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Development Potential and Future Prospects of the Digital Economy under the Background of Green Economy and Relevant Policies

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Abstract. Given the overlapping imperatives of the Dual-Carbon Goals and high-quality digital-economy development, advancing digital–green coordination in depth is critical for China to foster new quality productive forces and achieve low-carbon industrial upgrading. Digital technologies support the green low-carbon transition while green constraints restrain the extensive expansion of computing-power industry, and their two-way interaction underpins high-quality economic development. China's digital-green integration has scaled up from localized pilots to large-scale practice and generated multi-dimensional value. However, it still faces bottlenecks including high energy pressure from digital infrastructure, poor institutional coordination, dual-transition divide, talent shortages and imperfect market mechanisms. This paper sorts out its status, driving logic, potential and values and identifies restrictive factors. It concludes that digital-green integration demands combined efforts in hardware upgrading, institutional reform and market cultivation. Optimizing green computing-power layout, enhancing cross-department coordination, bridging transition gaps and improving talent and market systems can unlock its endogenous momentum and promote balanced, sustainable digital-green development.

Keywords: Digital Economy, Green Transition, Dual-Carbon Strategy, Resource Allocation, Technological Innovation

1. Introduction

With the advancement of China's Dual-Carbon Strategy and high-quality digital economy development, coordinated digital-green transition serves as a critical pathway for industrial upgrading, new-quality productive forces and society-wide low-carbon transformation [1]. Digital technologies including big data, AI and Industrial Internet empower energy saving, carbon supervision and resource allocation, serving as essential technical enablers of the green transition [2]. Green institutional constraints limit the energy-intensive expansion of computing capacity, forcing energy-saving retrofits of digital infrastructure and reshaping digital industry development.

China's digital-green integration has moved from isolated pilots to large-scale implementation, forming a pattern of infrastructure iteration, emerging business forms and regional differentiated development with multi-level benefits. However, multiple constraints remain: inadequate green

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retrofitting of existing digital infrastructure creates computing energy burdens, disjointed cross-department policies reduce implementation effects, regional and corporate dual transition gaps, interdisciplinary talent shortages and immature market mechanisms hinder progress [2].

This paper adopts systematic mechanism analysis and logical deduction to reveal the laws of digital-green transition. It develops a two-way coupled framework in which external incentives and constraints drive technological and industrial restructuring, generating multidimensional benefits. The study elaborates how policy, technology, market profit and internal-external demand jointly drive integration, and analyzes how infrastructure energy overconsumption, policy barriers and transition gaps break positive feedback. Targeted solutions covering hardware upgrading, institutional coordination and market cultivation are proposed to boost in-depth digital-green coordination.

2. Green-economy policies: development status and driving mechanisms of the digital economy

2.1. Overall development status of digital-green integration in China

China's digital-green integration has expanded from localized pilots to nationwide large-scale implementation, forming a two-way transition pattern of "low-carbon transformation of digital industries and digital upgrading of green industries", which underpins the Dual-Carbon Goals and the development of new-quality productive forces [1]. A complete institutional framework combining national top-level design and market incentives has been established for low-carbon transition [3]. Marked regional disparities exist across computing hubs: eastern regions face heavy computing loads but lack local renewable energy, whereas western regions with abundant wind and solar resources undertake off-site data-processing tasks under stricter energy-efficiency standards for new data centers. Digital infrastructure achieves dual upgrading to advance green computing and the digital renovation of environmental monitoring systems, with green computing, carbon digital services and virtual power plants gradually commercialized. Even so, the shift toward high-quality development still suffers from regional imbalances, inconsistent standards, data barriers, as well as shortages of core technologies and talents.

2.2. Driving mechanisms: policy regimes, technological innovation, market-based profitability, and internal-external demand pull

The deep integration of the digital and green economies arises from combined forces of policy regimes, technological innovation, market returns and domestic and foreign demands, forming an integrated driving system [1]. In policy terms, guided by the Dual-Carbon top-level design, rigid rules on computing power energy efficiency and carbon quotas curb extensive digital expansion, while pilot programs and standard-setting define transition directions and provide institutional impetus.

A two-way empowering technological closed loop is established. Digital technologies including AI, Industrial Internet and blockchain tackle monitoring, accounting and scheduling challenges for green transition. Green technologies such as liquid cooling, energy storage, and direct green power supply alleviate energy pressure from computing. Their integration fosters new forms including virtual power plants, green computing power and carbon-related digital services [4].

Market returns from energy savings, carbon asset trading, and premiums for low-carbon products motivate firms to transform voluntarily. Demand comes from China's new power system and traditional industrial upgrading, while international carbon tariffs and ESG disclosure rules further

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drive digital-green coordination. This reciprocal cycle, where digitalization empowers green transition and greenization constrains digital expansion, continuously amplifies synergies and underpins the long-term evolutionary logic of digital-green integration.

3. Development potential and multi-dimensional values of the digital economy under green constraints

3.1. Development potential: space for green quality improvement in digital industrialization and industrial digitalization

Under green constraints such as dual control over energy consumption and energy-efficiency access standards for computing power, the previous extensive computing power expansion model is unsustainable, pushing the digital economy to explore structural, incremental and business-form-oriented growth space [5]. In digital infrastructure, rigid indicators such as data center PUE and green electricity proportion accelerate the adoption of liquid cooling, waste heat recovery and direct green power supply. The combination of western China's wind-solar resources and computing power industry fuels green computing construction, forming a huge market for renovation of existing facilities and new projects [6].

For traditional industries, energy and carbon emission assessment pressures drive steel, chemical and building material sectors to carry out digital low-carbon retrofits. Demands for energy monitoring, carbon footprint tracing and zero-carbon factory solutions keep rising, creating new tracks for industrial digitalization. Driven by the expansion of the national carbon market, ESG disclosure and export carbon tariffs, carbon digital platforms, virtual power plants, smart energy dispatching and green financial digital services are being commercialized rapidly.

In general, green constraints do not hinder digital economy development. Instead, they reshape its growth logic, shifting the industry from traffic-oriented to high-quality value-oriented development and continuously unlocking long-term development potential.

3.2. Multi-dimensional values: economic value, ecological-environmental value, social value and institutional value

Digital-green integration can realize synergistic gains of multiple values and deliver positive outcomes in economic, ecological-environmental, social and institutional dimensions. From the economic perspective, digital technologies help enterprises cut energy costs through production-process optimization and intelligent energy dispatching, and increase the value of green assets through virtual power plants and carbon trading. Meanwhile, they foster emerging industries such as green computing power and carbon-management services, promote the high-end evolution of digital industries, and enhance the competitive position of China's industrial chains in low-carbon trade [7].

At the ecological-environmental level, digital approaches can increase the uptake of renewable energy such as wind and solar power, realize dynamic monitoring of pollution sources and carbon emissions, improve the recycling efficiency of solid waste and other resources, and advance the carbon reduction of digital infrastructure itself, thus supporting the coordinated regional governance of pollution reduction and carbon mitigation [8]. Socially, digitalization empowers urban low-carbon governance, facilitates the targeted implementation of various green support policies, and guides the whole society to adopt green production and lifestyles. Institutionally, digital tools promote the standardization and quantifiability of carbon and ecological data, facilitate the value realization of

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ecological products, and provide technical support for the operation of market-oriented green systems such as the carbon market.

4. Challenges and restricting factors for development

4.1. Insufficient greening level of digital infrastructure and high energy consumption of computing power

A large number of stock data centers and communication base stations in China were built in the early period and generally adopt the traditional air-cooling heat-dissipation mode. Energy-saving technologies such as waste-heat recovery, dynamic load adjustment, and intelligent base-station hibernation are not widely adopted, resulting in significant energy waste in aging computing-power facilities [5]. The rapid expansion of large-model training and intelligent computing services has driven a continuous increase in the power consumption of computing. The growth rate of computing-power electricity consumption is markedly higher than that of the whole society, imposing mounting carbon-emission pressure on the computing-power industry [9].

Although the state has set rigid thresholds for the proportion of green electricity for newly-built computer rooms within the eight major computing-power hubs, massive stock computing-power resources have not yet formed systematic green-electricity replacement solutions and still rely heavily on thermal power for operation. Meanwhile, there exists a spatial mismatch between regions rich in wind and solar resources and areas with concentrated computing-power demand. The construction of cross-provincial power transmission corridors lags behind relatively. Abundant green electricity in Western China cannot be delivered on a large scale to high-load computing-power hubs in Eastern China. This not only creates pressure on renewable-energy absorption, but also raises the overall energy cost of the digital industry, restricting the practical effects of digital-green integration from the hardware foundation.

4.2. Insufficient policy coordination: poor coherence among regulation, fiscal-taxation, finance and data governance

The digital-green transition involves multiple government departments including the National Development and Reform Commission, the Ministry of Industry and Information Technology, the Ministry of Ecology and Environment, energy authorities and financial regulators. Policies for different fields are issued separately, leading to insufficient overall coordination and interaction [1]. From the regulatory perspective, energy consumption assessment, carbon emission verification and the approval of digital-infrastructure projects fall under distinct systems with inconsistent implementation criteria. This results in duplicated regulation in some areas and regulatory gaps in certain segmented scenarios [3].

Fiscal and taxation support policies remain fragmented. The application procedures for subsidies on low-carbon technological renovation are complicated with long reimbursement cycles, which can hardly offset the capital pressure brought by enterprises' digital-green transformation. Green-financial resources tend to favor large-sized enterprises, while small-and-medium-sized manufacturers face high credit-grant thresholds and financing costs when pursuing digital-green upgrading.

Deficiencies in data governance are particularly prominent. Data concerning energy consumption, carbon emissions, electricity usage and pollutant discharge are stored on separate business platforms with inconsistent statistical standards. Inter-departmental data barriers are hard to break down,

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making it difficult to build an integrated system for energy-carbon monitoring, accounting and dispatching. Various policy instruments have not yet formed a "constraint-incentive-support" closed-loop system, which directly weakens the practical effects of policy implementation.

4.3. Imbalance between digital divide and green transition: shortcomings in talents and market mechanisms

Regions and market entities face the dual-transition divide between digitalization and greenization. Well-resourced large industrial firms and internet platforms in eastern coastal China can afford heavy investment in digital–green transformation and readily access green credit and subsidies to develop zero-carbon factories and green computing-power projects [2, 10]. In contrast, numerous central-western micro, small and medium-sized enterprises (MSMEs) suffer from tight profit margins and financing constraints. They can hardly bear the dual costs of digital hardware procurement and energy-saving retrofits, resulting in low willingness to transform and divergent development outcomes. Besides, the industry lacks interdisciplinary talents skilled in digital operation, energy regulation and carbon-asset management, so many firms fail to realize full decarbonization benefits despite relevant equipment deployment. Immature market mechanisms further hinder progress: incomplete trading and benefit-sharing rules make most projects rely on fiscal support, lacking self-sustaining business models for large-scale long-term development.

5. Future paths and policy recommendations

5.1. Accelerating green retrofit of digital infrastructure and coordinating the layout of computing power and green electricity

Efforts should be made to advance the low-carbon upgrading of computing-power infrastructure through both stock retrofits and incremental planning. Mandatory energy-saving renovation shall be implemented for outdated, high-energy-consumption data centers and communication base stations. Technologies including liquid-cooling heat dissipation, comprehensive waste-heat utilization and intelligent power-saving for base stations shall be popularized, and PUE energy-efficiency limits as well as the differentiated electricity-pricing mechanism shall be strictly enforced [5].

Relying on national computing-power hub nodes, coordinated construction of computing power and power supply shall be promoted. Green intelligent computing centers shall be deployed to support large-scale wind and solar bases in Northwest China, and the cross-provincial UHV power transmission network shall be improved to match computing-power loads with local green electricity in Western China. Subsidies related to green-electricity replacement shall be introduced for stock computing-power projects. Data centers shall be encouraged to build supporting distributed photovoltaic and energy-storage facilities, so as to transform computing-power nodes from mere power-consuming units into integrated source-grid-load-storage nodes [6]. A green computing-power labeling system shall be established, and differentiated pricing for low-carbon computing power shall be implemented to guide cloud-computing and artificial-intelligence enterprises to prioritize green-electricity-based computing-power procurement. Carbon emissions of the digital industry shall be reduced at the hardware level to consolidate the infrastructure foundation for digital-green integration.

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5.2. Strengthening inter-departmental policy coordination and unlocking the linkage mechanism among regulation, fiscal-taxation, finance and data governance

It is recommended that a special working group be established for the coordinated digital–green transition to coordinate the responsibilities of multiple departments, including the National Development and Reform Commission, the Ministry of Industry and Information Technology, the Ministry of Ecology and Environment, power authorities and financial regulators. Uniform regulatory standards for carbon emission accounting, energy consumption monitoring and digital-infrastructure project approval shall be formulated to eliminate duplicated regulation and regulatory gaps [1].

Fiscal and taxation incentive tools should be optimized. Application procedures for subsidies for low-carbon digital technological renovation shall be simplified, and accelerated depreciation of fixed assets as well as tax reductions and exemptions for energy conservation and environmental protection shall be implemented to effectively reduce the transformation burden on enterprises [3]. Financial institutions should be guided to develop inclusive green credit, carbon-pledged loans and financing products based on the income rights of energy-saving projects tailored for small-and-medium-sized enterprises.

Barriers to government-affiliated data shall be removed, and a provincial-level unified public big-data platform for energy and carbon shall be built to aggregate data on electricity consumption, pollutant discharge, carbon emissions and enterprise production. Standardized data sharing shall be promoted so as to form a complete policy closed-loop of "regulatory constraint — fiscal-taxation incentive — financial empowerment — data support" and improve the overall governance efficiency.

5.3. Bridging the dual-transition divide, filling the gap of interdisciplinary talents and improving the market-oriented operation mechanism

Differentiated regional transition guidance strategies should be implemented. Eastern China shall focus on exporting digital-green integration technologies and demonstration experience, Central China shall concentrate on digital low-carbon technological renovation for high-energy-consumption heavy industries, Western China shall develop the green computing-power industry based on its clean-energy resources so as to narrow the regional transition gap [10]. Lightweight transition service vouchers shall be launched for micro, small and medium-sized enterprises. Through government procurement of services, micro-enterprises can gain access to low-cost digital tools for energy-consumption monitoring and carbon accounting to alleviate the cost pressure brought by dual renovations [2].

Universities shall be encouraged to set up interdisciplinary majors covering energy digitalization and carbon-asset management, and to provide targeted school–enterprise practical training to expand the pool of interdisciplinary talents. Market-oriented trading rules shall be further improved, including systems for carbon-footprint asset right confirmation, green computing-power trading and spot trading of virtual power plants. Business models such as contracted energy management and energy-saving benefit sharing shall be popularized to reduce projects' reliance on fiscal subsidies. Market-driven returns shall be leveraged to motivate enterprises to pursue transformation, and thus realize balanced and sustainable development of digital-green integration.

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6. Conclusion

This paper focuses on the coordinated development of China's digital economy and green economy under green constraints, sorting out the practical status, four-dimensional driving mechanisms, development potential and multi-dimensional comprehensive values of digital-green integration. The study reveals that digital-green integration serves as a critical starting point for fostering new-quality productive forces and implementing the Dual-Carbon Strategy. A two-way transition relationship has been formed: "digitalization empowers green carbon reduction, while green constraints improve the quality of digital development" [11]. After years of development, China has achieved certain progress in infrastructure upgrading, cultivation of new business forms and regional transition practices, and multiple forms of value—economic, ecological, social, and institutional—have gradually emerged. Nevertheless, the overall transition is still in a critical stage of quality improvement and confronted with multiple structural contradictions. The lagging green retrofitting of stock digital infrastructure creates energy-consumption pressure for computing power, insufficient institutional connection exists among cross-departmental regulation, fiscal-taxation, finance and data governance, the dual-transition divide across regions and enterprises remains prominent, accompanied by shortages of interdisciplinary talents and an immature market-oriented operating mechanism. The advancement of digital-green integration cannot simply rely on a single technology or individual policy, but requires a multi-pronged approach including hardware upgrading, institutional reform and market cultivation [4]. By optimizing the layout of green computing power, strengthening inter-departmental policy coordination, bridging the transition gap among regions and market entities, and improving the talent system and market-oriented mechanism, China can effectively address development bottlenecks, fully unleash the endogenous driving force of digital–green integration, and achieve high-quality two-way development of industrial digitalization and green development.

References

[1] Chen, X. X. (2024). Theoretical interpretation and path selection of the coordinated digital and green transition. *Journal of Industrial Technological Economics, 43*(11), 3–12.
[2] World Bank. (2023). *Green digital transformation: How to sustainably close the digital divide and harness digital tools for climate action*. World Bank Group. Washington, D.C.
[3] Ma, X. Y., & Bai, Y. T. (2025). Theoretical logic, practical challenges and realization path of the coordinated development of digitalization and greenization. *Price: Theory & Practice*, (7), 45–52.
[4] Li, T., Rong, Q., Yan, Q. Y., et al. (2026). Configuration study on the improvement of supply chain resilience driven by digital-green synergy. *Science Research Management, 47*(2), 116–126.
[5] Chen, X. H., Tang, X. B., & Cao, Y. (2024). Demand, power consumption and green low-carbon transition countermeasures of computing power development in China. *Bulletin of the Chinese Academy of Sciences, 39*(8), 1180–1191.
[6] Masanet, E., Shehabi, A., Ramakrishnan, N., et al. (2020). Recalibrating global data center energy-use estimates. *Science, 367*(6481), 984–986.
[7] Khan, A., & Sun, C. (2024). Digital economy, green growth, and global energy transition. *China & World Economy, 32*(1), 173–197.
[8] An, Q., Wang, R., Wang, Y., et al. (2024). The impact of the digital economy on sustainable development: Evidence from China. *Frontiers in Environmental Science, 12*, 1341471.
[9] Koot, M., & Wijnhoven, F. (2021). Usage impact on data center electricity needs: A system dynamics analysis. *Energy Policy, 152*, 112226.
[10] Guo, F., Yang, S. G., & Ren, Y. (2024). Digital economy, green technology innovation and carbon emissions — Empirical evidence from Chinese cities. *Urban Problems*, (5), 56–64.
[11] Zeqiri, A., Bogers, M., & Hadjikhani, A. (2025). Twin transition: Digital transformation pathways for sustainable innovation. *Preprints*.