

ASSESSING THE TRAFFIC NOISE STATUS OF CITY HIGHWAYS

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ABSTRACT

In big cities today, interaction is important in the context of environmental problems that negatively affect human health. The inclusion of physics, engineering, biology, medicine, architecture and modern knowledge in solving noise problems requires a deeper study of this problem. Traffic noise is a problem in many cities, and scientific research and measures have been taken to address it. However, so far the state of traffic noise on the city streets of the Republic of Uzbekistan has not been studied and assessed. The results of the research conducted abroad were analyzed before conducting the research in the article. In this article, we have studied the traffic noise on the main streets of Tashkent, the capital of Uzbekistan, on the basis of real research and proposed evaluation criteria.

key words-traffic noise, city highways, traffic volume, noise level normative, evaluation criteria, noise meter.

INTRODUCTION

According to the latest data (2010), more than 130 million people in the EU are exposed to noise above 65 dBA (black zone) and 400 million people are exposed to 55-65 dBA (gray zone), which leads to strong protests and disease [1]. The main source of noise in European countries is road transport (up to 75-90% of complaints) [2,3,4]. In Rome, for example, acoustic pollution from road transport accounts for 75% of the population [5], and in Russia, one of the CIS countries, 58% of the population's complaints [6].

The effect of noise on the human body was started in 1936 by European scientist Bekesy H.E. He later studied in Johnson D.L. (1967), Leven-thal H.G. (1974), Gierke H.E. (1976), Gono F. (1978), Ising H. (1982), Babisch W. (2006). In the CIS countries, in 1974, IT Bachurina studied the effect of noise on the human body, its normal functioning. Later Yu.V.Eremina, I.Yu. Brinka, I.V. Cherunovoy, E.Ya. Surjenko, V.N. Zinkina, S.K. Soldatova, A.L. Terexova, M.N. Drobaxa, S.V. Kurenovoy, E.A. Drofa, N.A. Kuralesina, N.I. Ivanova and others have conducted research on the effects of noise on humans and continue to do so today. The most important of these is the research of the Russian scientist AP Kharlamov (2012), who found that young children are more prone to cardiovascular disease under the influence of traffic noise [5,7].

According to a study by Australian researchers, noise in large cities reduces life expectancy by 8-12 years [8,9]. It also found that noise was 36% more dangerous than smoking in terms of the negative effects of noise on humans [10].

Long-term noise above 70 dB (A) on highways leads to hearing loss and this ability cannot be restored[4,11]. People living in areas with traffic noise of 65-70 dBA are 20% more likely to develop heart disease than people living in other peaceful areas [12,13]. The results of the above research show the dangers of traffic noise and the important work ahead to eliminate it.

LITERATURE REVIEW

According to the purpose of the article, all the factors affecting traffic noise on the main streets of Tashkent were identified on the basis of experimental studies. One of our main tasks is to assess the current state of traffic noise on city highways and floodplains and to develop measures against it.

Based on the results of his research, P. Pospelov proposed the following assessment of the complexity of the design of noise protection measures to reduce the noise to the required level [14] (Table 1).

Table 1:

The required level of noise reduction, dBA	5	10	15	20
The complexity of achieving the result	Light	Available	Advanced (available)	Very complicated

N.N.Minina also proposed to classify highways and streets according to their category of noise (Table 2) [15] based on her experiments.

Table 2:

Noise class	Noise class naming	Equivalent noise level, dBA (7.5 m)	Traffic speed, km / h	Category of city highways and automobile roads
I	Low noise	55-60	Up to 40 km / h	Access roads
II	Increased noise	60-65	Up to 50 km / h	Highways of district significance, roads and streets of local significance
III	Noisy	65-70	60-70	Highways for pedestrians
IV	High noisy	70-75	80-90	Non-stop and regulated main streets
V	Very noisy	75-80	100-110	Highways
VI	Unbearable noise	80 дан юкори	120	Speed roads

Note: Noise-protected highways belong to the zero noise class.

The assessment proposed by P. Pospelov is aimed at measures to eliminate it, but the assessment that it is very difficult to reduce the noise-protected area to the required noise level does not lead to the failure to implement protective measures. In any case, we need to ensure acoustic comfort by reducing the noise level in accordance with the requirements of sanitary norms.

The classification anti-noise measure proposed by N.N.Minina has to be implemented along the entire length of the road or street, and the sanitary norms are different for the areas that need to be protected from road or street noise.

METHODOLOGY

Traffic noise on the main streets of Tashkent measured by GOST 20444-2014 "Noise. Traffic flow. Methods for measuring noise characteristics". Measurements will be carried out in clean and dry areas of the road surface, as well as on the right section of the road at a distance of 50 m from public transport stops and intersections. The researcher or examiner conducting the measurement should be at a distance of 0.5 m from the microphone. To measure the noise of traffic, including cars, trucks, buses, trolleybuses, trams, motor vehicles, the microphone of the meter is placed at a distance of 7.5 ± 0.2 m from the axis of the perimeter of the vehicle and 1.5 ± 0.1 m above the pavement. If the installation location of the Sumerian microphone is less than 7.5 ± 0.2 m, building, barrier, screen, carving, and similar barriers shall be permitted, provided that they are not less than 1.0 in relation to them. If the highway or street is crossed by a lift, it is permissible to measure the sumac meter at a height of 1.5 ± 0.1 m from the edge of the road (eyebrow). The duration of the period for measuring the noise characteristics of vehicles (including cars and trucks, public transport) depends on the speed of movement of the current.

In order to obtain a sufficiently accurate result of the traffic flow, the measurement is carried out for at least 10 minutes at a speed of more than 1000 rpm, at least 20 minutes at a speed of 500-1000 rpm, at least 30 minutes at a speed of 500 rpm [16].

In the study, traffic noise was measured in 2016 using a NORSONIC 140 (Nor140) device manufactured in Norway. According to the requirements for measuring traffic noise, the meter number Nor140 is a class 1 meter according to

GOST17187-2010 (IES 61672-2002). The technical description of the NORSONIC 140 (Nor140) is given on the official website of the manufacturer [17]. The results were processed using the NorXfer 6.1.1 program, and the Nor140 sumometer equipment and the results processing program are shown in Figure 1 below:

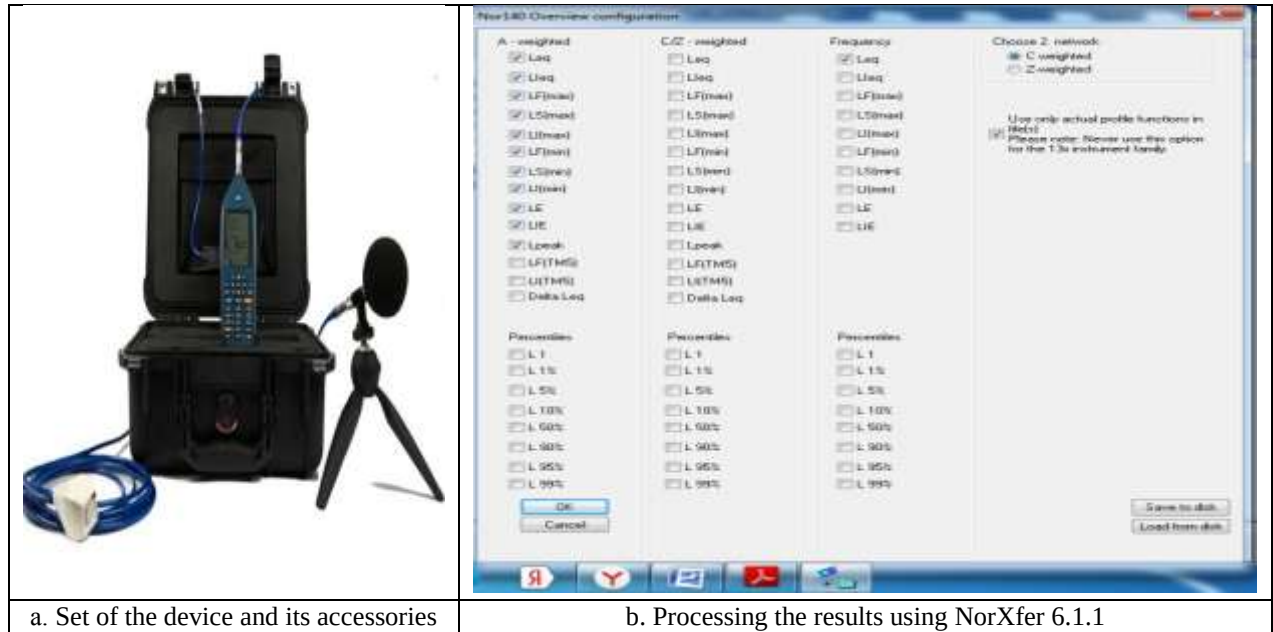


Figure 1: Basic and auxiliary devices of Nor140 shumometer

EXPERIMENTAL RESULTS

The research was conducted on several highways in Tashkent, and it was found that almost all cars in the volume of traffic on highways are domestically produced. The amount of movement itself does not give a sufficiently accurate result to estimate traffic noise, i.e., the speed of movement also changes as the amount of traffic changes. At the same time, the amount, speed and composition of traffic were measured when measuring traffic noise.

One of the results of the study was that the traffic volume and noise level of A.Temur Street were studied on weekdays and weekends, and the results are shown in Figure 2.

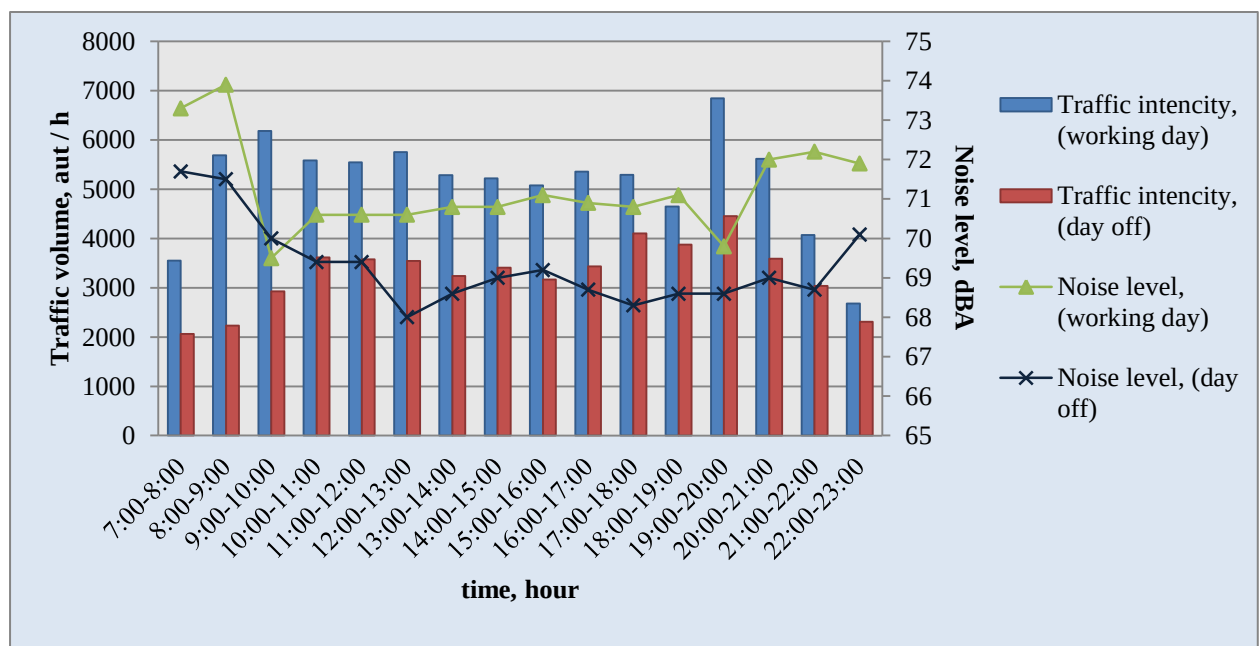


Figure 2. Noise mode of A.Temur avenue

Due to the proximity of traffic noise on the main streets of the 9 cities surveyed, only A.Temur Street data were provided. The units of measurement and standards of permissible noise of buildings and structures located along the main streets of the city are given in Table 3 [18] below.:

Table 3

T/p	Names of buildings or areas	Times of the day	Sound levels, L_A and equivalent levels of sound, L_{Aeqv} , DBA	Maximum levels of sound, dBA
1	2	3	4	5
1.	In areas directly adjacent to hospitals, clinics and sanatoriums	from 7 till 23 from 23 till 7	45 35	60 50
2.	In areas directly adjacent to residential houses, clinics, dispensaries, rest homes, boarding houses, boarding houses for the elderly and disabled, preschools, schools and other educational institutions and libraries	from 7 till 23 from 23 till 7	55 45	70 60
3.	In areas directly adjacent to hotels, campgrounds and dormitory buildings	from 7 till 23 from 23 till 7	60 50	75 65
4.	In recreation areas in the areas of hospitals, clinics and sanatoriums	-	40	55

Based on the units and norms of permissible noise, the linear distribution of traffic noise was studied because the buildings are located at different distances along the city main streets. The results of the study are shown in Figure 3. The figure shows the distribution of the noise level at a distance of 50 m from the center of the edge band of the carriageway in accordance with GOST 20444-2014 at a distance of 50 m.

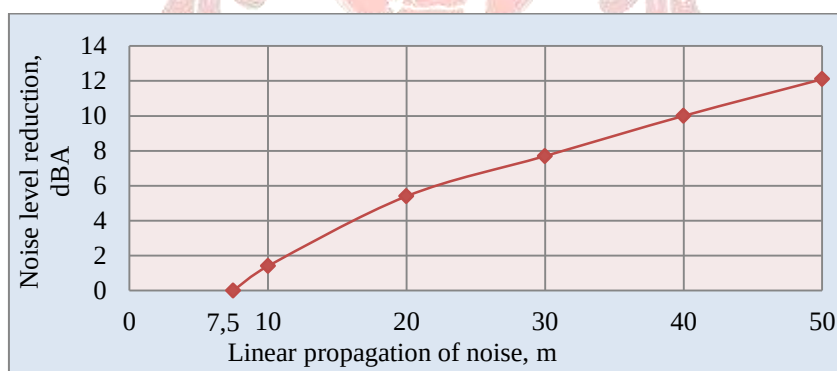


Figure 3. Linear distribution of traffic noise

Traffic noise decreases by 12 dBA when linearly propagated over a distance of 50 m. We inspected the buildings located at a distance of 50 m along A.Temur Street, which is the object of research, for compliance with the requirements of San QvaM 0008-20, and the results are shown in Figure 4.

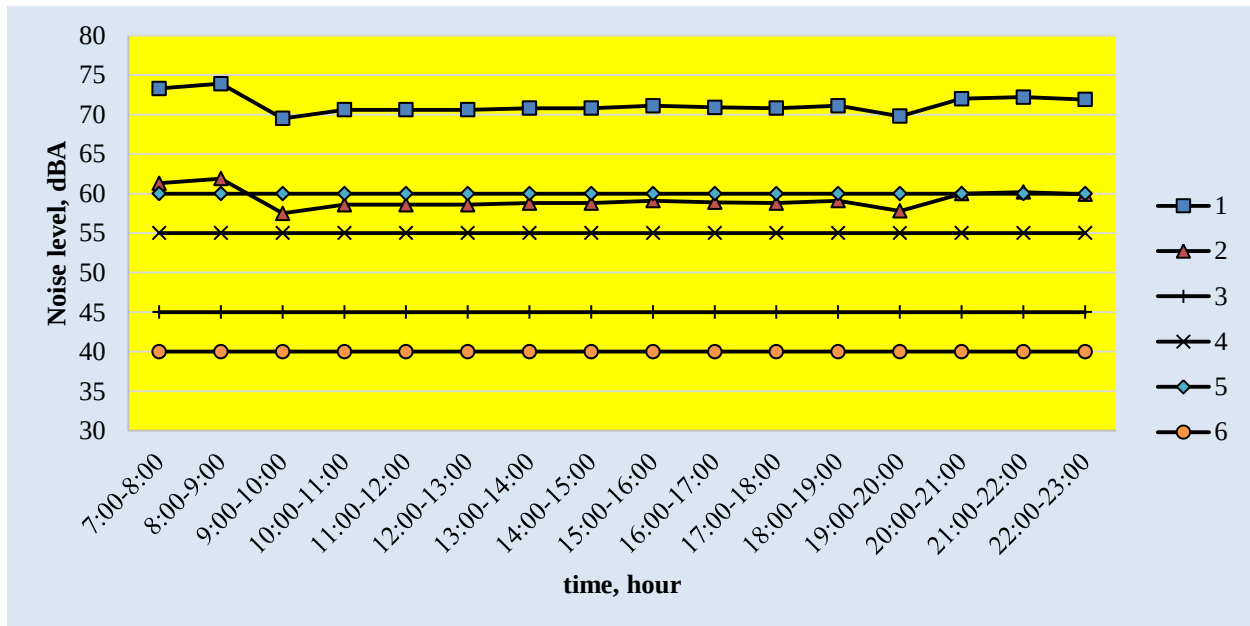


Figure 4. Compliance of noise levels in the areas of buildings and structures located along the main street of A.Temur with the standards of San QvaM 0008-20:

1. Noise level of A.Temur street according to GOST 20444-2014;
2. Decrease in noise level propagation over a distance of 50 m;
3. In areas directly adjacent to hospitals, clinics and sanatoriums;
4. In areas directly adjacent to residential houses, clinics, dispensaries, dispensaries, rest homes, boarding houses, boarding houses for the elderly and disabled, preschools, schools and other educational institutions and libraries;
5. In areas directly adjacent to hotels, campsites and dormitories;
6. In recreation areas in the territory of hospitals, clinics and sanatoriums.

Based on the above analysis and research, we propose a criterion for evaluating transport noise by the equivalent level of noise given in Table 4 below.

Table 4

№	Assessing degree	Equivalent degree of noise, dBA	Note
1	Excellent	$L_{real} \leq 40$	According to the WHO the safe degree of noise for people
2	Good	$40 < L_{\phi} \leq L_{norm}$	Required noise level according to sanitary rules and normative №0008-20 бўйича талаб этилган даражагача
3	Satisfactory	$L_{norm} < L_{\phi} < 65$	the boundary of bad impact of traffic noise
4	Unsatisfactory	$65 \leq L_{real}$	The increase of traffic noise from the boundary of bad impact

The proposed assessment criteria are based on San R and N №0008-20 “Sanitary rules and norms of permissible noise levels in residential, public buildings, residential areas and recreation areas”, as well as the high level of traffic noise posing a threat to human health. The target norm of night noise for the protection of public health, including the most vulnerable groups – such as children, patients with chronic diseases and the elderly – should be 40 dBA [19]. According to the results of many scientists [1,4,11,12,13] it is proved that,

traffic noise level more than 65 dBA is the most danger level of noise in city street roads. The method given above is based on assessing city street roads by traffic noise to impact for people's health.

CONCLUSION

When assessing urban main street areas according to the proposed assessment criteria, it will be possible to identify areas where measures should be taken to reduce noise levels in the first place. Depending on the level of importance, noise protection measures will be implemented gradually. For example, on A.Temur Street in the morning between 7⁰⁰-23⁰⁰ the noise level averages 71-72 dBA, along this street there are residential houses, clinics, dispensaries, dispensaries, rest homes, boarding houses, boarding houses for the elderly and disabled, preschool the noise level in educational institutions, schools and other educational institutions and library areas is higher than 65 dBA, which is the basis for the assessment as unsatisfactory. Measures to reduce the noise level to at least 10 dBA are required to bring these areas to an excellent level of 55 dBA. Also, the fact that the noise level on the sidewalks of the city's main streets averages 70-75 dBA increases the importance of noise control.

REFERENCES

1. A.V. Vasilev. Noise safety of urbanized areas. Applied ecology problems. Russia 2014 pp. 299-305.
2. Towards a Comprehensive Noise Strategy, Policy Department Economic and Scientific Policy. Environment, Public, Health and Food Safety, 2012. P 82.
3. Ivanov NI, Shashurin AE, Butorina MV, "Legislative regulation in the field of noise in the Russian Federation: disadvantages and ways of improvement" VI All-Russian scientific-practical conference with international participation. Protection against increased noise and vibration March 21-23, 2017 St. Petersburg. Collection of reports. Pages 15-24.
4. L.C. (Eelco) den Boer, A. (Arno) Schroten. Traffic noise reduction in Europe. Health effects, social costs and technical and policy options to reduce road and rail traffic noise. CE Delft, Brussels. March 2007. P 70.
5. A.P. Kharlamov. The role of traffic noise in the multifactorial impact of the surrounding urban environment and the formation of the health of the child population. Abstract. Moscow 2012 Page 14.
6. M.V. Tomakov., V.I. Tomakov., O. V. Kurochkina., Protection of residential buildings from the noise of construction sites is an urgent environmental problem of a large city. <http://iswsu.esrae.ru/20-36>.
7. Haralabidis A.S., Dimakopoulou K., Vigna-Taglianti F., et al. Acute effects of night-time noise exposure on blood pressure in populations living near airports. European Heart Journal, 2008, vol. 29, no. 5, pp. 658-664.
8. Misnichenko S.A. , Priymak N.V. Taking into account the roughness of the pavement when determining the traffic noise on motor roads. Student club "Alternative". 2013 year. <http://www.cs-alternativa.ru/author/2381>.
9. A.S. Ivanova. Influence of parameters of roadside forest belts on noise reduction near motor roads (on the example of the Saratov right bank). Thesis. Saratov. 2014 page 118.
10. Haines M.M., Brentnall S., Stansfeld S.A., Klineberg E. Qualitative responses of children to environmental noise. Noise & Health, 2003, vol. 5, no. 19, p 19-30.
11. U. Rosenhall, K. Pedersen, A. Svenborg. Presbycusis and Noise-induced hearing loss, In: Ear & Hearing, 11(4):257-263,1990 y.

12. Ising H., Babisch W., Guski R., et al. Exposure and effect indicators of environmental noise, 2004.
<http://dcnightlifenoise.com/effectindicatorsenviroiselsing.pdf>.
13. W. Babisch. Transportation Noise and Cardiovascular Risk : Review and Synthesis of Epidemiological Studies, Dose Effect Curve and Risk Estimation. Berlin : UBA, 2006 y. p 116.
14. P.I. Pospelov. B.A. Shield. ODM 218.2.013-2011. Methodical recommendations for the protection of areas adjacent to motor roads from traffic noise. Moscow 2011 .-- 123 p.
15. N.N. Minina. The problem of reducing the acoustic impact on residential buildings during the design, construction and operation of transport facilities. Abstract for the competition of the scientist Doctor of Technical Sciences. St. Petersburg. 2012 51 pp.
16. P.I. Pospelov, V.I. Purkin. Noise protection for road design. MADI. M., 1985.-119 p.
17. www.norsonic.com (https://web2.norsonic.com/product_single/soundanalyser-nor140/).
18. Sanitary rules and norms 0008-20 "Sanitary rules and norms of permissible noise levels in residential buildings, public buildings, residential areas and recreation areas." Tashkent. 2020 y.
19. Night noise guidelines for Europe. Copenhagen: WHO Regional Office for Europe; 2009.

