



STATEMENT OF OPINION

From: Assoc. Prof. Dr. Kostadin Kostadinov
Agricultural University – Plovdiv

Regarding: PhD dissertation for the acquisition of the educational and scientific degree "Doctor" (PhD)

Topic: "Typology and Methods for Noise Protection Through the Use of Greenery in Urban Environments"

Author: Landscape Architect Maria Petkova Grozeva

Supervisors: Assoc. Prof. Dr. Dimka Haytova, Prof. Dr. Valeriya Ivanova

1. Relevance and Significance of the Problem

The doctoral dissertation of Landscape Arch. Maria Petkova Grozeva addresses an exceptionally relevant, complex, and socially significant problem related to progressive acoustic pollution in modern urban areas. Under conditions of intensive motorization and growing pressure on the urban environment, the exceedance of sanitary noise limits has established itself as a chronic environmental and public health issue. The study is particularly pertinent as it focuses on the transition from costly and visually isolating "hard" engineering defenses (concrete and metal barriers) toward sustainable, ecologically sound solutions leveraging the multifunctional potential of the green infrastructure system.

2. Familiarity with the State of the Problem

The dissertation presents a comprehensive, in-depth literature review encompassing over 150 modern national and foreign sources. The author demonstrates excellent theoretical expertise in building acoustics, landscape architecture, and woody plant physiology. A thorough analysis has been conducted on the effective regulatory framework in Bulgaria (Protection from Environmental Noise Act, Ordinance No. 6, Ordinance No. 7 to the Spatial Development Act, etc.) and European directives. Existing scientific and practical gaps are accurately identified—most notably the lack of empirical data regarding the seasonal dynamics of noise mitigation by deciduous species under Bulgarian climatic conditions.

3. Research Methodology and Scope

The dissertation's methodological framework is precise and well-balanced, combining in-situ instrumental monitoring, dendrological expertise, and spatial acoustic modeling. The research was conducted between 2017 and 2022 across 19 representative locations throughout the Sofia agglomeration (along key transport arteries such as the Sofia Ring Road, Bulgaria Blvd., Al. Malinov Blvd., N. Vaptsarov Blvd., etc.).

A primary merit of the methodology is the comparative seasonal analysis (summer peak vegetative capacity versus winter dormancy/defoliation), which enables accurate quantification of actual Insertion Loss (IL).

4. Scientific and Applied Scientific Contributions

Key contributions of the dissertation include:

Empirical proof of seasonal dynamics: Establishing that deciduous species suffer a 50% to 65% reduction in acoustic insulation during winter due to foliage loss, whereas dense coniferous stands (e.g., *Picea abies*) maintain a constant noise reduction above 19 dB(A) year-round. This

justifies the imperative requirement for a minimum of 20–30% evergreen species in roadside shelterbelts.

Original structural typology of vegetative screens: Developing three core spatial models: Type 1: "Aerodynamic/Graded Profile" (for motorways and open expressways), Type 2: "Homogeneous/Checkerboard Screen" (for compact urban spaces), and Type 3: "Combined Screen/Bio-Shield" (high-density barrier with understory, designed for residential zones and sensitive sites).

Dendrological selection and zoning matrices: Formulating an evaluation matrix based on acoustic density, gas tolerance, and cold hardiness (Zone 6), alongside guidelines tailored to spatial urban zones under the General Spatial Plan (residential, central, mixed-use, park/open, industrial, and transport infrastructure zones).

Practical testing and verification: Successfully validating and testing theoretical models on live investment projects and realized sites with diverse specifications, including Kazichene Park, a residential complex in Botevgrad, the Linear Park along Macedonia Blvd. ("Green Tramway" track technology), and the Technopolis commercial complex.

5. Practical Applicability and Work Presentation

The dissertation exhibits a pronounced practical focus. The proposed technical and economic comparisons demonstrate that bio-barriers require between 3 and 4 times lower capital expenditures than conventional noise walls, while simultaneously generating added value through ecosystem services (particulate matter filtration, microclimate regulation).

The work is characterized by a clear logical structure, precise scientific language, and high-quality graphical and tabular illustrations. The dissertation summary (avtoreferat) accurately and thoroughly reflects the primary findings, scientific contributions, and conclusions.

CONCLUSION

The presented dissertation is a comprehensive, thorough, and independently conducted scientific study providing viable applied scientific solutions for urban planning and landscape architecture. The results achieved, their reliability, and their significance fully meet the requirements of the Development of Academic Staff in the Republic of Bulgaria Act (DASRBA) and its Implementing Regulations.

Based on the above, I firmly give a POSITIVE ASSESSMENT to the dissertation and propose that the Scientific Jury award Landscape Architect Maria Petkova Grozeva the educational and scientific degree "Doctor" (PhD).

Date: September 10, 2026

Plovdiv

Prepared by: ..

(Assoc. Prof. Dr. Koro

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