

NOISE POLLUTION IN URBAN AREAS. CASE STUDY – CLUJ-NAPOCA TOWN

Mihăiescu Tania, Antonia Odagiu

Universitatea de Științe Agricole și Medicină Veterinară Cluj, Mănăștur 3-5 Cluj-Napoca,
tmihaiescu@yahoo.com

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Abstract. Noise is a disturbance to the human environment that is escalating at such a high rate that it will become a major threat to the quality of human lives. In the past thirty years, noise in all areas, especially in urban areas, has been increasing rapidly. There are numerous effects on the human environment due to the increase in noise pollution. Slowly, insensibly, we seem to accept noise and the physiological and psychological deterioration that accompanies it as an inevitable part of our lives. Although we attempt to set standards for some of the most major sources of noise, we often are unable to monitor them. Community awareness of environmental noise has increased and there is a higher expectation for state and local government to reduce noise levels. The present study provides an evaluation of noise pollution in Cluj-Napoca. Equivalent noise levels (L_{eq}) were measured in 10 points (each point measured during 30 min). Measured values were confronted with Romanian legislation allowed limits. The most noise-polluted points in Cluj Napoca were Mănăștur district – traffic circle and Aurel Vlaicu street (at the international airport limit), with measured L_{eq} of 75.5 dB(A) and 75.91 dB(A).

INTRODUCTION

In the European policy, one of the most important objectives is to achieve a high level of health and environmental protection. The latest studies have shown that more than 20% of the world population lives under unacceptable noise levels and near 60% of the European population is exposed to worrying noise levels during the day. So, nowadays one of the objectives to be pursued is the protection against noise, one of the main environmental problems in Europe.

Noise pollution can be defined as unwanted or offensive sounds that unreasonably intrude into our daily activities. It has many sources, most of which are associated with urban development: road, air and rail transport; industrial noise; neighborhood and recreational noise. A number of factors contribute to problems of high noise levels, including:

- increasing population, particularly where it leads to increasing urbanization and urban consolidation; activities associated with urban living generally lead to increased noise levels
- increasing volumes of road, rail and air traffic.

The WHO suggests that noise can affect human health and well-being in a number of ways, including annoyance reaction, sleep disturbance, interference with communication, performance effects, effects on social behavior and hearing loss. Research into the effects of noise on human health indicates a variety of health effects. People experiencing high noise levels (especially around airports or along road/rail corridors) differ from those with less

noise exposure in terms of: increased number of headaches, greater susceptibility to minor accidents, increased reliance on sedatives and sleeping pills, increased mental hospital admission rates (JOB, 1996). Exposure to noise is also associated with a range of possible physical effects including: colds, changes in blood pressure, other cardiovascular changes, increased general medical practice attendance, problems with the digestive system and general fatigue (JOB, 1996). There is fairly consistent evidence that prolonged exposure to noise levels at or above 80 dB(A) can cause deafness (PULLES et al., 1990). The amount of deafness depends upon the degree of exposure.

The noise is one of the most frequently noxes recorded in urban areas. This presence generates problems of adaptability, health and pollution.

During the last decade, in the urban area of the county of Cluj the auto park substantially increased and the noise pollution problem is of high actuality.

Several noise categories simultaneously act in urban area:

- domestic,
- industrial,
- produced by construction works,
- transport

The vehicles represent the most important noise source. It was estimated to about 80% from noise pollution.

Road traffic noise is one of the most widespread and growing environmental problems in urban areas. The impact of road traffic noise on the community depends on various factors such as road location and design, land use planning measures, building design, vehicle standards and driver behavior.

The exposure to high noise levels is reported in Cluj-Napoca. It is especially determined by the road traffic, flight traffic, railway traffic, and public works. These are considered main environmental sources of noise pollution and they can represent a series of more or less clear disturbances with important effects of human health.

In Cluj-Napoca road traffic noise has become a major urban environmental problem because:

- historically, land use planning has not been well integrated with transport planning, allowing residential developments and major transport corridors to occur in close proximity without appropriate buffer zones or treatment to buildings
- there has been an increasing community reliance on road transportation, and a reluctance to implement or accept partial solutions involving greater use of public transport
- traffic on many existing roads through built-up areas has increased well beyond expectations prevailing during planning or construction of the roadways
- potential solutions, apart from new vehicle noise standards are complex, often costly, and require coordinated actions by a number of agencies and the community
- while there is high community awareness of the problem, there is a general lack of understanding of its extent and possible solutions.
- motor vehicle ownership in has increased substantially over the last 17 years and general levels of road traffic noise have increased through this period.
- out of date auto park;
- auto stationing at traffic lights, because majority of crossing points are supplied with traffic lights;
- large weight vehicles which cross Cluj-Napoca de, due to the lack of some overland routs in this area.

The analyze of the noise pollution recorded in main crossing roads and avenues with intense traffic in Cluj-Napoca is the aim of this paper.

MATERIAL AND METHOD

According to STAS 6161/3-82, the method used for determination of the urban noise level is the method of determination of equivalent noise, N_{ech} , which consists in *exploring the recorded noise* with the interval Δt with noise of stationary level, which produces the same effects (harmful) as noise recorded from source (this is of fluctuant level and different frequencies). The determination of the noise level was performed using short time measurements (30 min) according to STAS 10009/1988 and STAS 10144//1-90.

The settlement of measuring points

The measuring points for road traffic were settled within the main crossing points of the road, about half distance between bus stations:

1. – Mihai Viteazu Plaza
2. – Mănăştur District – traffic circle
3. – Unirii Plaza
4. – Cartier Zorilor District – traffic circle
5. – Baba Novac Plaza
6. – Gheorghieni District – Fagului st.
7. – Mărăşti District
8. – Crossing point 1 Decembrie 1918 Avenue with Petuniei st. (Grigorescu District)
9. - Crossing point Pavlov st. with Vasile Alecsandri st.
10. - Aurel Vlaicu st. (limiting the international airport area)

The requested number of prelevations

For all 10 measurement points, intense traffic period was selected (hour schedule 13:00 – 18:00) for performing individual and simultaneously prelevations.

Duration

The duration was of 30 minute for each prelevation.

Equipment

The equivalent noise level was determined with son meter (portable analyzer) 2250 type.

RESULTS AND DISCUSSIONS

Some of the data concerning the equivalent noise level in all points of measurement are presented.

The high values of the noise pollution, which in all cases were over the maximum allowed limit (65 dB) is reported. The maximum measured values were recorded in Aurel Vlaicu st. (limiting the international airport area) and Mănăştur District – traffic circle, due to the intense and heavy road traffic within the area. The direct correspondence between the intensification of the auto traffic expressed by the number of vehicles and intensity of the measured noise was recorded. In this way, the correspondent quantity of air pollutants generated by the vehicle traffic can be measured. These data can serve to the design of the strategies of urban development.

Table 1

The results of the determination of the noise level

Place	Data	Hour	No. of vehicles				Noise level (dB)		
			<2.5 t	>2.5 t	buses	motorbikes	minim	maxim	average
1	14.05.2007	14:45-15:15	980	17	31	5	61.9	83.4	71.5
2	10.05.2007	14:00-14:30	420	31	15	5	52.95	90.88	75.5
3	27.06.2006	14:45-15:15	519	2	0	3	58.9	85.8	71.5
4	10.05.2007	16:00-16:30	813	52	14	6	60.7	92.5	74.9
5	14.05.2007	15:30-16:00	678	11	8	2	58.9	78.1	68
6	10.05.2006	13:45-14:15	667	56	0	11	49.4	84	73.7
7	27.06.2006	14:00-14:30	721	12	22	4	61.9	78.4	70.8
8	27.06.2006	16:50-17:20	195	2	0	1	63.3	88.4	73.1
9	27.06.2006	15:45-16:15	341	2	2	0	56.6	86	71.2
10	28.06.2007	13:00-13:30	979	59	17	3	58.67	92.13	75.91
Admitted noise level 65 dB – according to STAS 10009-1988 (road traffic)									

CONCLUSIONS

The maximum noise levels are especially determined by the heavy traffic, technical status of the vehicles and quality of the rural surface (road situation).

The measurements performed at noon in working days emphasize values of the equivalent noise levels between 68 – 75.91 dB(A) in all measured points.

The following measures will be taken with the aim of reducing the noise level produced by different sources:

- supplying affluent traffic on the main urban roads through the improvement of the traffic lights cycles in crossing roads;
- the creation of belt lines;
- the rehabilitation of the infrastructure of the street networks of ways with intense traffic;
- the implementation of the technical measures for noise levels;
- reducing the noise level resulted from production or food production activities by putting into practice some systems of noise isolation in these units;
- blocking the ways of noise propagation by creating protection curtains, including green spaces within inhabited areas;
- performing special isolation for buildings against one or more types of environmental noise combined with ventilation or conditioned air facilities, in order to maintain high values of the isolations against environmental noise;
- performing noise maps. Among many obligations assumed by Romania as consequence of the process of acceding to the European Union the implementation of the EU directive 2002/49/EC and “Order for approving the Guide concerning the intermediary methods of calculation of the noise indices

for the noise produced by the activities from industrial areas, route traffic, railway traffic, and flight traffic from the neighborhood of airports” is one of the main obligations. This directive was adopted by the national aquis through a particular law, which stipulates the use of the methods recommended by the European Directive for the calculation of maps.

- According to HG 321/14.04.2005, in all urban agglomerations with over 250,000 inhabitants and roads with over 6,000,000 vehicles/year, beginning with 2006 such noise maps must exist. The noise map represents an important factor in establishing the future strategy of town development, with the aim of improving the regional habitat according to the National Plan of Action for Reducing the Level of Noise.

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