

## TO THE QUESTION OF PROTECTING FROM A TRANSPORT NOISE

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Road transport is one of the main sources of environmental pollution. Along with the main part of the volume of harmful emissions into the atmosphere, the development of the road complex and, as a result, an increase in the traffic volume resulted in a real danger of changing the quality of the environment as a result of an abnormal change in sound characteristics (periodicity, force of sound) in settlements and other places. With the increase in the number of vehicles and the speed of their movement through the streets of industrial cities, the world community identified noise as one of the main factors that aggravate the standard of living of people in cities. It is impossible to physically avoid noise pollution, it is possible only to subjectively ignore it. Emotional and physical stress associated with constant noise discomfort leads to noise stress. Therefore, the problem of noise pollution of the environment by transport highways is no less relevant than the chemical, as the studies determine the new aspects of the negative acoustic effect on the health of residents of major cities. In the course of the study, an analysis of existing mathematical models was carried out to determine the expected noise level of the transport flow. For the typical section of the city territory, theoretical and experimental studies of acoustic loading on the territory along the highway have been conducted. To estimate the complex noise impact from all sources and from individual sources, as well as to predict the total noise exposure for this site, a noise map was constructed using software. As a measure to combat traffic noise in the territory along the highway, the location of the noise protection screen was justified, taking into account the loss of part of the national income as a result of the continuous impact of noise on a person. The problem of combating urban noise is closely linked to the rational transformation of the urban environment, which must go through the elimination or reduction of the number of sources of noise, the localization of the noise emission zone, reducing the level of sound sources and protection against noise of places of residence of man. The results of the research allow to assess the degree of technogenic impact of noise pollution during the operation of the highway, which allows regulating by administrative and legislative methods the nature of the impact on natural objects and human health of certain types of activities, as well as reasonably proposing measures that ensure environmental safety when organizing urban streets traffic.

The constantly growing intensity of traffic flows annually is accompanied by increased man-made pressure on the population of modern cities. With the increase in the number of vehicles and their speed on the streets of major cities, the world community has identified noise as one of the main factors that worsen the standard of living of people. Compared to Ukraine, the international community is many

steps ahead in the fight against traffic noise. Noise pollution of the environment is an urgent problem for most countries of the European Union, which have a developed infrastructure.

The noise has an adverse effect on virtually all systems of the human body, causing both short-term and long-term and stable functional changes that lead to diseases of the cardiovascular, nervous and other systems, as well as the weakening of the immune system of the body. Excessive noise can cause nervous exhaustion, mental depression, autonomic neurosis, peptic ulcer, endocrine and cardiovascular disorders. Noise interferes with people working and relaxing, reduces productivity and increases injuries at work and at home.

The negative influence of noise due to its physical parameters (sound pressure level, intensity, duration of exposure, constant or inconstant noise, etc.), the specifics of the human body (age, gender, health status, etc.) and the influence of the accompanying factors that can increase the harmful effects of noise. The impact of transport noise on a person can be considered in various aspects, in particular in relation to:

- drivers;
- employees of administrative and office buildings, hospitals, schools and other facilities with special requirements regarding noise levels located near roads;
- residents of buildings located in close proximity to highways with significant traffic intensity.

The annual growth of the automobilization level has led to an increase in noise pollution in large Ukrainian cities like Kiev (3 mln. people), Kharkiv (2 mln. people), Dnepr (1 mln. people), Odessa (1 mln. people), Lviv (0,8 mln. people), Zaporizhia (0,8 mln. people). The presence of obsolete vehicles as part of the traffic flow poses the problem of noise pollution and the impact on the residents to the forefront. The installation of noise protection systems in Ukraine will be applied only on intercity routes and international highways, however, the need for their use at the main areas of the urban residences still less research. Based on the leading experience the development of a complex of noise protection is carried out in accordance with the necessary reduction of sound level, and the choice of screen structures is dictated primarily by considerations of the effectiveness of noise protection measures and their expenses, as well as security requirements, features of operation and aesthetic perception.

The article presents the research of acoustic climate in the residential area of the Kharkiv (Ukraine); an environmental protection measure to improve the environmental performance of transport infrastructure is proposed.

In the first stage, an analysis of existing mathematical models was performed to determine the expected noise level of the transport flow. After that, for the typical section of the city territory, theoretical and experimental studies of acoustic loading at the territory along the highway were carried out. A noise map was constructed to estimate the complex noise exposure from all sources and the effect of noise from individual sources, as well as to predict the total noise exposure for

this site using software. As a measure to combat traffic noise in the territory along the highway, the location of the noise protection screen was justified, taking into consideration the loss of part of the national income as a result of the continuous impact of noise on a person. The research results allow to assess the degree of anthropogenic impact during the operation of the highway on the state of the environment by the example of the city roads of Kharkiv, which allows regulating by administrative and legislative methods the nature of the impact on natural objects and human health of certain types of activities, and also reasonably suggest safety in the organization of traffic on the streets of major cities.

The need to combat noise in Ukraine is enshrined in law in accordance with the law of general action «On Environmental Protection». The noise penetrating a room or territory should not exceed the standard values established by building codes, standards and sanitary norms.

Sanitary norms of permissible noise necessitate the development of technical, architectural, planning and administrative measures aimed at creating a noise regime that meets the hygienic requirements, both in urban buildings and in various buildings that preserve the health and performance of the population. The main criteria for ensuring acoustic comfort in the residential building area are the normative equivalent noise levels of the residential area – 55 dBA per day and 45 dBA at night time.

The inhabitants of large cities are exposed to noise over a long period of time, so noise is especially dangerous for them. The total contribution of transport noise to the acoustic background of the residential area is estimated at 60-80%. It has been established that transport noise affects residents of the residential area located near the highways, during 15-18 hours per day.

The problem of combating urban noise is closely linked to the rational transformation of the urban environment, which must go through the elimination or reduction of the number of sources of noise, the localization of the noise emission zone, reducing the level of sound sources and protection against noise of places of residence of human.

At present, the huge practical experience of using various noise protection measures for reducing road transport noise is accumulated. In Brazil, USA, Serbia, Italy, Canada, Romania, India and other countries tens of thousands of kilometers of acoustic screens are installed. Slovakia, France and Germany use a noise-absorbing road surface to reduce the noise of car tires. Embankment and green plantations are successfully used to reduce the sound level in the way of its dissemination. The development of a complex of noise protection is carried out in accordance with the necessary reduction of sound level, and the choice of screen structures is dictated primarily by considerations of the effectiveness of noise protection measures and their cost, as well as security requirements, features of operation and aesthetic perception.