

NOISE MAPPING IN ROMANIA WITHIN THE FRAMEWORK OF EU DIRECTIVE 2002/49/EC

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The demand for environmental noise information in Romania will increase in the near future, first of all due to the integration of the country in the European Union. Some of the European Commission noise directives have already been transposed in Romanian legislation. According with this new legislation, Romania – like the EU countries – has to provide noise maps and also to prepare noise action plans with measures to reduce noise levels when limits are exceeded. The purpose is the definition of a common approach intended to avoid, prevent or reduce the harmful effects of the environmental noise.

The paper aims to present the Romanian first experience on noise mapping, during the year 2006, by respecting the requirements of European Directive 2002/49/EC. The general context is described and also specific methods for a practical case study are discussed.

Keywords: noise mapping, environmental noise, road traffic noise.

1. The general context of noise mapping

The noise became and will be a general motive for worry, first of all because of its long-term effect on human being. At the international level, researches related to noise, and generally related to the acoustics and vibration, have increased in number, fields and importance in the past few years. One of the motors of the growing activity, development and diversification of the preoccupations in the specified thematic area was the decision of the European Commission to give the status of priority objective to the activities related to noise evaluation, prediction and control, as result of the aim, tendency and necessity to improve the protection of population against the environmental pollution factors.

2. Transposed Romanian legislation for noise mapping

The European Commission has initiated a series of noise directives, some of them being transposed in Romanian legislation. The Directive 2002/49/EC of the European Parliament and of the Council, relating to the assessment and management of environmental noise, was transposed in Romanian legislation by HG 321/14.04.05 [6], published in the Romanian Official Monitor no. 358/27.04.05. The law was completed in the same year with legislation related to the competent authorities responsible with its implementation [3] (OM 1258/2005) and with a Guide related to the interim calculation methods of noise indicators for the industrial noise, road traffic noise, railway noise and aircraft noise [3] (OM 678-MMGA/1344-MTCT/915-MSP/1397-MAI /2006).

The above mentioned legislation was followed by a recent Law Project relating to the assessment and management of the environmental noise [7], published on the web page of the Ministry of Environment and Waters Management, on March 2nd, 2007. This Law Project aims to transpose in Romanian legislation all the requirements of the Directive 2002/49/EC and, in the same time, to establish responsibilities and management rules for the implementation of the directive. It was elaborated due to the perceived necessity of rebuild the implementation strategy, in order to ensure the correct interpretation of the European Commission requirements and to respects the terms of reports. This new legislation will replace HG 321/2005, actually in force.

According to the above mentioned Romanian legislation, in the first stage of the noise assessment process, strategic noise maps, showing the situation in the year 2006, must be provided and approved by competent authorities, for: agglomerations with more than 250.000 inhabitants, major roads having more than six million vehicle passages a year, major railways with more than 60.000 train passages a year and major civil airports with more than 50.000 plane motions per year. Strategic noise maps must be completed by action plans for noise reduction and control, adopted by the competent local, regional and national authorities.

Starting with year 2011, strategic noise maps and action plans have to be provided for all agglomerations, major roads and major railways. Reported data must be brought up to date after a period of five years, by refreshing noise maps and action plans.

The legislation stipulate the requirement and necessity of clear and detailed information of the inhabitants about the noise situation in their environment, on the basis of developed and approved strategic noise maps and action plans, by respecting the legislation of public access to information related to the environment.

Romania does not have a national methodology for the assessment and prediction of the environmental noise. Therefore, the Romanian legislation in this field [6, 7] recommend the use of interim computation methods:

- a) For industrial noise: ISO 9613 – Acoustics – Abatement of sound propagation outdoors, Part 2 – General method of calculation;
- b) For aircraft noise: ECAC.CEAC Doc 29 – Report on Standard Method of Computing Noise Contours around Civil Airports, 1997;

- c) For road traffic noise: the French national computation method – NMPB-Routes-96 (SETRA-CERTU-LCPC-CSTB) [4];
 d) For railway noise: the Netherlands national computation method [4].

The noise indicators are L_{zsn} (day-evening-night level L_{den} in [4]) and L_{noapte} (night-time noise indicator L_{night} in [4]).

3. First stage of noise mapping in Romania

The Law Project [7] clearly specify in its annex number eight the agglomerations, major roads and major railways that have to provide strategic noise maps until June 30, 2007 and correspondent action plans until July 18, 2008.

In the first stage of noise assessment in Romania, nine agglomerations need noise maps until June 2007, as it can be seen in Table 1 [7].

Table 1.

No.	Agglomerations with more than 250.000 inhabitants	Regional localization	Number of inhabitants	Density of population (inhab/km ²)
1	Bucuresti	South	1 926 334	8094
2	Iasi	North-East	320 888	3417
3	Cluj-Napoca	North-Vest	317 953	1771
4	Timisoara	Vest	317 660	2457
5	Constanta	South-East	310 471	2486
6	Craiova	South-Vest	302 601	3717
7	Galati	South-East	298 861	1213
8	Brasov	Central	284 596	1065
9	Ploiesti and the neighbor places: Valea Calugareasca, Brazi, Blejoi	South	258 777	3990

There were identified 30 sectors of main roads [7], with a total length of 268 267 km, with the traffic of more than six million vehicles per year, and five sectors of main railways, with a total length of 68 km, having more than 60 000 train passages per year. Although the Romanian airports are not included in the category of big airports, with more than 50 000 plane motions per year, there are five airports, situated in the neighborhood of the cities: Bucuresti, Timisoara, Cluj-Napoca, Iasi and Craiova, that must be taken into consideration for the elaboration of the strategic noise maps of the agglomerations, as component parts.

It must be pointed out that in the noise mapping action some specific conditions and influences must be taken in considerations, especially in cases of using noise models

calculations. As example, it can be mentioned that the general composition of the car fleet and also the road surfaces in Romania are different, in most cases, from those of EU countries. Therefore it will be necessary to periodically examine the noise emitted by the road traffic, by field measurements.

4. Specific methods for a practical case study

Studies related to the environmental noise assessment were conducted in the last years in different Romanian cities, ex: Bucuresti, Timisoara, Cluj-Napoca. Noise data were obtained by measurements made in well-established locations in the city, by respecting the methodology given by the national standards.

A noise study made during the years 2000 and 2001 in the city of Cluj-Napoca, by the author of the paper, doubled by a sociological study for the estimation of people annoyance, showed even that time the presence of noise levels in the city over the admitted values (settled by the Romanian standard STAS 10009-88 – Urban acoustics. Admitted values of the noise levels, and by the act OM 536/July 1997, of the Ministry of Health, which specifies the upper limits for noise levels (L_{eq}) in residential areas). A succinct examination of the situation of the year 2006, compared with the year 2001, indicated first of all a significant grow of the road traffic in the city, with the consequence of a corresponding grow of noise pollution.

The city of Cluj-Napoca is placed in the north-vest region of the country, being the largest city in Transilvania. It has an area of 179.5 km² and a road system of 662 km length. The urban transport is ensured by 218 buses, 111 trolley buses and 90 tram wagons, covering a street network of 342 km length, organized in 24 bus lines, 8 trolley bus lines and 3 tram lines, that make the connection between different residential and industrial areas of the city.

During the first semester of the year 2006, in Cluj-Napoca started a noise mapping action, at the initiative of the local authorities, as response to the requirements of the new noise legislation [6], in accord with EU Directive 2002/49/EC. As result of this action, at present the city already has a 3D digital noise map, made by computer simulation. The noise map was calculated and modeled with the help of Lima software, from Bruel&Kjaer, by the company EnviroConsult. During the months September, October and November 2006, a team from the Technical University of Cluj-Napoca, conducted by the author of the paper, accomplished a noise and traffic measurement action, on well-defined streets of the city. The measured data will be used to correct and adjust the noise map obtained by computer simulation.

In order to make a sketch of the noise environment in Cluj-Napoca, several results of noise measurements are given below, in Figs. 1, 3 and 5. The presented data were collected during September 2006, in 50 measurement locations, pointed on the streets map of the city in Fig. 7. Each noise measurement had a duration of at least three hours, was made with a Bruel&Kjaer sound level meter type 2250, and the noise source was

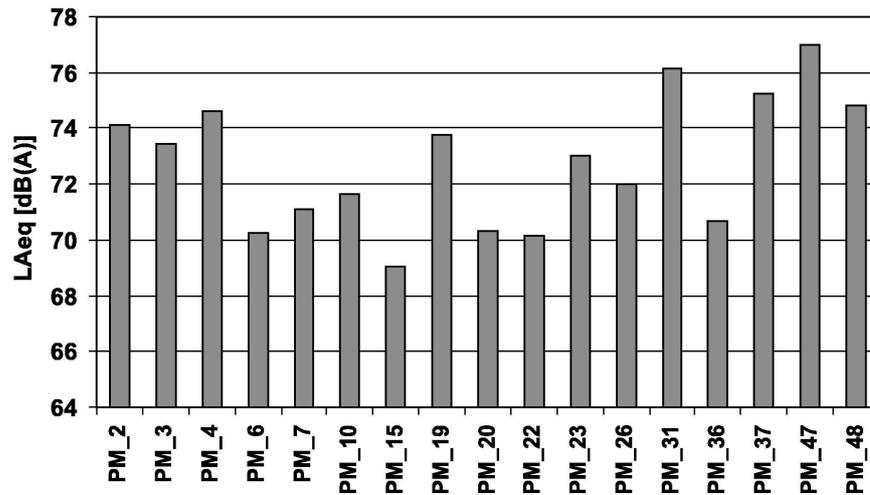


Fig. 1. Noise data: morning (7:00–11:00h) 17 points of measurement (PM).

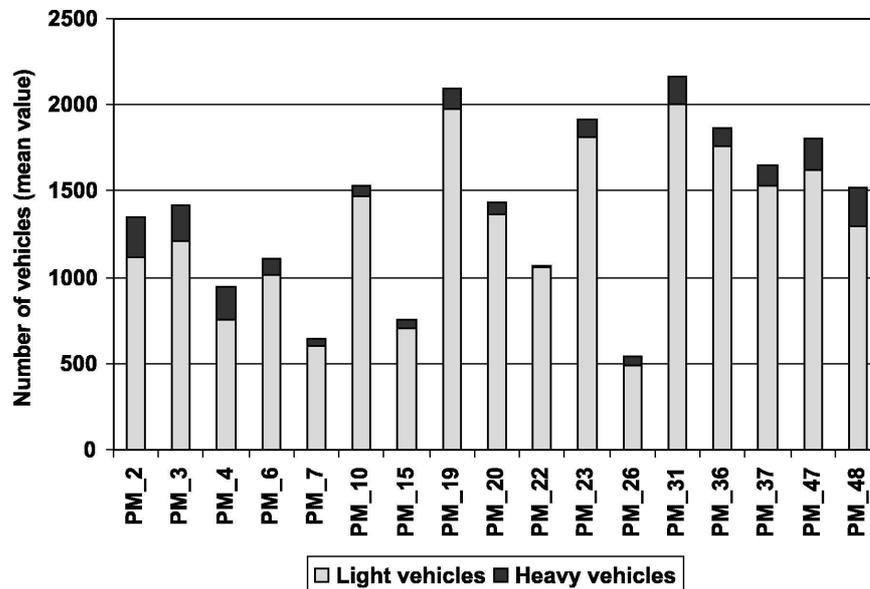


Fig. 2. Traffic: morning (7:00–11:00h) 17 points of measurement (PM).

the road traffic. Results are presented in terms of the A-weighted equivalent continuous noise level (L_{Aeq}) associated to each point of measurement (P_M). The measurements were grouped in three time-intervals: morning, noon and afternoon, defined by the following hours during a day: 7:00–11:00 (Fig. 1); 11:00–15:00 (Fig. 3); 15:00–19:00 (Fig. 5).

During the noise measurement, the numbers of light vehicles and heavy vehicles per hour, passing on the road, were counted. Results of traffic assessment are presented

in Figs. 2, 4 and 6. Noise levels and traffic data corresponding to the same group of measurement points are presented in pairs of diagrams, to facilitate their analysis.

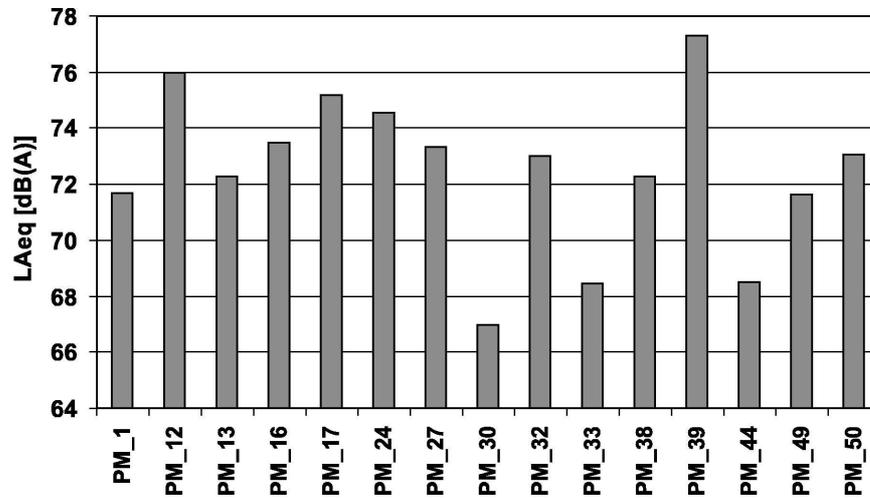


Fig. 3. Noise data: noon (11:00–15:00h) 15 points of measurement (PM).

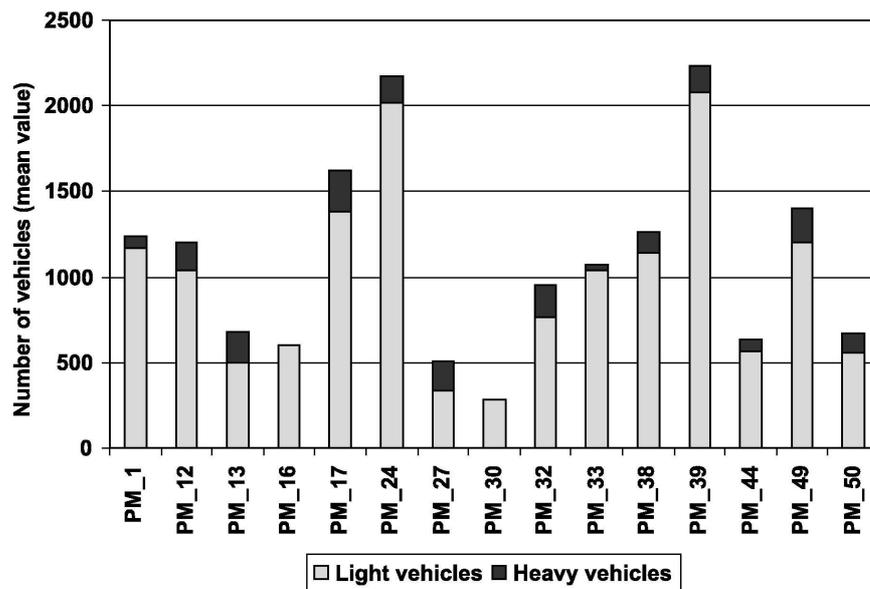


Fig. 4. Traffic: noon (11:00–15:00h) 15 points of measurement (PM).

Field measurements presented by the diagrams in Figs. 1 to 6 confirms and proofs a negative but expecting characteristics of the urban environment in Cluj-Napoca.

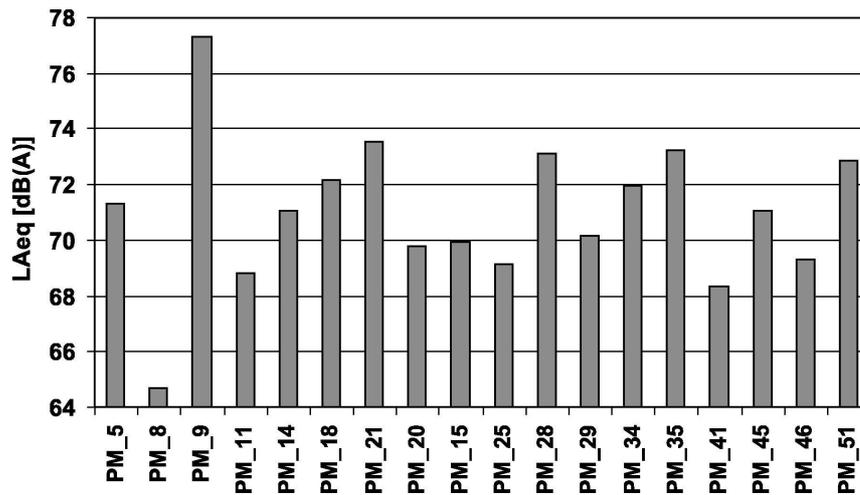


Fig. 5. Noise data: afternoon (15:00-19:00h) 18 points of measurement (PM).

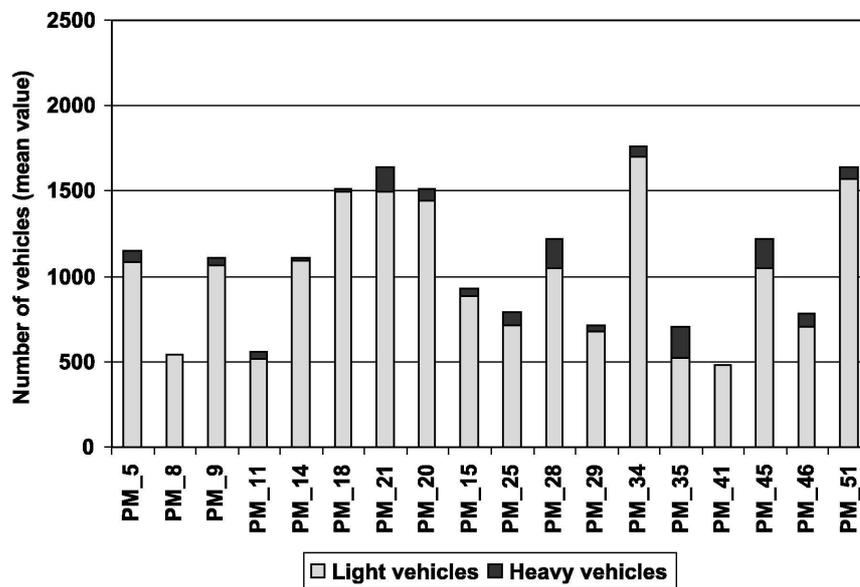


Fig. 6. Traffic: afternoon (15:00-19:00h) 18 points of measurement (PM).

Recorded L_{Aeq} values are over 64 dB(A) and also exceed the upper noise limits admitted by the Romanian legislation for the residential areas.

Comparing the pairs of diagrams noise-traffic, the direct relation between the noise level and the two components of the road traffic (number of light vehicles and number of heavy vehicles per hour) can be observed in the most measurement points. The exceptions confirm the necessity of using field measurements and not only calculations in the process of noise mapping, for reduce the estimation errors.

The mentioned noise assessment was made in order to highlight the noise component induced by the road traffic in the city, therefore at the designation of the measurement points were eliminated the streets with tram lines and also the streets situated in the neighborhood of the railway, passing the northern part of the city.



Fig. 7. Location of the measurement points on the Cluj-Napoca streets map.

5. Conclusions

The assessment of the environmental noise in a city may be based on different tasks, starting with solving noise complaints and ending with noise mapping imposed by legislation. The road transport has significantly increased over the past years. One of the negative aspects of this fact is that noise levels have raised and citizens have become disturbed by their noisy surrounding environment. The data of noise assessment presented in this paper as a particular case study confirm and sustain the last affirmation. The conclusion is that the implementation in Romanian legislation of the Directive 2002/49/EC is a positive fact, in accord with the tendency of improving the live quality of the population.

Romania has already made steps both in transposing the European noise legislation and also in improving the legal and methodological support for its application in good conditions, by respecting the terms and quality requirements. The experience achieved during the first stage of noise mapping will point out the specificity of noise environment and associated action plans.

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