



SUMMARY OF THE HABILITATION THESIS

The habilitation thesis titled "Environmental Protection through the Design of Sustainable Constructions and Urban Areas Resilient to Multiple Natural Hazards" presents the results of the author's activities in the field of environmental engineering, obtained since the completion of the doctoral thesis, as a qualified university professor, scientific researcher, and project engineer. It defines the main directions for future development in teaching, research, and professional activities. The work is structured into 6 chapters, concluding with summaries, a list of 175 bibliographic references, and 144 figures.

Chapter I, titled "INTRODUCTION. CURRENT STATE OF RESEARCH ON ENVIRONMENTAL PROTECTION" provides an overview of global research results and measures taken with the purpose of steering the planet towards a sustainable and resilient built environment, addressing pollution, global warming, and limited natural resource consumption. The analysis highlights the urgent need for adapting constructions to new forces and actions driven by dynamic climate changes. The chapter summarizes conclusions from numerous scientific articles in the field, focusing on ensuring sustainability and resilience of urban areas to multiple natural hazards. Special attention is given to presenting new philosophies of load-bearing structure design based on the evolving requirements of resilience and the life cycle management methodology of buildings, incorporating ecological measures for environmental protection.

Chapter II, titled "DESCRIPTION OF ACADEMIC AND MANAGERIAL ACTIVITIES" outlines the author's academic work as a professor at the Faculty of Architecture and Urbanism in Timisoara (F.A.U.T.) from 2009 until today. In 2004, the author defended a doctoral thesis titled "Contributions to the Calculation and Composition of Structural Walls made of Reinforced Concrete" receiving the grade "Very Good" and the "Cum Laude" distinction. In 2015, the author took the habilitation exam with a thesis titled "Load-bearing Structures in Architecture. Past, Present, and Future". As an educator, the author established 12 courses at the undergraduate and master's levels in Romania, covering areas such as designing new structures, reinforcing existing load-bearing structures, sustainable construction, and designing cities that are resilient to multiple natural hazards. The chapter also presents the author's international teaching activities as a visiting professor at the doctoral school of the Polytechnic University of Milan, ERASMUS MUNDUS master's program organized by the University Federico II of Naples, and ERASMUS + B.I.P. courses organized jointly with universities in Madrid, Naples, Catania, and Bialstok.

Regarding managerial activities held in the university, the author has served as vice-dean of the Faculty of Architecture and Urbanism in Timisoara from 2013 to 2020. In 2016, the author coordinated and participated in the ARACIS evaluation for all F.A.U.T. specializations at the undergraduate level. The author contributed to the establishment of the master's program in Restoration and Regeneration of Heritage, where he also engaged in managerial activities as a founding member. Since 2013, the author has managed the signing of agreements and the implementation of Erasmus mobility programs for students with universities in Italy, Belgium, Portugal, Greece, Poland, Spain, Iceland, and Turkey.

Chapter III, titled "DESCRIPTION OF SCIENTIFIC ACTIVITY" presents the author's activities as a researcher in designing load-bearing structures and urban areas to ensure buildings' and localities' resilience to extreme actions caused by earthquakes and climate change. The focus is on sustainable materials and technologies with low CO₂ emissions and embodied energy, utilizing local, reusable, recyclable, and biodegradable materials. As a result of the research activities he has conducted, the author is currently a member of CNATDCU in commission 6 for engineering and management in construction, an advisor in the Ministry of Research, Development, and Innovation commission 6, he coordinated the completion of three doctoral theses in 2020 and 2021, as a scientific coordinator, and participated as a referee in the doctoral committees for two theses in Italy and 13 theses in Romania.

The thesis highlights research studies coordinated at the master's and doctoral levels with students from the University of Trento and Naples, Italy. Internationally, the author has coordinated, as a partner, an international research contract, two COST actions, and participated as a member in an international research contract. Together with professors from universities in Naples, Milan, Lisbon, Sheffield, Ancona, and former doctoral students, the author edited special issues in the journals Sustainability and Engineering Failure Analysis. Four special sessions were organized at foreign conferences, and the author will deliver lectures as a guest professor at two sessions during the 2024 World Congress on Seismic Engineering in Turin. The chapter presents the 20 international conferences where the author participated as a member or session chair in scientific committees, lists over 20 international journals indexed in the Web of Science or Scopus databases, published by prestigious publishers such as Elsevier, Springer, Wiley, or Taylor and Francis, where the author serves as a reviewer or member of editorial boards. Regarding the research activity, the author has published over 100 scientific articles: 66 articles have been published in the SCOPUS international database, cited 560 times, and 73 articles in the ISI WEB OF SCIENCE database, cited 292 times. The author's Hirsch index in the Web of Science database is H=11, and in the SCOPUS database, it is H=13.

Chapter IV presents the professional activity held by the author as a designer, making constant efforts to identify and promote future development solutions for cities so that, through sustainable strategic investments, buildings could transform urban areas into more environmentally friendly systems and increase their resilience to the combined actions of multiple natural hazards. The projects presented in the habilitation thesis pursued reducing the dependence on non-renewable

energy sources, decreasing CO₂ emissions and energy consumption, reducing and reusing construction waste, using renewable plant resources, reusing traditional construction technologies, saving heritage buildings and vernacular architecture, reusing materials and local construction technologies, improving air quality, reducing noise pollution, and integrating green spaces into the urban landscape. Through sustainable urban development policies applied in the projects, multidisciplinary design teams, including the author, advocated for a balance between economic prosperity, environmental protection, and social inclusion.

Chapter V, titled "ABILITY TO COORDINATE RESEARCH TEAMS AND MANAGE TEACHING ACTIVITIES" presents the author's activities as a scientific coordinator for the training and integration of young researchers into multidisciplinary and multinational scientific teams. By presenting studies and execution projects published with undergraduate, master's, and doctoral students in congresses and international journals listed in Q1 and Q2 quartiles, the author has demonstrated the skills acquired in this field over the past 10 years. Over time, by drawing well-organized research directions, the author has managed to attract and convince young researchers to continue their studies from undergraduate to master's and doctoral levels. Additionally, the author has shown the ability to carry out teaching coordination activities that facilitated the integration of team members into international multidisciplinary collectives.

Chapter VI outlines the author's future development plans, based on the experience gained as a doctoral supervisor, professor, and professional. The proposed solutions for environmental protection could be developed in the future within multidisciplinary teams including biologists, chemists, physicists, landscape architects, urban planners, architects, construction engineers, geodetic engineers, etc. The habilitation thesis suggests practical solutions, capable of ensuring environmental protection through the reduction of energy consumption over the lifespan of buildings and of the produced amounts of CO₂.

The author suggests that in the future, together with doctoral students, they conduct research, teaching, and professional activities in three directions for creating sustainable buildings and cities, resilient to multiple hazards by:

1. Identifying the values of all current natural forces that influence buildings and cities and incorporating them into multiple hazard analyses. Based on the results provided by these complex analyses, maps and methodologies will be developed to evaluate possible losses for various risk scenarios.
2. Constructing new buildings and reinforcing existing ones with innovative ecological materials and technologies to ensure their resilience over their entire lifespan, based on modern, sustainable design philosophies.
3. Ensuring a pollution-free environment in the future by constructing ecological buildings with local, reusable, recyclable, and renewable vegetal materials, as well as biodegradable materials.

In conclusion, the habilitation thesis expresses the author's conviction, based on 25 years of experience as a university professor, results obtained as a doctoral supervisor in the last 8 years, and 30 years of activity as a project engineer. By expanding the research from civil engineering to environmental engineering, the author believes that, in the future, together with doctoral students and other collaborators, the proposed practical measures will contribute to environmental protection and the preparation of future specialists.