QUANTITATIVE STUDY OF ENVIRONMENTAL NOISE
ON DOVILŲ VILLAGE POPULATION

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Abstract. In today's life, mechanized industrial and agricultural production, increased traffic flows in cities and settlements are leading to a rapid increase in noise zones. The main source of noise is the noise emitted by vehicles, which is most intense during the day and evening. This noise is considered one of the most important sources of environmental noise, which has a negative impact on human health. 80 % of the environmental noise in cities is caused by the traffic noise. However, in recent years, traffic flows have increased significantly in suburbs. Dovilų village was chosen for noise study as suburb of Klaipeda city. This article presents a quantitative study of Dovilų village inhabitant satisfaction by the current noise level. The aim of the study was to make a quantitative study of the impact of noise in the surrounding area on the population. The questionnaire method for surveys of the sample of 800 correspondents was selected. The research target group is Dovilų urban inhabitants (respondents). The questionnaire was sent to all inhabitants of the city (1300 inhabitants), 800 respondents answered. The quantitative survey results show that 75 percent of the population of the village are faced with the problem of environmental noise. The main source of noise is caused by vehicles, intense noise day and night at a time. As one of the noise management principles of public information, the results of the survey showed that 84 ercent of the respondents even are not enough informed about the current situation of environmental noise. According to the quantitative study it may be concluded: the need for permanent or periodic public awareness of the existing noise levels and expected plans for environmental noise reduction. Given the Dovilų village layout, the possible noise reduction measures are suggested: plantation belts, freight and passenger traffic ban in certain areas of the village and the speed limit.

Keywords: noise, environmental, traffic, quantitative survey.

Introduction

In today's life, with mechanisation of industrial and agricultural production, increasing transport flows in cities and settlements, increased noise zones are growing rapidly. People suffer from noise not only in the workplace, but also in the streets, at home. Doctors say that the noise as a chronic source of stress acts on the central nervous system and causes various disorders. Even relatively mild around 60-70 dB noise causes headaches, dizziness, squeaking ears, insomnia, deterioration of memory, attention, orientation. Noisy environment deteriorates efficiency, coordination of movements, increasing stress and risk of injury [1;2].

Most of the noise (about 80 %) in Lithuanian cities is caused by road transport, but the success of the Lithuanian economy depends on how the transport system works [2].

Noise is one of the major environmental problems of quality in Europe and public dissatisfaction with the current situation is increasing. The noise level depends on the type of the car. Heavy vehicles cause much more noise than cars. An arriving passenger car emits 70 to 80 dBA, bus 80 to 85 dBA, truck about 80-90 dBA, motorbike 90-95 dBA noise [1;3]. The study indicated the fact that 85 % of the people were disturbed by traffic noise, about 90 % of the people reported that traffic noise is the main cause of headache, dizziness and fatigue [4]. Recently, a variety of engineering, technical and organizational measures to reduce motor noise from the main road accelerate environmentally cleaner, more economical and less noisy motor vehicle use [5;6].

Questionnaire is one of the most popular methods of quantitative research. By this data collection method, they had their own, according to the rules for filling, answering the investigator's questions (written or oral), whose purpose is to gather some knowledge about the phenomenon under investigation [7]. In order to avoid distortions of the information collected, the questionnaire questions have to be realistic, with a clear meaning and purpose of the scientific basis [8]. Questioning the reliability of the method leads to its popularity. It is only too frequent use of questionnaires that can falsely indicate that the test method is simple. In fact, the study questionnaire is a complex method that requires professional training, addresses the problems of knowledge, thorough and consistent work and a lot of time [9].

According to D. Krathwohl the research is usually aimed at confirming the hypothesis and in case of a qualitative approach the explanations arising from the situation analysis are more acceptable. The qualitative and quantitative research of the concept is more acceptable, because it defines not only the individual research methods or aspects, but the quantitative and qualitative approach to the research. In this case, the qualitative approach is characterized by the desire to understand how individuals perceive and interpret the world and how individually created meanings determine their behaviour. In quantitative terms, the aim is to seek external attributes, measure them and count, seek the only explanation, laws, rules, universality and universality [9].

The aim of the paper is to make a quantitative study of the noise exposure to the population in the surrounding area (Dovilų village as suburb of a city).

Materials and methods

Dovilų village was chosen for noise study as suburb of Klaipeda city. As road transport is crossing the suburb, its negative impact on the environment and the quality of life of people increases. Investigations were carried out in Dovilų village of Klaipeda district municipality, 3 km to the southwest of Gargždų [6].
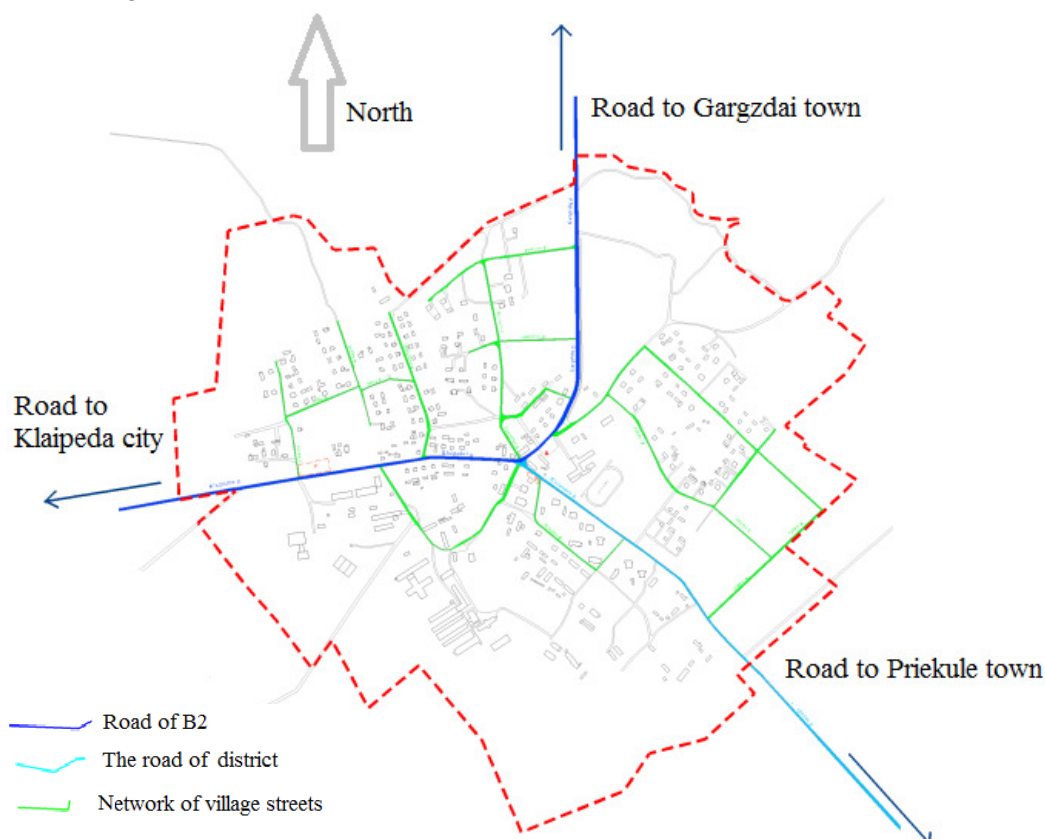

Fig. 1. **Network of roads in Dovilai village**

Currently Dovilai is a parish centre, with a population of about 1,300 inhabitants, and every year arriving population is growing. In the village are situated: a post office, kindergarten, medical centre, library, home care and the Evangelical Lutheran Church. The small town is often visited by freight cars carrying gravel from a nearby quarry and surrounding residents "holiday" at the quarry. Dovilų village registered 22 enterprises are engaged in wood processing and furniture production, stone processing [10].

The intersections of two most important (B2) roads are in the village centre (Fig. 1). That intersects the edge of several roads: Jakai-Dovilai-Laukgaliai and the district road to Priekule. Distance to Klaipeda from Dovilai is about 15 km, to Gargždai about 3 km. These roads formed the village functional and composite shafts. The street network performs several functions of roads of type

D and C. 400 farmers live in Dovilų neighbourhood. Most farms are small, but they have many agricultural machines. Rural tourism is developed, too [10].

The questionnaire (survey) is one of the most popular methods of quantitative research, qualitative research is usually done when we want to summarize data statistically – numbers. Key questions to be answered: what is going on, what is the extent of the problem, what are the possible alternatives and whether they are necessary.

Several forms of questions can be used to get a lot of information, but here there are received data of reliability issue. Reliable and objective data obtained from questionnaires, when:

1. Properly prepared the application forms;
2. Properly applied;
3. The questionnaire ensures the necessary conditions [7].

The number of respondents is calculated as follows:

$$n = \frac{z^2 s^2}{\Delta^2},$$

(1)

where z – Sjudent's t-distribution;
        s – standard deviation;
        Δ – permissible inaccuracy.

The permissible inaccuracy is the difference between the screening group and general whole average, optional, according to the previous research data and the data accuracy requirements [8], units.

Table 1

Description of the investigation

Style	Usage
Research object	Population satisfaction with the current noise level in the residential environment
Aim	Finding Dovilų village residents' satisfaction level of noise
Research tasks	Set population (noise makers) satisfaction with the current level of noise in the living environment. Set population (noise-maker) satisfaction of informing the current situation of noise in the living environment.
Research target group	Dovilų village residents
Survey sample	844 respondents
Research methods	Anketing survey; Mathematical statistics (statistical analysis).
Period of the study	September of 2018

As a rule, the open questions do not have possible answer options. The exemplary question "How do you usually spend your leisure time?" gives a complete freedom for the interviewee. However, that question is used in the case, when a problem or a question is asked for the first time and there are no clear options for its answer. They are sometimes appropriate at the beginning of the interview to activate the respondents [8].

Closed questions consist of two different components:

a) stimulating part (questions of interest);

b) answer part (possible answers).

Taking into account the methodological principles of the questionnaire that provided more detailed information on population attitudes towards the noise problem in suburb.

The survey is conducted by e-mail, as low costs are a special advantage compared to a personal survey and poll on the phone.

Compared to other methods, this survey does not contain the interviewer's mistakes, because there is no interviewer with whom the respondent has to communicate directly. This gives the

respondent a certain advantage, as he is unnoticed and unheard during the interview, this creates the image of anonymity. This anonymity can be useful in obtaining confidential information that would be difficult to obtain by another survey method.

Results and discussion

The survey was done by extending to all the residents of Dovilai village in September 2018 (from the data of the Dovilai government 1300 residents are in Dovilai village). The survey questionnaire was responded by 800 respondents. Methods of mathematical statistics were used for data analysis.

To the question "Do you (in your place) face a noise problem?" even 75 % of respondents answered that they faced the noise problem. 18 % of the population answered that they do not feel the problem of noise and 7 % of respondents do not have an opinion on this issue.
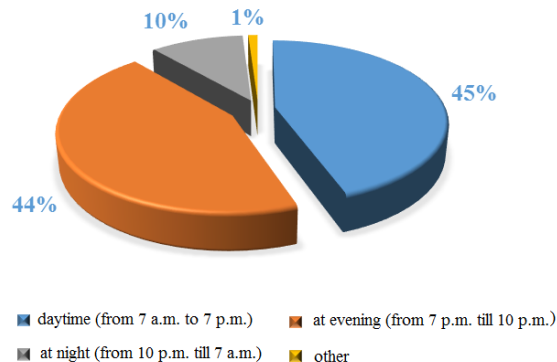

Fig. 2. **Graphic representation of "What are the most frequent problems with the noise problem at the time of the day?"**

To the question "What are the most frequent problems with the noise problem at the time of the day?" the respondents were able to respond by choosing a few possible options (Fig. 2). The results were distributed as the following: 45 % - 44 % of respondents felt the noise at the day time (between 7 a.m. and 19) and the evening (between 19 and 22), 10 % of the population felt it at night time (from 22 p.m. to 7 a.m.) and 1 % of respondents answered the question by choosing another option.

To the question "What noise is the problem for you?" the respondents could answer by choosing a few possible options, too (Fig. 3). The results of the studies showed that 61 % of respondents identified the highest noise source as transport (cars, tractors, motorcycles), 21 % of noise sources identify as household, 16 % identified the noise source as noise of plants and technical installations and 2 % chose another option.
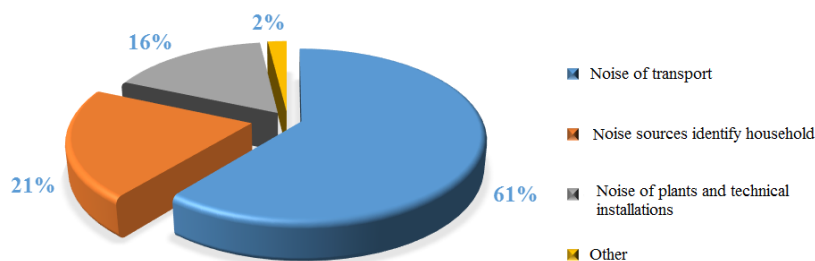

Fig. 3. **Graphic representation of "What noise is the problem for you?"**

The results of the question "The results of studies in your environment that reduce the harmful effects of noise (noise-limiting signs, noise-reducing walls, clear zones, etc.)" showed that 45 % of respondents do not know about the introducing noise-reduction means in their environment; 35 % of respondents answered that there are no implemented any means to reduce the harmful effects of noise and 20 % answered that such means are being implemented.

To the question "What measures are being taken to mitigate the harmful effects of noise pollution?" respondents responded by selecting several possible options. 42 % of respondents identified the car speed limits as means to reduce noise emissions, 36 % of respondents say that the

green band (trees, bushes) are means of noise reduction and 22 % of respondents are not aware what means are being implemented for noise reduction.

To the question "As is known than one of the principles of noise management is the public information. In your opinion, whether the public is adequately informed about the existing noise situation and problems?" the obtained results have shown that 84 % of respondents have insufficient information about the current noise situation, 14 % of respondents have sufficient information about the noise situation and 2 % of respondents do not have an opinion on the matter.

To sum up the used statistical analysis of the survey data it can be noted that even 75 % of the residents of Dovilai village face a noise problem. The most intense noise is felt during the day (between 7 a.m. and 19) and evening (from 19 to 22). The population estimates the highest noise source in transport flows. Even 84 % of respondents have insufficient information on the current noise situation and measures should be taken to improve the awareness of the population.

Conclusions

1. A method of questionnaire survey was chosen for the quantitative study. The survey is conducted by e-mail, because low costs have a special advantage compared to a personal survey or call by the phone.
2. After surveying the target group of the survey (inhabitants of Dovilai village, 800 respondents) it was found that 75 % of respondents faced the noise problem. 61 % of respondents identified the biggest noise source as transport traffic: cars, agricultural machinery and self-propelled transport. 45 % of respondents feel the noise of the largest transport movement during the morning peak, when the residents of the surrounding settlements go to work, kindergartens and schools at the time from 6 a.m. to 8:30 a.m. and during the evening peak, when the residents of the surrounding settlements return home from 6 p.m. to 7:30 p.m.
3. It was found that 45 % of respondents do not know about introducing measuring means for noise reduction in their environment. 84 % of respondents were supposed that they are not sufficiently informed about the current noise situation. It can be concluded that there is a need for regular or periodic public information about the current noise level and the plans for reducing noise.

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