

A. SUMMARY

The habilitation thesis entitled "MONITORING AND PROTECTION OF ENVIRONMENTAL FACTORS" is an overview of my professional, scientific and academic activity corresponding to the period after the doctoral internship, the PhD thesis defense and after obtaining the scientific title of Doctor (2008-2011-2023).

The habilitation thesis is structured in three parts, by its content it reflects both the accumulated experience and the main scientific contributions and the specific directions of my academic career. By content, the habilitation thesis is in line with national and European priority research areas specific to the field of Environmental Engineering. This is evidenced by the publication of more than 70 scientific articles: 35 papers indexed on the Web of Science platform; 42 papers indexed on the SCOPUS platform; papers indexed in various databases corresponding to different journals; 11 articles published in ISI-listed proceedings, 22 scientific articles in BDI-listed journals and articles published and presented at international conferences and scientific events.

Another important aspect of the research activity is related to the participation, as a member, in several research projects (more than 30) which had as research topics in the field of Environmental Engineering: the framing of noxious and noise emissions from industrial activities, the determination of the composition of residual, biodegradable and recyclable waste at the level of Bacau County, the assessment of environmental impact due to industrial activities, the treatment of municipal and industrial sludge, the treatment of municipal and industrial wastewater etc.

The knowledge and skills acquired during the doctoral internship were the starting point for the future research directions that I developed after obtaining my PhD. The research directions developed in recent years have an interdisciplinary character combining the various fields the interdisciplinary directions that have been addressed during my teaching and research career.

The first chapter of the thesis briefly presents the results obtained by the author after obtaining the title of Doctor in teaching, adding the main scientific and professional achievements.

Chapter 2 presents my scientific achievements based on representative publications as first author, corresponding author or co-author, and summarized by the relevant research directions in the current scientific context.

The scientific research activity developed during the postdoctoral period belongs mainly to the field of Environmental Engineering. Thus, the scientific research activity is materialized in papers belonging to several directions in which my scientific development evolved during the postdoctoral period.

One of these directions continues the research activity started with the elaboration of the PhD thesis, namely works dealing with methods and techniques for the identification of air quality and methods for the determination and reduction of noise levels with a focus on industrial environments.

First research direction *Air pollution sources and factors. Depollution procedures* was developed from the study of methods for analysing air quality in indoor, outdoor and industrial environments, which were further developed and used to identify ways of controlling pollution at local, regional and global levels.

The first part is an objective review of the results of experimental research in the field of assessing and reducing the impact of pollution from human activities on air. The second part presents directions for research and professional development in the evolving context of activities in human communities generating noise and thus noise pollution impacting human health.

The results of the studies carried out address the issue of particulate matter, PM_{2.5} and PM₁₀ pollution resulting from industrial activities for the repair of engines, transformers and electrical equipment, as well as from combustion plants for the production of thermal and electrical energy, activities that require continuous monitoring of particulate matter and the application of measures to reduce particulate matter emissions. Air quality was also analysed for a number of indicators, taking into account chemical pollution parameters, atmospheric air temperature, and the number and functionality of some vehicles in urban agglomerations.

The part dealing with noise issues focused on *Methods to reduce noise pollution in industrial enclosures* by using multi-component sound barriers as a means of attenuating the propagation of sound pressure levels; controlling noise transmitted in enclosed spaces through building structures, reducing sound radiated from external sound sources; and assessing the variability of noise levels of cars with different parameters of use, production and operation.

The second line of research *Sources and pollutants of water and soil. Depollution procedures* has been developed based on techniques and processes for water and soil remediation, identifying optimal ways to address pollution abatement issues for these two environmental factors. Research has been mainly directed towards studies on groundwater quality, surface water quality, water filtration systems and wastewater treatment. Thus groundwater quality was studied for several indicators; river water quality targeting representative physico-chemical parameters (pH, electrical conductivity, dissolved oxygen, turbidity, temperature), and specific heavy metals; the influence of the type of granular material in the filter bed for the removal of suspended matter from water; the use of treatment systems by small-scale SBR treatment plants adapted to the quantitative changes of wastewater flows.

The last part of the research chapter dealt with studies on the influence of soil fertilisation systems on chemical properties: magnesium, aluminium, potassium, calcium, iron and chlorine and studies on the uptake capacity of heavy metals from soil (copper and lead) in plant species at root, stem, leaf and flower level.

Research results have been exploited through publication of scientific papers in ISI, BDI journals, participation in conferences.

The third section specifies the *professional, scientific and academic career development plan*, oriented towards the exploration of new research directions of interest to the international scientific community, analysis and assessment of environmental vulnerability and adaptive capacity to climate change, research corroborated with the development of monitoring systems with provided tools and statistical-mathematical analysis to assess the quality of environmental factors. Research will be channelled into the directions where we have obtained results and the exploitation of research results will be through dissemination in the main information flow: journals, scientific events and conferences.

The university teaching activity started immediately after the completion of my university studies in the Engineering and Environmental Protection in Industry program, class 2002-2007. In 2007-2009 I attended the Master's degree courses, specializing in the Optimization of Equipment and Processes in the Food Industry, University of Bacau, Faculty of Engineering.

Since 2008 I started my doctoral studies in Mechanical Engineering, being a doctoral student under the supervision of Prof. Ph.D. Eng. Valentin NEDEFF, during which I did an external mobility internship at the Polytechnic of Turin, Department of Energetics, Italy, during which I studied industrial noise and ways of monitoring it.

The PhD was concluded with the public defense of the thesis entitled "Studies and research on the possibilities of reducing noise pollution from industrial plants" in 2011, defended at the "Vasile Alecsandri" University of Bacau.

I started my teaching activity as a substitute university lecturer in the Department of Environmental and Mechanical Engineering, then as a lecturer, university assistant, lecturer and associated professor in the present.

My teaching activity was also supported by the publication of 8 books and book chapters.

The results of the scientific research activity are evidenced by the publication of more than 70 scientific articles in specialized journals, volumes of important scientific events that fall within the theme of the field of Environmental Engineering and prove the ability to synthesize and carry out research activities.

Further didactic activity will be channeled towards the study and implementation of the latest developments in literature, continuous updating of the information presented in the subjects taught in order to continuously increase the quality of the educational process; diversification of teaching methods by developing the principle of collaborative creativity, actively involving students through the use of teaching methods centered on discovery learning.

The results of the professional and scientific activity will aim at developing the field of Environmental Engineering, establishing new collaborations with the socio-economic environment and increasing international recognition.