Noises and vibrations in Cluj-Napoca

INCDTIM

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INTRODUCTION

Noise and vibration measurements were carried out in Cluj-Napoca, in order to create a database on the potential of energy recovery in Cluj-Napoca, but also to find solutions to combat noise pollution in the city. A total of 27 measurements were performed in areas of interest throughout the Cluj-Napoca municipality. Key locations for this study are areas with high noise pollution, in order to estimate the energy levels of noise and vibration. Thus, the measurements were performed in key areas for local road infrastructure, such as intersections, bridges, roads with heavy road traffic. Also of interest are locations specific to the railway infrastructure, where a series of measurements have been made in locations such as the railway station, bridges over the railways and bridges for rail traffic. These data constitute the basis for making noise maps.

The noise map aims to highlight the areas in Cluj-Napoca, where the noise level rises above certain limits imposed by law and thus is used to develop action plans to protect residents against exposure and reduce noise levels. At the same time, the development of energy recovery systems from noise and vibration will contribute to the transformation of noise pollution into green energy and will lead to an increase in the quality of life in the municipality.

The measurement system used to determine noise levels in enclosed and open spaces are the Dynamic Vibration Behaviour Monitoring and Analysis Unit "SOUNDBOOK MK2", with the installed noise and vibration analysis software package "Samurai", the low noise 902220.3 SINUS seismometer and the MICROTECH GEFELL microphone WME 952.

This device is used for complex measurement of noise and vibration and includes the possibility of performing a frequency analysis in the 1/1 octave band and 1/3 octave band. In this study, we use dedicated vibration sensors and noise microphones. Measurements are performed that show both the noise and vibrations levels as a function of the 1/3 octave frequency bands in certain areas of interest throughout Cluj-Napoca.

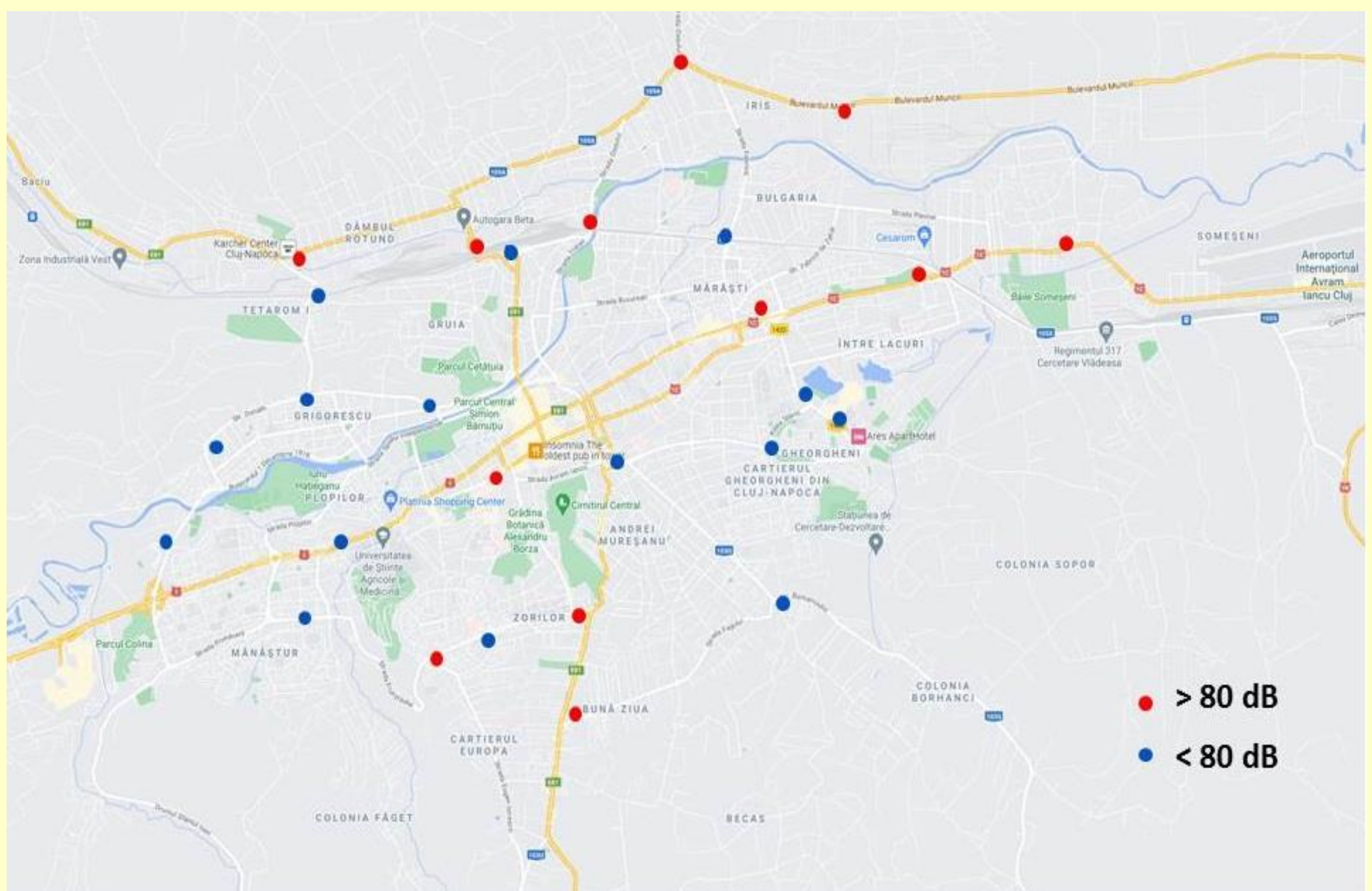

Figure 1. Location map of noise measurements. The noise levels are classified according to the 80 dB threshold.

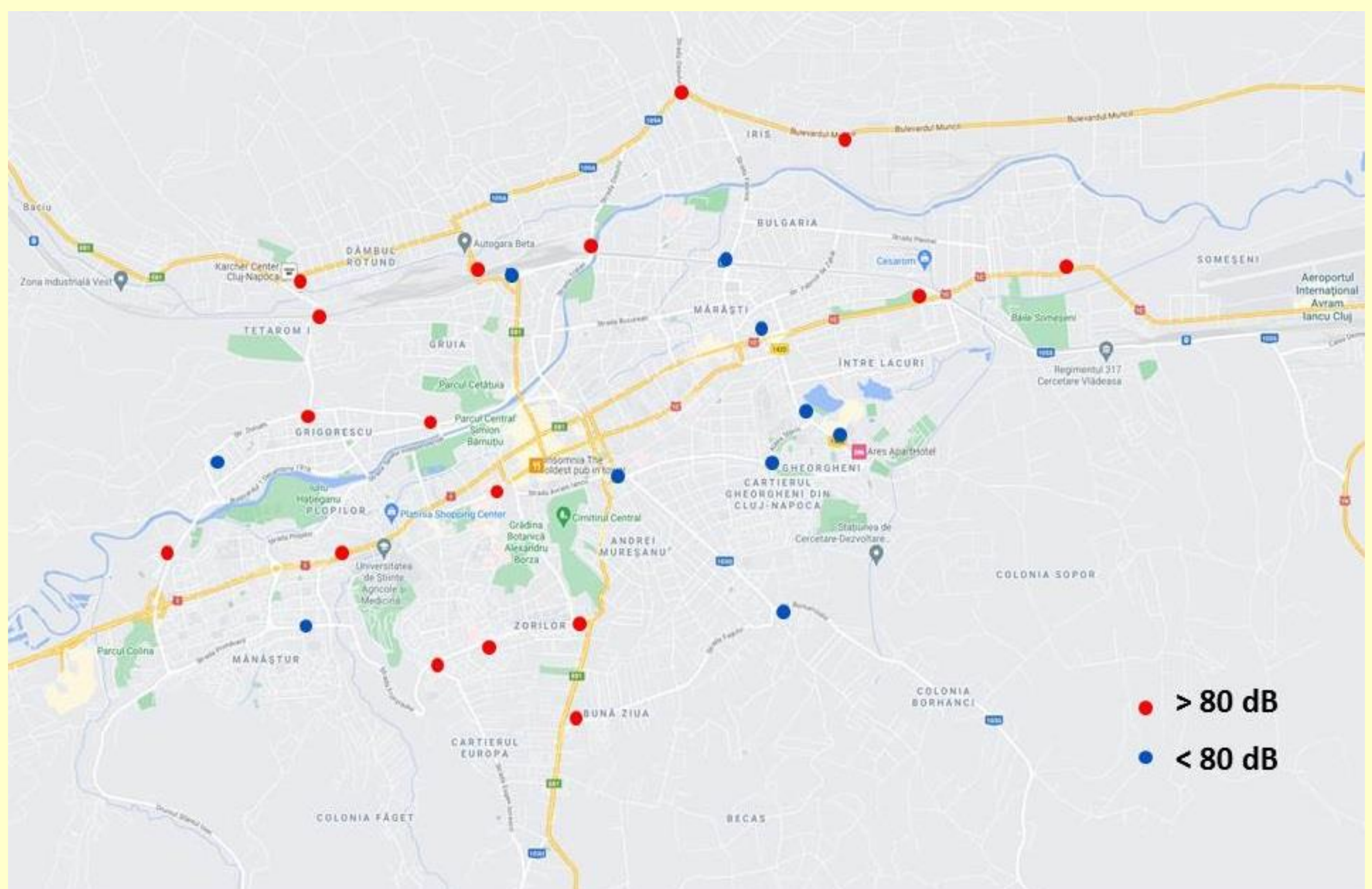

Figure 2 Locations of the vibration measurements, classified according to the threshold of 80 dB, related to the reference unit of 10^{-9}m/s.

CONCLUSIONS

Regarding the maximum value reached in L_{Zmax} measurements, no 1/3 octave frequency band was identified to stand out, since the vibration energy is scattered on almost all 1/3 octave bands of the 20-20000 Hz spectrum. Of the 27 measurements performed, 12 highlighted the highest vibration level on the 1/3 Octave band with a center value of 12.5 Hz. This band is limited between 11.2 Hz and 14.1 Hz. Approximately 45% of the vibration measurements performed recorded the maximum value in this frequency band, which would be a frequency band of interest for a vibration energy recovery device.

The results can be used to produce a device for converting vibrations and noise into green energy, which can be located in noisy areas or in places with high vibrations such as factories, airports, schools, stadiums, etc.

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