Digital Technology-Driven Realization of Ecological Product Value: Theoretical Logic and Practical Pathways

Guangju Chen*

School of Marxism Huzhou University, Huzhou 313000, Zhejiang, China

*Corresponding authors: chenguangju1121@126.com. Tel: +86-151-5781-7580

Abstract. The realization of ecological product value represents an important theoretical and practical development in China's ecological civilization agenda. In the context of the transition from the digital economy to the intelligent economy, digital technology is reshaping the technical and institutional foundations of ecological product value realization. However, this process still faces persistent challenges, including unclear ecological resource inventories, ambiguous property-rights boundaries, inaccurate value accounting, underdeveloped transaction mechanisms, and weak regulatory systems. To address these issues, this paper develops an analytical framework centered on "technological empowerment–mechanism reconstruction–practical pathways–governance support." The study argues that digital technology promotes ecological product value realization through five interrelated dimensions: value identification, value accounting, value transformation, value appreciation, and governance optimization. In practice, these effects are reflected in ecological resource monitoring, intelligent accounting and rights confirmation, platform-based transactions, digital-finance support, application-scenario innovation, and intelligent collaborative governance. At the same time, the digital transformation of ecological product value realization remains constrained by weaknesses in data infrastructure, institutional arrangements, regional heterogeneity, and governance capacity. This paper suggests that further progress depends on strengthening digital infrastructure, improving institutional design, expanding application scenarios, and enhancing cross-sectoral ecological governance. The study contributes a systematic explanation of how digital technology can be embedded in the full process of ecological product value realization and provides practical insights for green transformation and high-quality development.

Keywords: digital technology; ecological product value realization; theoretical logic; practical pathways

1 Introduction

The realization of ecological product value represents both a theoretical innovation and a practical advancement in China's ecological civilization development. It may also be understood as a production-oriented expression of the principle that "lucid

T. G. Guan et al. (eds.), *Proceedings of the 2026 4th International Conference on Digital Economy and Management Science (CDEMS 2026)*, Advances in Economics, Business and Management Research 392,
https://doi.org/10.2991/978-94-6239-699-9_29

waters and lush mountains are invaluable assets." In essence, on the premise of maintaining ecosystem stability and balance, it transforms ecosystem services into economic wealth and social welfare through institutional design [1] market transactions, and governance innovation, thereby promoting comprehensive green transformation and high-quality socio-economic development. In recent years, as the realization of ecological product value has advanced, many regions in China have accumulated diverse practical experience in ecological compensation, environmental rights quota trading, ecological resource development, and eco-cultural tourism. Overall, however, the process still faces a series of structural contradictions and practical difficulties. These are particularly reflected in unclear ecological resource property rights, inconsistent standards for ecological value accounting, underdeveloped market transaction mechanisms, inequitable benefit distribution, and insufficient regulatory feedback. Such problems continue to constrain the effective conversion of ecological value into actual economic and social returns.

The rapid development of digital technology and artificial intelligence has created new technical conditions and a new paradigm for the realization of ecological product value. As a new technological system built on data, algorithms, computing power, and network connectivity, digital technology not only changes the ways in which information is collected, transmitted, processed, and applied, but also reshapes patterns of resource allocation, market organization, and social governance. With the rapid embedding of artificial intelligence into socio-economic operations, digital technologies have demonstrated increasing transformative potential in ecological resource surveys, ecological value accounting, ecological product transactions, ecological monitoring and regulation, and collaborative ecological governance. [2]. Digital technology is no longer merely an auxiliary tool for ecological governance; rather, it is becoming a critical force in reconstructing the mechanisms of ecological product value realization and in providing digital-intelligent solutions to long-standing difficulties in this field.

Existing studies have generated valuable insights into the empowering role of digital technology in ecological product value realization and have laid an important foundation for this paper. Nevertheless, three limitations remain evident. First, most studies focus on a single stage of the process and lack a systematic explanation of how digital technology is embedded throughout the full chain of ecological product value realization. Second, much of the literature remains at the level of general "empowerment," while the mechanisms through which digital technology is transformed into institutional capacity, market capacity, and governance capacity have not been sufficiently clarified. Third, insufficient attention has been paid to the contextual constraints, implementation conditions, and governance risks associated with digital technology-driven ecological product value realization. Against this background, this paper adopts a normative analytical perspective to explain the theoretical logic and practical pathways through which digital technology drives the realization of ecological product value. It addresses three core questions: How is digital technology embedded throughout the entire process of ecological product value realization? What are the key mechanisms through which digital technology drives this process? And how does digital technology expand the pathways and application scenarios of ecological product value realization? The aim is to provide both theoretical reference and practical guidance.

2 Core Concepts and Analytical Framework

2.1 Ecological Product Value Realization

Ecological products refer to the totality of material products and service functions that human beings obtain from nature. They are the combined outcome of natural productivity and social productivity. Compared with ordinary products, ecological products possess not only natural attributes, but also economic, social, and public attributes. Their value is often embedded in ecosystem services and is characterized by invisibility, complexity, and externality [3].

Ecological product value realization refers to the process through which the potential value embedded in ecosystem services is transformed into actual returns and long-term incentives through institutional design, value accounting, market transactions, ecological compensation, industrial development, and public policy support [4]. At its core, ecological product value realization seeks to "let the market reveal the ecological price." It must answer three fundamental questions: How much is the value of ecological products? How can this value be transformed? And how should the process be governed? Accordingly, three interrelated dimensions must be addressed: value accounting, value transformation, and value governance. Among them, value accounting is the foundation, value transformation is the core, and value governance is the guarantee. In practice, the process may be summarized as a three-step sequence: "calculate, transform, and govern." These three dimensions, however, are not isolated linear stages; rather, they constitute an integrated and mutually reinforcing system of coordinated governance.

2.2 Connotations and Characteristics of Digital Technology

Digital technology refers to a new technological system in which data resources function as key production factors, network connectivity serves as the basic support, algorithmic processing constitutes the core capability, and computing platforms provide the operational guarantee. It mainly includes big data, cloud computing, the Internet of Things, blockchain, mobile Internet, digital twins, and artificial intelligence. In essence, digital technology is not simply an upgraded version of traditional technology. Rather, it is a new foundational capability capable of reshaping material flows, information flows, capital flows, and governance flows [5]. Its major characteristics include connectivity, real-time responsiveness, visualization, intelligence, and platformization. On this basis, it further promotes the coupled evolution of digitalization, intelligentization, and collaboration, thereby supporting the construction of a modern digital-intelligent governance system.

2.3 Analytical Framework for Digital Technology-Driven Ecological Product Value Realization

Digital technology-driven ecological product value realization refers to the systematic restructuring of information acquisition, value expression, market organization, interest coordination, and regulatory feedback throughout the full process of ecological product value realization through digital and intelligent means, thereby enhancing value identification efficiency, value accounting capacity, value transformation effectiveness, and governance performance [6]. Its essence lies not merely in substituting technology for human labor, but in using technological embedding to generate structural changes in the mechanisms of ecological product value realization, enabling a transition from static identification, fragmented operation, and low-efficiency governance to dynamic monitoring, platform linkage, precise decision-making, and collaborative governance.

Based on the intrinsic logic of ecological product value realization and the application principles of digital technology, this paper proposes an integrated analytical framework of "technological empowerment–mechanism reconstruction–theoretical logic–practical pathways" in order to reveal the internal logic and operational model of digital technology-driven ecological product value realization. As shown in Fig. 1:

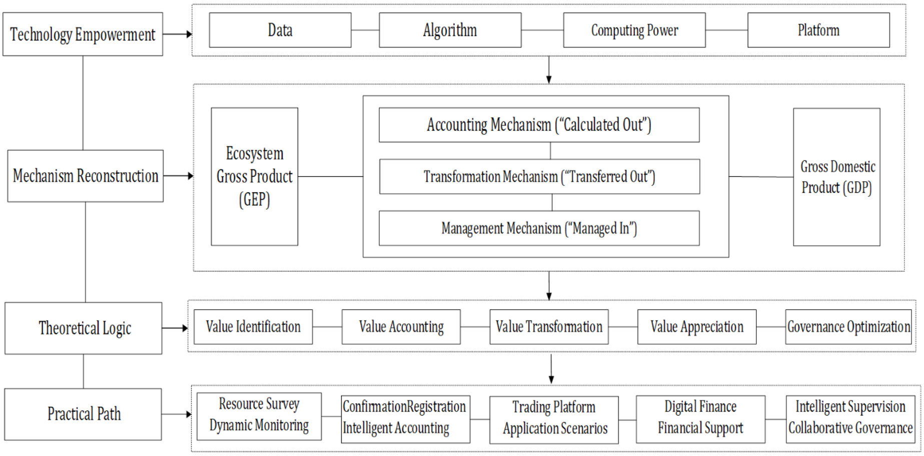

Fig. 1. An Analytical Framework for Theoretical Logic and Practical Pathways

From a structural perspective, the analytical framework presents a four-tier progression of "technology–mechanism–process–outcome." Technological empowerment functions as an exogenous driving force, providing foundational support for ecological product value realization through the integrated application of data resources, algorithmic models, computing infrastructure, and networked platforms. Mechanism reconfiguration enables the systematic construction of value accounting, transformation, and governance mechanisms, thereby facilitating the conversion of Gross Ecosystem Product (GEP) into Gross Domestic Product (GDP). The underlying theoretical logic encompasses five interrelated dimensions—value identification, value accounting, value transformation, value appreciation, and governance optimization—which are operationalized through key pathways such as dynamic monitoring and data updating, property rights confirmation and intelligent accounting, platform-based transactions and application scenarios, digital finance and financial support, and intelligent regulation alongside collaborative governance.

First, at the level of technological drivers, digital technologies—centered on data, algorithms, computing power, and network platforms—significantly enhance capabilities in information acquisition, spatial recognition, data processing, and system integration. These improvements establish both the ecological baseline conditions and the informational infrastructure required for effective value realization.

Second, at the level of mechanism reconfiguration, digital technologies are embedded into the core processes of accounting, transformation, and governance. The accounting mechanism addresses the quantification of ecological product value; the transformation mechanism enables the conversion of ecological value into economic returns and social benefits; and the governance mechanism ensures sustainability and institutional stability. Together, these mechanisms form an integrated institutional and policy framework.

Third, at the level of theoretical logic, ecological product value realization follows a progressive sequence of identification, accounting, transformation, appreciation, and governance optimization. Digital technologies enhance efficiency, reduce information asymmetry, and lower transaction costs across these stages, thereby strengthening the overall effectiveness of the value realization process.

Finally, at the level of implementation pathways, digital technologies are widely applied in ecological resource monitoring and dynamic updating, property rights registration and intelligent accounting, the development of market platforms and application scenarios, the provision of sustained financial support through digital finance, and intelligent regulation with collaborative governance. These applications collectively contribute to advancing comprehensive green transformation and high-quality socio-economic development.

3 Theoretical Logic of Digital Technology-Driven Ecological Product Value Realization

3.1 Value Identification: Enhancing the Recognition of Ecological Functions and Value Perception

The realization of ecological product value begins with the accurate identification of ecosystem service functions. Because ecological resources are diverse in type and widely distributed in space, many regions, despite possessing abundant ecological endowments, are unable to produce clear, accurate, and dynamic expressions of ecological value. Digital technology can significantly improve the identification of ecological functions and the perception of ecological value. Through remote sensing, geographic information systems, big data, the Internet of Things, and monitoring platforms, it becomes possible to collect information on the quantity, structure, quality, and changes of ecological resources with higher frequency and broader coverage, thereby improving the timeliness and precision of ecological surveys and monitoring. Moreover, with the support of multisource data integration and intelligent recognition models, various ecological elements, such as forests, grasslands, wetlands, water bodies, farmland, and ecological-cultural resources, can be incorporated into a unified analytical system, thus enabling a shift from fragmented understanding to systematic identification.

More importantly, digital technology enables ecological value to move from experiential cognition to data-based expression. By continuously monitoring ecosystem service supply capacity, trends in ecological environmental quality, and patterns of resource use, and by combining these with model-based analysis, ecological value can be translated from abstract perception into more intuitive, visualized, and comparable forms of data expression. This transformation promotes a shift from value being merely perceivable and experienceable to being measurable and tradable, thereby helping ecological products enter market exchange.

3.2 Value Accounting: Improving Rights Confirmation and Value Accounting Capacity

The identification of ecological value does not automatically mean that such value can be converted into actual returns. Ecological product value realization must further answer the questions of who owns the value and how much the value is worth. Accordingly, rights confirmation and value accounting become key links in the realization process. The contribution of digital technology to value confirmation is first reflected in the clarification of ownership relations. Through digital registration, spatial unit coding, blockchain-based traceability, and related instruments, digital technology can improve the standardized recording and dynamic updating of ownership information for ecological resources, thereby enhancing the precision of boundary identification and the transparency of process management.

Second, digital technology substantially improves the scientific rigor and granularity of ecological value accounting. With the support of digital models, accounting platforms, and artificial intelligence algorithms, the valuation of ecological material products, ecological regulating services, and ecological cultural services can become more dynamic, standardized, and comparable, thereby enhancing the credibility and applicability of Gross Ecosystem Product (GEP) accounting.

At a deeper level, digital technology helps shift the confirmation of ecological product value from administrative recognition to institutionally grounded confirmation supported by data. The significance of digital technology therefore lies not merely in statistical calculation, but in transforming ecological value into an institutionalized closed loop that is confirmable, tradable, governable, and distributable.

3.3 Value Transformation: Reducing Trust Costs and Transaction Costs

The key to ecological product value realization lies in converting identified and confirmed ecological value into actual returns and social welfare. Under traditional conditions, this process is often constrained by information asymmetry, supply-demand mismatch, weak transaction trust, and high circulation costs. Through platform connectivity and data-driven coordination, digital technology can effectively reduce the transaction costs associated with ecological product value transformation. On the one hand, digital platforms significantly improve the efficiency of information disclosure and supply-demand matching. Transaction barriers caused by geographical separation and information blockages among suppliers, consumers, and beneficiaries can be substantially reduced in platform-based environments. On the other hand, digital technology strengthens quality certification and contract-performance guarantees during transactions. Through traceability systems, digital certification, electronic contracts, and intelligent regulatory tools, it becomes easier to identify product quality, lower trust costs between trading parties, and reduce the risks of contractual default. By strengthening the broken links in the chain of information, institutions, markets, and governance through property-rights registration, value assessment, transaction platforms, and traceability regulation, digital technology supports the construction of a multilayered and diversified ecological product transaction system that combines online and offline channels, standardizes transaction behavior, broadens transaction channels, and improves transaction efficiency.

3.4 Value Appreciation: Expanding Premium Space and Transformation Channels

Ecological product value realization is not confined to the simple monetization of value; it also includes the extension, integration, and appreciation of ecological value across broader domains. For ecological material products, digital technology can be embedded throughout production, processing, circulation, and brand management, thereby promoting quality standardization, supply-chain coordination, and real-time market feedback, and thus enhancing product added value and brand premiums. For ecological regulating services, digital monitoring and intelligent accounting provide data support for institutional arrangements such as carbon-sink trading, ecological compensation, and water-rights allocation, enabling ecological services that were previously difficult to quantify or incorporate into market and policy systems to become more realizable. For ecological cultural services, digital display, immersive experience, online communication, and smart-tourism platforms can transform ecological landscapes and cultural resources into ecological capital and products with greater communicative reach and social influence. In this sense, by expanding application scenarios, connecting actors, and integrating production factors, digital technology not only enlarges the premium space of ecological products, but also broadens the channels and scope of value transformation.

3.5 Governance Optimization: From Fragmented Governance to Collaborative Governance

Ecological product value realization is a continuous process of institutional operation and governance adjustment. Without effective supervision and feedback, even if short-term value transformation is achieved, problems such as disordered development, ecological overexploitation, imbalanced benefit distribution, and distorted incentives may still occur. At the governance level, the role of digital technology is mainly manifested in improvements in monitoring, early warning, coordination, and evaluation. Through real-time monitoring and intelligent identification, digital technology can promptly detect abnormal changes and potential risks in the development and utilization of ecological resources, thereby improving the precision and timeliness of regulation. Through data-sharing platforms and collaborative governance systems, it can strengthen information linkage and policy coordination across departments, reducing information frictions and implementation deviations in multi-department governance. Through digital performance evaluation and result-feedback mechanisms, it becomes possible to assess policy effectiveness, project performance, and value-realization outcomes more clearly, thus providing a basis for institutional improvement and policy adjustment. It should also be recognized that digital-intelligent governance is not solely about efficiency gains. It may also introduce risks related to model bias, data ownership, and algorithmic opacity. Governance optimization therefore also requires institutional arrangements capable of constraining and regulating technological risks.

4 Practical Pathways of Digital Technology-Driven Ecological Product Value Realization

4.1 Ecological Resource Survey Monitoring, and Dynamic Updating

The first step in realizing ecological product value is to identify the ecological resource base. To this end, digital means must be used to improve resource surveys and dynamic monitoring. First, a unified digital ecological resource system should be established through the integration of data from natural resources, ecological environment, agriculture and rural affairs, and eco-cultural tourism departments, so as to build a comprehensive database covering resource types, spatial distribution, quality levels, and utilization status. Second, relying on remote sensing, sensors, the Internet of Things, and mobile terminals, it is necessary to improve ecological monitoring networks and achieve dynamic monitoring of environmental change, ecosystem service supply, and resource-use intensity [7]. Third, ecological information should be integrated through platforms so as to break down data barriers and promote effective linkage among survey, monitoring, assessment, and application.

4.2 Rights Confirmation and Intelligent Accounting

On the basis of ecological resource surveys and monitoring, it is further necessary to address the problems of unclear ownership and insufficient value expression. Here, the role of digital technology lies in improving the level of rights confirmation and intelligent value accounting. On the one hand, through digital archive management, spatial unit coding, and information registration platforms, it is possible to digitize ecological resource boundaries, ownership relations, and responsible entities, thereby improving the standardization and traceability of rights confirmation. On the other hand, with the support of digital models and intelligent algorithms, it is necessary to improve accounting rules by category and type, so that the valuation of ecological material products, regulating services, and cultural services becomes more dynamic, refined, and standardized.

4.3 Transaction Platforms and Application Scenarios

The realization of ecological product value relies heavily on digital transaction platforms. It is therefore necessary to improve key functions such as information disclosure, supply-demand matching, price discovery, credit evaluation, digital certification, and transaction settlement, thereby enhancing the organization and transparency of ecological product markets. Full use should be made of e-commerce platforms, livestreaming platforms, social media, and digital brand-communication mechanisms to broaden the market radius and application scenarios of ecological products. In ecological agriculture, smart agriculture, digital traceability, intelligent supply chains, and brand-marketing platforms can improve product quality, expand markets, and generate value spillovers. In the ecological industry, digital transformation and green-manufacturing coordination can promote resource conservation, circular utilization, and the integrated development of ecological resources. In eco-cultural tourism, digital display, virtual reality, smart scenic spots, and online communication can expand the dissemination of ecological-cultural resources and enhance both tourism experience and the added value of cultural services.

4.4 Digital Finance as Financial Support for Value Transformation

Ecological product development and operation generally involve large initial investments, long payback periods, and difficulties in risk assessment, all of which make conventional financial services poorly suited to the sector. The introduction of digital finance creates a new pathway of capital support for ecological product value transformation. Through digital credit evaluation, online risk-control models, and data profiling, digital finance can improve the efficiency of identifying green projects and increase access to financing, thereby mitigating information asymmetry in ecological-project financing [8]. On this basis, it is also possible to explore financial instruments such as green credit, ecological insurance, ecological asset-backed collateral, and green funds based on ecological accounting results and expected operating returns, gradually opening up the transformation chain from ecological resources to ecological assets, ecological capital, and ecological products.

4.5 Intelligent Regulation and Collaborative Governance

Ecological product value realization involves multiple stages, including environmental protection, resource surveys, rights confirmation and accounting, market transactions, financial support, and benefit distribution. Without effective regulation, problems such as resource misuse, distorted transactions, imbalanced returns, and unclear responsibilities are likely to arise. In this respect, digital technology contributes by enabling the construction of an intelligent whole-process regulatory system. On the one hand, it strengthens dynamic monitoring of key links such as development, operation, transactions, and distribution, thereby improving risk identification, anomaly warning, and responsibility tracing. On the other hand, it promotes data sharing and operational coordination among departments responsible for natural resources, ecological environment, agriculture and rural affairs, culture and tourism, market regulation, and financial supervision, thus advancing the modernization of the governance system and governance capacity for ecological product value realization.

5 Contextual Constraints and Conditions for Implementation

5.1 Contextual constraints

Digital technology-driven ecological product value realization is both a complex systemic project and a profound process of digital transformation and developmental paradigm change. In practice, it remains subject to multiple contextual constraints.

First, weak ecological data foundations limit the scope of digital technology application. Ecological data are often scattered across departments such as natural resources, ecological environment, agriculture and rural affairs, water conservancy, and meteorology, with problems including inconsistent standards, uneven update frequencies, and weak sharing mechanisms. This fragmented data situation hinders the formation of a unified data system and constrains effective ecological value accounting, transactions, and regulation.

Second, insufficient technological application capacity affects the level of digital implementation. In many regions, there is a shortage of digital talent, relatively weak infrastructure, inadequate deployment of sensing devices, and limited platform maintenance capacity, resulting in a situation where digital technology may be available in principle but difficult to apply in practice. This not only affects the accuracy of ecological monitoring and accounting, but also limits the adoption of digital transaction platforms and digital-finance tools.

Third, lagging institutional supply weakens the rule-based support for digital embedding. At present, a coherent institutional framework has not yet been fully established in areas such as ecological rights confirmation, value accounting standards, ecological product classification, data-property-rights definition, platform trading rules, and algorithmic governance. As a result, digital technology often lacks stable institutional support in practical operation, which undermines its long-term effectiveness [9].

Finally, significant regional disparities increase the difficulty of digital application and diffusion. Different regions vary considerably in resource endowment, economic development level, degree of marketization, and governance capacity, meaning that the same digital pathway may produce different outcomes across different localities [10]. This heterogeneity implies that ecological product value realization cannot simply rely on model replication, but requires region-specific adaptation and pathway adjustment.

5.2 Conditions for Implementation

In response to these contextual constraints, the further promotion of digital technology-driven ecological product value realization requires a comprehensive set of implementation conditions.

First, the digital foundation must be strengthened. It is necessary to accelerate the building of a unified ecological data-resource system, improve the layout of digital infrastructure for ecological surveys, monitoring, and evaluation, and enhance data collection, transmission, and processing capacity so as to provide reliable data support for ecological product value realization.

Second, institutional supply must be improved. Effective coordination should be promoted among ecological rights confirmation and registration, value accounting standards, transaction rules, and data-governance arrangements, thereby establishing a complete institutional framework covering rights confirmation, accounting, transactions, and regulation, and enhancing the standardization and predictability of digital applications.

Third, support from multiple actors should be strengthened. Governments, enterprises, platform organizations, communities, and professional institutions should participate collaboratively in order to form a synergistic mechanism that combines technological supply, institutional arrangement, and market operation, thus enhancing the endogenous driving force of ecological product value realization.

Fourth, regional adaptation mechanisms should be emphasized. According to differences in resource endowment and development stage, differentiated implementation pathways should be designed so that digital applications can be effectively aligned with local conditions and practical needs.

6 Policy Implications

6.1 Building a National Unified Ecological Data Platform

To address the problems of data dispersion and inconsistent standards, it is necessary to accelerate the construction of a national ecological data-platform system. On the one hand, data related to ecological resources, ecological environment, industrial operations, transaction circulation, and public governance should be integrated, and unified standards for data collection, classification, and updating should be established. On the other hand, cross-regional and cross-departmental data sharing and operational coordination should be promoted, so as to gradually realize centralized managemen. Dynamic updating of ecological resource data and provide a solid digital foundation for ecological value accounting and transactions.

6.2 Improving the Institutional System for Ecological Product Value Realization

A systematic institutional framework covering the full process of ecological product value realization should be established. Priority should be given to improving the ecological rights confirmation and registration system so as to clarify ownership boundaries; establishing unified standards for ecological value accounting to improve comparability and credibility; refining digital certification and platform trading rules to regulate market order; and improving benefit-distribution mechanisms so as to protect the legitimate interests of all actors.

6.3 Promoting Digital-Intelligent Scenarios in Key Fields

Innovation in digital application scenarios should be promoted in key fields such as ecological agriculture, eco-tourism, carbon-sink trading, and ecological compensation. Through the development of demonstration projects, replicable and scalable practical models can be explored, and an overall path of "pilot experimentation–experience summarization–regional diffusion" can be pursued.

6.4 Building a Cross-Regional Collaborative Ecological Governance System

To address regional imbalances, cross-regional collaborative mechanisms should be strengthened. On the one hand, mature experiences from more advanced regions should be adapted and transferred to less-developed areas. On the other hand, coordinated development should be promoted across river basins, regions, and urban-rural areas, thereby forming a more open, efficient, and integrated system for ecological product value realization.

6.5 Strengthening Digital Governance and Risk Prevention

In promoting the application of digital technology, close attention must be paid to risks such as data security, algorithmic bias, and platform governance. By improving data security institutions and strengthening algorithmic transparency and accountability, it is possible to establish a governance framework that balances technological application with risk prevention and control, thereby ensuring the sustainability and fairness of ecological product value realization.

7 Conclusion

Digital technology-driven ecological product value realization essentially reflects the deep coupling of digital-intelligent transformation and ecological civilization construction. Its core lies in the use of technological embedding to promote the systematic reconstruction of mechanisms for ecological product value realization. Centered on the three key questions of how much ecological value exists, how such value can be transformed, and how the transformation process can be governed, this process follows a progressive logic of value identification, value accounting, value transformation, value appreciation, and governance optimization. In this process, digital technology supports deeper applications in ecological surveys and dynamic monitoring, rights confirmation and intelligent accounting, transaction platforms and application scenarios, digital finance and capital support, and intelligent regulation with collaborative governance.

At the same time, it must be acknowledged that digital technology-driven ecological product value realization remains constrained by multiple factors, including the data foundation, technological capability, institutional supply, regional heterogeneity, and governance capacity. Therefore, it is essential to advance technological innovation and institutional innovation in a coordinated manner, to promote market development and governance optimization simultaneously, and to combine differentiated policy design with regional adaptation, so that digital technology can be embedded more deeply across the full process of ecological product value realization.

Overall, digital technology provides both a new driving force and a new pathway for ecological product value realization, while also offering a new technological paradigm for comprehensive green transformation and high-quality development. Future research should continue to examine differences in realization pathways across different types of ecological products, the boundaries of digital technology application, cross-regional collaborative mechanisms, and the fairness of benefit distribution, so as to further enhance the explanatory power and practical relevance of research on digital technology-driven ecological product value realization.

Acknowledgement

This research was supported by the Key Project of the National Social Science Fund of China, "Research on the Innovation of Mechanisms for Realizing the Value of Ecological Products in Ethnic Regions" (21AMZ009).

References

1. Costanza, R., de Groot, R., Braat, L., et al. (2017). Twenty years of ecosystem services: How far have we come and how far do we still need to go. Ecosystem Services, (28).
2. Chen, Q. R., Chen, B., Xie, H. L., et al. (2023). Digital empowerment of ecological product value realization: Basic logic and typical pathways. China Land Science, (11)
3. Zhuang, G. Y., Ding, F., Wang, S. B. (2024). Ecological products and their value realization: Reflections from a political economy perspective. Social Sciences in China, (11).
4. Ouyang, Z. Y., Wang, X. K., Miao, H. (1999). A primary study on Chinese terrestrial ecosystem services and their ecological-economic values. Acta Ecologica Sinica, (5).
5. Chen, Z. X., & Sun, B. Z. (2025). The core connotation, contemporary value, and practical pathways of digital ecological civilization. Studies in Ideological Education, (6).
6. Huang, X. Y., Chen, F. Y., Shu, X. J., et al. (2025). The influence mechanism of the digital economy on ecological product value realization. Scientific Decision-Making, (5).

7. Li, P. D., & Li, Y. (2025). Mechanisms and pathways through which the digital economy empowers ecological product value realization. Journal of North China University of Science and Technology (Social Sciences Edition), (6).
8. Cui, J. X. (2025). The generative logic, core characteristics, and practical pathways of Chinese-style digital civilization. Journal of Guizhou Normal University (Social Sciences Edition), (4).
9. Hong, Y. X., & Ren, B. P. (2023). The connotation and pathways of deep integration between the digital economy and the real economy. China Industrial Economics, (2).
10. Fan, D. X., & Liu, M. (2025). Coupling and coordinated development of the digital economy, technological innovation, and ecological protection. Ecological Economy, (7).