these areas. The present study is an attempt to estimate traffic noise pollution at five places on the way from Vyasa Vihar Campus to Gyan Vigyan Vihar Campus of Fakir Mohan University, Balasore, Orissa. The sources of noise at the studied sites are predominantly attributable to motor vehicular traffic. The noise levels of all the five locations were found to be beyond permissible limit during the day time. The contributions of different types of vehicles to environmental noise were found to ranging from 70.4-94.2, 79.0-96.1, 77.8-110.2, 70.8-90.3, 71.0-87.5, 71.1-84.4, 72.5-86.9 and 74.0-85.4 dB (A) by cargo carrying Trucks, Tractors, Dumpers, Town Buses, Motor cycles, Bolero/Trucker, Pick up and Tempo respectively. The contributions of individual vehicles towards noise pollution were found to be more than the road traffic noise-limit *i.e.*, 70 dB (A). On certain local inhabitants interviewed, the impact of noise was observed in the forms of alterations in their physical, psychological and personal aspects. This study warrants attention from all sections of people to deal with the problem of noise pollution.

Key words

Health impact, Noise pollution, Urbanizing areas, Vehicular noise

Introduction

One of the most undesirable effects of improperly planned industrialization is the pollution of the environment and consequent degradation of the quality of life. Noise pollution is a significant environmental problem in many rapidly urbanizing areas. A definite solution to it has not been developed yet. This is because the health effect due to noise pollution has not attracted much attention yet unlike air and water pollution. Noise is now known to be a potential hazard to health, communication and enjoyment of social life. It has become an unjustifiable interference and imposition upon human health, comfort and quality of modern life. To meet the demands of the goods and services of over increasing population, the traffics have become busy and hence there are always incidences of noise pollution in urban areas. The increase in the number of vehicles is aggravating the situation day by day.

Various noise surveys show conclusively that road traffic is the predominant source of annoyance; no other single noise has been of comparable importance. The total horse power which is 'built in' in automotive vehicles exceeds 20 times the horsepower of all the other prime movers combined (air craft, ships, and power stations) (Robinson, 1971; Roy *et al*., 1984; Ravindranath *et al*., 1989; Thakur, 2006).

The mechanism of radiation of noise to outside from a vehicle has been basically different from the noise generation by the vehicle internally. Except for some partial closure, none of the noise producing systems of the vehicles has been fully enclosed. Thus the noise emitted depends on the relative levels, characteristics and the interaction of the directly radiated noises from these systems. During the current production in vehicles, the power unit and its auxiliaries act as principal noise source. The other important generators of noise are the transmission system, tyres and braking system (Cohn and Meroy, 1982; Dixit *et al*., 1982; Anonymous, 2000; Jain and Parida, 2001; Chakraborty *et al*., 2002; Banerjee and Chakraborty, 2006).

In Orissa, the transportation sector is growing rapidly and the number of vehicles on roads is increasing at a rate of more than

7% per annum, which gives extra burden on the roads that are already overcrowded (Jain and Parida, 2001). In India, some studies on the traffic noise monitoring have been done at different cities like Delhi, Bombay, Visakhapatnam, Baroda, Anantpur, Asansol, Nagpur, Chennai, Lucknow, Burdwan, Balasore etc. and the average noise levels in these cities have been found to more than the recommended value (Pancholy *et al.*, 1967; Kadiayali, 1978; Prabhu and Chakraborty, 1978; Cohn and Meroy, 1982; Dixit *et al.*, 1982; Roy *et al.*, 1984; Rao *et al.*, 1987; Ravindranath *et al.*, 1989; Kudesia and Tiwari, 1993; Kumar and Jain,1994; Pamanikabud and Chairsi 1999; Anonymous, 2000; Jain and Parida, 2001; Chakraborty *et al.*, 2002; Pandya and Dharmadhikari, 2002; Nirjar *et al.*, 2003; Banerjee and Chakraborty, 2006; Thakur, 2006; Datta *et al.*, 2006; Kisku *et al.*, 2006; Krishna Murthy *et al.*, 2007; Goswami, 2009). Besides the studies of Patel *et al.* (2006) and Goswami (2009) on Jharsuguda and Balasore respectively, the traffic noise environment in major cities of Orissa in terms of standard noise indices, community response and community health effects have not been studied till date. On continuation with the study of Goswami (2009), a similar attempt has been made in this study to record the road traffic noise levels at five different places along the road from Vyasa Vihar (the South Campus) to Gyan Vigyan Vihar (the North Campus) of Fakir Mohan University.

Materials and Methods

Study sites: Balasore is a coastal district of Orissa, adjoining to Midnapur district of West Bengal on NH-5. The Fakir Mohan University, Balasore has two campuses *viz.* Vyasa Vihar (South campus) and Gyan Vigyan Vihar (North campus) at a distance of 11 km. The first site selected for noise monitoring was the Remuna Golei *Chhak* (square) Area, the place on NH-5 from which there is diversion to Balasore town and to Gyan Vigyan Vihar. This is the busiest traffic, where a large numbers of vehicles of all types run. The second spot was the Remuna Temple Square (Mandir *Chhak*) Area from where there is a diversion towards an ancient and famous temple of Lord Kshirachora Gopinath. The third site was the Remuna Bazar Area, where there is congregation of large numbers of people. The place becomes overcrowded on weekly market days. The fourth site was the Balgopalpur *Chhak* Area from where there is diversion towards two Industries *viz.* Balasore Alloys and Emami Paper Mills. Nuapadhi *Chhak* Area was the fifth site studied near which there are two stone crushers (Fig.1).

Measurement and evaluation of traffic noise: The noise levels were measured at 4 spots in each site during their busiest hour with the help of a portable precision digital sound level meter (Model-SL-4001, made in Tiwan). 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 pre-polarized condenser Microphone Type 4176. Measurements from 30 to 135dB (A) can be carried out with this instrument. The instrument calibration was achieved using pistaphone calibrator capable of producing known sound pressure level, supplied by the manufacturer.

The noise levels were measured at each spots, on 16 different times in a day following standard procedure using calibrated sound pressure level (dB) meter during day-time, at the five different sites along the investigated road of 11 km. As there is no prescribed basic noise levels for roads by Central Pollution Control Board (CPCB) of India; the detected noise levels in the present study during day time were compared with the prescribed basic noise level (tolerance limit) of United Kingdom *i.e.* 70 dB (A) (Krishna Murthy *et al*., 2007). Moreover, the detected noise levels in the present study during day time may also be compared with permissible limit of noise in commercial area *i.e.* 65 dB (A) (Anonymous, 2000).

To delineate the perception about the noise and its significance on health of community, a reprehensive group of people (136 local inhabitants) were interviewed using a questionnaire. The questionnaire was drafted in order to detect the people's degree of tolerance and awareness to transport related noise with consideration to various parameters such as location, age of respondent, occupation and a number of general psychological, personal as well as physical aspects. The perception survey was carried out to indicate high prevalence of sleep disturbance, cardiovascular problems, vomiting, hypertension, restlessness *etc.*

Results and Discussion

In the present study, an attempt was made for comprehensive study of traffic noise pollution at and around 2 campuses of university.

Noise levels at different locations: The traffic noise was measured at four different spots along highway areas at and around Remuna Golei Square, which is commercial in nature. The minimum and maximum noise levels observed were 70.1 dB (A) and 120.4 dB (A) (Table 1). The source was predominantly attributable to motor vehicular traffic. The permissible level for road traffic noise is 70 dB (A) (Krishna Murthy *et al*., 2007). Thus, in all the locations, the noise level measured was above the permissible limit. However, all the observations were made during day time.

The Traffic noise was measured at four various spots at and around Remuna Temple *Chhak* (Temple Square) during day-time. The minimum and maximum noise levels observed at and around Remuna Temple square were 70.2 dB (A) and 118.8 dB (A) (Table 1), which were also beyond the permissible limit for residential areas.

In order to investigate the noise levels of Remuna Bazar, measurements were done at four sites of the bazar (Table 1). Overall noise levels in the vicinity of Remuna Bazar ranges from 75.5 to 120.1 dB (A), which are more than the permissible limit (Table 1). The noise level during power cut in this area ranges from 107.3 to 111.1 dB (A). Therefore, the local authority should insist the shopkeepers to use the low sound or noiseless generators or to go for solar lantern.

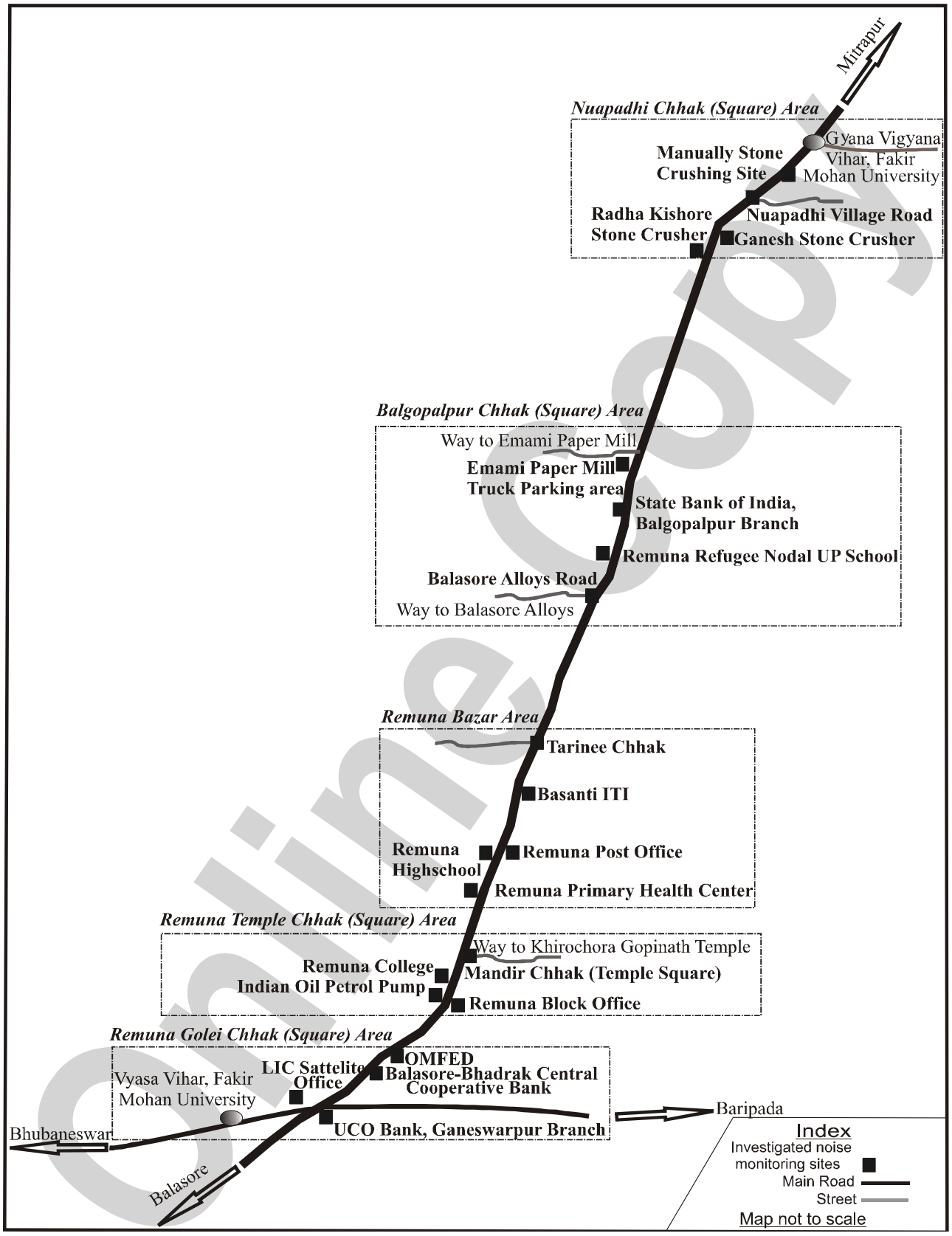

Fig. 1: Road map and locations for sample collection in two campuses of University in Balasore, India

Table - 1: Traffic noise (16 observations) along the road between two campuses of Fakir Mohan University, Balasore at different locations

	Sound pressure level in dB (A)	
	Min	Max
Remuna Golei Chhak (Square) Area		
LIC Satellite Office	74.1	120.4
UCO Bank, Ganeswarpur Branch	75.7	119.5
Balasore-Bhadrak Central Coperative Bank	70.3	100.4
OMFED	70.1	115.6
Remuna Temple Chhak (Square) Area		
Remuna Block Office	71.4	116.9
Indian Oil Petrol Pump	72.1	107.9
Remuna College	70.2	111.4
Mandir *Chhak* (Temple Square)	74.9	118.8
Remuna Bazar Area		
Remuna Primary Health Center	76.0	105.1
Remuna Post Office and Remuna High School	77.5	120.1
Basanti ITI	76.6	115.7
Tarinee *Chhak*	75.5	112.2
Balgopalpur *Chhak* (Square) Area		
Emami Paper Mill Truck Parking area	73.4	121.2
State Bank of India, Balgopalpur Branch	71.8	92.0
Remuna Refugee Nodal UP School	70.4	91.3
Balasore Alloys Road	74.5	118.9
Nuapadhi *Chhak* (Square) Area		
Radha Kishore Stone Crusher	90.4	123.4
Ganesh Stone Crusher	91.6	124.3
Nuapadhi Village Road	73.0	91.7
Manually Stone Crushing Site	70.2	82.5

Table - 2: Episodic and impulsive noise levels (20 observations) by the air-horn of motor vehicles in Balasore

Type of vehicle	Sound pressure level in dB (A)	
	Min	Max
Truck	70.4	94.2
Tractor	79.0	96.1
Dumper	77.8	110.2
Town bus	70.8	90.3
Motor cycle	71.0	87.5
Trucker/ Bolero	71.1	84.4
Pick up	72.5	86.9
Tempo	74.0	85.4

The Traffic noise was measured at the four spots along the road at and around Balgopalpur *Chhak* (Fig.1) and the data are presented in Table 1. The minimum and maximum noise levels observed were 70.4 dB (A) and 121.2 dB (A). The noise levels at and around this locality were found to be more than the tolerance limit.

In order to investigate the noise levels along the Nuapadhi *Chhak*, measurements were done at four different sites at and around Nuapadhi *Chhak* and the data are presented in Table 1. Overall noise levels in the vicinity of Nuapadhi *Chhak* ranges from 70.2 to 124.3 dB (A) and are more than the permissible limit.

Attempts were also made to measure the noise generated by different vehicles in order to assess their contribution to the environmental noise and also to know the maintenance status of the engine of particular vehicle. A noise of short duration (typically less than one second), particularly of high intensity, such as that produced by an air horn by any vehicle, occurring at regular or irregular intervals is known as episodic and impulsive noise. The episodic and impulsive noise levels of different types of vehicles are presented in Table 2. Noise produced by cargo carrying trucks, tractors, dumpers, town buses, motor cycles, bolero/trucker, pick up and tempo range from 70.4- 94.2, 79.0-96.1, 77.8-110.2, 70.8-90.3, 71.0-87.5, 71.1-84.4, 72.5-86.9 and 74.0-85.4 dB (A) respectively. The motor cycles, with their exposed engines and inadequate silencing arrangements, are notorious noise producers with a sound level roughly 30 times higher than that of a car (Roy *et al*., 1984; Kudesia and Tiwari, 1993; Pamanikabud and Chairsi, 1999; Nirjar *et al*., 2003). Since the numbers of two wheelers are increasing rapidly day by day adding more noise to roads. It was found that none of the vehicle types generate sound within the permissible limit of traffic noise limits, *i.e.* 70 dB (A), during our measurement period.

The survey based on questionnaire revealed that most of the people including vehicle drivers expressed their dissatisfaction over the increasing intensity of noise in the area but were not aware of its impact on health. Among the respondents, 43% were not satisfied on the noise level in Remuna and Balgopalpur area. They think themselves more vulnerable to noise pollution than water or air pollution in the particular area. About 59% of the respondents described the road traffic noise as the noise to which they would most like to get rid of. The 15% of them were quite irritated with the air-horn noise from motor cycle. Survey based on questionnaire indicated that the headache, bad temper, hearing problem, loss of concentration were some of the significant effects due to noise pollution. 53% respondents have identified that headache was the main health problem in them due to noise and 21% respondents have reported to have visited ENT specialists for health advice. 86% of students reported that their study was disturbed by frequent air horns of the vehicles. 21% of people conveyed their sleep disturbance due to traffic noise during night-time. Therefore, it warrants a systematic survey of sleep quality, number of awakenings or number of changes in sleep state to estimate the extent of sleep disturbance.

The respondent strongly supported the actions from government to reduce noise pollution. Most of them support the ban of hydraulic horn, old vehicles, installation of high-noise creating industries such as stone crushers, usage of sound amplifying mikes for processions, advertising and election campaigns. However, the local administration should take some imperative steps and regulatory measures to abate such noise pollution (Kumar *et al*., 2004; Patel *et al*., 2006; Garg, *et al*., 2007; Brown, 1994; Belojovic *et al*. 1997; Maschke, 1999; Pandya, 2001; Zannin and Diniz, 2002; Hokao,

2004; Kumar *et al*., 2004; Yang and Kang, 2005; Das, 2006; Gorai and Pal, 2006; Zannin *et al*., 2006; Datta *et al*., 2006; Peterson, 1980; Maschke, 1999). In rapidly urbanizing and industrializing state like Orissa, and in particular in outer Balasore (Remuna and Balgopalpur) the transportation sector is growing rapidly and the number of vehicles on roads are increasing. This has led to overcrowded roads and noise pollution. It is explicitly inferred from the present study that the noise levels are more than permissible limit (Krishnamurthy, 2007; Anonymous, 2000) in all the 20 sites of 5 locations. Since, there is no medicine to cure hearing loss; prevention of unnecessary exposure to noise is a better alternative. As there is an imminent health risk to the population, exposed to noise pollution, control measures should be adopted to minimize the noise levels. The authorities also have a great role to play in this regard.

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