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ASSESSMENT OF QUIET AREAS IN VILNIUS CITY AND MODELLING OF NOISE MITIGATION MEASURES

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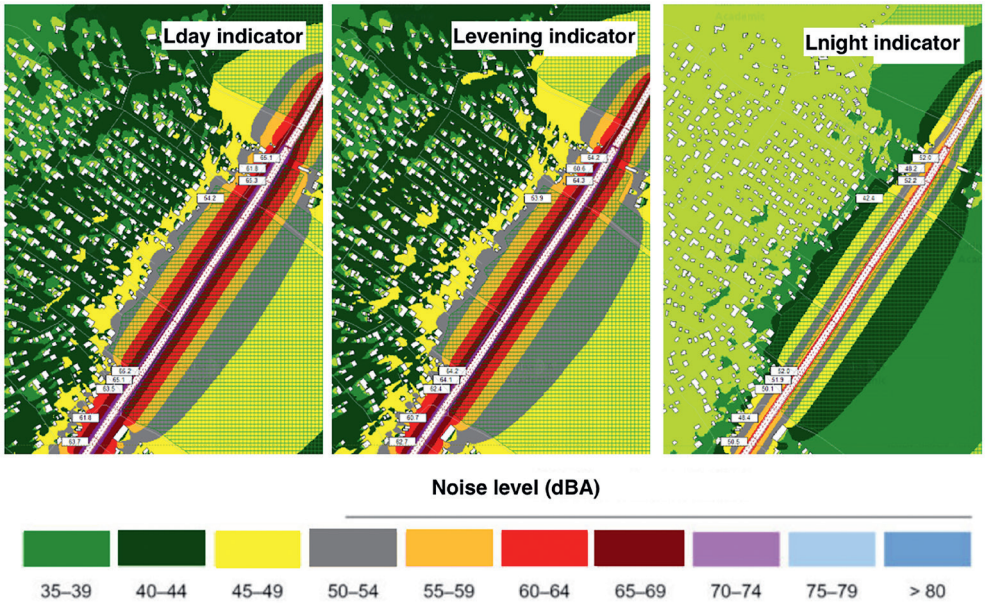
Abstract – Environmental noise is a major environmental stressor impacting human health and quality of life in cities. According to the European Environment Agency, environmental noise is the second most harmful environmental factor in Europe after air pollution. Continuous exposure to excessive noise levels contributes to adverse health effects such as sleep disturbance, cardiovascular diseases, and increased stress levels. In urban environments, quiet areas play an important role in improving public well-being by providing spaces with lower noise exposure suitable for recreation and relaxation. In Vilnius, quiet areas are defined as territories where environmental noise levels should not exceed Lnight (night-time noise indicator) 50 dBA, yet some designated areas are currently exposed to higher noise levels due primarily to road traffic.

The aim of this study was to analyse quiet areas in Vilnius city and to evaluate the effectiveness of potential noise mitigation measures through acoustic modelling. Noise propagation modelling was carried out using the CadnaA software to simulate road traffic noise distribution under different scenarios. The modelling incorporated traffic intensity data, spatial characteristics of the urban environment, and environmental parameters. Additionally, potential reductions in health impacts were evaluated using the Disability-Adjusted Life Years (DALY) approach. The modelling results showed that road traffic is the dominant noise source affecting the analysed quiet areas. In several locations the predicted noise levels exceeded the recommended Lnight 50 dB threshold for quiet areas. Scenario simulations demonstrated that targeted mitigation measures, such as traffic flow management, installation of noise barriers, and the use of green infrastructure, can significantly reduce noise exposure in these areas. The results indicate that integrating acoustic modelling into urban planning can effectively support the protection and improvement of quiet areas. The study demonstrates that the implementation of appropriate mitigation measures can reduce environmental noise levels and contribute to healthier and more comfortable urban environments.

Keywords – Acoustic environment; CadnaA (Computer Aided Noise Abatement); Disability-Adjusted Life Years (DALY); environmental acoustics; road traffic exposure; urban planning



Modelled road traffic noise levels for Lday, Levening and Lnight indicators under baseline conditions