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Investigation of Noise Pollution in Khalkhal Town in winter and Summer Using Analysis of Statistical Data

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ABSTRACT

Noise pollution in cities is one of the important environmental issues which causes harmful effects such as hearing loss, sleep disorder, hypertension and gastrointestinal complaints in people of cities. To prevent these effects and access to recommended standards, measuring noise pollution in cities is necessary. This study aims to identify amount of noise pollution in geographical arena of Khalkhal Town. Using sound maps, in 22 stations with regular 500 m distances in systematic random sampling, measuring were done in time slots of morning and evening in winter 2014 and summer 2015 through 450 cell hydrophone. Results indicated that noise pollution in Khalkhal Town is higher than standard in day according to Iran's Environment Standard in days (50 db) with average of 52/4313 db. Also, results of t-test at night (Iran's Environment Standard = 45 db) indicated that average of noise pollution in Khalkhal City (48/8370 db) is higher than standard limit.

Keyword: Noise pollution, Khalkhal Town, Statistical data

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INTRODUCTION

Men live in an environment which bothersome inferno get more and more every day. At the present century, in human environment, inferno has gotten a very important challenging factor (Fuladi Dahghi, 2003). According to Vesilon, the noise which is considered as undesirable by persons is called inferno. Maybe, a better definition can be as following: unwanted noise in an unsuitable place and at an inappropriate time (Alimohammadi, 2005). Noise is considered as the most important way to make relationship between man and world. Although sound waves are considered as a necessary factor in life of human being, in some cases and at special conditions, hearing such waves is not favored. Those kinds of sound waves which undesirably emit in environment and can be bothersome for hearing are called inferno or noise pollution (Davis, 1998). Sound is one of the physical factors which is made by industry and expansion of vast utilization of devices, machinery and equipments. This factor causes human beings face dangers and diseases resulting from noise in life. Amount of pollutions present in cities goes from traditional pollutions and today in science of environment; pollutions resulting from development of industry and technology have transmitted into one of the most important topics (Abbaspour, 1996). In fact, noise creates a necessary contact between man and his world. Also, noise can be taken into consideration as one environmental pollutant, meaning a waste product produced in relationship with different human activities (Spoon, 1991). Short-term and long-term contacts with noise pollution not only decrease hearing but also increase hypertension, cardiovascular diseases, excitability, anxiety, sleep disorder and change of behavioral pattern (Abbaspour, 1992; Tempest, 1985). Barigon and his colleagues (2002) studied equivalent noise in different municipal passages of one of cities of Spain according to kind of use in four groups of main streets in urban area, out of urban area, and main one-way and two-way streets. In this study, balance of equivalent sound in all streets was about 70 db in network A and in one-way streets was 5 db lower. Balance of equivalent noise during working hours in more than 90 per cent of performed measurements was more

than 65 db in network A. There was a meaningful relationship among balance of equivalent noise, traffic rate and percentiles of balance of equivalent noise. Picolo et al (2004) measured amount of noise pollution in Misena City of Italy which its results showed that in all measuring stations, average of the noise resulting from road traffics was 10 db higher than standard limit. Al-Sheikh et al (2010) investigated noise pollution resulting from highways in Tehran using geo-statistics. Their results indicated that most points near to highways are subject to pollution and proceeded to zoning noise pollution using Arc GIS. Batbusa et al. (2005) in Brazil conducted a research entitled 'How teachers and students face with noise?' and they found that the noise in the studied school was due to extra compression of activities in classes and lack of acoustic materials and devices. In the conducted investigation, there was balance of pressure of extensive noise (dBA95-60) with maximum of dBA80. Sometimes, balance of pressure of measured noise does not accord with limit of balance of pressure of industrial noise. This situation holds in offices such as office of school physician, reading room and teachers' room and sometimes in these spaces, principals of controlling sound are not observed. This study aims to investigate noise pollution amount in Khalkhal Town in winter and summer using analysis of statistical data.

Methodology

Introduction of the studied area

Khalkhal City is center of Khalkhal Town. This town has three districts and eight rural districts and is located at the south of Ardabil Province. Ii is located at 277885.7798 to 285515.7798 m eastern longitude and 4164402.1537 to 4168772.1537 m northern latitude at the south of Ardabil Province. Main development of the City is alongside northwest to southeast. The lowest height of the city is in northwest (1774 m) and the highest height of the city is in the southeast (1814 m from sea level). Main resources effective in making noise pollution in the City include factories and workshops and vehicles and vehicle repair shops. Figure (1) indicates position of sampling stations in Khalkhal City.



Fig. (1) – Position of Khalkhal City and sampling stations in Khalkhal City

University College of Takestan

In this research, 22 stations were identified which have business, residential and business-residential applications. Sampling was considered in two shifts of day and night in two seasons of winter and summer which there is possibility of changes in number of traffic and decrease and increase of balance of equivalent noise. Also, primary analysis was performed with exact geographical situation and entrance of database in SPSS software to analyze data. In analysis of data, t-test to accord with Iran's environment standard and Kolmogornov-Smirnov to assess normality of data were used.

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Table (1) – Allowed	limit of noi	se pollution	n, the subject of second Article of executive statute

The average balance of the night (10 pm to 7 am) (dBA), average sound pressure		The average balance of the day (7 am to 10 pm) dB(A), average sound pressure	Type of zone	
	45	55	Residential	
	50	60	Commercial-residential	
	55	65	business and administrative	
	60	70	Residential-Industrial	
	65	75	Industrial	

Results

Results of measurement of Leq index of balance of equivalent noise according to night and day

			8 8
Code Station	Station name	Day	night
1	S 1	44.68	41.08
2	S 2	45.08	41.47
3	S 3	46.18	42.58
4	S 4	47.28	43.68
5	S 5	47.68	44.08
6	S 6	48.58	44.98
7	S 7	48.85	45.25
8	S 8	49.08	45.55
9	S 9	50.48	46.88
10	S 10	50.68	47.08
11	S 11	51.28	47.68
12	S 12	52.08	48.58
13	S 13	53.28	49.68
14	S 14	54.51	50.91
15	S 15	55.58	51.98
16	S 16	56.48	52.88
17	S 17	56.55	52.95
18	S 18	57.24	53.64
19	S 19	58.68	55.07
20	S 20	59.28	55.68
21	S 21	59.48	55.88
22	S 22	60.48	56.8V
М	ean	52.43	48.83

According to Table 10-4, average of noise pollution in Khalkhal City during days of summer and winter equals 52.43 dB and during nights it equals 48.83 dB.

One-Sample	Kolmogorov-Smirnov	' Test
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		VAR00001	VAR00002
Ν		23	23
Normal Daramatarsa	Mean	52.4313	48.8370
Normal Farameters	Std. Deviation	4.86816	4.86448
	Absolute	.102	.101
Most Extreme Differences	Positive	.102	.098
	Negative	102	101
Kolmogorov-Smir	.490	.486	
Asymp. Sig. (2-ta	.970	.972	

a. Test distribution is Normal.

b. Calculated from data.

According to Kolmogorov-Smirnov test, meaningfulness level for day and night data equals 0.970 and 0.972,

respectively (P<0.050) which this indicates normality of data.

Test of normality of data (Kolmogorov-Smirnov)

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T-test for noise pollution at days with Iran's Environment Standard

One-Sample Statistics					
N Mean Std. Deviation Std. Error Me					
VAR00001	23	52.4313	4.86816	1.01508	

One-Sample Test

	Test Value = 50					
	t	df	Sig. (2-tailed)	Mean Difference	95% Confidence Interval of the Difference	
					Lower	Upper
VAR00001	2.395	22	.026	2.43130	.3262	4.5365

According to one-sample t-test, the test is meaningful (P<0.05). Also, score of t which is 2.395 is a positive

number which indicates that highness of noise pollution at days in this area.

T-test for noise pollution at nights with Iran's Environment Standard

One-Sample Statistics					
N Mean Std. Deviation Std. Error Mean					
VAR00002	23	48.8370	4.86448	1.01431	

One-Sample Test

	Test Value = 45					
	t	df	Sig. (2-tailed)	Mean Difference	95% Confidence Interval of th Difference	
					Lower	Upper
VAR00002	3.783	22	.001	3.83696	1.7334	5.9405

According to one-sample t-test, the test is meaningful (P<0.05). Also, t score which is 3.783 is a positive number which indicates highness of noise pollution at nights in this area.

Conclusion

Noise pollution is one of the essential issues in modern life at different points of the world. Of the essential actions to prevent this infelicitous phenomenon of urbanization include to study, identify its constituent factors and concoct authorities to programming to remove this problem.

This study aims to determine amount of noise pollution at Khlakhal City level and the way of distribution of its dispersion level in different seasons of year and also at hours.

Results of the research indicated that noise pollution in Khalkhal City according to Iran's Environment Standard at days (50 db) with average of 52.4313 db is higher than the standard at days. Also, results of t-test at nights (Iran's Environment Standard = 45 db) show that average of noise pollution at Khalkhal City (48.8370 db) is higher than standard limit.

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