ISSN:2790-1661 Volume-14-(2025)

Research on Practical Paths and Optimization Strategies for the Deep Integration of Green Finance and ESG in China

Yingqi Li

School of Business, Hohai University, Nanjing 21000, China

2208020111@hhu.edu.cn

Abstract. Under the dual impetus of the global sustainable development Goals and China's "dual carbon" strategy, green finance has become the core force driving the green transformation of the economy. From a multi-dimensional perspective of policy, market and institutional innovation, this article systematically reviews the current development status of China's green finance, the integration mechanism of the ESG framework and the existing challenges, and proposes targeted optimization strategies. The study found that China has established a policy system of "three major functions" and "five pillars", and the market size of green credit, bonds, etc. has continued to expand, but there are still bottlenecks in the unification of ESG rating standards, the optimization of product structure, and regional coordinated development. ESG analysis empowers green finance through mechanisms such as optimizing investment and financing decisions and strengthening risk management, but it faces practical problems such as coordination of multiple subjects' goals and uneven quality of information disclosure. The study suggests building a systematic green finance ecosystem by strengthening top-level design, deepening differentiated exploration in regional pilot projects, promoting product and service innovation, establishing an ESG risk management system and enhancing capacity building.

Keywords: Green finance; ESG integration; Policy framework; Market innovation; Optimization strategy.

1. Introduction

Global climate change is a major challenge, and promoting the green and low-carbon transition is an international consensus. China's goal of peaking carbon dioxide emissions before 2030 and achieving carbon neutrality before 2060 places demands on the financial system to support green development [1]. Green finance is key to environmental protection and economic development, guiding funds to low-carbon and environmentally friendly areas, optimizing resource allocation, controlling environmental risks and promoting sustainable development.

China has made progress in green finance, but there are structural contradictions: policy synergy needs to be enhanced, market product innovation is disconnected from the demands of the real economy, financial institutions' ESG integration capabilities vary, and regional development is unbalanced. In-depth exploration of green finance practice paths, ESG integration mechanisms and optimization strategies will help improve the green finance system with Chinese characteristics and provide a "Chinese solution" for global sustainable financial development. In the context of ESG becoming the mainstream standard for international investment, deep integration into green finance practices and improvement of resource allocation efficiency and risk management level are the core issues of concern for both the academic and practical communities. This article adopts a multi-faceted approach incorporating policy analysis, market dynamics, and institutional innovation to conduct a comprehensive review of China's green finance development landscape. It delves into the integration mechanism of the ESG framework, identifies existing challenges, and puts forward targeted optimization strategies. This study provides theoretical references and practical paths for improving the green finance system with Chinese characteristics and facilitating the realization of the "dual carbon" goals.

2. Definition of core concepts

2.1 Green finance

According to the "Guiding Opinions on Building a Green Finance System" issued by the People's Bank of China and seven other ministries and commissions in 2016, green finance refers to "economic activities that support environmental improvement, response to climate change and efficient use of resources. That is, financial services provided for projects in areas such as environmental protection, energy conservation, clean energy, green transportation, and green buildings, including investment and financing, project operation, and risk management. This definition emphasizes that green finance encompasses not only traditional financing support but also multiple functions such as risk management and market pricing, with its core being the integration of environmental, social and governance (ESG) factors into the financial decision-making process to achieve the unification of economic and environmental benefits.

2.2 ESG concepts and analytical framework

ESG (Environment, Social, and Governance) concept originated in 2004, the United Nations Environment programme (unep) "intentional who wins: Linking Financial Markets to Sustainability, this report aims to guide investors in assessing corporate value, in addition to financial indicators, also to environmental performance, fulfillment of social responsibility and the level of corporate governance. Its analytical framework covers three major dimensions: the environmental dimension includes carbon emissions, resource utilization efficiency, pollution prevention and control, etc. The social dimension involves employee rights, community relations, consumer protection, etc. Governance dimensions cover board structure, anti-corruption, data transparency, etc. The ESG concept goes beyond the traditional corporate social responsibility (CSR) category and forms a systematic and quantifiable assessment system, providing an important assessment tool and practice framework for green finance.

2.3 Correlation between green finance and ESG

There is an inherent logical consistency between green finance and ESG concepts: ESG analysis provides micro-level assessment criteria for green finance, helping financial institutions to screen projects and enterprises that meet sustainable development requirements; Green finance, on the other hand, provides funding channels and market vehicles for the implementation of ESG concepts, and both serve the goal of the green transformation of the economy. Specifically, ESG indicators can serve as the core basis for the design of green finance products, such as the issuance of green bonds that meet specific ESG standards; At the same time, the development of green finance also drives enterprises to improve their ESG performance, creating a virtuous cycle of "financial support - enterprise improvement - further financial support".

3. Research on Green Finance and ESG

Research on green finance and ESG both at home and abroad has formed multi-dimensional explorations:

At the green finance policy level, studies on the international have focused on carbon pricing mechanisms and the effectiveness assessment of green credit policies have constructed a quality evaluation system for China's green finance policies, pointing out the problem of insufficient policy synergy. In terms of product innovation, the design and application of tools such as green bonds and green insurance have become research hotspots, for example, Dai Yunhao et al. [2] further quantified the correlation between environmental pollution liability insurance and corporate ESG performance, providing empirical evidence for this innovative tool.

ESG integration research shows interdisciplinary characteristics: The management field focuses on the relationship between ESG and enterprise value, for example, Jing Jin analyzed how financial

institutions integrate ESG factors into investment strategies and risk management frameworks under China's policy context [3]; The finance field explores how ESG affects asset pricing and risk management, In the insurance sector, Zheng Meng identified emerging trends where ESG responsibilities are reshaping risk management frameworks [4]. In the Chinese context, Sun Fangcheng et al. [5] verified the effect of green finance reform and innovation pilot zones on improving ESG performance in manufacturing through the differe-in-differences method, but problems such as inconsistent ESG rating standards and uneven quality of information disclosure remain to be addressed.

The existing research still has the following deficiencies: First, there is a lack of systematic integrated analysis of green finance policy, market and institutional innovation; Second, research on the interaction mechanism between ESG and green finance is mostly theoretical, with insufficient empirical support; Third, research on green finance development strategies tailored to China's regional differences needs to be deepened.

4. The current situation and policy environment of green finance development in China

In recent years, China's green finance policies have further focused on the three major functions of "resource allocation, risk management, and market pricing" and constructed the five pillars of "standard system, regulatory disclosure, incentive and restraint, product market, and international cooperation" (Document 1). In terms of the standard system, the "Catalogue of Green Bond-Supported Projects (2021 Edition)" released in 2021 unified the project definition standards for greeLin bonds, addressing the previous problem of inconsistent standards among different institutions [1] ; In terms of regulatory disclosure, the Guidelines for Environmental Information Disclosure by Financial Institutions require financial institutions to gradually disclose their environmental risk exposure to enhance market transparency; In terms of incentives and constraints, green credit will be incorporated into macroprudential assessment (MPA), and through a dual mechanism of policy guidance and market incentives, financial institutions will be encouraged to increase green investment.

4.1 Green Credit: Scale growth and Structure optimization

China's green credit market is expanding continuously. By the end of 2023, the balance of green credit in both domestic and foreign currencies reached 34.8 trillion yuan, up 28.5 percent year-on-year, ranking among the largest in the world. Credit funds have been focused on areas such as clean energy, energy conservation and environmental protection. For instance, the Shandong branch of Industrial and Commercial Bank of China has built a green ecosystem in light of the characteristics of its heavy industry structure and supported projects such as clean energy power generation and low-carbon technological transformation. Meanwhile, the risk management mechanism for green credit has been continuously improved. Some banks have introduced ESG risk classification management. For instance, ICBC pioneered a four-level and tweld-level ESG risk classification management system to enhance the ability to identify and control environmental risks.

Table 1：China's Green Credit scale and Growth rate (2021-2023) [6]

Year	Balance of green credit in domestic and foreign currencies (trillion yuan)	Year-on-year growth rate (%)
2021	15.9	21.0
2022	27.6	26.5
2023	34.8	28.5

4.2 Green bonds: Innovative development in line with international standards

The green bond market has become an important growth point for green finance. China's green bond issuance exceeded 1.5 trillion yuan in 2023, with a significant increase in the proportion of innovative varieties such as carbon-neutral bonds and sustainable development-linked bonds. The first carbon neutrality green bond issued by a domestic commercial bank was issued by Industrial and Commercial Bank of China, with the funds raised specifically for low-carbon projects [7]. In the international market, the scale of green bond issuance by Chinese enterprises has also continued to expand. In 2023, the issuance of green bonds abroad reached 30 billion US dollars, and some of the bonds referred to the Common Classification Targets for Sustainable Finance between China and the European Union, enhancing the recognition of international investors [8].

Table 2: Scale of Green Bond Issuance in China (2023)

Type	Circulation (billion yuan/billion US dollars)	Proportion of innovative varieties	Typical Cases
Domestic green bonds	1.5 trillion yuan	35 percent (Carbon neutrality bonds, etc.)	Industrial and Commercial Bank of China issued the first carbon-neutral green bond issued by a commercial bank
Green bonds from abroad	$30 billion	20% (citing International classification criteria)	Some bonds use the China-Eu Sustainable Finance Classification

4.3 Green Insurance: Coverage expansion and Product Innovation

Green insurance plays a unique role in areas such as environmental pollution prevention and control and the dispersion of catastrophe risks [2]. The coverage of environmental pollution liability insurance has expanded from traditional high-pollution industries to emerging green industries. In 2023, more than 16,000 enterprises were insured, providing risk protection of over 160 billion yuan. Innovations in catastrophe insurance have been ongoing, such as the launch of products like earthquake co-insurance and weather index insurance. In the 2023 Typhoon Lekima disaster, Pacific Insurance paid out 240 million yuan in claims, demonstrating the risk buffering function of insurance. Green insurance for agriculture has evolved from the agricultural community to the China Agricultural Insurance Corporation to support green development in agriculture; Green building and energy insurance, such as performance insurance and ultra-low energy building insurance, have also been gradually implemented to provide risk protection for green infrastructure [9].

5. Deep Integration of ESG Framework with Green Finance: Mechanisms and Challenges

5.1 The core Supporting Role of ESG analysis in green finance

ESG analysis provides a scientific basis for green finance investment and financing decisions. In the project screening process, financial institutions use ESG negative or positive screening mechanisms to eliminate high-pollution and high-risk enterprises and focus on environmentally friendly projects. For instance, some green funds adopt a "negative list" model, refusing to invest in high-carbon industries such as coal and oil, while using positive screening to identify companies that excel in energy conservation, emission reduction, and social responsibility. At the portfolio management level, ESG indices such as the Chinabond - ICBC Green Bond Index provide investors with a tool to track the performance of green assets and direct funds to low-carbon areas.

ESG analysis helps financial institutions identify and quantify environmental, social and governance risks. In terms of environmental risks, climate risk stress tests are used to assess the impact of extreme climate events on asset values [3]. For instance, ICBC conducted stress tests on the coal power and cement industries, where the default probability of large coal power companies rose from 3% to 23% under a 2 ° C temperature increase scenario. In terms of social risks, ESG analysis focuses on corporate labor rights, community relations, etc., to avoid reputational risks caused by social controversy events. In terms of governance risks, it reduces risks such as financial fraud and decision-making mistakes by assessing board independence, anti-corruption mechanisms, etc.

ESG factors affect the efficiency of asset pricing and market resource allocation. Research shows that companies with good ESG performance tend to enjoy lower financing costs, such as a 10-20 basis point reduction in debt financing costs for every upgrade in a company's ESG rating. Under the influence of market mechanisms, funds are gradually tilted towards companies with excellent ESG performance, creating a "good money drives out bad money" effect. At the same time, the improvement in the quality of ESG information disclosure reduces information asymmetry and helps investors assess the value of enterprises more accurately and optimize resource allocation.

5.2 Application of ESG factors in green financial products and services

The integration of green financial products into ESG standards is becoming a trend. Green bond issuance needs to meet specific ESG requirements, such as the purpose of raising funds and the environmental benefits of the project, which must comply with the Catalogue of Projects Supported by Green Bonds. Innovative products such as ESG-themed wealth management products, funds and ETFs keep emerging [10]. Shenwan Hongyuan has launched a wealth management product linked to the ESG index to guide investors to focus on sustainable development enterprises. In the insurance sector, the framework of the "1-2-3-10" green insurance system has been established, with the green use of insurance funds as the fulcrum and green insurance products and services as the two rounds, focusing on the three major directions of environmental improvement, climate response and resource conservation, and developing ten types of green insurance products.

Financial institutions promote the improvement of ESG performance of the companies they invest in through shareholder advocacy, community-responsible investment, etc. Shareholder advocacy means that financial institutions, as shareholders, urge companies to improve their environmental management and social responsibility systems by participating in corporate governance and submitting shareholder proposals. Community responsibility investment, on the other hand, focuses on providing financing support for low-income communities, green infrastructure, etc., to achieve the unification of economic and social benefits. For instance, some banks have set up green community development funds to support energy-saving renovations of old residential areas, improving the quality of life of residents while promoting low-carbon transformation.

Insurance companies, as key players in green finance, have developed a distinctive ESG practice framework. Take the "1-2-3-10" system as an example: One fulcrum is the green long-term use of insurance funds, providing long-term funds for low-carbon projects by investing in green bonds, green infrastructure, etc. The two wheels are green insurance product and service innovation, developing products such as environmental pollution liability insurance and climate index insurance, while providing services such as environmental risk assessment and disaster prevention and mitigation consultation; The three directions are environmental improvement, response to climate change, and efficient utilization of resources; The ten categories of products cover multiple areas such as environmental damage, green resources, green industries, and catastrophic weather. This framework deeply integrates ESG concepts into the entire process of insurance operations, enhancing the industry's sustainable development capabilities [11].

5.3 Main challenges at present

5.3.1. The problem of multi-agent and multi-objective coordination

In the implementation of green finance policies, there is a problem of inconsistent goals between the central and local governments. Some local governments still provide implicit support to high-energy-consuming industries to maintain short-term economic growth, which conflicts with the central government's goal of green transformation and reduces the effectiveness of policy implementation. At the same time, there are differences among departments such as the Ministry of Ecology and Environment and the People's Bank of China in terms of the standards for identifying green projects and information disclosure requirements, which leads to multiple regulatory rules for market entities and increases institutional transaction costs.

5.3.2. Bottlenecks in ESG integration practices

There are significant differences in ESG rating systems both domestically and internationally. Take Huazheng and Bloomberg as examples; they have different weight allocations for the environmental (E), social (S), and governance (G) dimensions (see Table 3-1), which may lead to significantly different rating results for the same enterprise and affect the effectiveness of investment decisions. This issue of inconsistent standards increases the compliance costs for market participants and restricts the in-depth application of ESG assessment in investment.

Table 3： Comparison of core indicators of Huazheng and Bloomberg ESG rating systems

Dimensions	Huazheng Rating System (Weighting ratio)	Bloomberg Rating System (Weighting)
Environment (E)	40%-50% (with emphasis on carbon emissions and resource utilization)	30%-40% (Focus on climate risk exposure)
Society (S)	20%-30% (Focus on employee rights, community relations)	25%-35% (Focus on supply chain management)
Governance (G)	30%-40% (Emphasis on board structure, transparency)	35%-45% (Focus on anti-corruption mechanisms)

5.3.3. The structure of green financial products

At present, green financial products are mainly composed of loans and bonds (accounting for over 80%), while green insurance, ESG asset management products and carbon financial derivatives are underdeveloped, making it difficult to meet diverse financing needs. In addition, small and medium-sized enterprises, due to their small scale and insufficient collateral, find it hard to obtain green financial support, resulting in excessive concentration of resources in large enterprises.

5.3.4. Regional Fit and Resource allocation

"The current policies have not fully taken into account regional differences. For instance, the industrial structures and environmental carrying capacities of the Yangtze River Economic Belt and the Yellow River Basin are different, but the assessment standards are similar, leading to an unreasonable allocation of resources. Meanwhile, the green financial infrastructure in the eastern region is well-developed, while it is relatively weak in the central and western regions, further exacerbating regional development imbalances.

6. Strategic suggestions for optimizing the development path of China's green finance

6.1 Strengthen top-level design and multi-subject collaborative governance

Improve a unified green finance standard system by integrating domestic policies (e.g., green bond/credit guidelines) to eliminate departmental discrepancies, while aligning with international

norms like EU's classification and ICMA principles. Regulate ESG ratings via industry self-discipline, unified frameworks, and exit mechanisms for low-credibility agencies.

Optimize the policy framework by refining quantitative indicators for the "three functions" and "five pillars", strengthening cross-departmental coordination (PBC-led), and integrating green finance with inclusive/digital finance. Incentives like tax breaks and RRR preferences will be enhanced for green financial institutions [12].

6.2 Deepen regional reform pilots and differentiated development

Summarize and promote pilot zones' successful experiences by establishing a national-level exchange center to sort out innovative practices (e.g., Zhejiang's market-driven model and Jiangxi's ecological value realization) for replicable lessons. Foster cooperative mechanisms like the Yangtze River Delta Green Finance Alliance to enhance regional resource sharing and complementary development.

Develop region-specific policies: Tailor green finance strategies to local economic foundations and environmental capacities, prioritizing product innovation in eastern regions and infrastructure in central/western areas. Optimize assessment systems by reducing scale-related indicators' weight for less-developed regions and increasing focus on infrastructure and capacity building to avoid one-size-fits-all approaches [13].

6.3 Promote product and service innovation and market diversification

Vigorously develop green insurance by implementing the "1-2-3-10" framework, accelerating the development of ten types of green insurance products (e.g., environmental damage, carbon capture, biodiversity), and improving the catastrophe insurance system. Innovate service models to shift from risk compensation to prevention.

Meanwhile, enrich ESG investment tools by encouraging financial institutions to issue ESG-themed funds, wealth management products, and index derivatives. Promote ESG investment internationalization through cross-border products to attract global capital and support domestic investors in allocating high-quality international ESG assets [7].

7. Conclusions

Based on a multi-dimensional perspective of policy, market and institutional innovation, this study systematically analyzed the development status of green finance in China, ESG integration mechanisms and optimization strategies, and reached the following conclusions:

In terms of the current development status, China has established a relatively complete policy framework for green finance. The "three major functions" and "five pillars" system has initially taken shape. The market scale of green credit, bonds, etc. has continued to expand, and the regional pilot exploration has achieved remarkable results. The integration of ESG concepts with green finance has deepened and played an important role in investment and financing decisions and risk management, but still faces challenges such as multi-subject target coordination, inconsistent rating standards and unbalanced product structure.

In terms of the mechanism of action, ESG analysis provides core support for the development of green finance through optimizing resource allocation, strengthening risk management, and improving market pricing efficiency. Financial institutions have integrated ESG factors into product design and service innovation, forming distinctive practice models such as the "1-2-3-10" green insurance system, but there are still bottlenecks such as poor quality of information disclosure and insufficient analytical capabilities in the integration process.

In terms of optimizing strategies, it is necessary to build a systematic green financial ecosystem by strengthening top-level design, deepening regional pilot projects, promoting product innovation, improving risk management and enhancing capacity building. Particular emphasis should be placed on key issues such as the unification of ESG standards, support for small and medium-sized

enterprises, and data sharing to enhance the efficiency of green finance in serving the green transformation of the real economy.

Future research can be deepened in the following directions: a unified path for ESG ratings, exploring an integrated mechanism of ESG rating standards suitable for China's national conditions, and improving the comparability and credibility of rating results; Financial transmission mechanism of climate risk, study the potential impact of climate change on the financial system, and improve the risk early warning and response system; Deepen the application of fintech, explore the in-depth application of technologies such as blockchain and AI in green finance data management and product innovation; Biodiversity finance, study the mechanisms and pathways of financial support for biodiversity conservation, and expand the boundaries of green finance; Green investment and financing along the Belt and Road, analyzing the opportunities and challenges of green finance cooperation among countries along the Belt and Road, and optimizing cross-border green investment models; Just transition finance, exploring how to support the orderly transformation of high-carbon industries through financial means and avoid social risks in the process of transformation. China's green finance development is in a critical period of opportunity.

References

[1] Jia Huimin. Green finance and low-carbon sustainable development: A Case Study of Industrial and Commercial Bank of China [J]. Modern Marketing, 2023,(2):25-27.

[2] Dai Yunhao, Peng Keke, Tong Xinchu, Li Hongyu. Environmental pollution liability insurance and Corporate ESG performance [J]. Securities Market Herald, 2025,(2):24-35.

[3] Jing Jin. Green Investment Strategies and Risk Management of Financial institutions under the ESG framework [J]. China Collective Economy, 2024,(6):98-101.

[4] Zheng Meng. Green Finance: Trends and countermeasures for Social Responsibility of Chinese Insurance Companies [J]. Journal of Liaoning University (Philosophy and Social Sciences Edition),2021,49(1):65-74.

[5] Sun Fangcheng, He Yutian. Green finance reform and innovation and ESG performance in Manufacturing [J]. Journal of Guizhou University of Finance and Economics, 2024,(5):28-37.

[6] People's Bank of China. (2021-2023). Statistical data. http://www.pbc.gov.cn/diaochatongjisi/116219/116319/index.html

[7] Jia Huimin. Green finance and low-carbon sustainable development: A Case Study of Industrial and Commercial Bank of China [J]. Modern Marketing, 2023,(2):25-27.

[8] Yang Yi. Green Bonds, Asset Securitization, Carbon Finance products - Further broadening of Green Financing Channels in Capital markets [J]. Green China, 2025,(5):52-54.

[9] Zheng Meng. Green Finance: Trends and countermeasures for Social Responsibility of Chinese Insurance Companies [J]. Journal of Liaoning University (Philosophy and Social Sciences Edition),2021,49(1):65-74.

[10] Jing Jin. The Internal logic, Mechanism and countermeasures of green Finance development Empowering Corporate ESG performance [J]. Management and Technology of Small and Medium-sized Enterprises, 2024,(9):48-50.

[11] Tian Wanwan. Green Finance and ESG practices of Investment Enterprises [J]. Economic Research Guide, 2024,(12):52-55.

[12] Wang Peng. Research on the Development Path of Green Finance from the Perspective of ESG Analysis [J]. Finance and Economics Vision, 2025,(3):62-65.

[13] Li Jinman. Research on Mechanism Innovation of Green Finance Empowering the Realization of Ecological Product Value [J]. Market Outlook, 2025,(8):12-15.