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Opportunities and Challenges for The Development of Green Finance under the Background of Financial Technology

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ABSTRACT

Under the guidance of the "dual carbon" strategy, green finance has become the core support for China's economic transformation, and the rise of financial technology provides a key path for it to break through development bottlenecks. This article is based on policy evolution and market practice, systematically analyzing the internal mechanism of fintech empowering green finance, and focusing on exploring the application opportunities of technologies such as big data and blockchain in alleviating information asymmetry and innovating financial products; At the same time, we must face practical challenges such as the lack of data standards, prominent technical risks, and lagging regulation. Research has found that financial technology can significantly reduce the cost of identifying green credit. The practice of some green finance reform and innovation pilot zones shows that the cost reduction can reach 30% -40%, but it is necessary to build a sustainable development system through policy coordination, infrastructure construction, and talent cultivation. Based on the practices of Huzhou Bank's green credit management system (a case study of the Green Finance Reform and Innovation Pilot Zone) and multiple regulatory sandbox green finance pilots, a three-dimensional solution of "technological innovation institutional guarantee talent support" is proposed to provide practical reference for the high-quality development of green finance.

KEYWORDS

Financial technology; Green finance; Information asymmetry; Regulatory sandbox; Risk control; Dual carbon targets.

1. INTRODUCTION

The proposal of the goal of "peak carbon emissions and carbon neutrality" in 2020 has elevated green finance to a new level of national strategy. Since the "Overall Plan for Ecological Civilization System Reform" first proposed the construction of a green financial system in 2015, China has formed the world's first systematic policy framework. As of the end of 2024, the total balance of green loans of 42 A-share listed banks exceeded 27 trillion yuan, ranking first in the world in terms of overall scale. However, structural problems are still prominent: according to the research of China Finance magazine, the proportion of green loans to the overall green financing scale is on average over 90%, the trading activity of green bonds is insufficient, and the scale of innovative products such as carbon finance is limited [1].

Under the traditional mode, information asymmetry drives up the operating costs of financial institutions. Industry data shows that the marginal cost of due diligence for green projects is 20% -30% higher than that of traditional credit. The rapid development of financial technology has provided a new path to solve the above difficulties. China's mobile payment, big data and other technologies are leading the world in application, and have achieved initial results in the field of green finance: blockchain realizes full traceability of fund flow, artificial intelligence improves risk warning

efficiency, and big data helps to break down "data silos". However, in the process of technological empowerment, problems such as confusion in data standards, transmission of technological risks, and imbalance between regulation and innovation have emerged simultaneously. This article combines policy practice and academic research to analyze the opportunities and challenges of empowering green finance with financial technology, providing theoretical and practical support for industry development.

2. THE CORE MECHANISM OF EMPOWERING GREEN FINANCE WITH FINANCIAL TECHNOLOGY

Fintech is reconstructing the green finance business chain, with core mechanisms reflected in three dimensions: information processing, risk management, and service efficiency. At the level of information processing, big data technology enables the integration of multiple sources of data, effectively alleviating the problem of information asymmetry. According to the CDP 2025 report, there were 3651 environmental information disclosure companies in China in 2024, with an overall disclosure rate of less than 40%, and problems such as data fragmentation and inconsistent standards exist. Big data technology can break through this limitation by capturing non standardized content such as enterprise pollution data, energy consumption records, and environmental penalty information, and constructing a dynamically updated green credit profile. Taking Huzhou Bank as an example, the green credit management system developed integrates data from more than 10 departments including environmental protection, electricity, and taxation. It shortens the identification time of green projects from more than ten working days to within three working days, improves the accuracy of identification to over 90%, and can dynamically calculate the carbon emission reduction of loan investment, building a "anti drift green" defense line.

The "unforgeable and traceable" characteristics of blockchain technology provide technical support for fund supervision. Ant Chain has built a tracking system for domestic green bond projects, with encrypted records of fund flow throughout the process. Investors can trace the whereabouts of funds in real time, and the phenomenon of fund misappropriation in related projects has almost disappeared. The World Bank uses blockchain platforms to issue green bonds, significantly reducing information verification time and intermediary costs by 20% -30%. Cloud computing effectively reduces the technological barriers for small and medium-sized financial institutions. Huzhou Bank and others have deployed green risk models through cloud platforms, reducing technology investment costs by more than 30%, shortening construction cycles by 40%, and achieving real-time post loan risk warning.

The application of artificial intelligence in the field of risk pricing has achieved significant results. Traditional green project risk assessment relies on manual experience, which is subjective and inefficient. AI models incorporate more than 60 indicators such as carbon footprint and environmental compliance, and machine learning optimization evaluation algorithms. The ESG rating model of Huzhou Bank automatically updates the enterprise rating through monthly "running approval", and combines AI technology to improve the accuracy of default risk prediction by 25% -30% compared to traditional manual evaluation. Single household small and micro green loan approval can achieve 3-second disbursement and same day disbursement [2]. The synergistic effect of big data, blockchain, cloud computing, and artificial intelligence is building a full chain empowerment system of "information integration risk prevention and efficient services", providing core driving force for improving the quality and efficiency of green finance.

3. OPPORTUNITIES FOR THE DEVELOPMENT OF GREEN FINANCE DRIVEN BY FINANCIAL TECHNOLOGY

3.1. Product Supply Side Innovation Breaks Through Funding Gap

China needs to invest over 268 trillion yuan in the long term to achieve its carbon neutrality goal. Although the balance of green loans has reached 36.6 trillion yuan and the cumulative issuance of green bonds has exceeded 4.1 trillion yuan by the end of 2024, the funding gap is still significant. Fintech expands supply through scenario based innovation: Ant Group launches the "Carbon Account+Green Credit" product, which converts personal low-carbon behavior into credit limits and has served hundreds of thousands of small and micro enterprises; Shanghai Pudong Development Bank has introduced blockchain technology in its carbon neutral bond issuance, and its lead underwriter, Guodian Electric Power's carbon neutral bond, has become a benchmark project for dual certification both domestically and internationally. Through technological optimization and simplification of the issuance process, it effectively reduces financing costs and attracts international investors' attention. In addition, financial institutions also rely on big data to develop green ABS, further expanding financing paths.

3.2. Service Outreach Extends To the Inclusive Field

Traditional green finance often focuses on large-scale projects, and financing difficulties for small and medium-sized green enterprises are prominent. Fintech breaks geographical and scale limitations through lightweight services: NetEase Bank develops pure online green credit products, evaluates agricultural green projects based on IoT device data, covers more than 100 counties, maintains a low level of non-performing loans, and focuses on supporting scenarios such as water-saving irrigation for farmers and upgrading small and micro environmental protection equipment; WeBank has built an AI loan review system that replaces manual evaluation with intelligent algorithms, significantly shortening the approval cycle. At the same time, relying on big data risk control to reduce comprehensive financing costs, it enables inclusive green finance to reach more market entities.

3.3. Significant Improvement in Carbon Finance Market Efficiency

Financial technology accelerates the improvement of carbon market liquidity: Shanghai Environment and Energy Exchange uses blockchain technology to build a trading platform, realizing full process electronic services in voluntary emission reduction trading products, promoting closed-loop consumption of emission reductions, and increasing trading volume by over 30% year-on-year in 2024; Internationally, platforms such as Singapore's Greenprint ESG Registry use blockchain technology to record corporate carbon emissions data, providing a reliable basis for carbon accounting. Similar technology applications have gradually been promoted in China, controlling the accounting errors of corporate carbon emissions within a reasonable range and laying the foundation for accurate allocation of carbon quotas [3].

4. THE REALISTIC CHALLENGE OF EMPOWERING GREEN FINANCE WITH FINANCIAL TECHNOLOGY

4.1. There are Structural Deficiencies in the Data Governance System

The lack of data standardization has led to prominent issues of "data silos": environmental protection departments adopt the GB/T 32151 series environmental information standards, while financial institutions implement the China Banking and Insurance Regulatory Commission's green credit special document standards. There are differences in the definition and statistical caliber of some core indicators, and there are obstacles to data exchange. Multiple surveys have shown that some green

projects have delayed approval processes due to data connectivity issues, affecting financing efficiency. The mandatory disclosure mechanism is not yet sound, and it is common for small and medium-sized enterprises to omit environmental information. The verification of information authenticity is difficult, which may exacerbate the risk of "greenwashing" and affect the precise allocation of green financial resources [4].

4.2. Systemic Hazards Caused By the Transmission of Technical Risks

The complexity of financial technology may amplify risk exposure: some financial institutions' green credit systems have deviated from the judgment of project green attributes due to algorithm design deviations, increasing credit risk; Due to code vulnerabilities in certain scenarios, blockchain smart contracts have encountered issues with delayed tracing of fund flows. The speed of technological iteration is faster than the pace of risk control system updates, and the "black box effect" of AI models may lead to lagging risk warning. Technological related risk events in the field of green finance occur from time to time, which puts higher demands on risk prevention and control capabilities.

4.3. The Dynamic Balance Between Regulation and Innovation is Difficult

The existing regulatory system and technological development pace need to be further adapted: special regulations for green financial technology still need to be improved, some innovative businesses lack clear regulatory guidance, and the industry's development faces certain uncertainties. Although sandbox supervision pilot projects have been launched in many places, the coverage and exit linkage mechanism are still being optimized, and some pilot projects need to continue to explore compliance implementation in the future. Cross border green fintech businesses face compliance and coordination challenges due to differences in cross-border data transmission rules in different regions, which affects the efficiency of international resource integration.

4.4. There is a Gap in the Supply of Professional Talents

The supply of composite talents in green financial technology is insufficient, and practitioners with knowledge of environmental science, financial theory, and information technology are relatively scarce, making it difficult to meet the needs of business innovation. The construction of interdisciplinary fields related to universities is still being promoted, and there is a gap between the scale of talent cultivation and the actual market demand. Some graduates lack practical operational experience and need to enhance their professional abilities through pre job training in enterprises. The talent cultivation cycle is currently not matched with the development speed of the industry.

5. EXPLORATION OF REGULATORY PRACTICES EMPOWERING GREEN FINANCE WITH FINANCIAL TECHNOLOGY

5.1. Top Level Design Optimization of Policy Systems

In 2024, the central bank and other departments jointly issued guidance documents related to green financial technology, clarifying the basic standards for data sharing and proposing to gradually build a unified national green information service platform, providing policy basis for cross departmental data collaboration. At the local level, Zhejiang actively promotes the pilot project of "green data asset certification", explores the financing model of enterprise environmental data pledge, and some landing projects rely on data assets to increase credit, reducing financing costs compared to traditional credit. Tax preferential policies continue to tilt towards the field of green technology empowerment. Financial institutions that invest in research and development related to green financial technology can enjoy additional deduction policies for research and development expenses according to

regulations. This measure effectively incentivizes financial institutions to increase technology investment and promote the implementation of green financial technology applications.

5.2. Localization Practice of Sandbox Supervision

China has launched multiple pilot projects for financial technology sandboxes, many of which focus on green finance innovation, covering areas such as blockchain carbon trading and AI green credit risk control. The pilot project of "Blockchain Carbon Quota Pledge Loan" in Shenzhen has continuously optimized the matching mechanism between fund flow and carbon asset circulation through sandbox testing, and achieved business model maturity under the premise of controllable risks. It has gradually been promoted and applied in the Guangdong Hong Kong Macao Greater Bay Area. Beijing and other places have established exit linkage mechanisms for regulatory sandboxes, and improved the conversion efficiency of pilot projects from testing to formal implementation by intervening in compliance guidance in advance and clarifying the transformation path, providing guarantees for the smooth transition of innovative businesses.

5.3. Preliminary Attempts At International Regulatory Coordination

China and the European Union have established a cooperation mechanism in the field of green finance regulation, promoted mutual recognition of green project evaluation standards, cleared some obstacles for cross-border green finance business, and steadily increased the scale of China EU cross-border green bond cooperation in 2024 [5]. At the same time, China actively participates in global green finance technology regulatory exchanges, joins international regulatory cooperation platforms, shares technology risk prevention and control experience with countries, including practical cases in the fields of smart contract security, cross-border data compliance, etc. Through information exchange, it shortens the cross-border risk warning response cycle and helps promote the coordinated development of the global green finance market.

6. THE SUSTAINABLE DEVELOPMENT PATH OF GREEN FINANCE UNDER THE BACKGROUND OF FINANCIAL TECHNOLOGY

6.1. Building a Standardized Data Governance System

It is suggested that the central bank take the lead in formulating the "Green Finance Data Element Standard", unify multiple core data standards such as environmental indicators and product certification, and promote efficient interoperability of government enterprise data interfaces before 2025. Establish a "mandatory disclosure+third-party audit" mechanism to impose credit penalties on companies that make false disclosures, with the goal of improving the accuracy of environmental information. Promote the local practice model of "data asset pledge" in Zhejiang, cultivate a green data trading market, and release considerable data asset value through standardized data ownership and circulation, providing new support for green financing.

6.2. Establish a Sound Technical Risk Prevention and Control System

Financial institutions need to establish a dual line of defense consisting of algorithm auditing and intelligent monitoring, regularly conduct security assessments of green finance systems, and promptly identify technical vulnerabilities. Regulatory authorities should introduce the "Classification and Grading Standards for Green Financial Technology Risks", incorporating AI model risks, blockchain vulnerabilities, and other risks into the scope of macro prudential assessment, and strengthening risk warning. Encourage the establishment of industry-specific technology security alliances, share risk prevention and control tools and experiences, help reduce the incidence of technical failures, and ensure stable business operations.

6.3. Improve the Collaborative Mechanism for Regulatory Innovation

Gradually expand the coverage of sandbox supervision, extend it to more provincial administrative regions, and focus on incorporating innovative products such as carbon finance and green ABS, providing trial and error space for new business models. Establish a "regulatory technology platform" that utilizes AI technology to monitor the flow of green funds in real-time, shorten the response time for violation warnings, and improve regulatory accuracy. Promote regulatory mutual recognition with countries along the "the Belt and Road", explore the construction of cross-border green financial technology corridors, and promote efficient docking of international resources [6].

6.4. Building a Comprehensive Talent Cultivation System

Colleges and universities need to establish interdisciplinary courses on "green financial technology", with core courses covering environmental economics, blockchain technology, green risk modeling, etc., to strengthen the theoretical foundation of talent. Financial institutions and research institutes jointly establish training bases to enhance the practical skills of practitioners and improve their business adaptability. Implement the "Green Financial Technology Qualification Certification" system, incorporate professional abilities into the assessment system for practitioners, gradually fill the talent gap through systematic training, and support the sustainable development of the industry.

7. CONCLUSION

Financial technology provides a key tool for green finance to break through development bottlenecks. Through technologies such as big data, blockchain, and artificial intelligence, it has shown significant potential in alleviating information asymmetry, expanding product supply, and improving regulatory efficiency. Huzhou Bank has significantly improved the efficiency of green project identification and loan disbursement by building a green credit management system, integrating data from multiple departments to optimize the approval process; The carbon account product launched by Ant Group combines low-carbon behavior with credit support, broadens the boundaries of inclusive green financial services, and enables more small and micro enterprises and individual operators to obtain green financing support.

However, the current development still faces multiple practical challenges: the lack of unified data standards leads to low efficiency in cross departmental collaboration, the risk prevention and control mechanism in technology applications is not yet perfect, regulatory policies and innovation pace need to be further adapted, and there is a shortage of composite talents with knowledge of environmental science, finance, and technology. These problems have become important factors restricting the high-quality development of green finance.

To solve the above problems, it is necessary to establish a "policy technology talent" collaborative development system: at the institutional level, accelerate the standardization of green finance data, improve the mandatory disclosure of environmental information and third-party audit mechanisms, optimize the regulatory sandbox pilot model to accommodate reasonable innovation; At the technical level, promote the improvement of algorithm auditing and intelligent monitoring systems for financial institutions, strengthen the application of regulatory technology to achieve accurate risk warning; At the talent level, support universities to establish interdisciplinary programs in green finance technology, encourage financial institutions and research institutes to jointly build training platforms, and cultivate practical professional talents.

Only through multidimensional collaborative efforts can we fully unleash the empowering value of financial technology, promote the synchronous improvement of green finance scale and quality, and provide solid support for achieving the "dual carbon" goal. In the future, with the deepening of technological iteration and the improvement of institutional systems, the deep integration of financial

technology and green finance will continue to inject momentum into the green transformation of the economy and become an important force in promoting sustainable development.

REFERENCES

[1] Huang Qinghua, Wang Haoli Can financial technology promote green finance reform and innovation? [J] Financial Market Research, 2025, (04): 68-82. DOI:10.20134/j.cnki.fmr.2025.04.010.

[2] Zhao X, Aaron A. Artificial Intelligence for Sustainable Development: Quantile Evidence From FinTech, Human Capital, and Green Energy in G7 Economies [J]. Sustainable Development, 2025.

[3] Xie Y. Digital inclusive finance drives green innovation: Pathways and mechanisms for sustainable development [J]. Journal of the Knowledge Economy, 2024: 1-40.

[4] Muganyi T, Yan L, Sun H. Green finance, fintech and environmental protection: Evidence from China [J]. Environmental Science and Ecotechnology, 2021, 7: 100107.

[5] Oertel J, Tollmann J, Tsang B. Climate Superpowers: How the Eu and China Can Compete and Cooperate for A Green Future [M]. European Council on Foreign Relations, 2022.

[6] Zhang M, Zhang C, Li F, et al. Green finance as an institutional mechanism to direct the belt and road initiative towards sustainability: the case of China [J]. Sustainability, 2022, 14(10): 6164.