

EVALUATION REPORT

On the PhD thesis for awarding the educational and scientific degree of "Doctor" in professional field 4.4. Earth Sciences, specialization "Physical Geography and Landscape Studies," by Vanya Emilova Stoycheva, full-time PhD student at the Applied Geoinformatics Section, Department of Geography, NIGGG – BAS, titled:

Integrated Assessment of Regulating Ecosystem Services in Urban Areas

Member of the scientific jury: Assoc. Prof. Dr. Atanas Kitev, Department of Geography, National Institute of Geophysics, Geodesy and Geography (NIGGG) – BAS

General Information

The PhD thesis submitted by Vanya Stoycheva represents a collection of publications (a paper-based PhD thesis), in accordance with Article 26, Paragraph 3 of the Regulations for the Application of the Development of Academic Staff Act at NIGGG-BAS. The work comprises 201 pages and includes five publications where the candidate is the first author of four of them, as well as 63 figures and 13 tables. The PhD thesis is structured into eight chapters: Chapter 1 is the introduction; Chapter 2 outlines the methodological framework; Chapters 3 through 7 contain the collected publications; and Chapter 8 presents the conclusions. The PhD thesis also includes five appendices and a bibliography listing of 97 sources (excluding the publications themselves, though there is some overlap). A thesis summary of 66 pages has also been provided, accurately reflecting the content of the PhD thesis.

Characteristics of the PhD thesis

The topic of the submitted PhD thesis addresses a relevant issue, namely - the regulating ecosystem services in an urban environment. The stated objective is to develop a methodological approach for an integrated assessment of regulating ecosystem services in urbanized areas; four main tasks have been defined in order to achieve this goal. The results of these tasks are presented in a logical and sequential manner across the publications that constitute the individual chapters. Chapter 2 clearly outlines the methodological sequence for each task and describes how they were addressed. Chapter 8 is the final part of the presented PhD thesis, where the achieved results are very well described, what obstacles arose during the development of the study, and what future research is possible based on the results achieved in the presented work. It is worth highlighting the precision and coherence with which the interrelations between the theoretical review, the application of software models (InVEST and EnhancES), and the final results for the city of Sofia have been formulated.

Scientific and Applied Contributions

Five contributions are outlined in the presented summary of the PhD thesis. The first contribution is primarily informative in nature, and I would not classify it as an independent scientific contribution.

The next two contributions represent methodological developments - specifically, approaches to spatial analysis and assessment adapted to Bulgaria, as well as a multi-level approach to the integrated assessment of ecosystem services in urbanized ecosystems, which have been applied to the study area. The remaining two contributions exhibit primarily applied nature, and contribute to the information base for the natural resources and ecosystems management.

Observations, Questions, and Recommendations

Certain technical inaccuracies were noted - for instance, the list indicates 6 figures, whereas the text of the first two chapters contains 8 figures; a corresponding discrepancy also appears in the PhD thesis summary. When citing sources, I would recommend explicitly noting any additional materials beyond the listed publications, as the current presentation creates the impression of extra sources when, in fact, some duplication is observed. The PhD thesis summary contains both spelling and technical errors, as well as some inaccuracy regarding the title of Chapter 4 in both Bulgarian and English. Precision is essential here, given that the PhD thesis summary presents the essence of the dissertation.

Some socio-economic indicators are mentioned in calculation of the vulnerability composite index; my question here is: how does the indicator "share of the population of lower than secondary education" relate? What does this indicator tell us?

In Chapter 6, one of the ecosystem services under consideration is the PM_{10} . The study explains that this service relates to PM_{10} pollution from traffic, while the model was run using data from a single monitoring station - Pavlovo. PM_{10} comprises not only traffic-related particles but also those originating from solid fuels, area dust, and other sources. The specific station used is located in an area exhibiting high levels of these PM_{10} components. Why was this station selected, and does it not skew the actual results, given that the focus is on traffic-related PM_{10} ?

Conclusion

The submitted PhD thesis represents a substantial and detailed research work where the doctoral candidate demonstrates the ability to conduct independent scientific research. The PhD thesis is up-to-date, complete and contains original scientific and practical results achieved by the author. On this basis, I express my positive assessment and recommend that the Scientific Jury vote **"In favour"** the awarding of the educational and scientific degree **"Doctor"** to Vanya Emilova Stoycheva.

Sofia, 30.09.2026

Prepared by:

Assoc. Prof. Dr. Atanas Kitev