

Monitoring the Reaction and Response of People to Urban Noise

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An important aspect in assessing noise in urban agglomerations is the subjective one, which takes into account the sensitivity and specific reactions of residents to the noise in their living environment. This paper presents results of a sociological study initiated to determine the population awareness, regarding the urban acoustic environment and estimation of effects and disturbance. The survey was conducted in a Romanian city, to complement the information provided by the strategic noise map of the area. This approach allows the estimation of specific local patterns of reaction and response to urban noise of the exposed population and provides the information, needed to develop action plans and to set proper solutions for urban area planning.

Keywords: urban noise, noise pollution, noise annoyance, social survey.

1. Introduction

The assessment and description of noise in a given area should consider both the physical quantities that describe the noise source and the propagation path, but also a number of non-acoustic factors, specific for a particular receiver or group of receptors, due to the predominantly subjective character of noise (BELOJEVIC *et al.*, 1997; JOB, 1999). Socio-acoustic studies developed in different countries and regions have identified the non-acoustic factors, independent of noise source, that influence the level of noise annoyance. They may be grouped in three major classes (LAMBERT, 2003): situation factors (determinants of exposure situation); individual factors (subdivided into socio-demographic and perception factors) and social factors (life style, the activities conducted, attitude towards noise pollution in the social context, etc.). Short-term and long-term effects of

noise exposure are directly dependent on the interaction between acoustic and non-acoustic factors and on their relative proportion in a given noise situation.

Estimation of the exposure-effect relationship and community reaction to environmental noise in urban areas is approached in literature by various methods (KLÆBOE *et al.*, 2004; LI *et al.*, 2008; MIEDEMA, OUDSHOORN, 2001; MOHAMMADI, 2009; PULLES *et al.*, 1990; SKINNER, GRIMWOOD, 2005; ZANNIN *et al.*, 2003), one of them being socio-acoustic studies, based on noise questionnaire. The structure of a noise questionnaire depends on the purpose of the study and specificity of exposure situation, and it has to respect some guidelines applied in the field of noise effect research (BERGLUND, LINDVALL, 1995).

2. Methodology

A sociological study was conducted in the city of Cluj-Napoca, Romania. The city is one of the nine urban agglomerations in Romania having a population of more than 250 000 inhabitants, a big cultural, educational and economic centre. The study was based on survey questionnaires, distributed in 19 districts of the city, during May-September 2009. The response rate was approximately 87%, obtaining answers from 348 respondents. A number of 23 questionnaires were removed due to erroneous and incomplete answers or because the respondents did not live in the studied area. The rate of response was also calculated in relation with sex (51.4% males and 48.6% females), age (37.5% between 15–30 years, 55.1% between 31–60 years and 7.4% over 60 years), education (63.1% of respondents are university graduates, the others graduated a vocational or high school) and occupational state (Table 1).

Table 1. Response rate depending on the occupational state.

Occupation	Number of respondents		Males		Females	
	Number	%	Number	%	Number	%
Employed	222	68.3	107	67.7	115	68.9
Retired	42	12.9	18	11.4	24	14.4
Student	24	7.4	16	10.1	8	4.8
Unemployed	5	1.5	3	1.9	2	1.2
Other situation	32	9.9	14	8.9	18	10.7

3. Study objectives

The need of the study appeared in the context of the noise mapping actions, started in 2007 as a consequence of the European Commission noise reduction

initiative, aiming at responding to the lack of data in the field of environmental noise annoyance. In this sense, the aim of the study was to estimate specific local patterns of reaction and response to urban noise of the exposed population and to establish the references for:

- Level of knowledge and awareness of environmental noise in urban areas, by population;
- Information of citizens about the noise mapping action and its results;
- Main negative effects and reaction of population to the noise pollution, specific forms of behaviour;
- Hierarchy of different sources of urban noise, depending on the level of perception and disturbance of residents;
- Involving of citizens in authorities effort to improve urban acoustic environment;
- Citizens options on the most effective way of information that should be used by the authorities.

4. The questionnaire

The survey questionnaire was specifically designed to reflect the three major classes of non-acoustic factors that influence noise annoyance: situation, individual and social factors. It contains 24 questions that may be grouped as follows:

- Description of residential zone in relation with traffic and environmental noise;
- Noise sources annoyance and effects on peoples' habit;
- Information, trends and attitudes towards environmental noise;
- Identification of respondent by occupation, sex, age and education.

The questionnaire was dimensioned in order to be completed in 15–20 minutes, at the home of the respondent, and contains standard close questions (with answers: yes, no and I don't know), questions with given possible answers and filter questions.

5. Results

Opinions of respondents indicated that 37% of them (the majority) describe the noise level of residential area as *Medium*, 23% as *High* and only 5% as *Very high* (on a 5-point verbal scale), 50% of respondents reporting general satisfaction with their living environment.

Considering the reported L_{Aeq} measured values, on Cluj-Napoca streets, which frequently exceeded 64 dB(A) (POPESCU, 2007), it can be assumed that the respondents were accustomed to the noise in their residential area. In fact, most respondents (46%) reported to be *Little annoyed* by the environmental noise, 37% *Annoyed* and 6% *Not at all annoyed* (on a 5-point verbal scale).

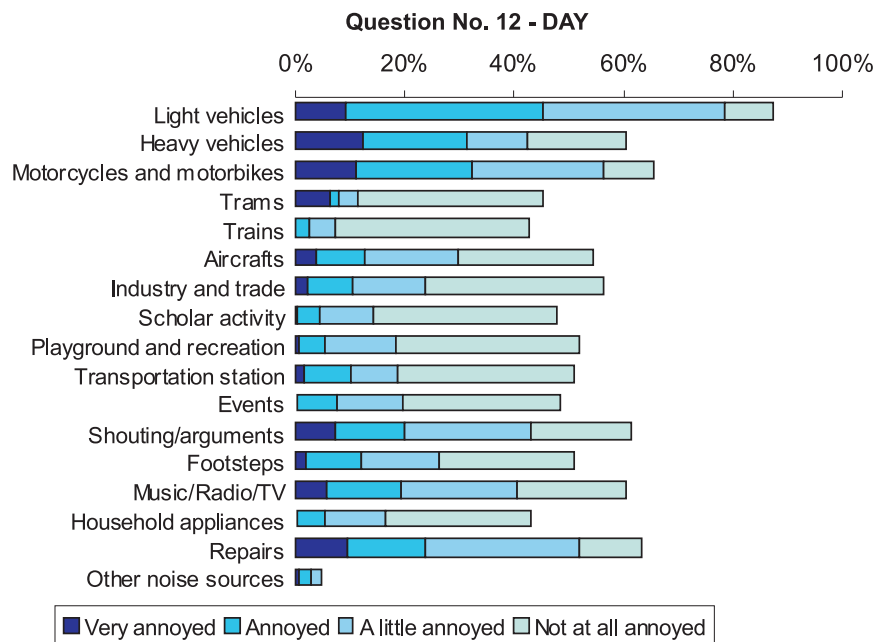


Fig. 1. Proportion of responses for question No. 12-D: “Indicate the degree of annoyance generated by the following noise sources, during the day period spent at home”.

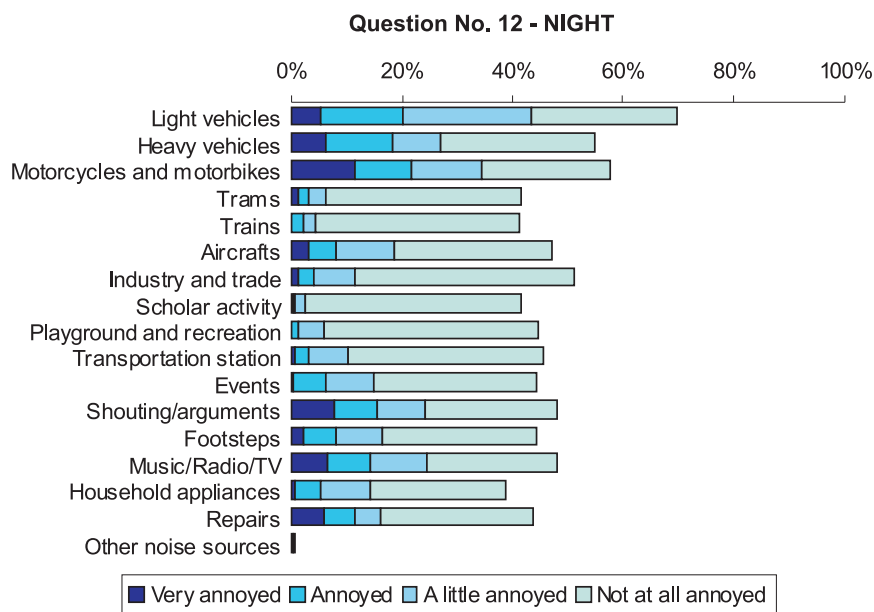


Fig. 2. Proportion of responses for question No. 12-N: “Indicate the degree of annoyance generated by the following noise sources, during the night period spent at home”.

Road traffic noise was reported by 75% of respondents as being one of the most present and annoying noise sources near their home. The degree of annoyance due to different specific noise sources, reported for the day time period and night time period, is presented in Fig. 1, respectively Fig. 2. The response to the question: "Indicate the degree of annoyance generated by the following noise sources, during the day/night period spent at home" was quantified on a 4-point verbal scale, each respondent having the possibility to choose no item, one, or more than one item. Responses were reported to the total number of analyzed questionnaires.

The afternoon and evening (15:00–22:00) periods are the times when 51% of respondents are most affected and disturbed by the environmental noise. It represents the time period spent at home by the most employed people and part of it overlaps the rest time in the afternoon, known as: "quiet hours". As presented in Fig. 3, 60% of the respondents consider that the annoying noise overlaps with the period of rest and relaxation. Only 16% of respondents reported to be bothered by noise during night-time (22:00–06:00).

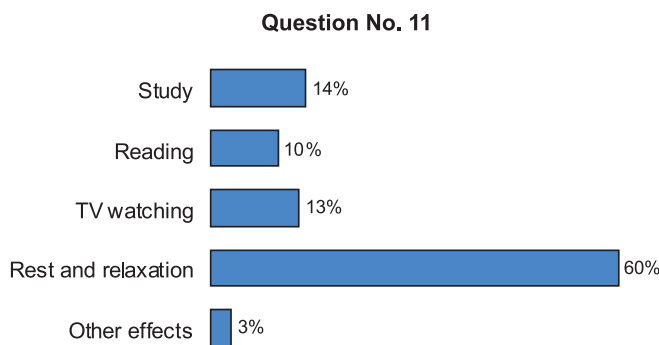


Fig. 3. Proportion of responses for question No. 11: "Indicate the activity most affected by noise during the period of time spent at home".

In Fig. 4 is presented the proportion of people reporting adverse reactions to the environmental noise that affected their live and daily activities: 27% fatigue, 17% nervousness, 16% focus reduction, 13% anxiety and agitation, 12% discomfort, 8% working capacity reduction, 6% insomnia.

The questionnaire contains a group of questions which intend to measure the degree of knowledge and information of the population about the noise as an environmental pollutant, recent actions developed by authorities in the city for noise assessment and noise reduction. In opposition to their opinion about the noise level of the residential areas, 54% of the respondents think that the noise level in the city is over the limits imposed by the legislation and 40% of them *Don't know*. 36% of respondents have no information about any noise study performed in their residential area and 54% of them choose to answer: *I don't*

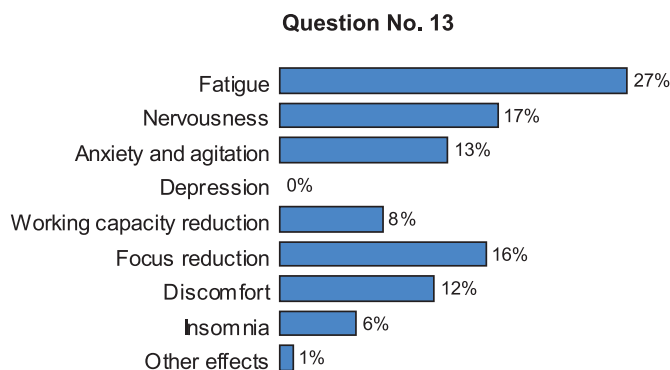


Fig. 4. Proportion of responses for question No. 13: "In what way is affected your daily life and activity by the environmental noise? It generates you:".

know (Fig. 5). More than half of respondents (52%) don't know if measures have been taken to reduce noise pollution in the city, 27% consider that no measure has been taken and 21% indicate some actions: road rehabilitation, modernization of public transport, reducing speed limits, etc.

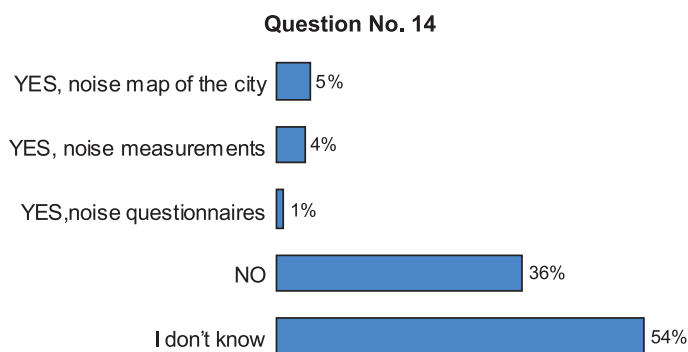


Fig. 5. Proportion of responses for question No. 14: "Have been performed noise studies in the area where you live, in the recent years?".

Also more than half of the respondents (51%) report that they have already acted in order to reduce the annoying noise in the neighborhood: improved the comfort of their home in terms of noise (93%), changed the residential place (2%), complained to the environmental department of the local authority or police (4%), other actions (1%).

Immediate conclusion is that the inhabitants are interested in reducing the annoying noise and to improve the acoustic environment of their residential area, but they receive insufficient information about this topic. Therefore, an important requirement is the increase of awareness and information actions. Asked about

the best information ways to be used in the future, most respondents (33%) suggested the issues presented by local radio and television stations (Fig. 6).

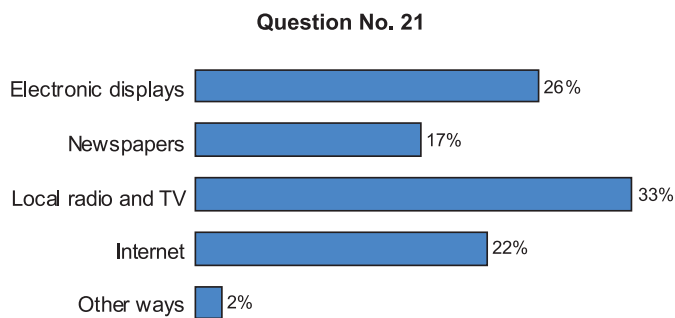


Fig. 6. Proportion of responses for question No. 21: "Indicate the best way to inform the population on urban noise".

In order to extend the study to a larger region, the full version of the questionnaire has been made available on the web site (www.idei1080.110mb.com/bibliografie_en.html). It must be mentioned that the present paper does not include responses received this way.

6. Conclusions

The study results provide a basis for the noise environment in Cluj-Napoca city, as perceived by citizens. In correlation with the noise map of the city, which reflects the measured or calculated noise indicators, the survey aims to add new information in order to develop a specific local pattern for noise annoyance, to evaluate the reaction and response to urban noise of the exposed population and also to estimate the needs and expectations for an improved acoustic environment.

As a general observation, it is obvious that the subjective non-acoustic factors play an important role in the characterization of noise exposure and description of environmental noise situations, so they must be included as input data in noise mapping actions, in order to obtain results closer to reality.

Acknowledgments

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