

RESEARCH ARTICLE



New Trends in Sustainable Development for Industry 5.0: Digital Green Innovation Economy

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Abstract: In the context of increasing anti-globalization trends, sustainable economic development has become an inevitable and feasible solution to address the growing contradictions between social, environmental, and economic factors. It aims to achieve a balance between the needs of the economy, society, and the environment, paving the way for long-term sustainable development. This article is rooted in the backdrop of severe global conflicts between the environment and economy, as well as society. By synthesizing and analyzing a wide range of literature, this article explores the pivotal role of digitalization, green practices, and innovation in driving sustainable economic development. This article emphasizes the interconnectedness and collaborative nature of digital empowerment, green leadership, and innovation-driven approaches in promoting harmonious coexistence between humanity and nature, as well as facilitating high-quality economic growth. Drawing insights from the “Taipao e-Agricultural Insurance” case study, this article demonstrates the benefits derived from the integration of digital, green, and innovation strategies, thereby providing valuable guidance for enterprises and industries seeking transformation and development. Furthermore, this article proposes viable strategies for achieving the integration of digital empowerment, green practices, and innovation-driven development. It offers a comprehensive analysis that expands the existing research on these topics and lays the foundation for future in-depth exploration. The findings of this article carry both theoretical and practical significance, offering valuable insights and practical approaches for achieving sustainable development in various sectors.

Keywords: sustainable development, digital green innovation, sustainable economy, digital economy, green economy, innovative economy

1. Introduction

Since the Industrial Revolution, humanity has created material wealth at an unprecedented pace, while also highlighting resource and environmental issues, posing a growing threat to human survival and development. From June 5th to 16th, 1972, the United Nations held a conference on the human environment, proposing the concept of “human environment” and adopting the “Declaration on the Human Environment,” establishing the Environmental Programme. The adoption of the “Declaration on the Human Environment” has groundbreaking and milestone significance in the history of human environmental protection, marking the awakening of human environmental awareness and opening a new era of global environmental protection. On April 27, 1987, the World Commission on Environment and Development published a report entitled “Our Common Future,” proposing the strategic concept of “sustainable development” and defining the concept of “sustainable development.” This concept is based on the idea of “meeting current needs without compromising the ability and opportunities of the next

generation to meet their own needs,” aiming to achieve balanced development in the three aspects of economy, society, and environment. Afterwards, the international community has made continuous and unremitting efforts to address major global environmental issues such as climate change, biodiversity conservation, and desertification prevention. Protecting the Earth’s home, which humanity relies on for survival, has become a common concern for countries and all sectors of society around the world. Everyone is increasingly aware that while developing the social economy, protecting the ecological environment is the most wise choice to maintain sustainable and healthy development of human society. However, these efforts have failed to fundamentally curb the trend of continuous global environmental degradation, nor have they effectively narrowed the north-south gap. With the deepening of globalization and the intensification of issues such as climate change and environmental pollution, more and more social problems are constantly emerging. The frequent occurrence of extreme weather events such as floods, droughts, high temperature heatwaves, and low temperature cold damage has brought great losses to human life and property. Global warming leads to the melting of glaciers and ice caps, rising ocean water levels, threatening the safety of coastal cities, and may even lead to the disappearance of some islands and

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coastal areas. The balance of the ecosystem is threatened and disrupted, leading to issues such as species extinction, decreased biodiversity, and ecosystem degradation. At the same time, food security and human health have also been greatly threatened. In this context, sustainable development in the future has also become an important issue and goal that the world is facing, and environmental development issues urgently need to be addressed.

In the future, to solve the contradiction between the global environment and socio-economic development, digital, green, and innovation will become the key words for sustainable economic development [1]. The so-called digital economy refers to the economic form in which humans use big data to identify, select, filter, store, and use, guide and achieve rapid optimization and regeneration of resources, and achieve high-quality economic development. At the technical level, it includes emerging technologies such as big data, cloud computing, the Internet of Things (IoT), blockchain, artificial intelligence (AI), and 5G communication. At the application level, it is typically represented by “new retail” and “new manufacturing.” It has brought enormous economic benefits and increasingly become a new driving force for economic growth, while also having a profound impact on environmental sustainability [2]. The so-called green economy is a new economic form developed with market orientation, traditional industrial economy as the foundation, and harmony between economy and environment as the goal. It is a development state that industrial economy has emerged and demonstrated to adapt to human environmental protection and health needs, which is conducive to driving the development of environmental protection and related industries and cultivating new economic growth points [3]. The so-called economic innovation refers to the development of new products, the exploration of new markets, the discovery of new production factors, the introduction of new production methods, and the implementation of new enterprise organizational forms. The integration of digital, green, and innovative development will become a strong support and driving force for sustainable economic development.

2. Literature

2.1. Development of digital economy

In terms of digital economy development strategies, Daunorienė et al. [4] explored and provided a sustainable development method for the sharing economy business model, providing effective reference for decision-making support for the sustainable development transformation of the sharing economy business model. Borremans et al. [5] rated the largest IT companies based on commercial capital, revealing the transition of the Russian Federation toward a digital economy management foundation and forming an IT strategy formation model for the digital transformation of enterprise business processes. Liang and Li [6] explored how government support can affect the development of China’s digital economy, which is of great significance for the policy agenda of China’s digital economy development. In summary, experts and scholars have conducted in-depth research on how to better promote the development of the digital economy from different perspectives such as digital economy management and government policy support, but there is a lack of targeted discussion on the development of related technologies and infrastructure construction.

In terms of the importance of digital technology for sustainable economic development, Frenken [7] argues for the important role of digital technology in sustainable economic development from the

perspective of sustainability in the sharing economy. Borremans et al. [5] described the impact of digital technology on the level of social, social, and economic development in their study, confirming the necessity of managing digital transformation in socio-economic development. Pouri and Hilty [8] demonstrated the various positive and negative potential of sustainability of digital sharing at different system levels, providing reference for future research and policies in this field. The relevant research by Li et al. [9] has enhanced people’s understanding of sharing economy practices and provided empirical evidence for the relationship between sharing economy practices and sustainable performance in the construction industry. Zhang et al. [10] demonstrated that digital infrastructure, digital industry, and digital integration have a significant positive impact on regional total factor productivity, providing theoretical basis and practical support for the government to formulate digital economy development policies. Zhang et al. [11] concluded through research that the digital economy has a significant positive impact on economic growth and found that its main impact mechanism is through promoting industrial structure upgrading, total employment, and employment structure adjustment. In summary, scholars have analyzed and studied the sharing economy, digital technology, and digital industry as research objects and have achieved rich research results, effectively proving that the development of the digital economy plays an irreplaceable and important role in sustainable economic development in the future.

2.2. Development of green economy

In terms of green economy development strategies, Weng et al. [12] discussed the problems in China’s green development, further summarized and defined the international experience and connotation of green development, and proposed countermeasures and suggestions for China’s green development. Sulich [13] pointed out the sources of factors in the development of green economy in his research findings and proposed a solution to the “growth before cleaning up” strategy. Ali et al. [14] used SWOT analysis tools to analyze the strengths, weaknesses, opportunities, and threats of Ghana’s green economy transformation efforts and proposed that policymakers must prioritize science and technology education and support the development of green economy. In summary, scholars have used different analytical methods to identify some problems in the development of green economy and proposed corresponding solutions, laying a solid foundation for subsequent related research and pointing out future development directions.

In terms of the importance of green for sustainable economic development, Aceleanu [15] starts with an analysis of the concepts of sustainable development, green economy, and green employment, elaborates on the role of green employment in ensuring sustainable economic development, and emphasizes Romania’s position in this regard. Unay-Gailhard and Bojnec [16] focus on the use of labor in the circular economy and examine the potential of green economy measures to create green employment opportunities in the agricultural sector. Lavrinenko et al. [17] conducted a study using EU countries as case studies to explore the role of green economy in sustainable development. Zhao et al. [18] found that green finance is a powerful weapon to alleviate China’s energy poverty and accelerate the recovery of green economy, indicating that the green evolution of financial institutions is an effective means to promote the recovery of green economy in the post-COVID-19 era. In summary, experts have conducted targeted research on the importance of green economy development from different fields of socio-economic life,

enriching the research results of green economy development and laying a solid foundation for further research.

2.3. Development of economic innovation

In terms of economic innovation development strategies, Casadella and Uzunidis [19] used a multidimensional approach to analyze and study the innovation system, innovation, and economic development policies of southern countries, exploring economic innovation development strategies and methods. Hidalgo and Albers [20] comprehensively studied the scope, trends, and main participants (companies, organizations, governments, consultants, academia, etc.) of the development and use of management innovation methods in the economy and proposed the main innovation management technologies for improving enterprise competitiveness through knowledge management. Srikanth et al. [21] answered the question of what policy framework should be for encouraging entrepreneurship and cultivating a culture of innovation in India in order to achieve the expected level of economic development. Wu et al. [22] used the Jianshe Town Village Joint Development Platform in Yixing City, Jiangsu Province as an example to explore innovative paths and efficiency enhancing mechanisms for the development of the new rural collective economy. In summary, experts have conducted research and exploration on strategies for economic innovation and development, providing important references for economic innovation and sustainable development. However, there is a lack of systematic analysis of the problems existing in economic innovation and development in today's social development process.

In terms of the importance of innovation for sustainable economic development, Albers-Garrigos et al. [23] concluded that innovation management technology has a clear positive impact on the innovation achievements of enterprises. Rauter et al. [24] conducted in-depth research on open innovation and its impact on economic and sustainable innovation performance, clarifying the relationship between economic and sustainable innovation performance and contributing to the literature on open innovation. Yoo and Yi [25] found that the impact of economic innovation on the technology and social fields interacts with economic innovation, providing a comprehensive framework for the literature on how economic innovation is linked to social institutions and how technology, economy, society, and policy sectors evolve together within a vast social institutional framework. In summary, scholars have demonstrated through research that economic innovation methods such as technological innovation and management innovation can have an important promoting effect on the development of sustainable economy, further emphasizing the prominent position of economic innovation in future development.

2.4. Integrated development of digital, green, and innovation

In terms of the integrated development strategy of digital, green, and innovation, Yin and Yu [26] clarified in their research how manufacturing enterprises can improve their digital green innovation performance by seeking external partners, providing a theoretical basis for enterprises to smoothly carry out digital green innovation activities. Ji [27] empirically explored the short-term nonlinear and long-term dynamic impact of digital technology on tourism green total factor productivity by constructing Gaussian Mixture Model GMM and Panel Vector Autoregression PVAR models and proposed suggestions for continuously promoting the green transformation of the tourism industry. Wang et al. [28] proposed innovative development strategies based on social

development background, such as actively implementing green innovation policies, focusing on green technology innovation, and exploring digital talent training mechanisms, in order to promote the sustainable development of manufacturing enterprises in Heilongjiang Province. In summary, experts have elaborated and researched on the current integrated development strategy of digital, green, and innovation, but the research related to this is not extensive enough and has enormous research potential.

In terms of the role of integrating digital, green, and innovative development, Ciocoiu [29] found in their research that the integrated development between the digital economy and the green economy has brought new development models and created opportunities for economic recovery in the context of sustainable development and crisis. Hysa et al. [30] found a strong positive correlation between circular economy and economic growth by studying the results of two econometric models, highlighting the key roles of sustainability, innovation, and investment in promoting wasteless initiatives for wealth. Dolbnya et al. [31] took the Siberian Federal District as an example and found a direct relationship between the value of regional innovation development indicators and digital economy development indicators, believing that digital innovation is a factor in regional economic development. Ikram [32] studied the role of technological innovation in the fashion industry, starting from the transition to a green economy. Luo et al. [33] explored the direct, indirect, spatial, nonlinear, and policy effects of the digital economy on green innovation through benchmark regression models, mediation effects models, spatial Durbin models, dynamic threshold panel models, and stepwise differences in differences models. Ma and Xu [34] empirically tested the impact and mechanism of digital empowerment on green technology innovation in enterprises based on micro data of listed companies from 2010 to 2020. Research has confirmed that the integration of digital, green, and innovative development is an important trend in future economic development, and further in-depth research in this field is of great necessity and importance.

3. Methods: Case Study of “Taibao E-agriculture Insurance”

3.1. System introduction

“Taibao e-Agricultural Insurance” is a digital green agricultural insurance management system jointly developed and jointly created by China Taibao Property Insurance and the Chinese Academy of Agricultural Sciences. The technical system is reflected in three aspects: the use of mobile terminals and information interconnection technology to liberate labor, the use of 3S (RS + GIS + GPS), satellite and drone remote sensing technology to change labor tools, and the use of image recognition, spectral analysis, and machine learning technology to strengthen digital information analysis applications and adjust labor objects. The functional system includes four main contents: the business operation section achieves frontline operation mobility, traditional operation online, external process internalization, and internal process standardization through functional applications such as “standard inspection/survey assistant, e-key underwriting/claims settlement, mobile underwriting/claims verification, remote experts, and backend assistance.” The risk management section provides risk management and control services through functions such as “meteorological proof, disaster warning, risk map, meteorological services, and intelligent agriculture and Ruitian.” The consulting management section provides comprehensive consultation services for agriculture, rural areas, and insurance

information for users. The auxiliary tool section provides convenient and efficient services for users through multiple convenient mini program applications such as “water printing camera, acre measuring instrument, and aerial photography assistant.”

3.2. Main features

One is to achieve a transformation from extensive underwriting to precise underwriting and digitization of underwriting information: breaking the limitations of time and space, being able to remotely, conveniently, and quickly obtain accurate information about the underwriting subject matter. All information is directly uploaded to the entire anti-counterfeiting process by the backend system, and the associated files are digitally stored. It can quickly and accurately identify problems with insurance and determine the authenticity of insurance information, effectively ensuring the authenticity of insurance. It provides great convenience for post-claim settlement services.

The second is to achieve a transformation from extensive claims to fast and accurate claims. By utilizing wireless networks to achieve rapid transmission of damage detection information, satellite remote sensing damage detection technology, unmanned aerial vehicle remote sensing damage detection technology, and mobile internet damage detection technologies such as mobile phones and iPads are, respectively, suitable for large-scale, medium, and small-scale disaster loss detection and recognition, to meet the different requirements for accuracy and speed of identification in different situations, simplify the detection process, reduce detection costs, and improve work efficiency.

The third is the transformation from providing pure insurance services to comprehensive risk management services. The digital green agricultural insurance management system of “Taipao e-Agricultural Insurance” can provide disaster warning and meteorological services to insured farmers through historical big data and real-time data and assist users in timely and scientific disaster reduction measures to reduce farmers’ business risks.

The fourth is to achieve a transformation from complex business processes to simple business processes. The “Taipao e-Agricultural Insurance” has achieved full process automation through mobile and IoT technology applications, including self-service insurance, automatic underwriting, and automatic triggering of claims, greatly facilitating the use of farmers and also helping to dispel their concerns about insurance.

3.3. Reflection and inspiration

“Taibao e-Agricultural Insurance” is a typical case of the integration of digital, green, and innovative development. In this case, by constructing a digital agricultural insurance management system, it innovatively combines the development of digital and green agricultural insurance, uses modern digital technology to change labor tools, and provides accurate and convenient insurance services for the development of green agriculture. It meets the diversified security needs of farmers, especially the new agricultural management entities, and better adapts to the development of agricultural modernization. It is obvious that in the future, the sustainable and healthy development of “Taipao e-Agricultural Insurance” cannot be achieved without the deep integration of digital, green, and innovation. Only by being customer-oriented, innovation-driven, and utilizing new digital technologies as a breakthrough can we better serve national strategies, practice green insurance, ensure food security, serve the real economy, focus on major projects, and assist small and micro

enterprises. Only then can we better serve a better life, innovate risk models, and build a common prosperity guarantee. Only in this way can we better create a “responsible, intelligent, and warm” Tai Bao service and adapt to the trend of the times. In other industries and fields of social life, in the future development process, the three keywords of digital, green, and innovation cannot be missing. Promoting the deep integration of the three, fully leveraging their empowerment, leadership, and driving roles, can we calmly adapt to the rapidly changing social development, seize the new opportunities given by the times, and discover infinite possibilities and new hope.

4. Results

Based on previous relevant research and case studies, the trend of integrating digital, green, and innovative development in the future is unstoppable. Exploring the integration development strategy of the three, namely how to extend the depth and breadth of their integration, is gradually becoming an important topic for future social development. We believe that there are mainly the following points.

One is to guide the integration and development of existing digital technology and green technology, promote the organic integration of new generation information technologies such as 5G, AI, the IoT, industrial internet, cloud computing, big data, and green and low-carbon industries, expand existing digital technology application scenarios, promote the construction of smart cities, smart logistics, and smart transportation, and promote the bidirectional integration of digital technology and green technology through scenario integration [35].

The second is to accelerate new technological innovation with the characteristics of digital and green integration, accelerate the deep integration of digital technology with green technologies such as environmental pollution control, clean coal power generation, carbon capture, and carbon sequestration, enhance the digital content of green technologies, increase support for digital green technology innovation, provide a good innovation environment, and strengthen the role of digital empowerment, green leadership, and innovation driving [36].

The third is to fully leverage the regulatory role of data in green transformation. With the help of digital regulatory platforms, we will shift from civil air defense to technical defense, and from post-supervision to pre-warning. We will implement real-time monitoring and full process supervision of green transformation regulatory objects, strengthen the ability to penetrate supervision, implement precise and efficient supervision through appearances, and leverage data empowerment to strengthen supervision and improve efficiency through data. At the same time, attention should be paid to strengthening data security risk prevention and data property protection, providing effective institutional environment protection for orderly data flow and promoting green development.

The fourth is to encourage widespread social participation. On the one hand, it is to guide the public to establish the concept of green development, enhance their awareness of conservation, environmental protection, and ecology, cultivate green consumption habits, and form a lifestyle of “taking with moderation and using with restraint” [37]. On the other hand, it is necessary to cultivate innovative talents, deepen the reform of the talent system, vigorously cultivate high-quality, high-level innovative and entrepreneurial talents who can meet the needs of sustainable economic development, actively cultivate an innovative culture,

create an innovative atmosphere, and make innovation a common practice in the entire society.

5. Discussion: The Important Role of Digital, Green, and Innovation in Sustainable Economic Development

5.1. Digital empowerment

The digital economy supports economic innovation and growth. The widespread adoption of advanced digital technology has the potential to transform, upgrade, and replace traditional and inefficient industries. This transformation can significantly improve the quality and efficiency of various production processes across different sectors, infusing new vitality into traditional economic sectors. Consequently, this shift in economic dynamics can drive the emergence and development of innovative economic sectors and formats, ultimately enhancing the ability to achieve sustainable economic growth and changing the overall mode of economic development [38].

The digital economy creates new opportunities for resource allocation. The digital economy has had a profound impact on social division of labor, changing the development mode of traditional industries and promoting the transformation and upgrading of various industries. In the context of the digital economy, data elements promote high-quality economic development by improving production technology and optimizing the allocation of production resources [39]. The digital economy can foster a new ecosystem of public resource allocation, with dual effects of “information diffusion” and “value aggregation.” The flow of data elements can break administrative barriers and achieve cross-level, cross-departmental, and cross-regional information sharing. At the same time, in the digital economy era, the new forms of enterprise organization and business models based on platforms have weakened the location attributes and geographical limitations of traditional public resource trading markets [26].

The digital economy provides opportunities for green development. The digital economy and the real economy are deeply integrated, utilizing digital technology to efficiently promote industrial transformation and transformation, establishing internal collaborative mechanisms, driving the intelligent digital transformation of traditional industrial chains, improving production and management efficiency, promoting production with green, innovative, and sustainable as the core, exploring quantifiable, visual and implementable management methods, creating business and economic development opportunities, and achieving production and development benefits [40]. The accelerated development of new generation information technologies such as 5G has provided networked, digital, and intelligent technological means for green economic and social development and has become an important engine for promoting social energy conservation and emission reduction. The application of IoT technology can improve production efficiency, optimize resource allocation, and thereby reduce energy consumption and environmental pollution. For example, intelligent agriculture can achieve precise fertilization, irrigation, etc. through IoT technology, which not only improves the yield and quality of crops but also reduces the use of fertilizers and water. AI can help humans solve some environmental problems and play an important role in the circular economy, such as predicting climate change, optimizing energy consumption, and classifying and treating waste. At the same time, the development of digital technology has also brought new green lifestyles to

people. Taking shared bicycles, paperless offices, and smart public transportation as examples, the application of digital technology in these fields not only provides convenience for people’s lives but also reduces resource consumption, helping to form a “moderate and efficient” lifestyle throughout society and consciously practice the concept of green development.

5.2. Green leadership

Green consumption has become a new consumption hotspot, guiding innovation and change in the production field. With the improvement of economic development level and the promotion of sustainable development concept, consumers’ demand for environmental protection and healthy green consumption is growing day by day. Green consumption has become a new driving force for high-quality consumption development, which is of great significance for addressing climate change, protecting the environment and biodiversity, maintaining ecological balance, and promoting sustainable economic and social development [41]. The transformation of demand forces the transformation of production. In order to adapt to the formation of a consumption model that is moderate [42], green, low-carbon, and civilized and healthy, producers must change their traditional production methods and shift to researching and developing more environmentally friendly, low-carbon, and circular products, thereby promoting the innovation and development of green environmental protection technologies, which is conducive to the transformation and upgrading of economic structure. At the same time, it helps to promote the development of green industries such as energy conservation and environmental protection, new energy, and new energy vehicles and has a significant supporting effect on the economy. It has great potential to become a new engine of economic growth and also provides a foundation for upgrading green consumption.

5.3. Innovation driven

Technological innovation provides technological support and internal driving force for sustainable economic development. Technological innovation transforms production models, improves production efficiency and resource allocation rationality, and reduces production time and price costs, while reducing the degree of environmental damage to traditional industries, forming a green industrial system, and enhancing economic growth momentum [43]. Technological innovation can promote the upgrading of traditional industries through radiative effects, giving birth to new elements, further driving the development of new products and formats, and promoting sustainable economic development. Technological innovation supports the greening and digital transformation of the economy. As the main body of technological innovation, universities and research and development institutions provide new knowledge, technologies, and talents for enterprise production through scientific research and innovation, promoting the development of green industries. At the same time, institutional innovation provides a solid foundation and important guarantee for coordinated economic development, which can effectively solve various problems and contradictions in the process of sustainable economic development. Cultural innovation provides intellectual support and spiritual motivation for high-quality economic development, and the new development concepts of innovation, coordination, green, openness, and sharing have made significant contributions to sustainable economic development and social progress [44].

6. Conclusion

New trends in sustainable development are emerging at the intersection of the digital, green, and innovation economies. These trends are shaping the way we approach sustainability and drive economic growth.

- 1) Digitalization for Sustainability: The digital revolution is playing a crucial role in enabling sustainable development. Digital technologies such as the IoT, AI, and big data analytics are being used to optimize resource use, monitor and manage environmental impacts, and promote sustainable consumption and production. From smart energy grids to digital platforms for sharing resources, digitalization is transforming how we tackle environmental challenges.
- 2) Green Technologies and Practices: The transition to a greener economy is gaining momentum. Innovations in renewable energy, energy storage, green transportation, and eco-friendly materials play a pivotal role in driving sustainable development by effectively reducing carbon emissions and minimizing adverse environmental impacts. These advancements contribute to the transition to a more sustainable and environmentally conscious society.
- 3) Innovation for Sustainable Solutions: Innovation is key to addressing complex sustainability issues. It involves developing new technologies, business models, and approaches that contribute to sustainable development. Innovations in areas such as clean energy, sustainable agriculture, circular economy, and climate resilience are bringing transformative solutions to the forefront. Collaboration between startups, established companies, research institutions, and policymakers is fostering a vibrant ecosystem for sustainable innovation.
- 4) Circular Economy and Resource Efficiency: The circular economy is gaining prominence as a sustainable alternative to the traditional linear economic model. It emphasizes the reduction, reuse, and recycling of materials to create a closed-loop system. By minimizing waste generation, extending product lifecycles, and promoting the sharing and circularity of resources, the circular economy maximizes resource efficiency and mitigates environmental impacts.
- 5) Sustainable Finance and Investment: The financial sector is increasingly recognizing the importance of sustainable. The rise of sustainable finance and impact investing is driving capital toward environmentally and socially responsible projects. Sustainable finance initiatives, such as green bonds and sustainability reporting, are mobilizing funds for sustainable development, supporting green infrastructure projects, and promoting responsible business practices.
- 6) Collaborative Partnerships: Addressing sustainability challenges requires collaboration between various stakeholders, including governments, businesses, civil society organizations, and communities. Partnerships are emerging as a powerful tool to leverage collective expertise, resources, and influence to drive sustainable development. Collaborative initiatives are addressing issues such as climate change, biodiversity conservation, and social equity through shared responsibility and joint action.

In conclusion, the convergence of the digital, green, and innovation economies is shaping new trends in sustainable development. Digitalization, green technologies, innovation, circular economy principles, sustainable finance, and collaborative partnerships are driving the transition toward a more sustainable and inclusive future. Embracing these trends will contribute to economic growth while ensuring environmental sustainability and social well-being.

Funding Support

This research was funded by Philosophy and Social Sciences Planning Project of the Ministry of Education (21YJCZH203), Top Young Talents Scientific Research Project of Higher Education in Hebei Province (BJ2021084), and Scientific Research Foundation for the Talents of Hebei Agricultural University (YJ2020017).

Ethical Statement

This study does not contain any studies with human or animal subjects performed by any of the authors.

Conflicts of Interest

The authors declare that they have no conflicts of interest to this work.

Data Availability Statement

Data available on request from the corresponding author upon reasonable request.

Author Contribution Statement

Shi Yin: Conceptualization, Formal analysis, Investigation, Writing – original draft, Writing – review & editing, Project administration, Funding acquisition. **Lirui Liu:** Conceptualization, Investigation, Writing – original draft. **Tahir Mahmood:** Formal analysis, Writing – review & editing, Project administration.

References

- [1] Sjödin, D., Parida, V., & Visnjic, I. (2022). How can large manufacturers digitalize their business models? A framework for orchestrating industrial ecosystems. *California Management Review*, 64(3), 49–77. <https://doi.org/10.1177/00081256211059140>
- [2] Leino Lindell, T. (2020). Teachers calling for organizational support to digitalize teaching. *International Journal of Information and Learning Technology*, 37(5), 323–339. <https://doi.org/10.1108/IJILT-02-2020-0017>
- [3] Dincer, I., & Zamfirescu, C. (2012). Potential options to greenize energy systems. *Energy*, 46(1), 5–15. <https://doi.org/10.1016/j.energy.2011.11.061>
- [4] Daunorienė, A., Drakšaitė, A., Snieška, V., & Valodkienė, G. (2015). Evaluating sustainability of sharing economy business models. *Procedia-Social and Behavioral Sciences*, 213, 836–841. <https://doi.org/10.1016/j.sbspro.2015.11.486>
- [5] Borremans, A. D., Zaychenko, I. M., & Iliashenko, O. Y. (2018). Digital economy. IT strategy of the company development. In *MATEC Web of Conferences*, 170, 01034. <https://doi.org/10.1051/mateconf/201817001034>
- [6] Liang, L., & Li, Y. (2023). How does government support promote digital economy development in China? The mediating role of regional innovation ecosystem resilience. *Technological Forecasting and Social Change*, 188, 122328. <https://doi.org/10.1016/j.techfore.2023.122328>
- [7] Frenken, K. (2017). Sustainability perspectives on the sharing economy. *Environmental Innovation and Societal Transitions*, 23, 1–2. <https://doi.org/10.1016/j.eist.2017.04.004>

- [8] Pouri, M. J., & Hilty, L. M. (2018). Conceptualizing the digital sharing economy in the context of sustainability. *Sustainability*, 10(12), 4453. <https://doi.org/10.3390/su10124453>
- [9] Li, Y., Ding, R., Cui, L., Lei, Z., & Mou, J. (2019). The impact of sharing economy practices on sustainability performance in the Chinese construction industry. *Resources, Conservation and Recycling*, 150, 104409. <https://doi.org/10.1016/j.resco.nrec.2019.104409>
- [10] Zhang, W., Zhao, S., Wan, X., & Yao, Y. (2021). Study on the effect of digital economy on high-quality economic development in China. *PLoS One*, 16(9), e0257365. <https://doi.org/10.1371/journal.pone.0257365>
- [11] Zhang, J., Zhao, W., Cheng, B., Li, A., Wang, Y., Yang, N., & Tian, Y. (2022). The impact of digital economy on the economic growth and the development strategies in the post-COVID-19 era: Evidence from countries along the “Belt and Road”. *Frontiers in Public Health*, 10, 856142. <https://doi.org/10.3389/fpubh.2022.856142>
- [12] Weng, Q., Xu, H., & Ji, Y. (2018). Growing a green economy in China. *IOP Conference Series: Earth and Environmental Science*, 121(5), 052082. <http://doi.org/10.1088/1755-1315/121/5/052082>
- [13] Sulich, A. (2018). The green economy development factors. In *Vision 2020: Sustainable Economic Development and Application of Innovation Management from Regional Expansion to Global Growth: Proceedings of the 32nd International Business Information Management Association Conference*, 6861–6869.
- [14] Ali, E. B., Anufriev, V. P., & Amfo, B. (2021). Green economy implementation in Ghana as a road map for a sustainable development drive: A review. *Scientific African*, 12, e00756. <https://doi.org/10.1016/j.sciaf.2021.e00756>
- [15] Aceleanu, M. I. (2015). Green jobs in a green economy: Support for a sustainable development. *Progress in Industrial Ecology, an International Journal*, 9(4), 341–355. <https://doi.org/10.1504/PIE.2015.076894>
- [16] Unay-Gailhard, Ī., & Bojnec, Š. (2019). The impact of green economy measures on rural employment: Green jobs in farms. *Journal of Cleaner Production*, 208, 541–551. <https://doi.org/10.1016/j.jclepro.2018.10.160>
- [17] Lavrinenko, O., Ignatjeva, S., Ohotina, A., Rybalkin, O., & Lazdans, D. (2019). The role of green economy in sustainable development (case study: The EU states). *Entrepreneurship and Sustainability Issues*, 6(3), 1113–1126. [http://doi.org/10.9770/jesi.2019.6.3\(4\)](http://doi.org/10.9770/jesi.2019.6.3(4))
- [18] Zhao, J., Wang, J., & Dong, K. (2023). The role of green finance in eradicating energy poverty: Ways to realize green economic recovery in the post-COVID-19 era. *Economic Change and Restructuring*, 56, 3757–3785. <https://doi.org/10.1007/s10644-022-09411-6>
- [19] Casadella, V., & Uzunidis, D. (2017). National innovation systems of the south, innovation and economic development policies: A multidimensional approach. *Journal of Innovation Economics & Management*, 23(2), 137–157. <https://doi.org/10.3917/jie.pr1.0007>
- [20] Hidalgo, A., & Albors, J. (2008). Innovation management techniques and tools: A review from theory and practice. *R&D Management*, 38(2), 113–127. <https://doi.org/10.1111/j.1467-9310.2008.00503.x>
- [21] Srikanth, M., Kumar, G. N., & Reddy, W. R. (2020). Entrepreneurship, innovation, and economic development: An Indian experience. *SEDME (Small Enterprises Development, Management & Extension Journal)*, 47(3), 279–292. <https://doi.org/10.1177/09708464211042100>
- [22] Wu, Z., Huang, M., & Zhuang, J. (2023). Xīn xíng nóng cūn jí tí jīng jì zhōng zhèn cūn lián hé fā zhǎn píng tái de chuàng xīn lù jìng yán jiū—jī yú sū nán wú shì de diào yán [Research on the innovative path of the town village joint development platform in the new rural collective economy – Based on a survey of five cities in southern Jiangsu]. *Journal of Agro-Forestry Economics Management*, (05), 621–631. <https://doi.org/10.16195/j.cnki.cn36-1328/f.2023.05.65>
- [23] Albors-Garrigos, J., Igartua, J. I., & Peiro, A. (2018). Innovation management techniques and tools: Its impact on firm innovation performance. *International Journal of Innovation Management*, 22(06), 1850051. <https://doi.org/10.1142/S1363919618500512>
- [24] Rauter, R., Globocnik, D., Perl-Vorbach, E., & Baumgartner, R. J. (2019). Open innovation and its effects on economic and sustainability innovation performance. *Journal of Innovation & Knowledge*, 4(4), 226–233. <https://doi.org/10.1016/j.jik.2018.03.004>
- [25] Yoo, I., & Yi, C. G. (2022). Economic innovation caused by digital transformation and impact on social systems. *Sustainability*, 14(5), 2600. <https://doi.org/10.3390/su14052600>
- [26] Yin, S., & Yu, Y. (2022). An adoption-implementation framework of digital green knowledge to improve the performance of digital green innovation practices for industry 5.0. *Journal of Cleaner Production*, 363, 132608. <https://doi.org/10.1016/j.jclepro.2022.132608>
- [27] Ji, Y. (2023). On the influence of digital technology on green total factor productivity in tourism: Empirical evidence from provinces along the belt and road initiative. *West Forum on Economy and Management*, 34(3), 74–85. <http://doi.org/10.12181/jjgl.2023.03.07>
- [28] Wang, X., Wang, Y., & Wei, C. (2023). The impact of natural resource abundance on green economic growth in the belt and road countries: The role of institutional quality. *Environmental Impact Assessment Review*, 98, 106977. <https://doi.org/10.1016/j.eiar.2022.106977>
- [29] Ciocoiu, C. N. (2011). Integrating digital economy and green economy: Opportunities for sustainable development. *Theoretical and Empirical Researches in Urban Management*, 6(1), 33–43. <https://www.jstor.org/stable/24873273>
- [30] Hysa, E., Kruja, A., Rehman, N. U., & Laurenti, R. (2020). Circular economy innovation and environmental sustainability impact on economic growth: An integrated model for sustainable development. *Sustainability*, 12(12), 4831. <https://doi.org/10.3390/su12124831>
- [31] Dolbnya, E. A., Kozlova, O. N., Vasilyeva, M. K., & Lyukina, A. Y. (2021). Digital innovation as a regional economy development factor. *IOP Conference Series: Earth and Environmental Science*, 666(6), 062133. <https://doi.org/10.1088/1755-1315/666/6/062133>
- [32] Ikram, M. (2022). Transition toward green economy: Technological Innovation’s role in the fashion industry. *Current Opinion in Green and Sustainable Chemistry*, 37, 100657. <https://doi.org/10.1016/j.cogsc.2022.100657>
- [33] Luo, S., Yimamu, N., Li, Y., Wu, H., Irfan, M., & Hao, Y. (2023). Digitalization and sustainable development: How could digital economy development improve green innovation in China? *Business Strategy and the Environment*, 32(4), 1847–1871. <https://doi.org/10.1002/bse.3223>
- [34] Ma, Z., & Xu, B. (2023). Shù zì fù néng yù lǜ sè jì shù chuàng xīn—jī yú zhōng guó shàng shì gōng sī de jīng yàn shù jù [Digital empowerment and green technology innovation – Based on empirical data of Chinese listed companies]. *Ecological Economy*, (10), 81–88.
- [35] Sun, F., Zhou, H., Gu, L., Han, C., Huang, J., Li, C., . . . , & Zhao, Q. (2024). General method to digitalize multi-layer woven structure. *The Journal of the Textile Institute*, 115(7), 1039–1047. <https://doi.org/10.1080/00405000.2023.2207753>

- [36] Yin, S., Zhang, N., Ullah, K., & Gao, S. (2022). Enhancing digital innovation for the sustainable transformation of manufacturing industry: A pressure-state-response system framework to perceptions of digital green innovation and its performance for green and intelligent manufacturing. *Systems*, 10(3), 72. <https://doi.org/10.3390/systems10030072>
- [37] Inman, R. A., & Green, K. W. (2018). Lean and green combine to impact environmental and operational performance. *International Journal of Production Research*, 56(14), 4802–4818. <https://doi.org/10.1080/00207543.2018.1447705>
- [38] Lambert, C., & Rouleau, J. L. (1989). How to digitalize and to maintain optimal digoxin levels in congestive heart failure. *Cardiovascular Drugs and Therapy*, 2, 717–726. <https://doi.org/10.1007/BF00133199>
- [39] Hu, C., Sun, T., Yin, S., & Yin, J. (2023). A systematic framework to improve the digital green innovation performance of photovoltaic materials for building energy system. *Environmental Research Communications*, 5(9), 095009. <https://doi.org/10.1088/2515-7620/acf550>
- [40] Eriksson, K. M., Carlsson, L., & Olsson, A. K. (2022). To digitalize or not? Navigating and merging human-and technology perspectives in production planning and control. *The International Journal of Advanced Manufacturing Technology*, 122(11), 4365–4373. <https://doi.org/10.1007/s00170-022-09874-x>
- [41] Green, K. W., Zelbst, P. J., Meacham, J., & Bhadauria, V. S. (2012). Green supply chain management practices: Impact on performance. *Supply Chain Management: An International Journal*, 17(3), 290–305. <https://doi.org/10.1108/13598541211227126>
- [42] Green, T., & Peloza, J. (2014). Finding the right shade of green: The effect of advertising appeal type on environmentally friendly consumption. *Journal of Advertising*, 43(2), 128–141. <https://doi.org/10.1080/00913367.2013.834805>
- [43] Hasan, I., & Tucci, C. L. (2010). The innovation–economic growth nexus: Global evidence. *Research Policy*, 39(10), 1264–1276. <https://doi.org/10.1016/j.respol.2010.07.005>
- [44] Teece, D., Peteraf, M., & Leih, S. (2016). Dynamic capabilities and organizational agility: Risk, uncertainty, and strategy in the innovation economy. *California Management Review*, 58(4), 13–35. <https://doi.org/10.1525/cmr.2016.58.4.13>

How to Cite: Yin, S., Liu, L., & Mahmood, T. (2024). New Trends in Sustainable Development for Industry 5.0: Digital Green Innovation Economy. *Green and Low-Carbon Economy*, 2(4), 269–276. <https://doi.org/10.47852/bonviewGLCE32021584>