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Noise level and Annoyance in Mela Ground, Santiniketan, India during Poush Mela

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Abstract

Noise level was monitored for two consecutive years of 2012 and 2013 during Poush Mela (fair) organized by Visva-Bharati University, Santiniketan, West Bengal held during 23^{rd} to 25^{th} December every year. Poush Mela is one of the great occasions in Santiniketan, which draws thousands of people from all over India as well as neighboring countries. The Poush Mela ground become abuzz with various activities, excitement, and joy due to the mingling of almost 50,000 odd visitors, which is enough to give rise to noise pollution. In order to check the intensity of the pollution, noise data were recorded from various locations of the Mela (fair) ground during morning, evening and night hours. The various noise level indices like Equivalent Sound Level (L_{eq}), Day Night Level (L_{dn}), Community Equivalent Level (L_{den}) and Noise Pollution Level (L_{np}) were determined to compare them with the national standard levels. Probable measures which can keep the noise levels during Poush Mela in check were discussed. A social survey was adopted to study the impact of noise on the people during Poush Mela.

Keyword: Poush Mela, noise pollution, equivalent sound level (L_{eq}) , day night level (L_{dn}) , community equivalent level (L_{den}) , noise pollution level (L_{np}) .

Introduction

Noise means unwanted sound that annoys the people. Recently it has become a serious problem for human health. Major sources of ambient noise pollution are anthropogenic activities¹. The sources may be domestic, commercial, industrial and transport. Exposure to high noise levels for a long time is causes to many health effects such as hearing loss, malfunctioning of cardiovascular system, high blood pressure, peripheral vasoconstriction, sleep disturbance, impaired performance, and psycho-physiological symptoms².

Poush Mela is an annual fair that takes place in Santiniketan, West Bengal, India with pomp and pleasure, during the last week of December. The key characteristics of this fair are Bengali folk music, mainly Baul music. Some 1,500 stalls take part in the fair. Government statistics put the daily inflow of tourists in to Santiniketan at around 40,000 per day during Poush Utsav³.

Santiniketan is one of the quiet place dotted with greeneries, where people belonging to different ages particularly the elderly often come for relief. Although the Poush Mela is for three days, but people starts coming to Santiniketan much before the scheduled date. Even after the official closure, the Mela continues for another week or so, drawing more visitors to the site. Such a surge of people within a very short period add woes to the local inhabitants by virtue of high noise levels. The main cause for the high noise in the Mela is due to playing of microphones loudly, interaction of a large number of people

with sellers, live performances, outburst of emotion and so on. Associated with high noise levels, air and land also rendered unsuitable for living due to increased anthropogenic activities like use of private cars, throwing of plastics etc.

Keeping in mind the disturbances created due to high turnout of visitors during Poush Mela, the present study was taken up: To record noise levels at various locations in Santiniketan Mela ground and compare with prescribe standard values for risk assessment. To study road traffic noise levels at surrounding Mela ground during Mela and compare with noise level of the same place at normal day. Arrange a social survey about annoyance of the people due to noise pollution during Poush Mela

Material and Methods

Eight locations were identified for Noise monitoring around the Mela ground and are presented in table-1 and study location are also shown in the map (figure-1), created by using Intergraph Geo Media Professional 2014.

For this survey a digital sound level meter, type-2 with frequency weighting network as per IEC 651 specification, frequency range of 31.5 Hz to 8,000 Hz and measuring range between 0-130dB was used. Before and after use of Sound Level Meter, it was calibrated at 94.0 dB(A). Sound data were recorded at one minute interval on the A-weighting frequency network at the height of 1.5 m from the ground^{4,5}.

Table-1 Distribution of the noise sampling locations

	GPS co	ordinate
Study Location Name/No.	Longitudes	Latitudes
Central Office of Visva- Bharati (S1)	87°41'21.26"	23°40'47.57"
Second Entrance Gate of Mela Ground (S2)	87°41'24.40"	23°40'43.22"
Near Police Line (S3)	87°41'31.68"	23°40'38.99"
Near Purbapally Boys' Hostel (S4)	87°41'28.09"	23°40'50.14"
Third Entrance Gate of Mela Ground (S5)	87°41'22.39"	23°40'35.60"
Near State of India, Santiniketan (S6)	87°41'20.85"	23°40'41.11"
Lodge More (S7)	87°41'31.06"	23°40'16.33"
Chitra More (S8)	87°41'39.19"	23°40'05.09"

Sound Pressure that the meter receives is not the same as what the ear would perceive⁶. For this reason an electronic circuitry called weighting network is built into the meter so as to produce

a read out that closely resembles a human response. A series of three internationally accepted weighting scales has been adapted. These are A, B and C weighting networks. The 'A network' approximates human auditory response to low intensity and high frequencies sounds, the 'B network' approximates the response to medium intensity and low frequencies sounds, and the 'C network' approximates the human response to high intensity sounds^{6,7}.

The various noise indices determined in the study are as follows:

Equivalent Sound Level (Leq) is the sound pressure level equivalent to the total energy of sound over a specific time^{8,9}.

Equivalent Sound Level, 'L_{eq}' can be estimated using following equation: $L_{eq} = 10 \log_{10}[(1/N) \sum_{i=1}^{N} 10^{(Li/10)}]$

Where: Li is the noise level of the i^{th} reading and N is the number of noise samples.



Figure-1 Study Location of noise monitoring sites

Day-night equivalent noise level, expressed as: $L_{dn} = 10 \log_{10} (1/24) [16(10^{Ld/10}) + 8(10^{(Ln+10)/10})]$

The community noise equivalent level (L_{den}), expressed as: $L_{den}=10log_{10}(1/24)[12(10^{Ld/10})+4(10^{(Le+5)/10)}+8(10^{(Ln+10)/10)}]$

Where: L_d , L_e , L_n is the equivalent continuous noise level for day, evening and night time respectively.

It is very similar to the L_{dn} , but with the added penalty for the evening period^{10,11}.

Percentile Noise Levels, L_{10} and L_{90} which are the noise level exceeded for 10% and 90% of measurement period respectively.

 L_{10} (av. Peak level) - L_{10} is the sound level exceeded for 10% of the measurement period^{10,12,13}.

L₉₀ (av. Background level)- L_{90} is the sound level exceeded for 90% of the measurement period. It is representing the background or ambient noise level of the environment^{10,12,13}.

Noise Pollution Level (L_{np}) defined as a variation on L_{eq} which accounts for short term variability in noise levels, expressed as⁴: $L_{np} = Leq + (L_{10} - L_{90})$

Results and Discussion

Ambient noise levels were monitored in eight locations around

the Mela ground for two years. They consist of residential area such as Purbapally Boys' Hostel, commercial area such as Lodge more, Chittra More, State Bank of India, second and third entrance gate of Mela and Police line, silence zone such as central office.

Hourly noise levels are recorded in each station during day (07:00 am to 07:00pm), evening (07:00pm to 11:00pm) and night (11:00pm to 07:00am). Various noise parameters are tabulated in table 2, 3, 4 and 5.

The L_{eq} value in various location of Mela ground ranged from 49.1dB(A) to 88.7 dB(A) in first day, 60.0 dB(A) to 88.8 dB(A) in second day and 60.6 dB(A) to 92.7 dB(A) in third day. The maximum and minimum Leq value was recorded in Central Office of Visva-Bharati and Lodge More (S7) and/or Chittra More (S8) respectively. In evening time the noise level was elevated than the day and night time because the number of visitors increase in evening time and various programmes such as folk music, quiz competition etc. were arranged during evening, using load speakers and heavy sound systems. The third or last day of Mela was noisiest then the other two days. The maximum Noise Pollution level (Lnp) was recorded in Lodge More(S7) and Chittra More(S8) in last day of Poush Mela which was 107dB(A) and 110 dB(A) respectively and minimum Noise Pollution (Lnp) level was recorded in Purbapally Boys' Hostel (S4) 58.8 dB(A) in second day of Poush Mela. Table-6 shows that the various noise parameters in Lodge More (S7) and Chitra More (S8) after the Mela ending. It is clearly indicated that all noise pollution parameters has increased during Poush Mela.

Results of	noise	indices	at diff	erent l	ocatio	ns in Sa	antinik	tetan N	1ela G	round	and su	rroun	ding ai	reas at	first d	ay of n	nela
								Study	Locati	oncolu	mn18						
Parameters	Time	S	1	S	2	S	3	S	4	S	5	S	6	S	7	S	8
		2012	2013	2012	2013	2012	2013	2012	2013	2012	2013	2012	2013	2012	2013	2012	2013
	D	63.1	68.5	62	67.2	74.5	70.2	62.2	62.3	74.3	75.1	72.1	77.1	86.6	85.8	86.5	80.1
L _{eq}	Е	70	70.6	68.5	70.8	80.7	79.5	68.3	70.5	77.7	74.4	79.6	76	84.3	88.7	83.7	85.5
	Ν	50	49.1	55.5	59.8	65.4	61.2	50.8	49.8	63.2	60.8	62.7	58.3	66.4	65	64.5	63.8
	D	70.3	75.2	73.7	81.3	87.1	84.2	70.8	71	86.6	86.6	80.4	92.8	96.5	90.5	100.5	98.2
Lmax	Е	80.3	79.7	85.2	86.1	93.4	88.1	77.7	76	91.7	90.7	88.6	90.3	98.4	98.5	95.8	101.5
	Ν	65	63.7	70	73.3	75	72.2	65.5	63.1	72.2	70.6	69.8	65.1	70.6	71.6	78.7	75.5
	D	55.8	58.2	56	60.3	59.2	57.4	53.1	50.3	56.6	60.8	63.1	66.6	70.6	71.2	69.6	65.6
Lmin	Е	63.1	62.1	60.1	61.2	66.7	68	60	62.2	69.3	65.6	64.7	69	72.5	70.8	70.7	72.4
	Ν	40.3	38.8	45.7	48.8	50	47.5	40.1	37.8	50.1	48.8	46.4	39.3	56.2	55.6	58.8	54.6
	D	68.5	72.4	66.6	73.3	77.1	75.2	67.2	68	80.1	82.2	76.2	83.4	90.5	92.6	93.6	88.7
L_{10}	Е	74.4	75	76.3	79.5	86.8	86.4	72.3	77.8	86.4	79.8	88.2	82.3	90.6	93	90.7	91.5
	Ν	58.5	55.6	60.1	65.7	70	67.5	55.3	55	69.9	66.7	71.8	65	76.5	72.4	71.6	70.3
	D	60.5	62.6	56.1	60.4	68.9	64	56.1	55.7	67.7	67.4	65.2	70.1	75.4	75.6	73.9	75.5
L ₉₀	E	65.4	64.5	60	61.2	73.8	72	62.5	67.5	68	68	69.4	69	75.3	75.5	74	74.6
	Ν	45.2	42	50.4	53.1	59.9	54.2	45.1	44.5	56.2	52.1	50.8	51	62.5	61.1	60.5	59.7
	D	71.1	78.3	72.5	80.1	82.7	81.4	73.3	74.6	86.7	89.9	83.1	90.4	101.7	102.8	106.2	93.3
L _{np}	E	79	81.1	84.8	89.1	93.7	93.9	78.1	80.8	96.1	86.2	98.4	89.3	99.6	106.2	100.4	102.4
пр	Ν	63.3	62.7	65.2	72.4	75.5	74.5	61	60.3	76.9	75.4	83.7	72.3	80.4	76.3	75.6	74.4

Table-2

								Study	Locati	oncolu	mn18		0			- U	
Parameters	Time	S	1	S	2	S	3	S	4	S	5	S	6	S	7	S	8
		2012	2013	2012	2013	2012	2013	2012	2013	2012	2013	2012	2013	2012	2013	2012	2013
	D	61.3	65.5	71.4	74.6	74.4	70.6	63.2	65.1	78.7	75.1	81.4	78.8	85	86.7	87.1	84.5
Leq	Е	69.1	70.6	78.2	80.2	80.6	80.7	67.5	71.7	82.2	80.3	84.3	80.3	86.5	90	88.8	85
	Ν	56.6	53.2	60	63.5	65.5	66.8	53.7	56.3	68.4	63.4	70.1	68.7	65.8	64	65.6	63.5
	D	80.1	80.2	86.6	87	96.6	94.2	80.4	81.5	90.3	88.2	93.8	90.3	95.8	92.4	98.8	98
Lmax	E	86.8	85.7	92.4	96.1	97.7	96.1	84.7	84	91.7	90	92.1	94.4	98	97.4	97.5	101
	Ν	70	68.3	71.1	73.8	75.8	77.8	68	68.8	80	78.8	81.7	76.8	70.6	70.2	77	75
	D	51.2	62.5	60.6	63.8	61.3	62.8	52.5	58.6	60	52.4	65	63.8	71.1	70.2	70.1	67.5
Lmin	E	62.7	65.2	63.5	68.3	65.8	69	58.3	62.2	63.5	63.7	66.6	65.5	71.5	72	70.7	70.8
	Ν	48.9	47.6	52.2	51	58	58.8	48.7	45.5	55.6	53.6	55.9	57.7	55.3	55	54.6	56.8
	D	66.7	69.3	77.3	80	80.5	78.3	70.1	70.2	81.8	80	85.4	82.3	91.2	90.7	93	89.5
L ₁₀	Е	73.4	74.5	83	85.2	86.7	85	72.2	73.6	85.3	85.2	88.8	83	90	94	91.4	90.4
	Ν	61.1	60	69.1	68.8	71.2	70.3	55.5	60.7	72	69.9	73.1	73.3	77	74.7	72.2	72.3
	D	54.9	59.7	64.7	68.2	66.5	65.2	58.7	59.8	74.1	66.9	73.6	71.1	75.6	74	74.1	71.8
L ₉₀	E	63.2	63.8	73.1	74	73.7	72.7	61.4	62.4	73.6	73.1	76.3	74.8	78.4	77.3	76.7	75.4
	Ν	50.6	50.8	53.1	58.1	61.9	62.1	50.4	50.3	67.7	53.2	63.6	60.6	65	61.4	64.4	61.5
	D	73.1	75.1	84	86.4	88.4	83.7	74.6	75.5	86.4	88.2	93.2	90	100.6	103.4	106	102.2
L _{np}	E	79.3	81.3	88.1	91.4	93.6	93	78.3	82.9	93.9	92.4	96.8	88.5	98.1	106.7	103.5	100
	Ν	67.1	62.4	76	74.2	74.8	75	58.8	66.7	72.7	80.1	79.6	81.4	77.8	77.3	73.4	74.3

 Table-3

 Results of noise indices at different locations in Santiniketan Mela Ground and surrounding areas at second day of mela

Table-4 Results of noise indices at different locations in Santiniketan Mela Ground and surrounding areas at third day of mela Study Locationcolumn18

								Study	Locati	oncolu	mn18						
Parameters	Time	S	1	S	2	S	3	S	4	S	5	S	6	S	7	S	8
		2012	2013	2012	2013	2012	2013	2012	2013	2012	2013	2012	2013	2012	2013	2012	2013
	D	65	64.5	70	71.3	78.5	74.4	69	74.8	75.7	72.6	81	77.8	86.4	85.8	88.6	84.7
Leq	Е	71.2	72.3	80.3	79.4	81.8	79.2	71.5	76.6	86	84.4	85	83.1	90.4	89.1	92.7	91.3
	Ν	60.6	61.4	69.1	65.5	72.3	70	65.8	63.4	72	70	73.5	70.8	68.4	64.7	67	63.4
	D	82.5	82	77.6	80.7	89.5	88.3	80	90.2	88.5	84.3	92	90	98.1	94.5	98.1	95.7
Lmax	Е	87	85.5	89.8	94	93.3	90.2	84.4	90.6	97.8	92.3	97.7	94.8	101.2	100.4	102.2	102
	Ν	72.2	70.4	79.5	75	81.6	81	79.8	78.7	85	82.2	87.6	83.3	74.6	74	77	74
	D	58.7	55	60	60.5	66.2	60	59.8	62.2	61.3	56.1	60.5	60.5	71.1	70.5	72.1	71
Lmin	Е	60	62.8	65.1	63	61.3	61.5	60.1	60.7	65.5	65	62.2	62.2	71.5	73.2	74.4	72.7
	Ν	52.6	50.2	58.3	55.1	58.7	56	53.4	50.4	58.4	54.7	53.4	57.7	55.3	58.1	63.5	60.1
	D	73.5	73.3	76.6	74.1	81.9	80.4	73	81.2	70.4	78.6	87	81.3	92.1	90.5	95	91
L ₁₀	Е	78.2	80	85.5	85.6	86.6	83	74.4	82.5	90	90.2	89.5	88.4	94.6	94	94	93.4
	Ν	66	66.5	73.4	71.3	77.7	75	70.7	66.3	76.6	60.3	71.7	76.8	78	75.1	74.4	70.5
	D	60.1	58.7	65	67.7	74.5	72.6	65.2	70.7	70	65.6	74.4	70.1	76.4	75.7	75.2	74
L ₉₀	Е	68.6	68.8	74	70.5	76.6	75.7	61.9	70.4	80.2	80.7	74.9	73.7	78	78.2	76.8	74.6
	Ν	54.2	59.1	60	58.9	67.9	66.8	60.5	60.4	68.8	66.4	65.6	60.9	66.6	60.9	66.4	62
	D	78.4	79.1	81.6	77.7	85.9	82.2	76.8	85.3	76.1	85.6	93.6	89	102.1	100.6	108.4	101.7
L _{np}	Е	80.8	83.5	91.8	94.5	91.8	86.5	84	88.7	95.8	93.9	99.6	97.8	107	104.9	109.9	110.1
	Ν	72.4	68.8	82.5	77.9	82.1	78.2	76	69.3	79.8	63.9	79.6	86.7	79.8	78.9	75	71.9

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				un	uu												
	Dama		Study Location														
Day Para		S1		S2		S 3		S4		S5		S6		S7		S8	
	meters	2012	2013	2012	2013	2012	2013	2012	2013	2012	2013	2012	2013	2012	2013	2012	2013
1 st day	L _{dn}	75.2	80.5	74.5	79.6	86.8	82.5	74.4	74.4	86.5	87.2	84.4	89.1	98.6	97.8	98.5	92.2
of mela	L _{den}	78.1	81.2	77	80.7	89.2	86.9	76.8	78.2	87.6	87	87.6	88.9	98.2	98.7	98	94.2
2 nd day	L _{dn}	74	77.6	83.6	86.8	86.7	83.4	75.4	77.4	90.9	87.3	93.6	91	97	98.7	99.1	96.5
of mela	L _{den}	77.2	79.5	86.4	88.9	89.1	88.1	76.9	80	92	89.2	94.5	91.4	97.4	99.8	99.6	96.6
3 rd day	L _{dn}	77.7	77.5	83.5	83.8	91	87.1	81.9	86.9	88.5	85.6	93.4	90.2	98.4	97.8	100.6	96.7
of mela	L _{den}	79.9	80.5	87.8	87.3	92	88.7	82.6	87.5	93.3	91.4	94.7	92.1	99.8	98.9	102	99.5

 $Table \mbox{-} 5 \\ L_{dn} \mbox{ and } L_{den} \mbox{ value of study areas for two years of study location}$

Table-6	
Noise indices of Lodge more (S7) and Chittra More (S8) in normal da	av

Study		L_{eq}			L ₁₀			L ₉₀		т	т	L _{np}			
Location	D	Ε	Ν	D	Е	Ν	D	Е	Ν	L _{dn}	L _{den}	D	Е	Ν	
S7	86	74	48	87	85	67	70	67	55	84	85	100	86.8	58.7	
S8	86	83	54	92	87	67	76	75	58	85	86	102.2	104.2	81.3	

Social Survey: The questionnaire survey was carried out during the Mela which was designed in English, and regional language, Bengali. The prepared questionnaire was distributed to the tourists, Mela's volunteers, and students of nearby hostels. The questionnaire survey had two parts. In first part focus on responder gender, age, annoying intensity, and time of most noise pollution intensity and second part focus on effect of noise pollution on their health such as headache, hypertension, and interference of their daily activities¹⁴.

Table-7 shows that about 52.9% of responders were male and 47.1% were female. 54.9% of the responders belong to the age group between 15 and 30 years; mainly they were students of Visva-Bharati, who worked as volunteers in the Mela or residents of hostels. About 49.0% of responder stated that evening time was the noisiest and 21.6% responder stated that during Mela whole day was noisy. About 90% responders stated that use of laud speaker and mike with high volume was responsible for noise pollution in Mela. About 96.1% of the responders were annoyed by the noise in Mela. The annoying level was measured by five point semantic scale such as no annoying, little annoying, moderate annoying, very much annoying and extremely annoying. About 35.3% of people stated that they were extremely annoyed, 33.3% were very much annoved, 15.4% were moderately annoved, 12.4% were littleannoyed, and 3.6% were not annoyed.

Table-8 shows that noise interferes with people's activities. About 80.5% respondersdeclared that they feel general problems such as speaking, hearing, talking in cell phone etc. About 78.4% feel headache and 72.5% declared that the high noise during the Mela annoyed them when they are relaxing. One of the vital facts was that about 35.3% did not know about the problem of hypertension by noise pollution. And one of the concerning fact was found that about 68.6% of responders feel disturbed while sleeping and studying, most of whom were

hostel students because of high noise in night time also.

Charac	icincis of i	csponders	
Variables/Question		Percent	Cumulative Percent
Gender	Male	52.9	52.9
Gender	Female	47.1	100.0
	<15	15.7	15.7
	>15-30	54.9	70.6
Age	>30-45	23.5	94.1
	>45-60	5.9	100.0
	>60	0	100.0
At what time during	Morning	15.7	15.7
At what time during	Evening	49.0	64.7
meta noise intensity	Night	13.7	78.4
was most?	All time	21.6	100.0
Does any particular	Yes	96.1	96.1
this mela?	No	3.9	100.0

 Table-7

 Characteriters of responders

Table-8 Distribution of response about physical problem by noise pollution in Mela ground

Disturbances due to noise		Respon particij	se of the pant (%)
	Yes	No	Don't know
General Disturbance	80.5	9.7	9.8
Headache	78.4	11.8	9.8
Hypertension	31.4	33.3	35.3
Sleep disturbance	68.6	17.6	13.7
Relaxing	72.5	17.6	9.8
Concentration on studying	68.6	15.7	15.7
Listening Music, watching TV	52.9	33.3	13.7

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The present study conducted on the noise levels in and around Mela ground and their distribution, shows some interesting findings. It can be concluded that, the noise level ranges mostly between medium to the moderately high in comparison to the national standard levels. A huge difference in minimum and maximum noise level was noticed for one of the main parameter Leq ranged from 49.1dB (A) to 92.7 dB (A). The main sources of noise pollution in Mela ground is miking, crowding of people etc. as the days past during Mela time.

The survey had been made during the Mela for different problems faced by the people. The responses of the people were studied and most of them had problems such as masking, headache, hypertension, sleeplessness and other problems.

This can be concluded that noise pollution should not be ignored at all, the Mela committee should take action against it as well as the volunteers stall owners and the visitors must be active and try to reduce the noise production as much as possible.

References

- 1. Datta J.K., Sadhu S., Gupta S., Saha R., Mondal N.K. and Mukhopadhyay B., Assessment of noise level in Burdwan town, West Bengal, *Journal of Environmental Biology*, **27**(3), 609-612 (**2006**)
- Stansfeld S.A. and Matheson M.P., Noise pollution: Nonauditory effects on health, *Br. Med. Bull.*, 68(1), 243-57 (2003)
- 3. West Bengal Tourism, Poush Mela, Retrieved 2009-02-14, (2009)

- ISSN 2319–1414 Int. Res. J. Environment Sci.
- 4. http://en.wikipedia.org/wiki/Poush_Mela, (2015)
- 5. Banerjee D., Ambient Noise Level around an integrated Iron & Steel works, *Bulletin of National Institute of Ecology*, **32(4)**, 144-146 (2006)
- 6. Banerjee D., Chakraborty S.K., Bhattacharyya S. and Gangapadhya A., Appraisal and Mapping the spatial: temporal distribution of Urban and Traffic Noise, *Int. J. Environ., Sci. Tech*, 6(2), 325-335 (2009)
- 7. Pani B., Text book of environmental chemistry, I. K. International Pvt. Ltd., 414 (2007)
- 8. Smith C., Environmental Physics, *Routledge, Taylor and Francis* Gr., 236, (2001)
- 9. Central Pollution Control Board (CPCB), Ambient Air Quality Respect of Noise, Schedule: Part-II, Sec-3(II) (2000)
- 10. http://www.acoustic-glossary.co.uk/leq.htm, (2015)
- https://www.noisemeters.com/apps/ldn-calculator.asp, (2015)
- 12. http://www.engineeringtoolbox.com/sound-leveld_719.html, (2015)
- 13. http://www.acoustic-glossary.co.uk/leq.htm, (2015)
- 14. http://www.epd.gov.hk/epd/noise_education/web/text/EN G_EPD_HTML/m2/types_3.html, (2015)
- **15.** Patil C.R., Modak J.P., Choudhari P.V. and Dhote D.S., Subjective Analysis of Road Traffic Noise Annoyance Around Major Arterials in Intermediate, City, *European Journal of Applied Sciences*, **3**(2), 58-61 (2000)