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Assessment of Ambient Noise Quality in Jirania Brick Industries Cluster: a Case Study

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***Abstract*— Rapid and excessive growth of brick industries in Jirania area is one of serious environmental issues in Tripura, India. It is realized that regulation for brick industries siting is typically not based on formal spatial planning to facilitate clustering of industries, resulting in degradation on air, water and soil quality and consequent increased a number of environmental problems in Jirania Brick cluster area, one of which being noise pollution. Evaluation of noise pollution load and its mitigation is a big challenge like other environmental components such as air, water and soil. The present study is an attempt to assess the noise pollution load of entire Jirania brick industries cluster. Extensive field level noise study was conducted at 21 identified monitoring stations and recorded noise data are interpreted in the form of equivalent sound pressure level (Leq). The Leq values were compared with the prescribed standard of CPCB aimed to evaluate the ambient noise quality status in and around the study area. This ambient noise quality is intended to use as baseline for assessing actual noise pollution load in future. The present study is an approach towards preparing a comprehensive noise pollution prevention and mitigation plan for taking appropriate measures for reducing noise pollution over the prevailing area of Jirania brick industry cluster.**

Keywords— Brick industry, Noise, Jirania Brick cluster, Pollution load.

I. INTRODUCTION

Industries are the prima facie indicator of development of an area. Economic growth of an area purely depends on many industrial activities that are being carried out. The industrial development has been brought about to a significant extent through considerable increase in the number of industries. Increased industrial activities have meant significant consumption of natural resources resulting in degradation in environmental quality. The proximate drivers of environmental degradation are population growth, use of inappropriate technology and other development activities including excessive growth of polluting industry. Such a problem in environmental degradation is very acute, if there is haphazard industrial growth in a small clustering area. No exception found in the Jirania Brick Industries Cluster cases also. Rapid increase of brick industries coupled with haphazard industrial siting in the small area has resulted significant contribution of pollution load over the prevailing environment. Apart from the increased industrial activities, population both endemic and floating and vehicular pollution etc have led to a number of environmental problems in Jirania Brick cluster area, one of which being noise pollution. Noise is described as any unwanted sound that has deleterious effects on human health and environment and affects the physical and psychological well being of the person. Noise intensity varies randomly with time. Exposure to noise not only causes annoyance but also causes noise induced hearing loss including other adverse health effects.

Environment and health impacts associated by the brick kilns industries were studied in the Kathmandu valley by Pariyar et.al (2013). Positive outcome of this study is that entrepreneurs are searching for environment friendly and cost effective alternative technologies, instead of Bulls Trench brick kilns in Kathmandu. In a study made by Tiwari et.al (2013) monitoring of the noise pollution due to railway and vehicular traffic at one of the major intersection Rajapeth in Amaravati, India was made. The variation in the noise level due to change in railway traffic data in the peak hours are presented graphically in the study. Noise level at different locations including residential, commercial, industrial and transportation zones in Punjab of Pakistan is studied by Shahid & Bashir (2013). Various adverse impacts of the high noise level at the mentioned locations are also pointed out in the study. A comparison with other major cities in terms of noise level is also performed in the study. The adverse impact of noise pollution on the occupants of various zones of Delhi is studied by Singh & Davar (2004). A study was carried out by Murthy et.al (2007) 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 and some remedial measures are also discussed in the study.

II. SITE DESCRIPTION

Jirania Brick Industries cluster has been located at the latitude between N $23^{O}50.334^{/}$ to N $23^{O}48.579^{/}$ and the longitude between E $91^{o}23.708^{/}$ to E 91^{o} $30.457^{/}$. It is the largest brick industries cluster in Tripura, India. Sub-Divisional Head Quarter of Jirania is located at the centre point of the study

area. Agartala, the state capital of Tripura and also the District Headquarter of West Tripura District located nearly at an aerial distance of about 15 Km from the site by road. The national highway NH-44 connects Jirania with the Agartala by road. This apart, there is a Railway Station at Jirania within the vicinity of Jirania Brick Industries cluster which connects the State Capital & other neighboring States of NE Region by rail. Other small urban centers namely Ranirbazar & Jirania are situated within the radius of 10 k.m. of study area.

There are many rural human settlements surrounding the periphery of Jirania Brick Industries cluster, which include Joynagar, Ramthakurpara, Noabadi, Bankimnagar, Kalachan Kobrapara, Kalabagan, Jirania Khola, S. N. Colony, Harijoy Chowdhury, Madhabbari, Brajanagar, Bhaskar Kobrapara, Mohanpur, Chintaram Kobrapara, Purba Debendranagar, Dhundri, Khamarbari, Brajanagar, Majlishpur etc. The National Institute of Technology Agartala is also closely situated near the Jirania Brick Industries cluster.

III. METHODOLOGY

In order to assess the noise pollution due to activities of brick industries, a preliminary survey was conducted in the Jirania Brick industries areas aimed to identify the potential sources of noise pollution. Major noisy areas are identified on the basis of magnitude of sound. Major factors that were considered during selection of the noise monitoring stations were, distance between brick industry from nearest settlements which are likely to be impacted from activity of brick industry, presence of any anthropogenic activity in the cluster that can interfere with the noise, prevailing wind direction and possibility of natural attenuation of noise due to distance from source, presence of vegetation and hillocks etc. The noise due to vehicular movement is also considered as a factor in identifying the noise monitoring stations. The baseline noise monitoring was conducted at 20 locations in four different categories of area within the vicinity of Jirania Brick Industries cluster. The different categories of area includes residential, commercial, industrial and silence zones. Ambient noise monitoring was conducted using Sound Level Meter. Sound Pressure Level (SPL) measurements in dB (A) were recorded for both day and night time. The day time noise monitoring was conducted during 6 a.m. to 10 p.m. Similarly, night time noise data were collected during 10 p.m. to 6 a.m. in compliance with the CPCB guidelines. Equivalent noise levels in the form of Leq day and Leq night were computed using the formula.

$$L_{eq} = 10 \log (\sum t_i \times 10^{Li/10})$$

Where, L_{eq}= Equivalent sound pressure level,

L_i = The noise level of any i^{th} sample,

n=Total number of sound samples,

t_i = Time duration of i^{th} sample expressed as fraction of total sample time.

The results obtained were compared with the standard specified under Noise Pollution (Regulation and Control) Rules, 2000.

IV. RESULT & DISCUSSION

Interpretation of Noise Quality Results indicates that the daytime noise level in residential area varied from 41.08 dB (A) reported at Brajanagar to 67.21 dB (A) in Kainta Kobra Para. Except 2 locations, the day time noise levels in residential areas are found within the ambient noise standard of 55 dB(A). The Leq value of 56.70 dB(A) reported at Dasharam Para is slightly deviated from the prescribed ambient noise standard. The highest noise level in respect of residential area during night time is reported at 47.92 dB(A). The higher noise level in residential areas are mostly due to vehicular movement and the residents in the area situated near main road with higher traffic density are exposed to higher noise levels. L_{eq} values in respect of residential areas are presented in the Table 1. The graphical representations of the noise level parameters for day and night time in respect of residential area are given in Fig 1 & 5 respectively.

So far the commercial area is concerned, majority of locations are highly exposed to human crowed, high traffic density. The interpreted Leq value indicates that Jirania Motor Stand is highly exposed to high traffic density. Equivalent sound pressure (Leq values) of 77.45 dB (A) observed during day time and 61.55 dB(A) during night time at Jirania Motor Stand. Noise levels in other 3 commercial areas are found within the prescribed standard both during day & night time. However, the Leq values in night time at 3 locations are well below the corresponding values at day time and found within the prescribed limit of CPCB. Table No.2 shows the day time noise levels in commercial areas. The graphical representations of the noise level parameters for day and night time in respect of commercial area are given in Fig 2 & 6 respectively.

There are 2 stations considered for noise monitoring under the categories of Silence Zones. In both the locations day time noise levels are found to be exceeding the prescribed standard limit in respect of silence zone. The recorded data as interpreted in the form of Leq are 65.51 dB(A) and 50.36dB(A) respectively. The night time data of both locations are found to be within the prescribed limit. The noise level data of day time is interpreted in the table 3. The graphical representations of the noise level parameters for day and night time in respect of silence zone are given in Fig 3 & 7 respectively.

Ambient noise monitoring has conducted at 8 locations of industrial areas. The interpreted Leq value for day time and night time data are presented in the Table 4. The graphical representations of the noise level parameters for day and night time in respect of industrial area are given in Fig 4 & 8 respectively.

The data indicates that the day time noise levels in all the stations are within permissible range specified by CPCB. In Jirania, most of the brick industries are set up along the road side. Even a number of small industrial units are found set up in the brick industries cluster. Activities of such industries generated considerable noise. The continuous vehicular movement for loading unloading of bricks, supply of coal, excavation of earth & sand by excavator etc. are also contributing significant level of noise pollution in and around the brick industries Cluster.

TABLE-1: RESIDENTIAL AREAS

Sl. No.	Location	Day time (6:00a.m. – 10:00 p.m.)			Night Time (10:00 p.m. – 6:00 a.m.)		
		Leq in dB (A)	Lmax in dB (A)	Lmin in dB (A)	Leq in dB (A)	Lmax in dB (A)	Lmin in dB (A)
1	Kainta Kobra Para	67.21	71.7	46.2	43.58	46.1	39.2
2	Chintaram Kobra Para	61.70	87.7	49.9	47.92	52.3	40.1
3	Bhaskar kobra Para	43.25	46.6	35.1	43.41	47.7	34.2
4	Dasharam Para	56.70	65.3	39.4	45.67	48.6	37.1
5	Chak bosti	46.51	50.0	36.5	43.42	48.8	36.2
6	Kalimura	42.10	46.5	36.6	40.48	44.2	36.1

TABLE -2 : COMMERCIAL AREAS

Sl. No.	Location	Day time (6:00a.m. – 10:00 p.m.)			Night Time (10:00 p.m. – 6:00 a.m.)		
		Leq in dB (A)	Lmax in dB (A)	Lmin in dB (A)	Leq in dB (A)	Lmax in dB (A)	Lmin in dB (A)
1.	Jirania Motor stand	77.45	87.0	54.4	61.55	69.9	46.5
2.	Champaknagar Bazar	64.28	72.7	51.4	53.18	57.1	35.6
3.	S.N. Colony Bazar	50.28	58.9	53.1	50.83	58.6	44.5
4.	Kobra Khamar Bazar	43.35	46.7	38.3	42.9	47.3	37.8

TABLE – 3: SILENCE ZONES

Sl. No.	Location	Day time (6:00a.m. – 10:00 p.m.)			Night Time (10:00 p.m. – 6:00 a.m.)		
		Leq in dB (A)	Lmax in dB (A)	Lmin in dB (A)	Leq in dB (A)	Lmax in dB (A)	Lmin in dB (A)
1.	Jirania Inspector of Schools	65.51	61.1	42.4	43.80	48.2	40.5
2.	Jirania Hospital	50.36	53.9	46.8	44.80	49.1	42.3

TABLE – 4: INDUSTRIAL ZONES

Sl. No.	Location	Day time (6:00a.m. – 10:00 p.m.)			Night Time (10:00 p.m. – 6:00 a.m.)		
		Leq in dB (A)	Lmax in dB (A)	Lmin in dB (A)	Leq in dB (A)	Lmax in dB (A)	Lmin in dB (A)
1	Joynagar-Janani Bricks	56.40	61.1	42.4	47.67	51.2	42.0
2	Kalabagan-Durga Bricks	60.59	66.1	42.4	50.39	55.6	40.6
3	Dundri- Rita Bricks	56.2	64.5	37.2	43.65	46.2	36.1
4	Noabadi-B.C.Semi Mechanised	47.88	54.5	38.1	43.89	48.3	36.6
5	Noabadi -NEC Bricks	53.86	53.2	38.3	50.48	56.6	37.6
6	Noabadi Rail line	42.17	46.6	31.6	41.56	44.1	32.4
7	Daspara- Satanarayan Bricks	52.54	58.1	47.8	49.50	58.1	47.1
8	Brajanagar	41.08	44.2	37.2	40.37	43.6	36.2

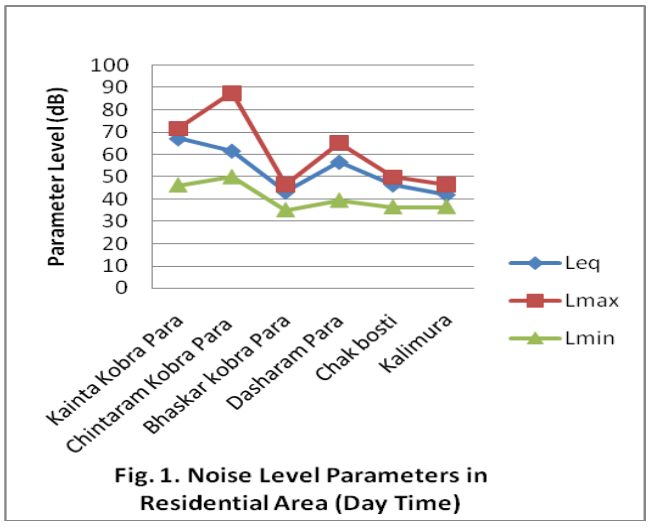

Fig. 1. Noise Level Parameters in Residential Area (Day Time)

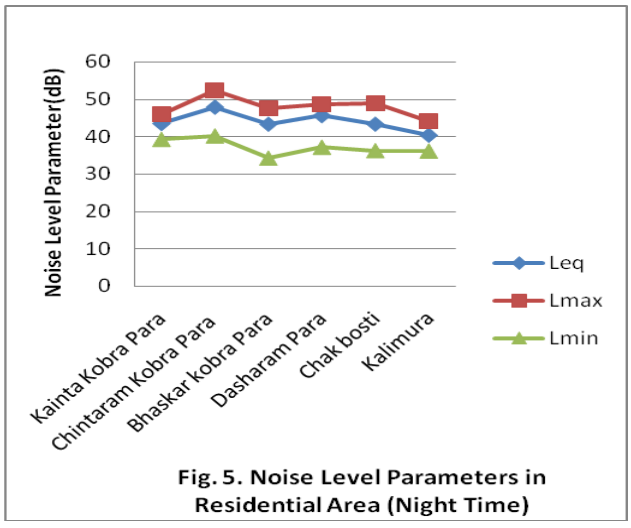

Fig. 5. Noise Level Parameters in Residential Area (Night Time)

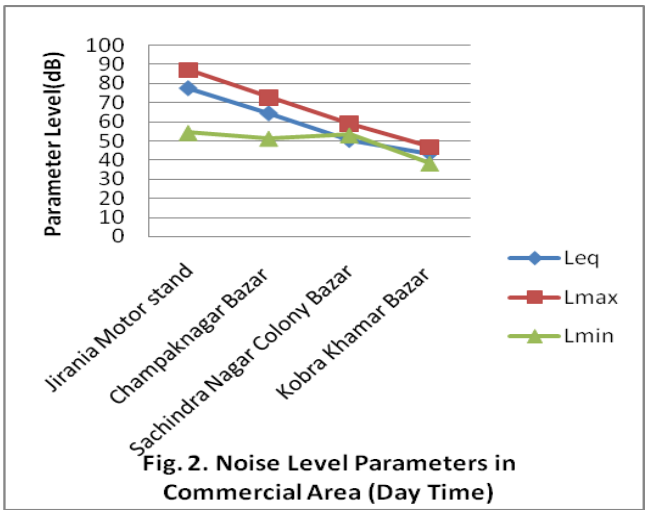

Fig. 2. Noise Level Parameters in Commercial Area (Day Time)

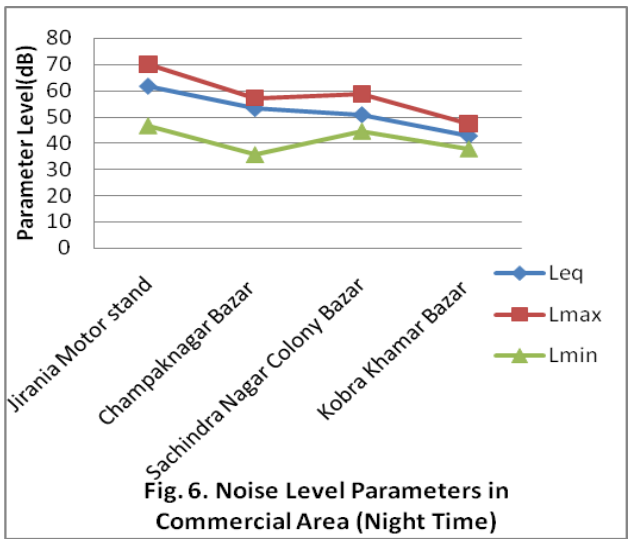

Fig. 6. Noise Level Parameters in Commercial Area (Night Time)

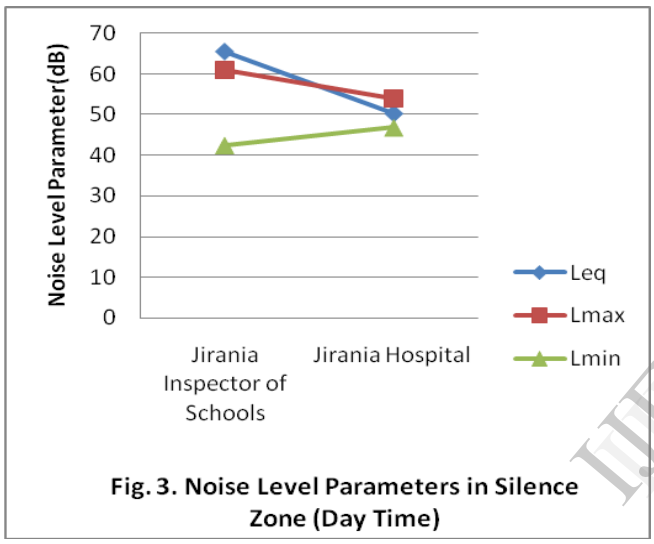

Fig. 3. Noise Level Parameters in Silence Zone (Day Time)

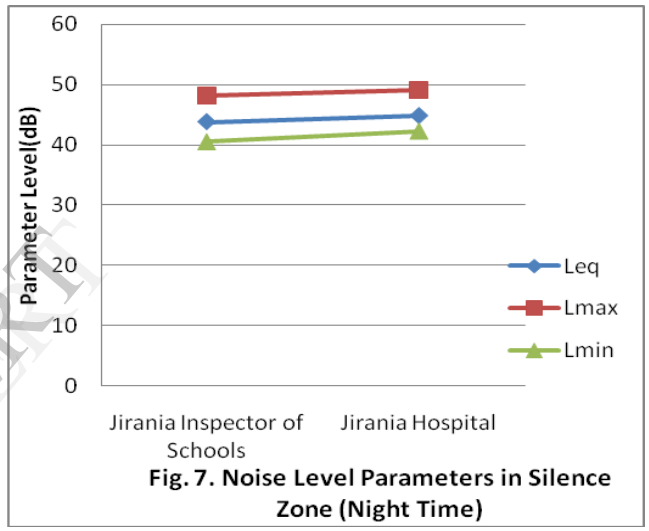

Fig. 7. Noise Level Parameters in Silence Zone (Night Time)

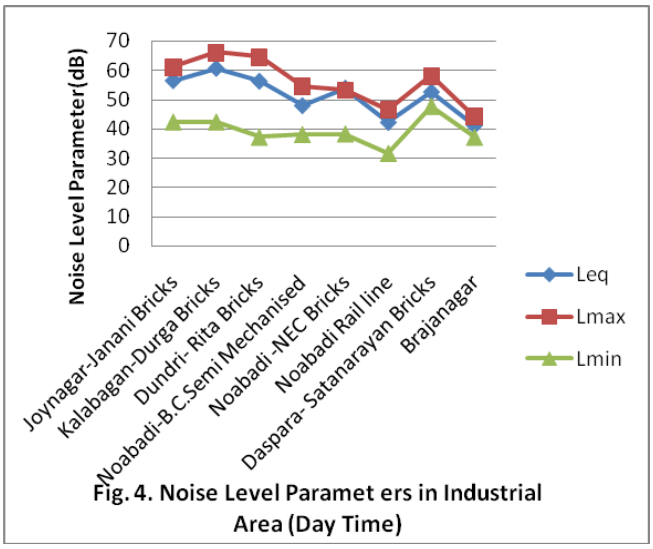

Fig. 4. Noise Level Paramet ers in Industrial Area (Day Time)

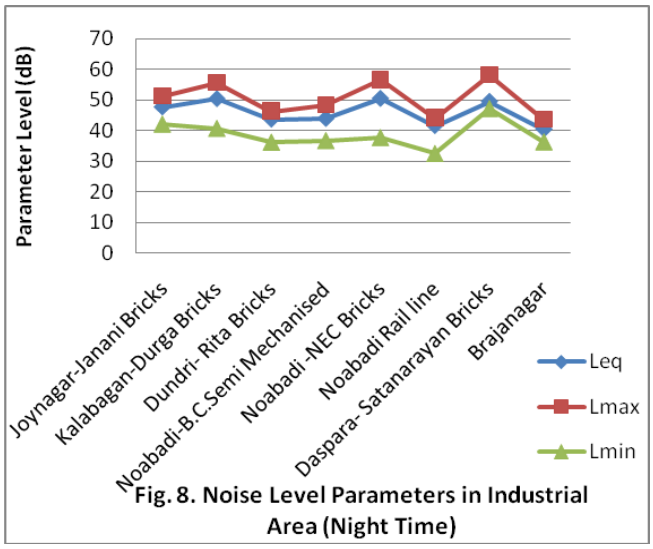

Fig. 8. Noise Level Parameters in Industrial Area (Night Time)

IV. CONCLUSION

It is thus concluded that ambient noise qualities in many locations are highly exposed to the noise pollution during day time. However, the ambient noise quality during night time is found within the prescribed standard except 2 locations. The study also indicates that human interference, vehicular movement, human crowed, loading un-loading of vehicles etc. are some sources responsible towards significant contribution of noise within the study area. As the high noise level has resulted significant adverse health impacts, therefore, it needs to be understood that exposure levels to third parties who are not participants in the activity do not exceed prescribed ambient standards. Appropriate mitigation measures, mass awareness among the general people etc. are recommended as a part of minimizing the noise pollution associated problems of the Jirania Brick industries cluster. The study was conducted in the post monsoon period. For evaluation of actual noise pollution load of the Jirania Brick industries cluster, interpreted Leq values of this paper may be used as a baseline.

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