

REVIEW

from Assoc. Prof. Daniela Simeonova Toneva, PhD
Technical University – Varna,
Dept. „Ecology and Environmental Protection“

of a dissertation for the award of the ESD "Doctor"

in the field of higher education: 4. Natural sciences, mathematics and informatics

professional field: 4.2. Chemical Sciences

doctoral program: "Ecology and environmental protection"

author: Master Eng. Dimitrinka Slavova Ivanova

form of doctoral studies: self-study

scientific organization: University "Prof. Dr. Asen Zlatarov"- Burgas, Department:
"Ecology and Environmental Protection"

Topic of the dissertation: Study of road sediment pollution along main and secondary
transport arteries in the city of Burgas

Scientific supervisors: Assoc. Prof. Aleksandar Dimitrov, PhD
Assoc. Prof. Yordanka Tasheva, PhD

General presentation of the procedure and the PhD student

According to the present procedure, I have been provided with a set of materials on an electronic medium in accordance with Art. 43, para. 3 of the "Regulations on the terms and conditions for acquiring scientific degrees and occupying academic positions at the University of Prof. Dr. Asen Zlatarov" - Burgas" (PURPNSZAD) from 2009 (amended and supplemented in 2019), which includes the following documents:

- Dissertation work;
- Abstract;
- Certificate of fulfillment of the mandatory minimum national requirements;
- List of scientific publications;
- Copies of scientific publications;
- Declaration of originality and authenticity of the attached documents.

Dimitrinka Slavova Ivanova is a master engineer in industrial ecology. She completed her higher education, "Master", in 1999 at the University "Prof. Dr. Asen Zlatarov" - Burgas. Since 2003, he has been working as an assistant at the University "Prof. Dr. Asen Zlatarov" - Burgas and has more than 12 years of work experience (taking into account interruptions due to maternity). In her professional development, she took part in the implementation of 10 different scientific projects in the period from 2000 to 2022. From 2017 to 2022, she annually participates in the organizing committee of a conference for schoolchildren and students "Let's think ecologically for the future". She is fluent in English and Russian. Has the skills to work with specialized software for analysis and assessment of the quality of the environment.

In 2021, Eng. Dimitrinka Ivanova was enrolled as a doctoral student of independent training in the doctoral program "Ecology and Environmental Protection", professional field 4.2. "Chemical Sciences" at University "Prof. Dr. Asen Zlatarov" - Burgas. Scientific supervisors are: Assoc. Dr. Alexander Dimitrov and Assoc. Dr. Yordanka Tasheva. In 2022 Eng. Ivanova was awarded the right of defense the PhD thesis by order No. UD-119/ 26.07.2022. of the Rector of the University "Prof. Dr. Asen Zlatarov".

The presented set of documents is in accordance with the requirements of the Law on the Development of the Academic Staff in the Republic of Bulgaria, Regulations for the Implementation of the Law on the Development of the Academic Staff in the Republic of Bulgaria and the "Regulations on the terms and conditions for acquiring scientific degrees and occupying academic positions at the University "Prof. Dr. Asen Zlatarov" - Burgas". After getting acquainted with the development of the procedure, presentation and development of the doctoral program training, I consider that they meet all the requirements of the regulatory framework.

Actuality of the problem developed in the dissertation

Environmental pollution from linear sourcesq and in particular from road transport, is a global, deepening problem accompanying our modern times. At the same time, the negative effects are not limited to atmospheric air quality, but also extend to soils, surface waters, biodiversity and human health. For the adequate management of atmospheric air quality, the knowledge of pollutants, their distribution and transformation is of key importance. Systematic observations in the country are carried out within the framework of ecological monitoring, but the transport-oriented points in the national network for atmospheric air monitoring are few in number and have a very small scope, due to the nature of the pollution source. These obstructions in terms of collecting the necessary information empirically only emphasize the relevance of the problem developed in the dissertation work.

The study of the generation and distribution of atmospheric pollutants from road transport and the used road infrastructure, and their deposition, by means of the study of the content of road sediments, is relevant and significant from a scientific and scientific-applied point of view.

In the context of air quality management and environmental protection, the comparative analysis of road sediments on main and secondary transport arteries is useful and promising, not only for the city of Burgas, but also for the whole country.

Knowledge of the problem

The good literary awareness of the candidate is evident from the overview of publications related to the topic of the dissertation made in the dissertation. 121 documents are cited in the bibliography. Of these, 95 are in Latin and 26 in Cyrillic, with over 80% of the cited publications being from the period after the year 2000.

In the presented dissertation, M.Sc. Eng. Dimitrinka Ivanova has carried out a sufficiently thorough overview and analytical review of the problem. In the first chapter, a critical review was made regarding the influence of road transport and the used transport infrastructure on the state of the environment with an emphasis on the quality of atmospheric air, the role and importance of the main sources of pollution and the factors influencing the processes of generation, distribution and deposition of the pollutants.

Based on the above, it can be concluded that mag. Engineer Dimitrinka Ivanova is very well acquainted with the state of the problems and can creatively interpret the literary material.

Research methodology

The chosen methodology for conducting the scientific research allows to achieve the set research goal of the dissertation "research and assessment of the road sediment from the transport scheme of the city of Burgas, taking into account the influence of various factors", in all the required aspects determined by the precisely set tasks. The experimental work and the fulfillment of the set tasks, as well as the main goal, require the use of a variety of qualitative and quantitative methods, as well as precise laboratory-analytical work.

With enviable skill and at a good scientific level, a wide range of methods have been applied for: gathering representative data in terms of volume and content to characterize the transport scheme in the city of Burgas, including direct measurements of the intensity of traffic on each linear source; for sampling and laboratory analysis of road sediment on asphalt road surfaces, including determination of the granulometric composition of road sediment samples and examination of the content of heavy metals

in them; correct interpretation of the results. It is appropriate to apply the American Environmental Protection Agency's methodology for sampling and analysis of road sediment on asphalt roads. In the analytical work, weight methods, sieve analysis, laser diffraction analysis, calculation procedures, modeling using specialized software, mapping and others are applied. Combining an analytical and systematic approach in the realization of the research is a positive side of the dissertation work.

The chosen research methodology is applicable, well-argued and expedient, applied in the necessary integrity.

Characterization and evaluation of the dissertation work

The dissertation work is developed in a volume of 127 pages, well structured in an introduction, including the aim and objectives of the research, literature review, experimental part with methodology and results and discussion, conclusions, contributions and literature. The development is well laid out graphically. The visualization includes 32 figures, 5 photographs and 17 tables.

The separate meaningful parts are presented in the necessary interconnection and no imbalance is allowed in terms of their volume. The exposition is presented in a logical sequence, tight, stylistically and scientifically sound.

After presenting the purpose and tasks of the research and the literature review, in which the problem is examined in the necessary depth, based on a critical analysis of the scientific literature and practice, in connection with pollution from road transport, combustion processes and the mechanism of formation of toxic substances, the factors determining the formation and release of pollutants, including dust particles from road transport and road sediments, attention is paid to the research methodology.

In the second chapter, "Experimental part", applicable methods for monitoring, determination of pollution, accounting of emission factors and mathematical modeling of the spread of pollutants are considered, together with methods for sampling road sediment and subsequent analyses. The methodology is thoroughly presented, and the application of the specified research methods, preparatory procedures and technical means for performing the analyzes is justified. Eng. D. Ivanova shows not only in-depth theoretical knowledge and knowledge of the problem, but also demonstrates skills in constructing adequate experimental setups for research in the problem area of the dissertation.

The substance of the experimental work and the results of the analytical work are successively presented in Results and Discussion. The main characteristics of the car traffic on the main and secondary transport arteries in the city of Burgas have been established, and for this purpose an electronic map of the transport scheme of the city of Burgas has been created. The intensity of road transport by category was analyzed and the time intervals of peak intensity were empirically determined. The analysis of

the relative traffic intensity by seasons, weeks and hours is presented. Confirmatory data were obtained regarding the interdependence between the relative change in traffic intensity on busy major city boulevards and the concentration of nitrogen oxides in ambient air in a narrow range around the linear source of pollution. The condition of the road surface and other elements of road infrastructure, and the green system, as far as they are relevant for the formation of road sediment along the considered 42 transport arteries in the city of Burgas, are subjected to analysis. The sampling of road sediment in 12 appropriately selected segments of the road network is presented. The correlation between the condition of the road surface and the deposition of road sediment has been proven. For streets in inter-block spaces, with a vehicle flow of less than 500 vehicles/24 h and no road surface cleaning, the measured average value for road sediment is 37.81 g/m². According to the presented data, particles with sizes from 30 to 75 µm dominate in sediments in terms of size. (about 55%), and those with sizes below 30 µm are about 45%.

Road sediments were studied in relation to the concentration of heavy metals: Cr, Ni, Co, Zn, Cu, As, Pb. Analyzes show the presence of heavy metals, with the concentrations of Ni, Cu, Zn and Pb being high at vehicle traffic intensity above 500 MPS/24h. For all samples, the average concentrations of the studied pollutants were higher in the fractions with a particle size below 40 µm. It has been empirically proven that in areas with low traffic intensity, despite the large amount of formed road sediment, the concentrations of Ni, Cu, Zn and Pb are lower.

The presented conclusions follow logically from the empirical material and analyses. The dissertation work has the characteristics of a fully completed scientific research, achieving in its entirety the set goal in the implementation of the defined tasks.

Contributions and significance of the development for science and practice

In the dissertation and the abstract, four contributions are stated, which I accept as significant for theory and practice, contributions with scientific and applied value, namely:

- A methodology for calculating the absolute value of traffic for any time of the year has been developed and implemented. Hourly, daily and seasonal load coefficients are determined;
- A correlation has been proven between the relative average monthly concentration of nitrogen oxides and the change in the intensity of movement of motor vehicles;
- The experimental results for road sediment and heavy metals have an applied nature in the methods for assessing atmospheric air pollution with fine dust particles;

- The data obtained can be applied to the calculation of emission factors from fine dust particles, emissions from FFP and modeling of transport pollution in cities, as well as environmental impact assessment.

The significance of the results is high, as the presented basic data on road sediments, the derived dependencies, and the methodology for their research can be applied together with other methods for monitoring and managing atmospheric air quality in the country.

Assessment of dissertation publications

In the attached documents, 4 scientific papers are presented, and their content is reflected in the dissertation work. Three of them were published in refereed and indexed in world-famous databases with scientific information in the period 2020-2022, and for one - a document was presented that it was accepted for publication also in refereed and indexed. The publications are the work of a collective of authors, in which Eng. Ivanova is the lead author. Two of the publications fall into the Q3 quartile and two into the Q4.

I have no citation data for the publications presented. Eng. Ivanova has presented a list of participations in scientific conferences and projects, with 3 participations in international scientific conferences and 3 participations in contractual topics, on topics related to the dissertation.

With the presented developments, the minimum national requirements for acquiring the ESD "Doctor" in professional field 4.2. Chemical sciences are completed by the doctoral student. The requirements arising from the Regulations for the terms and conditions for acquiring scientific degrees and occupying academic positions at the University "Prof. Dr. Asen Zlatarov" - Burgas.

Assessment of the abstract of the PhD thesis

The abstract is qualitatively developed in a volume of 57 pages and reflects the main results, conclusions and contributions of the dissertation research, as well as the author's publications on the subject of the dissertation. Corresponds in structure and content to the requirements of the regulations of the University "Prof. Dr. Asen Zlatarov" - Burgas.

Critical Notes

I have no critical remarks on the essence of the dissertation. Some inaccuracies were admitted when citing the literature used, stylistic weaknesses and typographical errors, which do not affect the significance, scientific and scientific-practical value of the dissertation work.

Conclusion

The dissertation contains results of scientific and scientific-practical significance, representing an original contribution to science and meets all the requirements of the Law on the Development of the Academic Staff in the Republic of Bulgaria, the Regulations for the Implementation of the Law on the Development of the Academic Staff in the Republic of Bulgaria and the Regulations for the Terms and Conditions for Acquiring Scientific Degrees and Tenure of academic positions (PURPNSZAD) at the University "Prof. Dr. Asen Zlatarov" - Burgas. The presented materials and dissertation results fully correspond to the specific requirements of the University "Prof. Dr. Asen Zlatarov" - Burgas.

The dissertation shows that the doctoral student Eng. Dimitrinka Slavova Ivanova possesses in-depth theoretical knowledge and professional skills in the field of the doctoral program (Ecology and Environmental Protection), demonstrating the qualities, skills and competence to independently conduct scientific research.

Based on the above, I give a positive assessment of the developed dissertation work, abstract, achieved results and contributions, and I propose to the scientific jury to award the educational and scientific degree "doctor" to Dimitrinka Slavova Ivanova in the doctoral program "Ecology and environmental protection", in professional field 4.2. Chemical Sciences.

05.10.2022г.

Reviewer:..

Подпис заличен
Чл.2 от ЗЗЛД

Assoc. Prof. D. Toneva, PhD