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Editorial: Evolution of environmental economics and management in the age of artificial intelligence for sustainable development

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Editorial on the Research Topic
Evolution of environmental economics and management in the age of artificial intelligence for sustainable development

Introduction

An environmental economy is a realm in which economic practices and social and environmental effects are well-balanced and systemically high (Ramzan et al., 2023). This economy shows optimal conditions for implementing a set of environmentally Sustainable Development Goals (SDGs) (Popkova, 2022). The environmental economy includes the transition to climate-resilient (decarbonisation to support SDG13) and clean (renewable–which preserves the heritage of fossil fuel for future generations to support SDG7) energy (Popkova and Sergi, 2021), responsible communities and sustainable territories (SDG 11), practices of responsible production and consumption (SDG 12) and preservation of biodiversity and protection of ecosystems (SDGs 14–15). The COVID-19 pandemic and multiple new zoonotic diseases require coordinating efforts to protect the environment and healthcare. SDG 3 is supported in the environmental economy (Popkova and Shi, 2022).

These new economic practices are deep-rooted in economic systems in developed and developing countries (Sharma et al., 2023). In the 21st century, the Fourth Industrial Revolution led to the evolution of the environmental economy. More perfect and leading technologies became affordable and widespread; they transformed the above institutes and the managerial mechanisms that influence them (Ayakwah and Damoah, 2022).

The Decade of Action is the age of artificial intelligence since artificial intelligence technologies have become widespread and widely used in practice (Haq et al., 2022; Khan et al., 2023; Zador et al., 2023). Decision support, smart technologies and automatised

environmental monitoring and control on artificial intelligence outline a new technological landscape of the environmental economy and the horizons of its development until 2030 and, perhaps, further on (Pagallo et al., 2022; Lei et al., 2023; Stahl et al., 2023).

The extant literature described some aspects of using artificial intelligence technologies in the environmental economy (Asha et al., 2022; Ligozat et al., 2022). However, as the general knowledge is fragmentary, this Research Topic aims to delve into current trends and prospects for the environmental economy in the age of artificial intelligence. The Research Topic connects all aspects of adaptation of the environmental economy to the age of artificial intelligence to support sustainable development. In the extant literature, environmental management practices were considered fragmentarily, and this research gap is what Research Topic fills. On the one hand, smart technologies create new opportunities for developing green economic practices. On the other hand, digital innovations can pose a direct danger or hidden threat to nature and environmental management helps disentangle and balance opportunities and threats.

This Research Topic had to reach the three following tasks. The theoretical task: conceptualising the notion and clarifying the essence of environmental AI economy as a category *per se*. The methodological task: describing the economic and managerial foundations of monitoring and regulating the environmental economy in the age of artificial intelligence. The empirical task of the Research Topic is to recommend proposals for the environmental AI economy.

Overview of the Research Topic

This Research Topic sheds light on the international experience of sustainable and environmental development of the energy economy. Amid Industry 4.0 and the digital economy, sustainable and environmental development of the energy economy takes place on Smart Grids and EnergyTech. All papers on the Research Topic elaborate on the notion that environmental management must be flexible enough to adapt successfully to new opportunities and threats in the age of artificial intelligence.

Skiter et al. formulated the concept of smart ecology, which allows for identifying a close association between the conditions of smart ecology and the sustainable development of an enterprise. The authors scrutinised the sustainable development of companies under the conditions of smart ecology. Innovation management under the Fourth Industrial Revolution conditions relates to risks. Since it requires information to support managerial decision-making, the authors developed an expert machine learning and artificial intelligence system that increase the effectiveness of smart ecology technologies.

Ragulina et al. settled the contribution of the environmental AI economy to decarbonisation and waste reduction. The authors created a model of the evolution of the artificial intelligence economy and the environmental AI economy as its ongoing stage by identifying the contribution of each element of digital competitiveness towards decarbonisation and reduction of production and consumption waste. The authors also proposed a set of recommendations for unlocking the potential of the environmental AI economy in support of decarbonisation and waste reduction.

Atabekova et al. studied the role of education and social policy to prove the leading role of universities in the development of responsible production and consumption in the environmental AI economy. By developing knowledge and technologies, the authors also recommended developing education and improving social policy to support responsible production and consumption in the AI economy.

Vagin et al. justified the role of technologies in environmental decision-making and business management, which is related to harmonising the balance of economic and environmental interests. Multiple examples of Russian companies show that high technologies have a potential for decision-making effectiveness in the production sector, AgroTech and other sectors.

Khoruzhy et al. performed an overview of international experience in 2021. The authors' recommendations outlined the priorities in the AI economy for the most effective support of investments in ESG and a new basis for classifying countries. The authors developed a theory of interconnection between ESG and artificial intelligence, proving this at the level of institutes, not only technologies. A novel approach to developing ESG investing in the age of artificial intelligence considers the possibility of using the leading innovative technologies in practice.

Lobova et al. discovered the current trends in the management of the environment associated with the increase in environmental indicators and reduction of rent from natural resources. Sustainable artificial intelligence was reconsidered as an intelligent technology for environmental protection. The authors also discovered its significant potential. Based on the experience of the OECD countries and Russia, the authors showed that the prospects of the economy and management of the environment in the post-COVID-19 period include a better potential for sustainable artificial intelligence.

Chutcheva et al. distinguished three types of activity that make the oil and gas business socially responsible: production and supply, financial and environmental management. Using various case examples, the authors demonstrated that AI could be useful for the environmental management of oil and gas companies during oil and gas field development and transportation.

Osipov and Skryl rethought the role of environmental justice in the Decade of Action. They confirmed that environmental inequality has increased during the COVID-19 pandemic. The example of experience in developed (G7) and developing (BRICS) countries showed that achieving environmental justice lies in social and technological progress and the optimal use of artificial intelligence.

Vorozheykina identified challenges of the age of AI: on the one hand, an increase in CO2 emissions and the reduction of the share of clean energy in robotisation. On the other hand, support for decarbonising the AI economy. Breakthrough innovations may accelerate or slow down the processes of reduction of CO2 emissions. The transition to clean energy considers state and corporate sectors while managing environmental and economic development.

Kukushkina et al. proved that AI governs success in slowdown/preventing the depletion of natural resources. The authors described the contribution of artificial intelligence to environmental competitiveness in the context of components of competitiveness

and the light of implementing the Sustainable Development Goals (SDG). The authors support artificial intelligence's flexibility and effectiveness in managing environmental and economic development.

Khoruzhy et al. contribute to environmental taxation to maintain the environmental economy in developed and developing countries worldwide. The authors explained a universal tool for environmental protection and preservation of biodiversity and unlocking the potential provided by the AI economy for the maximum increase in the contribution of environmental taxation to the protection of the environment and preservation of biodiversity.

Yankovskaya et al. postulated the development of corporate social responsibility from the standpoint of Stakeholder Theory through the example of the global COVID-19 crisis and the international sanction crisis. The authors proposed a new theoretical interpretation of corporate social responsibility as a socioeconomic and environmental practice that requires systemic management.

Hongsuchon et al. provide evidence that customer trust and commitment are decisive in ensuring the high effectiveness of online commerce platforms. This study includes an original sociological survey for a deep understanding of the nature of online commerce.

Popkova et al. elaborated on the lessons of the COVID-19 pandemic for ecological behaviour and biodiversity in Russia. In the 3P model of sustainable development, the authors corroborated the ecological behaviour in preserving biodiversity during the COVID-19 pandemic. Through the AI economy, they discovered a potential for preserving biodiversity by improving ecological behaviour in the post-COVID period. The authors foresee progress in implementing SDG 14 and SDG 15 by improving ecological behaviour in the AI economy.

Trukhachev and Dzhikiya described a complex chain of cause-and-effect relationships in the development of green finance in the age of artificial intelligence. The authors reflect on green finance and environmental management to discover that green finance can fully realise its potential for development only with intelligent technologies.

Krupnov et al. specified the notion of energy security from the perspective of the Sustainable Development Goals (SDG) and proved a contribution of sustainable and clean energy. Ensuring stability and high effectiveness of the energy system and environmental protection are accomplished more successfully by the fuel and energy complex with sustainable and clean energy development.

Sozinova et al. presented a complete ecological economy and management view. The digital economy and businesses could positively influence the ecological economy and management if the corporate social responsibility of the market participants is high. The authors showed that systemic management of the digital economy and business development in the age of AI is preferable, as it ensures a synergetic effect towards sustainable development.

Thus, the articles filled the literature gap, outlined the distribution of stakeholders' roles in the environmental economy in the age of artificial intelligence and designed a comprehensive view of environmental management.

Conclusion

The Research Topic "Evolution of Environmental Economics & Management in the Age of Artificial Intelligence for Sustainable Development" introduced the notion of an "environmental AI economy". This notion refers to all practices responsive to the environment and decarbonisation. Collectively, the papers enabled the understanding of the complexity of adapting the environmental economy to the age of artificial intelligence. Likewise, the Research Topic systemically expanded a range of directions for adapting the environmental economy to new opportunities for environmental protection. The state's contribution must ensure environmental justice, energy security, competitiveness, environmental taxation improvement and responsible production and consumption development. Society's contribution must be coupled with optimising environmental decisions, environmental awareness, improvement of environmental behaviour to protect biodiversity and preference for ESG investments.

Moreover, the Research Topic processed the cause-and-effect links of the environmental AI economy. It strengthened the concept of sustainable development as the balance of opportunities and threats, nature and technologies and stakeholders' interests. The proposed guidelines let improving the environmental AI economy management and the spreading of the best practices in developed and developing countries. The systemic view of environmental management quickens the selection of practical managerial tools and stakeholders' roles in environmental protection in the age of artificial intelligence.

Author contributions

All authors listed have made a substantial, direct, and intellectual contribution to the work and approved it for publication.

Conflict of interest

The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

Publisher's note

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