RESULTS OF RESEARCH IN NOISE POLLUTION IN URBAN AREAS

Anca-Maria MOSCOVICI, Oana GRECEA

Politehnica University of Timisoara, 2A - Traian Lalescu Str., Timișoara, Romania,
Email: moscovicianca@gmail.com, oana.grecea@yahoo.com

Corresponding author email: moscovicianca@gmail.com

Abstract

The increase in road traffic in the recent years brings into question the complex issue of noise pollution. In numerous surveys carried out on population samples from urban areas, noise pollution or “noise” as it is generically called appears in the forefront of inconveniences and discomfort list. With the use of new techniques developed by acoustics experts, it is possible to study sound propagation and its impact on population in specific urban areas. The purpose of this paper is to compare noise levels in different areas of Timisoara, in order to determine the sensitive buildings in the city. Their identification is essential because on these building facades the noise level resulting from exposure to road noise exceeds or threatens to exceed at least one of the limit values.

Key words: noise maps, urban areas, urbanisation, GIS.

INTRODUCTION

A noise map with using GIS has become very important tool for environment of urban areas and road traffic has become an important factor in the development of society, particularly in terms of comfort of living and economic progress. With the increasing number of vehicles in former communist bloc countries, including Romania, traffic is the most common source of noise in urban areas (Figure 1). In various studies and surveys on the quality of urban life, noise is placed in the forefront of inconveniences and discomfort list.

One of the phenomena of urban traffic is of particular importance when determining noise is congestion (Figure 2) (Moscovici, 2015). This is the result of a large number of vehicles participating in traffic at peak hours on the same road section. Therefore we considered to be worthwhile tracking noise on a street in the central area of Timisoara in the 12:00 - 13:00 time intervals.

The reasons for the emergence of congestion and noise are therefore the most diverse, from deficient design and systematization of cities and to managing inadequately to the present realities and challenges. Therefore, for an optimal approach, it is essential to integrate real-time traffic information in geographical information...
systems (GIS) for immediate decision-making (Runyoro, 2013).
A first step in this direction can be the assessment of the traffic data provided by the organizations responsible for road traffic management and by road users. In areas where the traffic composition is maintained at the same parameters, decrease in noise can be achieved by reducing the vehicle speed. The immediate effect, in economic terms, would be experienced by reducing the billion euro losses per year due to traffic congestion (Lam, 2009). GIS is foreseen as a promising solution for the reduction of noise, road traffic congestion and, as a consequence, of toxic emissions (Figure 3).

![Figure 3. Traffic Safety from GIS](image)

Managed effectively, this solution would allow road users which are traffic participants to receive real time information about traffic and road conditions.

**NOISE AND BUILDINGS**

In the architecture field have the designers and engineers responsible for façade and enclosure systems which embraced smart materials for environmental protection. Buildings noise protection is expected to have a lesser impact on the environment by using mineral wool insulation, which is the most common method, by proper installation of double-glazed windows or by using expanded polystyrene insulation.

These factors can contribute significantly to reducing noise originating from the outside (Figure 4).

![Figure 4. Insulated residential building](image)

The following are some of the negative consequences caused by increased noise on the human factor:
a). First noticeable effect is hearing impairment, as repeatedly subjecting the eardrum to noise can temporarily or even permanently damage it;
b). Noise affects sleep and the worst aspect of this is the high noise pollution near hospitals, where patients need a restful sleep;
c). Health is endangered, noise mainly affecting the heart, brain and liver;
d). Noise creates discomfort that causes migraines, dilated pupils, elevated blood pressure;
e). Noise affects people in terms of social and emotional comfort, as conversations are disrupted due to noise, leading to people raising their voices, which also results in forcing the vocal cords (Aziz, 2012).

**MATERIALS AND METHODS**

The traffic type of the street is accelerated pulse, as it is a one-way street with traffic lights and it connects two major streets. Measurements were made at 20 December 1989 Street, located at 230 m from the main artery Vasile Parvan Boulevard and at 110 m to Constantin Diaconovici Boulevard.

By providing traffic lights on the artery, the noise pollution is the result of noise emitted by
motor vehicle at acceleration, deceleration and while waiting during red color. The interest for this street is increased because here is located the town hall of Timisoara, public institution with working hours from 8 to 19 hours on some days. Since the historical value of this building does not allow the sound insulation of the facade and being classified as a sensitive building, it is recommended in this area to reduce noise pollution at source and not at the receiver (Moscovici, 2015).

RESULTS AND DISCUSSIONS

In addition to the measurements carried out on the artery, we decided to perform a series of measurements on the Mihai Viteazu Bridge, which is a road traffic concentrator, redirecting traffic to 20 December 1989 Street as can be seen on Figure 5 (Moscovici, 2015).

![Figure 5. Section of the noise map and the location of measured point](image)

In the diagrams showing variation of noise over time in Figure 6 and Figure 7 below, we can see that the noise reaches the threshold of 75 dB in some cases. Using specific formulas, we determined the equivalent noise level measured with frequency A weighting - Leq dB (A) to be 68.96 for the artery and 68.93 for the bridge.

![Figure 6. Variation of noise over time on 20 December 1989 artery](image)

![Figure 7. Variation of noise over time on Mihai Viteazu Bridge](image)

The noise action plan based on noise maps and measurements is similar in nature to a policy statement where objectives have been described on a general level (Table 1).

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<td>63.79</td>
<td>82.73</td>
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The equipment used for measurements included a Bruel & Kjaer sonometer, which is a high-precision, Class 1 sound integrator, with a monitoring software that we used to obtain the diagram of the statistical distribution of the
noise for point 2 (Figure 8), which is essential in the analysis of noise (Herişanu, 2006).

Noise maps are important at decisional level for establishing the adopted solutions and the activity of monitoring and managing strategic noise maps by means of GIS (Grecea, 2014).

CONCLUSIONS

Acoustic measurements for different areas of the city are essential for finding the most affected buildings. The activities undertaken in these buildings may increase the need for better soundproofing. The most effective solutions according to the building positioning, architectural importance and the number of people affected can only be found through acoustic studies and through involvement of responsible authorities in order to support noise reduction. Also another important tool is noise maps, which are important at decisional level for establishing the adopted solutions.

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