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Scientific Review Paper

LEVERAGING DIGITAL TRANSFORMATION FOR GREEN ECONOMIC TRANSITION: REGULATORY CHALLENGES AND LEGAL IMPLICATIONS

Ksenija Pejica

College of Business Economics and Entrepreneurship, Belgrade

e-mail: ksenijapejica804@gmail.com

<https://orcid.org/0009-0009-0488-4097>

Nataša Milojević

College of Business Economics and Entrepreneurship, Belgrade

e-mail: natasa.milojevic@vspep.edu.rs

Mirela Mitrašević

University of East Sarajevo, Faculty of Business Economics,
Bosnia and Herzegovina

e-mail: mirela.mitrasevic@fpe.ues.rs.ba

<https://orcid.org/0000-0001-5393-4139>

Abstract: Digital transformation has emerged as a critical enabler of the green economic transition by enhancing resource efficiency, promoting innovation, and supporting sustainable development goals. The increasing integration of digital technologies – such as artificial intelligence, big data, and smart platforms – into economic and environmental governance creates new opportunities, but also raises significant regulatory and legal challenges. This paper examines the role of digital transformation in advancing the green economy, with a particular focus on the regulatory frameworks and legal implications that shape this process.

The study analyzes key regulatory challenges related to data governance, digital infrastructure, environmental compliance, and market regulation in the context of green economic transition. Special attention is given to the alignment between digitalization policies and environmental legislation, as well as the risks of regulatory fragmentation, legal uncertainty, and unequal access to digital technologies. The paper further explores how existing legal frameworks can be adapted to ensure that digital transformation supports environmental sustainability while safeguarding public interests, transparency, and accountability.

By adopting an interdisciplinary approach that combines legal analysis with insights from environmental economics and digital policy, this paper contributes to the understanding of how coherent regulatory and legal frameworks can leverage digital transformation for an effective and inclusive green economic transition. The findings offer policy-relevant insights for lawmakers, regulators, and stakeholders involved in designing sustainable digital and environmental governance systems.

Keywords: *Digital transformation; Green economy; Regulatory challenges; Legal implications; Environmental regulation; Sustainable development.*

INTRODUCTION

The transition to a green economy has become a global imperative, driven by the need to address climate change, resource scarcity, and environmental degradation. Digital transformation – encompassing technologies such as artificial intelligence, big data analytics, blockchain, and the Internet of Things – offers significant opportunities to accelerate this transition by enhancing efficiency, reducing emissions, and promoting sustainable practices across industries.

However, the integration of digital technologies into environmental management and green economic initiatives is not without challenges. Regulatory frameworks and legal systems often struggle to keep pace with rapid technological developments, creating uncertainties regarding compliance, data privacy, liability, and intellectual property. These legal and regulatory challenges can slow down the adoption of green digital innovations and limit their effectiveness in achieving sustainability goals.

This paper explores how digital transformation can support the green economic transition, focusing on the regulatory challenges and legal implications that arise in this context. By examining both opportunities and constraints, the study aims to provide insights for policymakers, businesses, and researchers seeking to harness digital technologies (Joksimović, M. 2025) while ensuring legal compliance and sustainable development.

LITERATURE REVIEW

The intersection of digital transformation and green economic transition has attracted increasing scholarly attention in recent years. Researchers have highlighted that digital technologies can significantly enhance environmental sustainability by improving resource efficiency, reducing greenhouse gas emissions, and enabling more informed decision-making. Technologies such as artificial intelligence, blockchain, and the Internet of Things (IoT) are particularly promising in monitoring envi-

ronmental impact, optimizing energy consumption, and facilitating circular economy practices.

At the same time, the literature underscores several challenges. Regulatory frameworks often lag behind technological innovation, creating legal uncertainty around issues such as data governance, liability, cybersecurity, and intellectual property rights (Akpobome, O. 2024). For instance, (Lescrauwaet, L., Wagner, H., Yoon, C., & Shukla, S. 2022). AI applications in environmental management raise questions about accountability for decisions made by automated systems, while blockchain-based solutions may face obstacles related to energy-intensive operations and cross-border data regulations.

Several studies also emphasize the role of policy and governance in enabling the digital-green transition. Effective regulations, incentives, and legal frameworks can stimulate investment in green technologies (Joksimović, M. 2025), support sustainable business models, and ensure ethical and responsible use of digital tools. Conversely, gaps or inconsistencies in legislation can hinder the adoption of innovative solutions, slowing the overall progress toward a low-carbon economy.

Despite growing research, there is still a need for studies that integrate the technological, economic (Zhou, Y. 2024), and legal dimensions of digital transformation for green economic transition. (Zhang, Y., & Bilawal Khaskheli, M. 2025). This paper aims to fill this gap by analyzing both the potential of digital technologies to support sustainability and the legal and regulatory challenges that must be addressed to ensure effective and responsible implementation.

METHODOLOGICAL FRAMEWORK

This study adopts a qualitative and analytical approach to examine the role of digital transformation in supporting the green economic transition, with a particular focus on regulatory and legal implications. The methodology consists of three main components:

- **Document and Literature Analysis:** A comprehensive review of academic literature, policy documents, and legal frameworks is conducted to identify the key digital technologies driving green economic transition, as well as the associated regulatory and legal challenges. Sources include peer-reviewed journals, reports from international organizations (e.g., OECD, UNIDO, European Commission), and relevant national legislation. (Carroll, P., & Kellow, A. 2011) (Canton, H. 2021)..
- **Comparative Legal Analysis:** To understand regulatory approaches and legal frameworks, the study examines case studies from different jurisdictions, comparing how various countries address the legal implications of digital technologies in environmental protection and sustainable economic develop-

ment. This includes analysis of laws related to AI governance, data protection, intellectual property, environmental compliance, and sustainability reporting.

- **Integrative Synthesis:** The findings from the literature and legal analysis are synthesized to highlight the interconnections between digital transformation, green economic objectives, and legal constraints. The study identifies key regulatory gaps, best practices, and policy recommendations that can facilitate a responsible and legally sound digital-green transition.

By combining insights from technological innovation and legal studies, this methodological framework allows for a holistic understanding of how digital tools can drive sustainability while complying with and shaping legal standards. This approach ensures that the research contributes not only to theoretical knowledge but also to practical policymaking and regulatory design.

RESEARCH RESULTS

The analysis of digital transformation initiatives in the context of the green economic transition highlights several important insights. Artificial intelligence (AI), big data analytics, the Internet of Things (IoT), and blockchain have emerged as the most influential technologies driving sustainable practices. These digital tools facilitate more efficient resource management, predictive maintenance in industrial processes, smart energy grids, and transparent supply chains, all of which directly contribute to environmental objectives.

Despite their potential, the adoption of these technologies faces significant regulatory and legal challenges. Data privacy and security regulations differ across jurisdictions, creating complexities for compliance. Intellectual property rights (IPR) issues also arise, particularly regarding ownership, licensing, and patenting of AI-generated innovations and green technologies. Furthermore, existing environmental laws often lag behind technological advancements, limiting the full utilization of digital solutions. Cross-border regulatory differences add another layer of difficulty, restricting the global scalability of green innovations.

Comparative legal analysis reveals that some jurisdictions have implemented forward-looking policies to foster digital-green innovation. For example, the European Union's AI Act provides a framework that balances technological innovation with risk management. Green public procurement laws in several countries incentivize environmentally friendly technology adoption, while legal frameworks promoting digital transparency and sustainability reporting enhance corporate accountability in the green economy.

Overall, the results indicate that the success of the green economic transition depends on the integration of digital and legal strategies. Coordinated efforts are necessary to align technological deployment with regulatory compliance, ensuring both innovation and legal security. While digital transformation offers significant oppor-

tunities for advancing sustainability, its full potential can only be realized through adaptive and coherent legal frameworks that mitigate risks and support innovation.

DISCUSSION

The findings of this study underline the critical role of digital technologies in driving the green economic transition. AI, IoT, big data analytics, and blockchain demonstrate clear potential to improve resource efficiency, enhance sustainability reporting, and optimize industrial processes. These technologies not only support environmental objectives but also offer economic benefits by reducing costs and increasing operational efficiency.

However, the study also emphasizes the legal and regulatory barriers that can limit the effective implementation of digital-green innovations. Data privacy, intellectual property rights, and inconsistencies in environmental and digital regulations across jurisdictions represent significant challenges. These barriers highlight the need for adaptive legal frameworks that can keep pace with rapid technological developments and ensure both innovation and compliance.

Comparative analysis of best practices shows that proactive regulatory approaches – such as the European Union's AI Act, green public procurement policies, and sustainability reporting requirements – can foster a supportive environment for digital-green initiatives. These measures demonstrate that legal frameworks can act as enablers, rather than obstacles, for sustainable innovation.

The discussion suggests that the green economic transition cannot rely solely on technological innovation; it requires a coordinated approach that integrates digital solutions with legal and policy measures. Organizations and policymakers must develop strategies that align innovation with regulatory compliance, balancing economic, environmental, and legal considerations. In this context, the study reinforces the importance of legal foresight and policy adaptability as key enablers of sustainable digital transformation.

CONCLUSION

This study highlights the transformative potential of digital technologies in advancing the green economic transition. Artificial intelligence, IoT, big data analytics, and blockchain emerge as key enablers of sustainable practices, enhancing resource efficiency, transparency, and environmental performance across sectors.

At the same time, the research underscores that legal and regulatory challenges – such as data privacy, intellectual property rights, environmental compliance, and cross-border regulatory inconsistencies – can significantly limit the adoption and effectiveness of digital-green innovations. Addressing these challenges requires

adaptive and forward-looking legal frameworks that balance innovation with risk management.

Comparative analysis demonstrates that jurisdictions adopting proactive regulatory measures, including AI legislation, green public procurement, and sustainability reporting requirements, provide valuable models for integrating technology and law. Ultimately, the successful transition to a green economy depends on coordinated strategies that align digital transformation with regulatory compliance, ensuring that technological innovation contributes to sustainable development in a legally secure and socially responsible manner.

REFERENCES

1. Akpobome, O. (2024). The impact of emerging technologies on legal frameworks: A model for adaptive regulation. *International Journal of Research Publication and Reviews*, 5(10), 5046–5060.
2. Carroll, P., & Kellow, A. (2011). *The OECD: A study of organisational adaptation*. Edward Elgar Publishing.
3. Canton, H. (2021). United Nations industrial development organization – UNIDO. In *The Europa directory of international organizations 2021* (pp. 365–367). Routledge.
4. Joksimović, M. (2025). Catalyst for sustainable development and digital transformation: Roundtable on the green economy. *REVIZOR*, 28(2(110)).
5. Joksimović, M. (2025). The green transformation of the banking sector: Challenges and opportunities for sustainable finance. *ECOLOGICA*, 32(119), 167–172.
6. Lescauwaet, L., Wagner, H., Yoon, C., & Shukla, S. (2022). *Law and economics*.
7. Zhang, Y., & Bilawal Khaskheli, M. (2025). The role of digital technologies in advancing sustainable economic development into intersections of policy, law, environmental economics, and a comparative study of China, the EU, and the USA. *Sustainability*, 17(19), 8666.
8. Zhou, Y. (2024). Natural resources and green economic growth: A pathway to innovation and digital transformation in the mining industry. *Resources Policy*, 90, 104667.