

Research on the development of environmental strategies in the context of climate change

(Cercetări privind elaborarea strategiilor de mediu
în contextul schimbărilor climatice)

A Thesis Submitted for obtaining the Scientific Title of PhD in Engineering

from

Politehnica University Timisoara, Romania

in the Field of “ENGINEERING AND MANAGEMENT”

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month 07 year 2023

1. Summary of the doctoral thesis

Currently, local energy and climate strategies need to fit into European policies in this area, taking into account the 2030 targets of reducing greenhouse gas emissions by 40 % compared to the 1990 baseline, with a share of at least 27 % of renewable energy consumed and a 27 % improvement in energy efficiency [1]. At global level, the effects of climate change are already visible and unavoidable due to the inertia of the climate system, but the result of action to reduce emissions can help to decelerate the process of aggressive effects (global warming, depletion of freshwater resources, average global sea level rise, etc.) [1-5].

In this context, the research *theme aims at identifying, characterising and substantiating methodological and procedural-applicative a model for developing and implementing a feasible, efficient and effective environmental strategy for achieving the goal of a sustainable local community (green)*. This must be done through a stronger integration of the environmental dimension with the social and economic dimension and, more specifically, climate change issues with the two key components: (1) combat and mitigation and (2) adaptation. Beyond these dimensions of strategy definition must be integrated (holistic approach) knowledge in the fields of management, sustainable development, public administration, environmental protection and social protection, and the conceptual-procedural link must be achieved through communication and stakeholder management. The ultimate objective of the holistic approach to developing the environmental strategy is a *resilient urban community* (capable of adapting to change while continuing to function and develop).

Research on bibliographic referential and good governance practices has highlighted that *environmental strategies, developed by integrating climate change, must aim to limit greenhouse gas emissions and their negative effects*. From a praxiological point of view, dedicated climate and energy plans (addressing concepts on the impact of climate change on the natural and anthropogenic environment, potential and residual impacts, vulnerability, adaptation and resilience) need to be developed integrated with economic, social and environmental development strategies.

The premises of doctoral research are also given by the national regulations on the development of energy and climate plans related to the National Strategy for Sustainable Development of Romania Horizons 2013-2020-2030 [2], and those at European level, of the existing guidelines, elaborated under the aegis of the “Convention of Mayors for Climate and Energy”, by the Sustainable Development Goals as described in the documents, reports and recommendations of the United Nations through the “2030 Agenda for Sustainable

Development” [3], and which create a global but also local framework on sustainable development. In addition, *efficient management of the urban environment* requires an understanding of the interactions between policy options/decisions, proposed associated objectives and real processes, covering complex social, economic, technical and environmental aspects that manifest themselves at local level (of an administrative territorial unit, ATU) [6-9]. As a result of these considerations, the approach and resolution of the research theme is linked/determined to the local context, connected to the global one through the normative-legislative dimension. A generic schematisation of the research approach is presented in Fig. 1 and contains:

- **Theoretical research** oriented towards the study, characterisation and analysis of practices (from strategic and tactical level) of local public authorities in Romania, but also of cities (leaders at European and global level), in order to understand the guidelines, approaches, methodologies specific to this approach and of innovative methods developed (existing best practices). Critical analysis of good practices will allow the design *of a model for developing and implementing a feasible, efficient and effective environmental strategy to achieve the goal of a sustainable local community*. Furthermore, research will seek to identify knowledge gaps/skills of staff in public organisations, those involved in development, implementation, monitoring and evaluation of the results of such strategies (operational level staff) [11-12];
- **Applied research** with the main purpose of conducting a pilot investigation on the level of implementation, implementation of strategic environmental planning (in the context of climate change) at the level of local public authorities. Thus, knowledge capitalisation was achieved in terms of the level of training, responsiveness of employees from various ATUs to adopt and implement the model for developing and implementing a feasible, efficient and effective environmental strategy for achieving the goal of a sustainable local community (testing and validation of the level of acceptability) (as also demonstrated by studies [13-16]).

The research context targeted the national local public authorities, but also public and private organisations in Timisoara and the Growth Pole. The results of the research on climate change will make it possible to compare them with those of other cities (*benchmarking*), which will help define the research gap and the original innovative approach of the *strategic model for environmental protection in the context of climate change for the development of a sustainable community*.

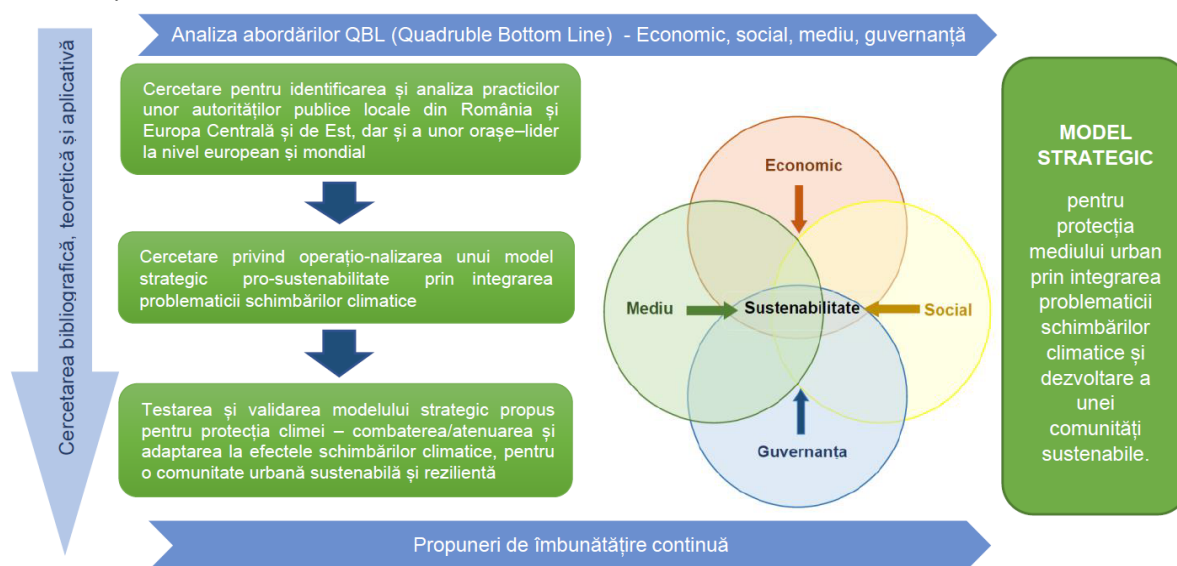


Fig. 1. Schematising the proposed research approach (original development in Romanian language)

The main operational objective of the research was to analyse the concrete ways in which an ambitious climate strategy could be developed, through a high-performing multidisciplinary team, engaging all stakeholders of the community, including by participating in the co-creation and future co-implementation of the plan of measures and actions for reducing, mitigating and adapting to the effects of climate change, as well as in ways of communicating strategic documents, by highlighting the interdisciplinarity to address the problem of organisational communication as well as external communication, with relevant stakeholders and defining ways of communicating with target groups. In approaching doctoral research, the issue of climate change was the central objective, being the subject of strategic thinking and planning. The secondary objectives pursued by doctoral research were:

A second objective pursued by the research will be dedicated to the need for training of the climate strategy planning team, the theoretical and practical knowledge in the field being incomplete. The lack of formal and informal educational curricula in the field of climate change generates, on the one hand, a lack of commitment on the part of the collectives in public or private organisations – employees and coordinators of departments/managers, lack of performance or what is even worse inaction. In the current context of climate change, public administration cannot have a passive attitude, or here we even talk about addressing a second aspect, that of managing change, organizational behavior and good governance through transparency, accountability, participation, efficiency and coherence.

A third objective specifically considered is the management of stakeholders, but especially of citizens and groups of citizens. The interest in stakeholder management lies in their importance in the effective implementation of climate change measures and actions. A climate strategy developed with excellence can become unoperable or partially effective without the active involvement of civilian actors. Identifying each group in civil society, assessing knowledge, attitude, perception of climate change and understanding potential inputs in that from the strategic planning phase is essential, otherwise the climate strategy risks being emptied of participatory content.

A fourth objective is communication in the development of the climate strategy, as a basis for transparency. Organisational and external communication activity is to be analysed from at least the following perspectives: information, awareness, confidence building, transparency of actions, engagement/activation of stakeholders.

In Fig. 2 presents, in graphic synthesis, the conceptual framework of research and the multidisciplinary approach to research, observing the high level of interdisciplinarity required by the approach of the research theme.

The way in which the research objectives have been achieved is demonstrated by the content of each chapter of the doctoral thesis.

Chapter 1 (DEFINITION OF CONCEPTUAL AND CONCEPTUAL DERULATION DERCEPTION) presents a set of bibliographic research that evolves on three levels:

- Research on the methodology and process of developing strategies that debate how strategic planning is carried out and strategic thinking is cultivated;
- The definition and dimensions of strategic thinking, which connects with sustainable development to explain the manner of action. As proof of feasibility, sustainable development models and relevance in the development of the environmental strategy in the context of climate change are presented;
- Pillars of the development of strategies introducing the procedural dimension relative to how the strategy development process should be addressed by considering associated dimensions.

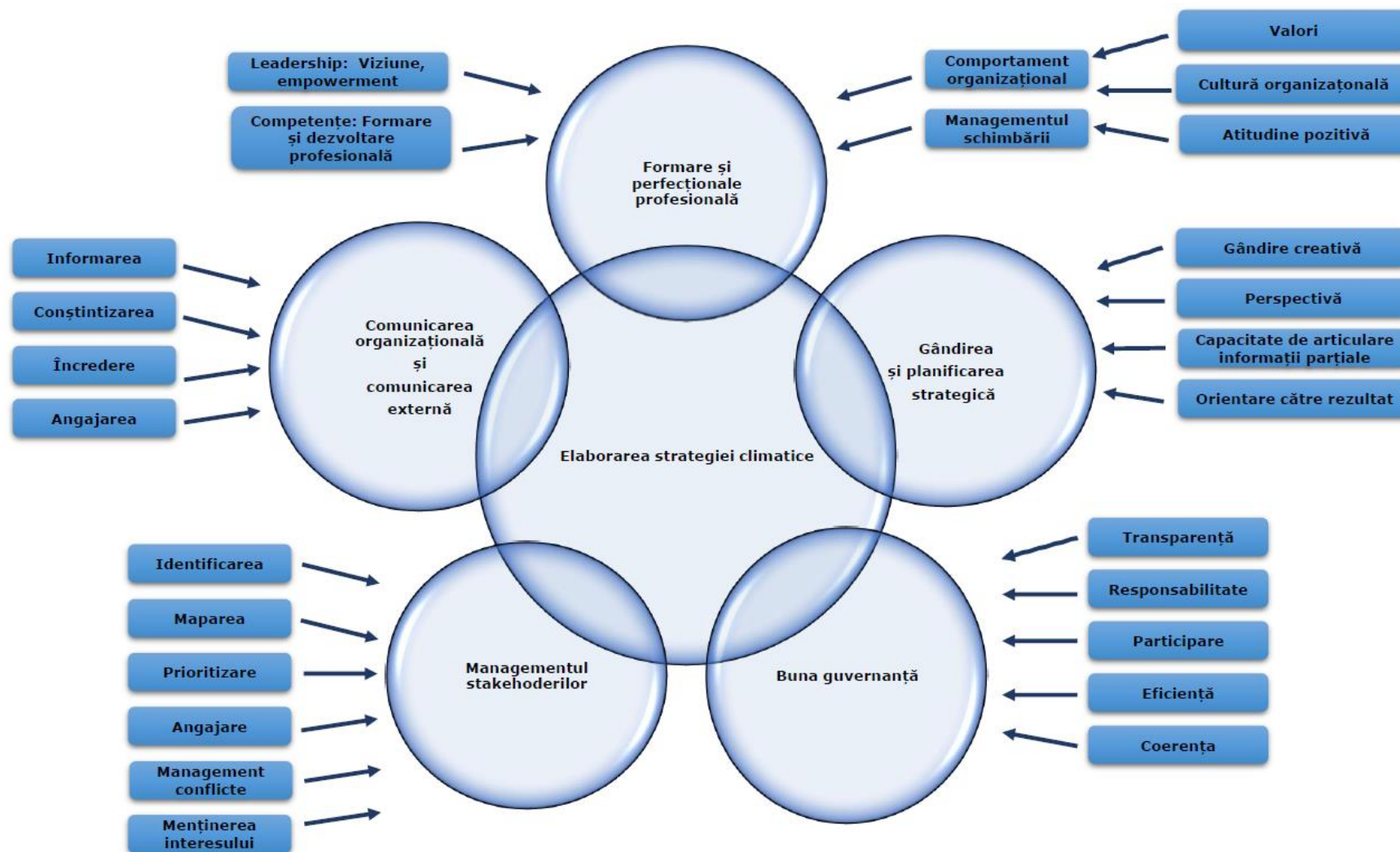


Fig. 2. Conceptual research framework and multidisciplinary approach to research (original development in Romanian language)

Chapter 2 (REQUESTIONS TO THE Bibliographic Referential AND THE NORMATIVE-LEGISLATIVE DRAFT ON CLIMATIC SCHIMBARS) is dedicated to characterising the context of the research, based on recent bibliographic resources (2018-2023), recent and relevant statistical data. Research is evolving in three areas:

- Climate change through consistent research to define the phenomenon, the associated concepts, to characterise the main phenomenological effects (local, national, international);
- bibliometric research on the issue of climate change in the literature of the last 5 years, proving the interest in the topic, the area of publications and the themes. This provides new insights into the current progress and challenges in achieving sustainable cities through appropriate strategic planning for environmental protection and climate change;
- Current trends and themes on climate change incidents dedicated to presenting good practices, achievements and examples related to: innovation in environmental strategies, ways to achieve adaptation and mitigation of climate change; disaster risk prevention due to climate change, environmental public policy instruments related to climate justice and global environmental governance.

At the end of the chapter, there is a definition of the research breach with some clarifications on how to approach the research in the field.

Chapter 3 presents a set of theoretical-applicative researches on the preparation of the ELABORATION OF THE ENVIRONMENT STRATEGY IN THE CONTEXT OF CLIMATIC CHANGE. The research scenario comprises three consistent researches that prefigure the need for an approach, model for developing and implementing a feasible, efficient and effective environmental strategy to achieve the goal of a sustainable local community. Thus, three “neuralgic” aspects of interest in defining the approach of the model are investigated through:

- Applied research on citizens’ perception, knowledge, attitudes and behaviour towards climate change. Case study Timișoara;
- Applied research on exploring training needs for climate change and sustainable energy consumption for local public authorities;
- research on nature-based solutions and green infrastructure for climate change mitigation and adaptation.

To these applied researches is added an inventory of contextual and phenomenological premises for establishing a methodological framework for substantiating the environmental strategy: The European Covenant of Mayors for Energy and Climate and details of the Green European Capitals. As a result, at the end of this chapter we present *the conceptual model for developing and implementing a feasible, efficient and effective environmental strategy for achieving the goal of a sustainable local community* (resulting through a creative approach of innovation by combining and applying the method of induction, generalising research findings, observations and capitalising on the critical mass of the professional experience gained by the author in over 20 years of activity in the field).

Chapter 4, PILOT RESEARCH ON STRATEGICAL ENVIRONMENT PLANIFICATIONS (IN THE CONTEXT OF CLIMATIC CHURCHING) to the LOCAL PUBLIC AUTHORITIES, is dedicated to an exhaustive diagnosis (through a survey based on a questionnaire of 40 questions; the distribution of the questionnaire concerned 10 administrative-territorial units involved in the theoretical-applicative research; 86 valid questionnaires processed) of the state of affairs regarding the level, readiness and awareness of employees from different ATUs in the Western Region to adopt the approach, model for developing and implementing a feasible, efficient and effective environmental strategy for achieving the goal of a sustainable local community.

The processing and interpretation of experimental data related to the following aspects:

- ***Opinion on climate change*** – the results confirm a good awareness of phenomena at personal and professional level;
- ***Local public administration and strategic planning status on environment and climate change*** – the results highlighted several gaps in strategic planning caused (most likely) by lack of knowledge and specific procedures for action;
- ***Organizational leadership*** – research has highlighted an acute need for sustainable pro-development leadership, and for the management of extreme situations they face, the ATUs will face;
- ***Impact of climate change at local and organisational level*** – the results of the processing of responses indicate that there is a significant differentiation between the views of the different ATUs as a result of the related average scores for this question;
- ***Level of information and sources of information on climate change*** – there is evidence of a fragmented, relatively balanced opinion between the lack of information for residents (36.05 %) and the fact that residents are informed about climate change (34.88 %). The high level of information of the inhabitants is appreciated by the respondents at only 11.63 %, and the percentage of respondents who answered “I do not know/I do not answer” is relatively higher, at 17.44 %;
- ***Environmental and climate finance*** (on the current budget dedicated to environmental and climate change at organisation level) – responses point to a significant percentage of favourable agreements (55.81 %), so respondents’ views show that the local budget dedicated to environmental and climate change is effective in achieving positive results;
- ***Management of stakeholders in environmental and climate change issues at local level*** – the research results highlight that there is a significant differentiation between the views of different ATUs as a result of the related average frequencies for this question. Between the average frequencies of favourable opinions for the 15 entities interested in environmental protection and climate change there is a significant and higher variation compared to the variation between the localities studied;
- ***Communication and information to stakeholders and emergency prevention and response procedures*** – survey responses indicate that there is a significant differentiation between the views of the different ATUs as a result of the related average frequencies for this question. Between the average frequencies of favourable opinions for the nine communication channels (social media and public meetings) there is a significant and higher variation compared to the variation between the ATUs.

Chapter 5 (GENERAL CONCLUSIONS. PERSONAL CONTRIBUTIONS. Future RESEARCH Directorates) presents the review of doctoral research carried out through: the general conclusions formulated, the original contributions made in the plan of scientific knowledge, in the theoretical-applicative research plan, but also on the praxiological level, of the managerial practices; the limits of the research carried out are identified and assumed. There are also some future directions for research.

2. Conclusions of the research. Original contributions

a) *General conclusions of the research carried out*

The exhaustive research presented in the doctoral thesis took place between 2018-2023, bibliographic and theoretical-applicative researches surprising aspects, relevant phenomena regarding the development of ***a (model) approach to develop and implement a feasible, efficient and effective environmental strategy for achieving the goal of a sustainable local community.*** It should be noted that, since the beginning of the research on the bibliographic referential and on the normative-legislative framework on climate change (Chapter 1 and 2), preliminary experimental research has also been carried out, with the role of diagnosing phenomena and

highlighting the state of affairs both from a scientific perspective, but also from a praxiological perspective. They provide a very strong conceptual, contextual and procedural basis of research, underlining the anchoring of the doctoral research approach to the reality in the field of strategic management in the context of climate change (with reference, impact and analysis at the level of some organisations in Romania). As can be seen, all the research objectives outlined at the beginning of the doctoral program have been fully achieved with success. The difficulty of achieving the doctoral application was related to the pre-pandemic, pandemic and post-pandemic context.

The most important conclusions drawn are:

- The terminological, conceptual framework on: the methodology and process of elaboration of strategies is well defined, but sometimes less understood are international trends and mode of action, the usefulness and transferability of some international experiences (good practices, methods and means, IT platforms, etc.) at the national organisational level. Phenomena of terminology and notional ambiguity manifest themselves in the field of strategic management of sustainable development;
- At the level of bibliographic research there is a dominance of empirical, quantitative research on related phenomena of the process of elaboration of environmental strategy, but there is no uniformly accepted approach that can be transferred to the practice of organisations. From this perspective there is a gap of knowledge in the field of strategic thinking and planning, but especially of pro-sustainability leadership in the context of climate change;
- Bibliographic research and follow-up, analysis of specific statistical indicators on the causes and effects of climate change (dynamic analysis of indicators such as: increased emissions of carbon dioxide, methane, greenhouse gases, etc.) provide robust evidence of the phenomenon, its risks, trends and the need for rapid adaptation and mitigation action, as well as prevention of risks to disasters caused. Furthermore, the ‘grey literature’, the reports of international bodies or specialised consultancy firms, highlights and supports these phenomena;
- The national and international normative-legislative framework is mature and well-defined, but there are no operational initiatives, procedures and action plans (updated annually) to support an approach (model) to develop and implement a feasible, efficient and effective environmental strategy for achieving the goal of a sustainable local community, from political decision-makers (local authorities, ministry(s) with responsibilities in the field). At national level there is a good explanation and support of the legislative compliance process, largely aware at organizational and managerial level. Romania’s National Climate Change Strategy 2013-2020 provides the framework and support for the implementation of the continuous improvement of the strategic management of sustainable development;
- Applied research on citizens’ perception, knowledge, attitudes and behaviour towards climate change. Case study Timișoara highlighted:
 - o That climate change is a real and very serious problem facing humanity. From the respondents’ point of view, the EU and the national government are considered as the main entities responsible for implementing climate action;
 - o Almost half of the respondents said they had taken personal action in the fight against climate change;
 - o A large majority of respondents have a positive attitude and behaviour towards sustainable urban mobility, energy efficient and environmentally friendly means of transport;
 - o It was noted that there was a lack of clarity between the causes and effects of climate change, the latter apparently being better recognised than the causes;

- The importance attributed to climate change issues and mitigation, the severity with which the subject is addressed and the fact that national and local public authorities are considered the main actors responsible for combating and mitigating the effects of climate change are relevant aspects of the research;
- Applied research on exploring training needs for climate change and sustainable energy consumption for local public authorities highlighted:
 - Numerous knowledge gaps that are directly reflected in the non-professionalism of addressing and solving sustainable development management problems (including strategic ones and in the context of climate change) at the level of the ATU respondents group. Thus, respondents expressed a huge need for preparation for topics in the fields of water management and climate change;
 - Respondents usually obtain professional information and knowledge (associated with a self-learning process) from scientific resources, legislation (including laws, norms and standards) and their involvement activities in different projects, with different partners;
 - The most relevant training/training methods that could accelerate the transfer of information and knowledge in ATU practice are: debates on real cases or working on hypothetical scenarios, video presentations of case studies and presentation of concepts, terminology and methodologies followed by group activities (learning, interaction and work);
 - The role of leadership in (public) organizational learning was most appreciated for the ways in which top management provides “support and seek learning opportunities for subordinate staff”;
- Research on nature-based solutions and green infrastructure to mitigate and adapt to the effects of climate change (Bibliometric research) highlighted:
 - The subject of nature-based solutions is multidisciplinary, illustrating the complexity of problems. In recent years, nature-based solutions have become increasingly appreciated in European cities as a response to addressing urban challenges such as climate change, urban degradation and obsolete infrastructure. However, data and results on the effectiveness of these solutions are still needed;
 - The articles analysed aim at presenting management models and methods or present approaches to nature-based solutions, in a transdisciplinary manner, by reference to climate risks. As a result of the research conducted, a consistent bibliographic analysis and synthesis was presented regarding the areas of interest of nature-based solutions, key issues addressed and references;
 - All these nature-based solutions can be considered and included on the local agenda of local authorities, after a thorough analysis of their effectiveness, with a view to maximising ecosystem benefits. Thus, a problem raised by nature-based solutions is co-design and co-participation in implementation to ensure the highest level of community acceptance, after a cost-benefit analysis of possible scenarios;
- Pilot research on strategic environmental planning (in the context of climate change) at the level of local public authorities highlighted:
 - Lack of knowledge of practical problems, but a good awareness of them, especially in the current context of the dynamics of the external environment. Good managerial support, but not pro-sustainability leadership
 - The existence of strategic plans, but which need to be better anchored to the reality of the ATU, thus reflecting reality and a feasible way of action (good resilience of the ATU);

- An appropriate level of information, using diverse sources and channels of information, adapted to the ATU and the local community, in relation to climate change-related phenomena and events;
- The current budgets dedicated to environmental issues and climate change at the level of the research ATUs are appropriate for the actions undertaken, but which should be better reflected by the potential measures to be taken in the context of the frequent occurrence of extreme events resulting from climate change;
- The management of stakeholders in environmental and climate change issues at local level needs to be better considered and applied by the ATU.

b) Original contributions claimed as a result of research

Bibliographical research has the role of characterising, from the perspective of several facets, dimensions, perspectives, the process of elaboration/planning/implementation of environmental strategies (in the context of climate change) at the level of organisations of the type of local public authorities (ATU from the Western Region of Romania). Then, the area of theoretical-applicative research carried out and the obtained results prove to be not only as added value created in the field of scientific knowledge of the field of strategic management in the context of climate change, but also as added value created for its praxiological, managerial field in Romania.

In the field of bibliographic research, the content of the doctoral thesis demonstrates the expansion of the knowledge of strategic management of sustainable development in the context of climate change. The most valuable original contributions in this regard are:

- Conducting a "terminology X-ray" investigation in the field of methodology and strategy development (Chapter 1.1);
- Analysis and synthesis of terminology, relevant conceptual aspects on the dimensions of strategic thinking, highlighting models of sustainable development and relevance in the development of the environmental strategy in the context of climate change (chapter 1.2);
- Establish an inventory to define the pillars of strategy development and strategic planning (Chapter 1.3);
- Bibliographic analysis and synthesis on the theme "climate change" accompanied by bibliometric research (Chapter 2.1 and Chapter 2.2) aimed at highlighting the importance, relevance and timeliness of research topics;
- Drawing up an inventory of current trends and issues related to climate change, which is based on: bibliographic research, normative-legislative framework analysis, secondary data analysis, analysis of practical observations and capitalisation of the author's experience in the field (chapter 2.3);
- Description of the research breach (Chapter 2.4) with the presentation of the conceptual framework of research and the multidisciplinary approach to research.

In the theoretical and applicative research plan (which most of the time were carried out together), the elements of originality realised (developed and implemented) are:

- Applied research and results on citizens' perception, knowledge, attitudes and behaviour towards climate change. Case study Timișoara (Chapter 3.1);
- Applied research and its results on exploring training needs for climate change and sustainable energy consumption for local public authorities (Chapter 3.2);
- Applied research and results on citizens' perception, knowledge, attitudes and behaviour towards climate change. Case study Timișoara (Chapter 3.3);
- Pilot research and results achieved in investigating strategic environmental planning (in the context of climate change) at the level of local public authorities (Chapter 4).

An important contribution of the research carried out is **managerial through the methodologies designed and applied and the results obtained**, so that they provide management

factors and decision-makers solutions (scientifically documented) to some problems in the field of strategic environmental planning under the conditions of climate change, as well as behavioral models associated with the development of a genuine pro-sustainability leadership. Research can also be a guide for more effective involvement of decision-makers in the development of environmental strategies in the context of climate change at the level of ATUs.

Last but not least, the research carried out proves their **contribution in the didactical field** related to the subjects of teaching: Sustainable Development and Leadership (from the Master's program Public Organisations Management) and Sustainability and Risk (from the master's program Entrepreneurship Management for Business Administration) by providing completely conceptually and methodologically grounded topics that can be the subject of debates, topics from seminars or that can be extended through specialised projects.

c) Potential future research directions

As a result of the preliminary conclusions set out at the end of each theoretical-applicative research sequence, the following research directions have been identified with the potential to be addressed in the future:

- Developing strategies or planning for climate change adaptation and mitigation at the level of all ATUs in Timis County/Western Region, but also at the level of public and/or private companies, as a prerequisite for the unification of local efforts in the field of climate change;
- Implementation and reporting of progress on environmental protection and effectiveness of climate change mitigation and adaptation actions, including procedures for operationalising the activity – public administration/local public companies;
- The role of financial incentives in stimulating environmental and climate action at the level of urban communities – comparative research at the level of the European Union and Romania;
- Characterisation and importance of ecosystem services in urban communities, as a prerequisite for effectively addressing environmental and climate change mitigation and adaptation actions;
- Communication in the field of climate change – modality, communication techniques and communication channels;
- 'Citizens science' and its contribution to understanding environmental phenomena and climate change;
- The contribution of urban regeneration to local climate action and to highlight key aspects of quality of life from a climate change perspective;
- Etc.

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