

**AUTHOR'S PRESENTATION
OF DOCTORAL (PhD) DISSERTATION**

**NATIONAL UNIVERSITY OF PUBLIC SERVICE
FACULTY OF MILITARY SCIENCES AND OFFICER TRAINING
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**Strategic research and development of industrial safety activities
related to the sustainable operation of energy systems**

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THE FORMULATION OF THE SCIENTIFIC PROBLEM

My scientific research was aimed at investigating the strategic importance of industrial safety in environmental sustainability, for which I took as a basis the role of the field aimed at accident- and malfunction-free operation of energy systems. Accordingly, the research subject of the thesis can be defined at the common intersection of industrial safety, environmental sustainability and the energy sector. Numerous scientific studies have already pointed to the problem of the global environmental impact caused by the energy sector. In accordance with this, in both the supranational and national level strategy-making, serious emphasis is placed on the reduction of environmental pollution emitted by energy systems, which thus attaches particular importance to the reduction of normal operating emissions.

However, emergency emissions caused by serious accidents or malfunctions are also to be assessed as a significant environmental burden. Due to their frequency, minor energy accidents and malfunctions are considered constant emitters on a global scale. Serious accidents occur much less frequently, however, if they do occur, they can cause irreversible environmental damage.

I therefore considered it justified to examine the industrial safety aspects of supranational strategic directions for sustainable development, as well as the theoretical and practical industrial safety strategic aspects – contained in national level (government) strategic documents and other relevant professional sources – which are aimed at the sustainable operation of the energy sector. Keeping these in mind and developing them can contribute to the realization of the strategic vision of environmental sustainability – and, in a broader sense, sustainable development – by enforcing the safe operation of energy systems as effectively as possible.

RESEARCH HYPOTHESES

1. According to my assumption, in order to realize the global strategic vision of environmental sustainability, it is essential to guarantee the safe operation of plants dealing with hazardous materials, including energy facilities, as well as the energy sector in general – which plays a unique role in sustainable development. As a result, it has become propitious to determine the aspects that prove the strategic importance of the industrial safety field in the environmental dimension of sustainable development, as well as the identification of the current strategic target areas that contribute to the safety of the energy sector and thus to the realization of environmental sustainability.

2. Based on my assumption, as part of the analysis of the process leading to the vision of environmental sustainability from an energy and industrial safety point of view, it is appropriate to categorize the identified strategic target areas – i.e. those aimed at the safe operation of energy facilities and the energy sector in general, relevant from an industrial safety point of view – according to how they contribute to the realization of a vision of the future. In addition, it is recommended to develop a methodology that can be used during energy industry security strategic planning for this future vision.

3. According to my assumption, a necessary condition for the realization of the strategic vision is the transferability and enforceability of the strategic target areas and the objectives defined in connection with them. In view of this, on the one hand, it is necessary to identify the most typical industrial, supply and technical security challenges in connection with the strategic target areas, furthermore to summarize and analyze the opportunities for their management. As one of the most fundamental practical aspects of achieving environmental sustainability, it is reasonable to develop the protection planning tool system for the energy sector's operational facilities, and within this framework to define scientifically based conditions on the basis of which the identification of dangerous plants and critical infrastructure elements and the authorization of their operation – as well as their continuity of operation – are exactly as can be ensured, given that the accidents and malfunctions that occur in them can cause the most serious environmental impact in emergency situations.

RESEARCH OBJECTIVES

I am formulating my research objectives in three research sub-areas, already described in the definition of scientific problems. Regarding the thesis as a whole, my basic research goals include the examination of the international and domestic strategic documents and legal environment related to the research subject, the review of relevant publications of foreign and domestic researchers. My goal is also to create an opportunity to transfer the international good experiences into the Hungarian system.

1. In the field of examination of the global strategic vision of environmental sustainability from the point of view of industrial safety, with particular regard to the safety of the energy sector:

- a) I analyze the general goals of strategy creation, as well as the connections between sustainability, energy and industrial safety, and subsequently make an assessment of the importance of industrial safety in the realization of environmental sustainability, taking into account the particularities of industrial safety.

- b) I examine the connections between supranational sustainability strategy making and industrial safety, and then identify the strategic target areas which contribute to the safe operation of the energy sector as defined in domestic strategic documents relevant to the research.
2. In the field of examining theoretical industrial safety strategic aspects aimed at the sustainable operation of the energy sector:
- a) Within the framework of presenting and explaining the content of the identified strategic target areas, I categorize them according to how they contribute to environmental sustainability.
 - b) I develop the methodology of the energy industry safety strategy for environmental sustainability, and then analyze the identified strategic target areas using it.
3. In the field of examination of practical industrial safety strategic aspects aimed at the sustainable operation of the energy sector:
- a) I identify and analyze the most typical industry, supply, and technical security challenges indicated in current strategies and/or other relevant, scientific sources in connection with the strategic target areas, and then summarize and analyze their management options.
 - b) I make a technical proposal for energy systems based on the examination of the identification procedures and authorization criteria system for protection against serious accidents related to hazardous materials and critical infrastructure protection, as well as the management options of newly emerging security challenges at the operator level.

RESEARCH METHODS

During the preparation of the thesis, I generally used the research methods of analysis, synthesis, induction and deduction, a system-based scientific approach. The following specific research methods were used when developing the individual chapters and subsections in order to fulfill the research objectives:

1. Comparative analysis and evaluation of professional and scientific books, studies, publications that are part of the domestic and international literature related to strategy creation and the three research pillars of the thesis – namely environmental sustainability, the energy sector and industrial safety.
2. Examining the main international conventions, European Union and domestic strategic documents related to the research subject of the thesis and the announcements evaluating them.

3. Making findings, suggestions, and drawing conclusions based on the strategic documents, as well as other scientific publications, doctoral theses related to the content detailed in the strategic documents.
4. Continuation of professional consultation with recognized domestic and foreign specialists, educators and researchers in the field of research pillars of the thesis and strategy creation.
5. Utilization of relevant professional experience gained in the framework of participation in domestic and international scientific conferences.
6. Making calculations using data collected from open, online sources, and drawing scientific conclusions based on them.
7. Summarizing the experiences of personal visits to plants, and conducting in-depth interviews.

BRIEF DESCRIPTION OF THE STUDY CARRIED OUT BY CHAPTER

In the **first chapter**, based on the relevant literature, I identified the basic conditions of strategy creation, and then revealed the connections between the three research pillars that make up the research subject of the thesis. In the context of this, I referred to the global relevance of environmental sustainability in the 2020 and 2021 global risk reports of the World Economic Forum. After that, I revived the unique role of the energy sector in the evolution of environmental sustainability, after which I proved with theoretical arguments the strategic importance of industrial safety in environmental sustainability.

In this chapter, I pointed out the industrial security aspects of the supranational strategic directions for sustainable development. By studying the domestic strategic documents concerning the topic of environmental sustainability – after defining the concept of energy industry security – I identified the strategic target areas that are the research subject of the thesis. Among the strategic target areas, I highlight two general target areas that appear in all other specific strategic target areas, i.e. generally serve their implementation.

In the **second chapter** of the thesis, based on strategic documents and other relevant literature, I explained the content of the specific strategic target areas identified in the previous chapter, pointed out their industrial safety relevance, and then classified them into three different categories according to how they contribute to the realization of environmental sustainability.

Within the framework of this chapter, I developed the methodology of the energy industry safety strategy for environmental sustainability, on the basis of which I analyzed all identified specific target areas based on strategic and technical aspects. The purpose of this analysis was primarily to determine to what extent the target areas could form part of an energy industry safety strategy for environmental sustainability.

The second subsection of the **third chapter** of the thesis deals with the analysis and evaluation of the practical implementation of the identified specific strategic target areas. Using the strategic documents and the relevant literature, I identified the most typical industrial safety and – attributable to technical or meteorological reasons – supply security and other technical security challenges related to these target areas, furthermore the management options of the challenges.

In the third subsection, in order to provide the most general service for the implementation of environmental sustainability from the practical side of industrial safety, I defined scientifically based conditions on the basis of which the identification of dangerous plants and/or nationally vital elements and the authorization of their operation – including the continuity of operation – can be ensured in an exact manner.

SUMMARIZED CONCLUSIONS

I. In the field of examining the global strategic vision of environmental sustainability from the point of view of industrial safety, and with particular regard to the safety of the energy sector

1. After presenting the general purpose of strategy making, the aspects to be taken into account during correct strategy making, the concept of sustainable development, and the fundamental role of the energy sector in the process leading to environmental sustainability, I proved the strategic importance of industrial safety in the environmental dimension of sustainable development.
2. The multitude of international, European Union and national level strategic documents prepared on the subject of sustainable development credibly support the assumption that the realization of sustainability in itself is a vision requiring extensive strategic planning. In my opinion, the reason for this can be traced back to the fact that in overcoming the overall problem of unsustainability and in realizing the narrower, environmental dimension of sustainability, many sectors, disciplines and fields of expertise play a role concurrently.

I believe that all sectors, sub-sectors and areas of expertise, the neglect of which would make the realization of the vision impossible or significantly more difficult, should be considered to be of strategic importance.

3. When explaining the connection between the energy sector and environmental sustainability, I relied on already existing scientific works and findings that pointed to the energy sector's fundamental role in the functioning of other sectors and in industrial-economic development, its intense impact on the environment, and thus in the development of the ecological footprint to its special importance, as well as to the close relationship between the domestic energy strategic goals and the environmental dimension of sustainability.

4. For the need to examine the role of the industrial safety field in environmental sustainability, CRED's analysis can also serve as a reference point, which points out that compared to natural disasters, disasters of technological origin receive more moderate attention from the scientific community, despite the fact that the latter account for approximately one third of all disasters reported since 1900.

5. The indispensable nature of industrial safety in the implementation of environmental sustainability, i.e. its strategic importance, can also be justified with theoretical arguments. With arguments supporting the applicability of the field in sustainability strategic planning, I pointed to the existence of industrial safety strategy-making bases in the National Security Strategy of Hungary, the ecological crisis management role of industrial safety, and the multidisciplinary nature of the field of industrial safety, which is therefore obvious for strategic planning. The arguments pointing to the priority role played in environmental sustainability – on the analogy of the triple disaster protection task system of prevention, defense, recovery – call attention to the purpose of industrial safety in preventing the development of environmental problems that can be traced back to the emergency operation of industrial facilities, in protecting industrial facilities from changed environmental conditions, and in restoring the environmental balance.

6. Starting from the existing relationships between supranational sustainability strategy-making and industrial safety, further research can be carried out along the strategic target areas identified in domestic strategies in order to develop energy industry safety and thereby achieve environmental sustainability, which also serves as the basic condition for the research carried out in the second and third chapters.

II. In the field of examining theoretical industrial safety strategic aspects aimed at the sustainable operation of the energy sector

1. Following the development of the methodology necessary for the analysis of the strategic target areas for the energy sector's contribution to environmental sustainability relevant from the point of view of industrial safety, I identified the system of strategic and technical aspects that lay the foundation for the sustainable development of the sector and at the same time aim at energy industry safety for each strategic development target area.

2. The creation of the methodology can be based on the assumption that one of the most important aspects during strategy creation is that the strategic target areas and objectives are aligned with the vision of the future that the strategy aims to achieve, and serve to achieve it. With this in mind, I created the methodology, which – based on strategy-making and technical aspects – primarily intends to examine whether the specific strategic target areas identified in the first chapter could be part of an energy industry security strategy for environmental sustainability. In this way, during the relevant strategic planning, the methodology can serve as an aid for adapting to the environmental sustainability defined as the vision, for distinguishing important aspects from less important aspects in terms of the realization of the vision, and for deciding in which category it is justified to define additional goals in order to realize the vision. The methodology can be used during future strategic planning related to both sustainable development (environmental sustainability) and disaster prevention (industrial safety).

3. Prior to analyzing, I established three large categories of the specific target areas, according to how they contribute to the realization of the environmental dimension of sustainable development. The first category includes the target areas for the restoration of environmental balance, the second includes those that serve to adapt the energy sector to newly emerging environmental problems, i.e. the protection from extreme environmental conditions, and the third includes the target areas that serve to prevent environmental pollution arising from novel disaster prevention risks. The three categories can be paralleled with the task system of disaster management, and with the arguments establishing the prominent role of industrial safety in environmental sustainability.

4. Based on the analysis according to the methodology carried out after the description of the strategic target areas in categories, I came to the conclusion that strategic goals related to energy industry security can be defined in connection with all identified strategic target areas, so they can form part of an energy industry security strategy for environmental sustainability.

III. In the field of examination of practical industrial safety strategic aspects aimed at the sustainable operation of the energy sector

1. In the third chapter, which approaches strategy-making from a practical side, most of the typical industrial, supply and technical security challenges identified in connection with the specific strategic target areas – based on the studied literature – can, in my opinion, be handled with the current level of technical-technological development. Exceptions to this arise in connection with issues related to carbon dioxide absorption technologies, P2G technology, the extensive use of hydrogen for energetic purposes, as well as certain cyber security issues and the use of AI. The management of certain hazardous waste streams, which are expected to be produced in increasing quantities in the future – for example batteries and accumulators wastes – also requires significant technological development.

2. In order to provide the most general service of the implementation of environmental sustainability defined as a strategic future vision from the practical side of industrial safety, I have defined conditions based on scientific foundations, on the basis of which the identification of dangerous plants and the authorization of their operation can be ensured.

3. In the course of my analytical work focused on the plant identification procedure, I came to the conclusion that extending the list of hazardous substances may be justified due to new environmental challenges, including lithium battery production.

4. In connection with the selection process, I have ascertained that there is no unified system of criteria for the exact technical definition of either the sectoral or the horizontal criteria. Regarding district heating, it can be said that the district heating provider does not meet the sectoral criteria in many counties. In view of this, a systematic review of the sectoral criteria system based on scientific methodology is necessary in relation to district heating services. At the national level, I recommend analyzing the diagram(s) of the district heating provider – the number of district-heated apartments in order to develop a comprehensive picture. Among the sectoral criteria, the technical safety level of the district heating provider should also be taken into account.

5. I propose to modify the procedure of the authorization process in relation to plants below the threshold value. During the consequence analysis, I consider it necessary to extend the inspection procedure to other plants in the environment as well. According to this, if there is another plant within the zone causing the lethal effect, it is advisable for the operator to prepare informational material, which includes a brief presentation of the most serious emergency situations, the method of alarm, and recommended protective measures.
6. In the regulations related to critical infrastructure protection, the acceptability criteria and the necessary measures in case of non-acceptability do not appear. In my opinion, the OSP is acceptable if the operator has adapted the risk analysis table published by the National Directorate General for Disaster Management, Ministry of the Interior (NDGDM) and included its full operational spectrum in the analysis, the frequency, hazardous effect and exposure values used in the risk analysis are realistic and correspond to the environmental conditions characteristic of the sector. In addition, the operator has elaborated measures for unacceptable risks, and has the appropriate human resources and technical conditions to implement the measures.
7. It is recommended that the sectoral authority create an integrated database from the analyzed sequence of events data plus risk reduction measures, which can ensure objective decision-making on the one hand, the basis of a full-scale analysis on the other hand and, furthermore, map the tasks of the state's role on the third hand.

NEW SCIENTIFIC FINDINGS

1. After a comparative analysis of the international, European Union and domestic environmental sustainability strategy-making, as well as the specifics of industrial safety, I **determined** the strategic target areas related to the development of the domestic energy sector and the conceptual elements of energy industry safety, which serve the safe operation of the facilities of the energy sector. Based on my research, I **proved** the strategic importance of industrial safety in the environmental dimension of sustainable development.
2. Following the **development** of the analysis methodology of the strategic target areas for the energy sector's contribution to environmental sustainability, relevant from the point of view of industrial safety, I **identified** for each strategic development target area the system of strategy creation and technical aspects that lay the foundation for the sustainable development of the sector and at the same time aim at energy industry safety.

3. After identifying the main industrial safety, supply security and technical security challenges limiting the achievement of the energy sector's environmental sustainability strategic vision – related to technical and meteorological factors, as well as the identification and authorization procedure – I made a **technical proposal** for their possible management options at operator level, and based on my test results I developed a **procedural and methodological proposal** for the development of official acceptability criteria to be used for the identification procedure of plants dealing with hazardous substances.

RECOMMENDATIONS

1. The strategic importance of industrial safety in the environmental dimension of sustainable development – proven in the thesis with theoretical arguments – can serve as a guideline and reference point for the reduction of emergency pollutant emissions in the process of sustainable development during strategic planning.
2. The system of strategic target areas relevant to industrial safety identified in the thesis, created by analogy with the triple task system (prevention, protection, recovery) of disaster management, can serve as a methodological basis for the analysis of the topic of sustainable development from the point of view of industrial safety.
3. The methodology of the energy industry safety strategy for environmental sustainability can be used in future strategic planning related to both sustainable development (environmental sustainability) and disaster prevention (industrial safety) either in the form defined in the thesis or expanded with new test conditions.
4. The system of the most typical industry, supply and technical security challenges related to the strategic target areas and the options and proposals aimed at their management and solution can contribute to the efficient performance of strategic monitoring tasks related to sustainable development.

THE PRACTICAL APPLICABILITY OF RESEARCH RESULTS

1. The thesis can serve as an aid, as a scientific and methodological basis for government strategic planning concerning the topic of sustainable development (especially environmental sustainability), climate change, environmental protection, energy, disaster prevention (industrial safety), and for the development of strategies on such topics.

2. With regard to emergency pollutant emissions, the thesis can be used for the formation of a sustainability approach at the operator level, and in the determination of tasks related to sustainable development within facilities dealing with hazardous substances.
3. In connection with the identified strategic target areas, the summary of the main industrial security, security of supply and other technical security challenges in the thesis and the proposals for their management can serve as a starting point for further technical research and development work aimed at environmental sustainability.
4. The suggestions contained in subsection 3.3 can help to ensure the continuity of the operation.

LIST OF PUBLICATIONS PREPARED BY THE PHD CANDIDATE

ARTICLES

In a peer-reviewed journal in a foreign language

- [1] Iván Sibalin, Zsolt Cimer, Lajos Kátai-Urbán, Béla Szakál: Hungarian legal and institution system for critical infrastructure protection. Science For Population Protection 12 1 pp 1-6 (2020) ISSN: 1803-635X

In a domestic peer-reviewed journal

- [2] Sibalin Iván, Kátai-Urbán Lajos; Vass Gyula: Environmental and industrial safety aspects of international regulations relating to the operation of energetic systems. Műszaki Katonai Közlöny 29 3 pp 153-161 (2019) ISSN: 2063-4986
- [3] Bognár Balázs, Cimer Zsolt, Kátai-Urbán Lajos, Sibalin Iván: Az energetikai rendszereket érintő nemzetközi környezetbiztonsági szabályozás értékelése – I. rész. Hadtudomány: A Magyar Hadtudományi Társaság Folyóirata 28: E-szám pp. 111-121. (2018) ISSN 1588-0605
- [4] Bognár Balázs, Cimer Zsolt, Kátai-Urbán Lajos, Sibalin Iván: Az energetikai rendszereket érintő nemzetközi környezetbiztonsági szabályozás értékelése – II. rész. Hadtudomány: A Magyar Hadtudományi Társaság Folyóirata 28: E-szám pp. 174-184. (2018) ISSN 1588-0605
- [5] Sibalin Iván: Magyarország energiapolitikai érdekeinek környezet- és iparbiztonsági szempontú stratégiai elemzése 1. rész. Hadmérnök 15 4 pp. 107-118. (2020) ISSN 1788-1919

- [6] Sibalin Iván: Magyarország energiapolitikai érdekeinek környezet- és iparbiztonsági szempontú stratégiai elemzése 2. rész. Hadmérnök 16 2 pp. 141-156. (2021) ISSN 1788-1919

In other domestic professional journals

- [7] Sibalin Iván, Vass Gyula: Az ENISA által meghatározott aktuális technológiai kihívások kezelése a katasztrófavédelem szemszögéből. Védelem Tudomány: Katasztrófavédelmi Online Tudományos Folyóirat III.: 2. pp. 119-134. (2018) ISSN: 2498-6194
- [8] Sibalin Iván: Az energetikai létfontosságú rendszerek és létesítmények védelmével kapcsolatos szabályozás bemutatása. Védelem Tudomány: Katasztrófavédelmi Online Tudományos Folyóirat II.: 3. pp. 84-97. (2017) ISSN: 2498-6194
- [9] Sibalin Iván, Kátai-Urbán Lajos, Cimer Zsolt: A horvátországi LNG-terminál fejlesztés értékelése. Védelem Tudomány: Katasztrófavédelmi Online Tudományos Folyóirat. 5: 1 pp. 153-166. (2020) ISSN: 2498-6194

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Peer-reviewed lecture in a foreign language

- [10] Kátai-Urbán Lajos, Érces Gergő, Sibalin Iván, Vass Gyula: Risk assessment in the field of disaster management in Hungary. In: Branko, Savic (szerk.) 13. МЕЂУНАРОДНО САВЕТОВАЊЕ РИЗИК И БЕЗБЕДНОСНИ ИНЖЕЊЕРИНГ ЗБОРНИК РАДОВА. Novi Sad, Szerbia: Visoka Technicka Skola (VTS), pp. 340-345. (2018)
- [11] Sibalin Iván, Kátai-Urbán Lajos, Vass Gyula, Cséplő Zoltán: Development of fire protection engineering education in Hungary. In: Michal, Titko; Daniel, Brezina; Romana, Erdélyiová; Stanislava, Gašpercová; Michal, Peňaška (szerk.) RIEŠENIE KRÍZOVÝCH SITUÁCIÍ V ŠPECIFICKOM PROSTREDÍ: zborník príspevkov z 23. vedeckej konferencie s medzinárodnou účasťou. Zilina, Szlovákia: Žilinská univerzita v Žiline, pp. 327-332. (2018)

PROFESSIONAL-SCIENTIFIC BIOGRAPHY OF THE DOCTORAL CANDIDATE

Name: dr. Ivan Sibalin

Place and time of birth: Budapest, October 26, 1988.

Studies: In 2012, he obtained a diploma in International Studies at Corvinus University of Budapest, and in 2017 in Law at Eötvös Loránd University.

Professional career:

Between 2009 and 2012, he was an external employee of the Institute for Minority Studies of the Hungarian Academy of Sciences. In 2017, he continued his career as a legal expert at the Department of European Cooperation of the Ministry of the Interior, and from January 2018 he became the head of the office of the Institute of Disaster Management – National University of Public Service. From August 2018, he performed the duties of head of department and professional consultant at the Deputy State Secretariat for Strategic Analysis of the Prime Minister's Office. He is currently a chief government advisor of the State Secretariat for Strategic Affairs of the Prime Minister's Office.

Language skills:

He has an intermediate level exam in English and Russian, and an advanced level complex language exam in Croatian and Serbian.

Qualification:

In 2019, he passed the public administration examination with an excellent rating.

Memberships:

Between 2018 and 2019, he participated as a member of the National University of Public Service – University Doctoral Council, and between 2018 and 2022, in the Hungarian National Commission for UNESCO. From 2021, he has been a member of the Hungarian Association of Police Science. In 2022, he became the portfolio coordinator of the Prime Minister's Office in the OECD National Council.

Awards, recognitions:

In 2021, for his high-quality professional work he was awarded a certificate of ministerial recognition from the Minister of the Prime Minister's Office.

Budapest, November 2, 2022.



dr. Ivan Sibalin