



LITHUANIA  
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16TH INTERNATIONAL SCIENTIFIC CONFERENCE

***ON SUSTAINABLE REGIONAL DEVELOPMENT:  
CHALLENGES AND SOLUTIONS FOR THE FUTURE 2025***

***Klaipeda, Lithuania, 3-4<sup>nd</sup> October 2025***

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**Abstract Book**

Editors

Jurgita Martinkiene – Szergej Vinogradov

Budapest Metropolitan University  
Budapest, 2025

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Published by  
Budapest Metropolitan University, Budapest, Hungary  
Under the supervision of Prof. Dr. Tamás Gergely Kucséra

H-1148 Budapest, Nagy Lajos király útja 1-9.

Tel.: +36-1/273 2467

<https://www.metropolitan.hu>

ISBN 978-615-5459-56-6 (print)

ISBN 978-615-5459-57-3 (online)

## CONTENT

**Anatoliy Melnyk, Viktor Voloshyn, Taras Rak**

*Interuniversity Research and Innovation Center: a Platform for International Collaboration in Developing Advanced Solutions in Information Technologies* ..... 25

**Agnieszka Astapczyk, Kamila Trojanowska, Katarzyna Bartczak, Małgorzata Nadolska Zduńska**

*The Role of Kpis in the Process of Improvement and Production Management* ..... 26

**Asta Valackienė, Renata Karpavičė**

*Can Small Business Stay Cyber Secure While Relying on Personal Mobile Devices? ..* 26

**Asta Valackienė, Kateryna Svichkar, Yauheni Tsurhanau**

*How Social Media Can Help Us to Increase Brand Awareness:*

*What is the Experience? .....* 27

**Angelė Lileikienė, Eglė Brezgytė**

*Assessment of Innovation Support and Technology Transfer in HEI* ..... 27

**Algirdas Giedraitis, Rasa Romerytė-Šereikienė, Arturas Petrauskas, Dalius Kurlinkas**

*Change Management in a Waste Management Center: Readiness for Change Phase .* 28

**Angelė Lileikienė, Jurgita Martinkienė, Justinas Jonušas**

*Business Models, Enabling Evaluation the Company's Financial Condition* ..... 29

**Džeina Kleina-Šnipke, Kārlis Krēsliņš**

*NEET Youth and the United Nations Sustainable Development Goals: A Case Study of Latvia* ..... 30

**Jana Španková, Katarína Kráľová, Jana Sochuľáková**

*The Impact of Artificial Intelligence on the Transformation of the Labor Market: Challenges, Opportunities, and Perspectives* ..... 31

**Jovita Einikienė**

*Reforms in the Field of Justice and their Impact on the Right to Court* ..... 31

**Francesca Capolini**

*The Role of ESG Disclosure in Driving Performance in the Energy Transition* ..... 33

**Faton Shabani**

*The Ratio Between Premiums and Claims Paid by Insurance Companies in the Republic of North Macedonia* ..... 33

|                                                                                                                                                                                                                            |           |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------|
| <b>Genovaitė Avižonienė, Patricija Kemte, Alesia Kozlinskaja</b><br><i>Some Challenges to Financial Stability During the Economic Downturn .....</i>                                                                       | <i>34</i> |
| <b>Egidijus Nedzinskas, Renata Šliažienė</b><br><i>New Challenges of Corruption in the Context of Digital Transformation .....</i>                                                                                         | <i>36</i> |
| <b>İlhan Tarımer, Simona Grigaliūnienė, Zubair Tahir</b><br><i>Developing A Decision Support Interface Software For Property Valorization System</i>                                                                       | <i>37</i> |
| <b>Larysa Antoniuk, Yuliia Strilchuk, Mariia Sandul, Vladyslav Lavreniuk</b><br><i>Financial Ecosystem in a War-Affected Economy: The Case of Ukraine .....</i>                                                            | <i>38</i> |
| <b>Līga Roķe-Reimate, Anita Lasmane, Lāmsa Balceraitė, Alisa Lāce, Iveta Broliša</b><br><i>Mindfulness and Financial Behaviour in College Students: the Mediating Role of Financial Self-Efficacy Across Genders .....</i> | <i>38</i> |
| <b>Ligita Āzena</b><br><i>Merchandising as a Strategic Marketing Instrument for Attracting Consumer Attention in a Saturated Market Environment .....</i>                                                                  | <i>40</i> |
| <b>Ľuboš Kazán, Maroš Korenko, Lukáš Hanko, Kristina Puleikienė</b><br><i>Enhancing Data-Driven Sustainability Through Digital Quality Management In Automotive Manufacturing .....</i>                                    | <i>41</i> |
| <b>Lea Hakszer, Rastislav Mikuš, Simona Grigaliūnienė</b><br><i>Practical Surface Wear Evaluation Using 3D Scanning and Open-Source Tools for Applied Research .....</i>                                                   | <i>42</i> |
| <b>Karyna Anapriiuk, Larysa Antoniuk</b><br><i>Sustainable Development of Space Economy: Conceptual Frameworks and Emerging Challenges .....</i>                                                                           | <i>43</i> |
| <b>Kristína Kozová, Simona Kosáková, Martin Šrámka</b><br><i>The Silent Weight of Benefits: Generational and Gender Dimensions of Workplace Satisfaction.....</i>                                                          | <i>44</i> |
| <b>Jānis Grasis, Renata Šliažienė</b><br><i>Artificial intelligence and law: mutual influence and future.....</i>                                                                                                          | <i>44</i> |
| <b>Jurgita Martinkienė</b><br><i>Integrating Digital Management Competencies into Resilient Business.....</i>                                                                                                              | <i>46</i> |

**Marcel Kordoš**

*Circular Economy within the Smart City Policy Concept – Implications in EU and Slovakia..... 47*

**Marcin Rabe, Monika Klos, Anna Szydłowska, Małgorzata Nadolska-Zduńska**

*Customer Relationship Management in Practice: Analysis of CRM System Effectiveness in the Context of Customer Loyalty ..... 48*

**Mihaela Simionescu**

*From Traditional to Modern Approach: Leadership Through Sustainable Development ..... 48*

**Monika Klos, Agnieszka Astapczyk, Katarzyna Bartczak, Małgorzata Andrukajtis**

*The Impact of Different Concepts of Motivating Employees on Their Commitment at Work ..... 49*

**Natalia Iershova**

*Accounting Philosophy as a Strategic Direction of The Discourse of Sustainable Business Management..... 50*

**Oleksandra Ovchynnykova, Valentinas Navickas**

*Blue Economy: Labour Automation as a Driver of Regional Sustainability..... 51*

**Olha Abramova, Yuliia Peniak**

*ESG in E-Commerce: Responsible Marketing or Sustainable Development Strategy?. 52*

**Roushdat Elaheebocus, Simona Grigaliūnienė**

*Engaging University Students In Sustainable Health Behaviours Through Virtual Reality Exergaming: Comparative Insights From Mauritius And Lithuani ..... 53*

**Roman Galych**

*Regarding the New Concept of Social Partnership in Labor Relations in Ukraine on the Path to EU Accession ..... 54*

**Toader (Mitrache) Roxana Bianca**

*Data-Driven Sustainability: Artificial Intelligence (AI), Cybersecurity, Digitalization Processes ..... 56*

**Taras Rak, Olga Smotr**

*Strategies for Integrating Artificial Intelligence into the Training of Civil Protection Specialists ..... 57*

## **Strategies for Integrating Artificial Intelligence into the Training of Civil Protection Specialists**

This paper explores strategic approaches to integrating artificial intelligence (AI) into the training of civil protection specialists. In response to the growing complexity of natural and man-made threats, AI offers transformative potential in personalizing education, simulating crisis scenarios, and enhancing decision-making. The authors propose adaptive learning models based on trend analysis and emphasize the importance of ethical implementation, cybersecurity, and teacher training. The study concludes that AI can reshape pedagogy in security-oriented fields, provided that risks are mitigated through scientifically grounded strategies and continuous policy adaptation.

In an era marked by the rapid escalation of natural disasters, man-made accidents, and geopolitical conflicts, the training of civil protection (CP) specialists is becoming increasingly complex. Traditional educational paradigms often fail to address the dynamic nature of these threats, necessitating innovative approaches – such as the integration of artificial intelligence into the educational process. AI holds transformative potential for simulating crisis scenarios, personalizing learning paths, and enhancing decision-making under uncertainty. However, its implementation raises critical questions regarding strategy, impact, and security. This paper explores strategic approaches to integrating AI into the training of CP specialists and offers scientifically grounded recommendations for its ethical and effective application in education.

Effective AI integration requires a multifaceted strategy that aligns technological capabilities with the specific needs of civil protection. A key approach involves developing adaptive learning models that leverage trend analysis to tailor educational trajectories. For instance, AI can analyze external factors such as climate change, urbanization, and digitalization to prioritize the competencies essential for CP specialists – such as risk assessment, emergency forecasting, and unmanned aerial vehicle (UAV) operation. This underscores the need for conceptual and mathematical models that encompass strategic trends in civil protection, competence profiles of specialists, and probabilities of emergency scenarios, thereby optimizing personalized learning paths for each student.

The significance of this issue is reflected in the growing interest, funding, and legislative support at the highest governmental levels across leading nations. For example, the U.S. Department of Homeland Security (DHS) outlines measures for managing AI in civil protection, including risk assessment and workforce training. Hybrid strategies, such as AI-driven simulations (e.g., rescue robotics workshops) combined with human oversight are receiving considerable attention. Similarly, the European Civil Protection Knowledge Network promotes the use of AI in hazard data analysis and virtual training environments, emphasizing the importance of diverse datasets to avoid gaps in real-world applicability. At the regional level, policymakers in Albania, Kosovo, and North Macedonia stress the importance of international cooperation and capacity building, recommending alignment with global funding for phased AI deployment. These strategies highlight the value of foresight analysis, SWOT assessments, and scenario modeling to dynamically adapt training programs and ensure preparedness for multifaceted threats.

AI integration is profoundly reshaping education in security-oriented fields, offering both opportunities and challenges. It enables personalized learning by automating routine tasks and facilitating realistic simulations that accelerate skill acquisition in areas such as crisis prediction and resource management – potentially reducing economic losses from emergencies. However, the use of AI in education also presents risks. While it enhances training, it may lead to data breaches, algorithmic bias, and diminished critical thinking among students. For example, reliance on generative AI tools can foster dependency on automation, potentially undermining independent decision-making

in high-risk scenarios. Moreover, AI introduces new cybersecurity vulnerabilities, requiring educational institutions to address threats such as model attacks and data leaks.

Overall, AI is driving a shift toward interdisciplinary, data-driven pedagogy, but safeguards are essential to mitigate its adverse effects on student autonomy and system reliability. To harness AI's benefits while minimizing its risks, implementation must be guided by scientifically sound principles – particularly those concerning data confidentiality and ethical use. A crucial component is continuous professional development for educators, incorporating AI literacy into curricula to foster ethical competencies. Pilot programs can serve as a testing ground to evaluate effectiveness prior to full-scale deployment. As global challenges evolve, ongoing research and adaptive policies will be vital to sustaining AI-enhanced educational ecosystems.

Keywords: *artificial intelligence, civil protection, adaptive learning, crisis management, cybersecurity, sustainable training.*

JEL classification: O33, I23, H56, K24, M53.

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## **Examination of the Social, Income and Housing Quality Components of Energy Poverty Based on Eurostat Data**

Energy poverty characterized by a household's inability to afford adequate energy services for a decent standard of living, extends beyond mere income deprivation, encompassing factors such as poor housing conditions, high energy prices, and inefficient energy consumption. Consequently, understanding and addressing energy poverty requires a holistic approach. Energy poverty is also shaped by factors such as the energy efficiency of dwellings, the cost of energy, and individual energy consumption behaviours. Early scholarly contributions, notably Brenda Boardman's seminal work, established the foundational understanding of energy poverty as a condition where households are unable to afford adequate energy services to maintain a healthy and comfortable living environment. Building on Boardman's work, subsequent research has further refined these factors, integrating aspects like energy efficiency, housing quality, and the broader socio-economic context to provide a more nuanced understanding of energy poverty dynamics. The complexity behind the concept of energy poverty has led to varied measurement approaches globally, with no single, universally accepted standard for assessing energy poverty, leading to challenges in international comparability and policy implementation. Recognizing these complexities, the European Union has moved towards a more comprehensive understanding, seeking to integrate various dimensions into a cohesive Framework. The European Union's approach often incorporates metrics such as the inability to keep homes adequately warm, the presence of leaking roofs or damp walls, and high housing cost overburden rates to capture the lived experiences of energy-poor households.

This research employs a methodology centred on four basic indicators extracted from Eurostat data, enabling a comprehensive examination of energy poverty's social, income, and housing quality components. Specifically, the selected indicators—percentage of total population living in a dwelling with structural defects, percentage of households unable to keep home adequately warm, and housing cost overburden rate—offer a robust framework for assessing the multifaceted nature of energy poverty across EU member states. The general trend indicates a slight improvement in the level of energy poverty across EU countries, albeit with persistent variations between the best and worst performers. While some policy measures may be effective

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Supporting scientific journal:

**Journal of Management** ISSN 1648-7974

# VADYBA

2025, Nr. 2 (41)

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## MOKSLO TIRIAMIEJI DARBAI

**Turiny / Contents**

|                                                                                                           |    |
|-----------------------------------------------------------------------------------------------------------|----|
| Vedamasis žodis / Editorial                                                                               | 7  |
| Algirdas Giedraitis, Rasa Romerytė-Šereikienė, Artūras Petrauskas, Dalius Kurlinkas                       | 9  |
| Assessing Readiness for Change in Waste Management Centers: a Change Management Approach                  |    |
| Džaina Kleina-Šnipke, Kārlis Krūliņš                                                                      | 25 |
| Employee Engagement Across Borders: A Gallup-Based Analysis of Global Workforce                           |    |
| Greta Gruodė, Jolita Variakojienė, Neringa Mimiotienė                                                     | 35 |
| Aligning ESG, SDGS, and Firm Performance: Lessons From Practice                                           |    |
| Luboš Kazán, Maroš Korenko, Lukáš Hanko, Kristina Puleikienė                                              | 43 |
| Enhancing Data-Driven Sustainability through Digital Quality Management in Automotive Manufacturing       |    |
| Kristina Kozová, Simona Kosáková, Martin Šrámek                                                           | 53 |
| The Silent Weight of Benefits: Generational and Gender Dimensions of Workplace Satisfaction               |    |
| Jovita Firnikienė, Erika Stočkienė                                                                        | 61 |
| Peculiarities of the Application of Temporary Protective Measures in Civil and Administrative Proceedings |    |
| Soekmawati, Robert Jeyakumar Nathan, Simona Grigaliūnienė                                                 | 73 |
| Household Food Donations in Malaysia: an Integrated Norm Activation and Planned Behaviour Approach        |    |
| Waldemar Gajda, Hanna Górka-Warszewicz, Kinga Podleśna                                                    | 83 |
| AI-Based Innovation Management: a Bibliometric Analysis                                                   |    |
| REIKALAVIMAI STRAIPSNIŲ RENGIMUI                                                                          | 95 |
| REQUIREMENTS FOR THE PREPARATION AN ARTICLE                                                               |    |