Associations between Environmental Noise Mapping and Self-Concerned from Noise in Can Tho Community, Vietnam

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ABSTRACT

Noise pollution is one of the main forms of urban environmental pollution and is becoming more urgent, direct impact on the environment and quality of life of people, especially in developing countries. Consequently, the purpose of this cross-sectional study was to determine factors related to self-concerned from noise. Subjects were 320 people among five residential zones of Thot Not district, Can Tho city, Vietnam. Data were collected by using a standardized questionnaire and noise measurement in the community, the noise level was transferred into the Noise At Work version 3.32 software for creating the noise mapping of each residential zone. Pearson's correlation, Spearman's rank correlation, independent test and one-way ANOVA were performed in the analysis. The findings revealed three factors significantly associated with self-concerned from noise ($P < 0.05$). Those factors were age group, living time in the community and noise level. Part of the one-way analysis of variance indicated that the difference was statistically significant with the level of self-concerned from noise in five residential zones ($F = 543.77$, $p < 0.001$). These were crucial factors to determine preventive measurement in further research.

Keywords: Noise mapping; Self-concerned from noise; Can Tho; Vietnam.

Introduction

Noise pollution is one of the main forms of urban environmental pollution and is responsible for negative impacts that are harmful to the environment and the quality of life of the population [1]. Noise induced adverse effects on psychological and physiological. Exposure to noise in continuous long time will cause significant impact to the health community, reducing an

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ability to hear, annoying, increases stress and hypertension. Noise pollution is becoming more urgent, direct impact on the environment and quality of life of people within the last 3 decades [1], especially in developing countries.

In Vietnam's urban areas, traffic noise pollution is one of the worrying issues. In fact, traffic transportation is very important for the local economy and the country. In many biggest city such as Ha Noi, Ho Chi Minh, Hai Phong, Can Tho with the high population growth, the sharp increase of the traffic transportation and inappropriate designed traffic transportation in planning and programs resulted pollution including noise pollution is the most notable.

Can Tho is a city in southern Vietnam's Mekong Delta region, the largest urban center and also concentration a lot of noise, in Fig.1 [2]. The main source of noise consists of an opening shops, karaoke bars, pubs, production facilities, until the traffic transportation, etc. making noise always surrounded people. Can Tho city is also the place get a lot of people reflects on noisy activities affect to health [3, 4].

Consequently, environmental noise is currently regarded as the key aspects in the Can Tho. If the environmental noise has not been resolved. It will affect those who live in the community contributes to health problems. Murphy, E. [5], Yano, T. Sato, T. Bjorkman, M. and Rylader, R. [6] and Vinita Pathak, Tripathi, B.D. and Mishra, V.K. [7] stated that noise levels have reached alarming levels in most of the areas in the city has exceeded the noise level standards. The study results showed that 85% of people were bothered by noise and health effects such as headache, dizziness and fatigue fatigue. In research published in recent years [8, 9] specify that a noise mapping was a fundamental tool for the study, diagnosis and control of the environment, but greater detail of these concepts, and their influence on people's concern regarding environmental noise has not been found in the relevant literature. Therefore, this study will focus on an association between environmental noise mappings and self-concerned from noise in Can Tho community, Vietnam.

Fig. 1. Map of Can Tho, Vietnam.

Materials and Methods

Study Design and Setting

A cross sectional study was conducted in June-October 2016 at Can Tho city in Vietnam**.** The 320 people who live in the residential five zones were collected the data regarding self**-**concerned from noise by using the standardized questionnaires**.** These subjects were identified by Yamane**'**s sample size calculating formula **[**10**].** Thoi Thuan ward, Thot Not district, Can Tho city was divided into residential five zones in order to creating the noise mapping by using the Noise At Work version 3**.**32 software**.**

Instrument Development

An instrument for data collecting consisted of general information of participants, self-concerned from noise, and noise level in the residential five zones which was measured by sound level meter**:** NL31 – RION **(**Japan**).** This equipment was certified IEC 61672**-**1 Class 1, IEC 60804, IEC 60651, JISC 1505

standard was shown in Fig. 2. All collecting parts were verified the Index of Consistency (IOC) by three safety and environment specialist. There were three parts for collecting the data. Three parts of the study was described below.

Fig. 2. Sound Level Meter: NL31-RION (Japan).

General information of participants

Individual data of 320 people were asked to do self-administered questionnaire. There were asked about sex, age, education level, marital status, address, occupation, ear problems, how long have you been living in Thotnot district. All questions were multiple choice and filled in the blank.

Self-concerned from noise

Self-concerned from noise questions consisted of 24 items. All items were Likert Scale [11]. Also, Cronbach's Alpha Coefficient was used for reliability analysis which was 0.912. If Cronbach's Alpha Coefficient greater than 0.8 is a good reliability [12].

Noise level in the residential five zones

Noise level in the community was divided into five zones were zone I: quiet suburban or rural community (remote from large cities and from industrial activity and trucking), zone II: normal suburban community (not located near industrial activities), zone III: urban residential community (not immediately adjacent to heavily traveled road and industrial areas), zone IV: noise urban residential community (near relatively busy roads or industrial areas), and zone V: very noisy urban residential community respectively. Noise level in the community was complied with the Vietnamese standard TCVN5964 [13].

Noise sampling technique

Basic parameter was used for evaluating the noise level in the community was equivalent sound level: LAeq. The LAeq represents a value known as Equivalent Continuous Sound Level. Usually the sound pressure level (SPL) you are measuring varies in amplitude over time. A point of noise measurement was established in the center of grid space (10 m. × 10 m.) for a period of 10 minutes. All area in the community were measured the noise. If some areas were not able to measure the noise as the result of obstruction, the Noise At Work version 3.32 software would be applied for predicting the noise level.

Data analysis

After noise measurement in the community, the noise levels were transferred into the Noise at Work version 3.32 software for creating the noise mapping. Only standardized questionnaire would be transferred to the SPSS software version 20 for analysis. Descriptive analysis was used to describe characteristic of study subjects, sex, age, education level, marital status, address, occupation, ear problems, and how long have you been living in Thotnot district. Pearson's correlation, Spearman's rank correlation, and independent test at level of confidence 95% are well known statistical approaches used to study the relationship between environmental noise mapping and self-concerned from noise in the community. Finally, one-way ANOVA would be applied for testing the difference of noise concern between each residential five zones.

Results

Population characteristics

The study population characteristics consisted of 320 people aged between 16-60 years who had been living in the community in Thoi Thuan ward, Thot Not district, Can Tho city, Vietnam. The study population consisted mainly of males (55.0%) and the most of them had been living in the urban residential community (31.9%) more than twenty years (50.6%) and worked as a worker in the factory (54.7%), the education level of people were secondary education level (46.3%), marital status was married (84.4%) as well as no problems with hearing loss (98.8%).

The characteristic of participants were shown in Table 1. In parts of noise level in the community each five zones including noise mapping were shown in Table 2 and Fig. 3-7.

Table 1. Population characteristics (N = 320).

Population characteristics	Frequency	Percent
1. Sex		
Male	176	55.0
Female	144	45.0
2. Age ($\bar{x}$ = 35.25, S.D. = 9.99)		
16-20 years	10	3.1
21-29 years	97	30.3
30-39 years	116	36.3
40-49 years	66	20.6
50-59 years	23	7.2
60-70 years	8	2.5
3. Education level		
Uneducated	39	12.2
Primary education	83	25.9
Secondary education	148	46.3
Diploma	43	13.4
Bachelor's degree or higher	7	2.2
4. Marital status		
Single	13	4.1
Married	270	84.4
Divorce	37	11.6
5. Address		
Zone I: quiet suburban or rural community	44	13.8
Zone II: normal suburban community	78	24.4
Zone III: urban residential community	102	31.9
Zone IV: noise urban residential community	71	22.2
Zone V: very noisy urban residential community	25	7.8

Table 1. Population characteristics (N = 320). (Continued)

Population characteristics	Frequency	Percent
6. Occupation		
Worker	175	54.7
Farmer	27	8.4
Officer	64	20.0
Student	4	1.3
Business	31	9.7
Homeworker	19	5.9
7. Ear problems		
Yes	4	1.2
No	316	98.8
8. The respondents have been living in Thotnot district		
0-5 years	53	16.6
6-10 years	44	13.8
11-15 years	27	8.4
16-20 years	34	10.6
20+ years	162	50.6

Table 2. The number of noise measurement in the community**.**

Residential zones	The number of noise measurement (points)	Vietnamese standard TCVN5964: 70 dB(A)			
		Passed		Not passed	
		n	percent	n	percent
Zone I: quiet suburban or rural community	155	155	100.0	0	0
Zone II: normal suburban community	264	264	100.0	0	0
Zone III: urban residential community	419	347	82.8	72	17.2
Zone IV: noise urban residential community	214	100	46.7	114	53.3
Zone V: very noisy urban residential community	403	125	31.0	278	69.0

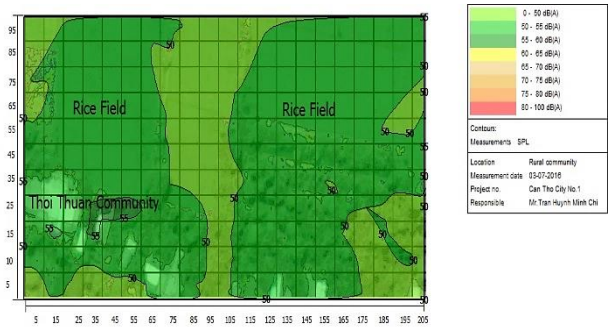

Fig. 3. Noise mapping in rural community (Zone I).

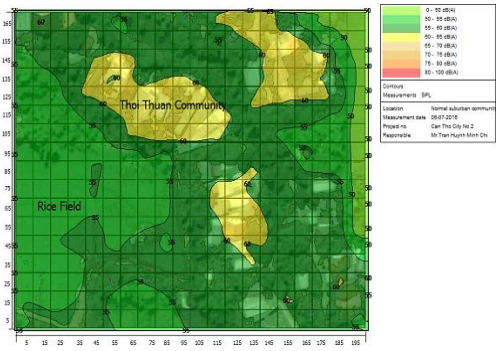

Fig. 4. Noise mapping in normal suburban Community (Zone II).

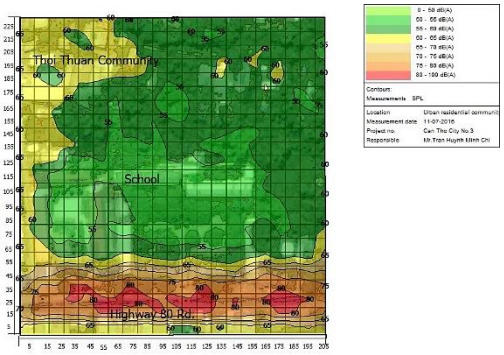

Fig. 5. Noise mapping in urban residential Community (Zone III).

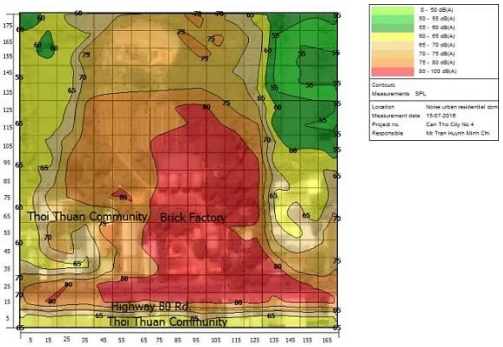

Fig. 6. Noise mapping in noise urban residential Community (Zone IV).

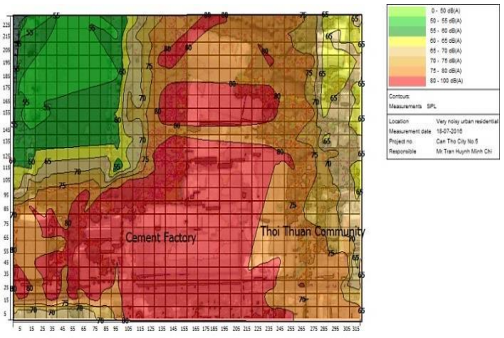

Fig. 7. Noise mapping in very noise urban residential community (Zone V).

Relationship between environmental noise mapping and self-concerned from noise

The findings revealed that age group, living time in the community and noise level related to self-concerned from noise is shown in Table 3**.**

Table 3. Relationship between independent variables and self-concerned from noise (N = 320).

Independent Variables	Correlation	*P*-Value*
Age group	0.129[a]	0.011
Living time in the community	-0.095[b]	0.044
Noise level	-0.70[c]	<0.001

a,b = pearson's correlation and
c = Spearman's rank correlation
**p*-value < 0.05

Differential comparison between five zones and self-concerned from noise

One- way analysis of variance indicated that the difference was statistically significant with the level of self-concerned from noise in five residential zones were shown in Table 4.

Table 4. One-way ANOVA test was used to compare among five zones and self-concerned from noise**.**

Residential zones	N	ANOVA	*P*-Value*
Zone I	44	$F_{(4)}$ = 543.77	<0.001
Zone II	78		
Zone III	102		
Zone IV	71		
Zone V	25		

**p*-value < 0.05

Discussion

There were three factors related to self-concerned from noise in Thot Not district, Can Tho city, Vietnam (P < 0.05). These were age group, living time in the community and noise level. Age group, there was a positive relationship with self-concerned from noise because of the most people with an average age between 30-39 years (36.3%). Sleep quality of older people was easily affected by noise which according with Shepherd, D. et. Al. [14] have been found that the higher global noise score the more noise sensitive the individual, Pearson's correlation coefficients showed positively correlated with sleep ($r = 0.412$, $p < 0.001$) [13]. Living time in the community, there was a negative relationship with self-concerned from noise. Indeed, no information was found in the literature about the influence of living time in the community with self-concerned from noise. Finally, noise level (Lower noise level standard zone/ Upper noise level standard zone) had a negative correlation with self-concerned from noise as the result of Shepherd, D. et. al. found that people who was contacting to the high noise, has a high sensitivity to noise, a positive correlation between feelings of noise effect on activities such as leisure, work, habituation, communication and sleep [13].

In parts of differential comparison between residential five zones and self-concerned from noise indicated that the difference was statistically significant with the level of self-concerned from noise in five residential zones ($F = 543.77$, $p < 0.001$). Because each area had different noise levels and affects different noise concerns which according with Zannin, PHT. et. al. [14] have been found that very noisy areas in university campus in Brazil by using noise mapping will affect those who live there.

Conclusion

Environmental noise was the most frequent sources of complaint regarding environmental issues in Cantho city, Vietnam especially in densely populated urban areas and residential areas near highways, rural roads and factories. Currently, environmental noise is becoming more alarming in Vietnam. Therefore, the study focused on each factors and study relationship between independent variables and self-concerned from noise including the difference of noise concern between each residential five zones.

There were three factors related to self-concerned from noise. These were age group, living time in the community and noise level. In addition, the study also found that the difference was statistically significant with the level of self-concerned from noise in five residential zones. Those results can be used as a basis for community health management policy to ensure environmental health in Cantho community.

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