
Research on the Mechanisms and Effects of Green Credit Business Development Empowered by FinTech: A Case Study of Huzhou Bank

Submitted 15/04/24, 1st revision 22/04/25, 2nd revision 28/05/25, accepted 30/06/25

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Abstract:

Purpose: The evolution of financial technology (FinTech) has introduced transformative opportunities for the banking industry, particularly in enhancing operational efficiency and refining risk management practices. Huzhou Bank has pioneered the adoption of a green credit management system, achieving notable progress in FinTech-enabled green credit development, positioning itself as a representative case among Chinese city commercial banks. This study outlines the current landscape of FinTech-driven green credit development in China, clarifying the pivotal role of FinTech in green credit innovation.

Design/Methodology/Approach: This paper adopts a case study approach to conduct an in-depth analysis of Huzhou Bank's operational performance before and after the empowerment of financial technology, and elaborates on the mechanism through which fintech plays its role in this context.

Findings: The research findings reveal that FinTech has a significant promoting effect on the development of Huzhou Bank's green credit business.

Practical Implications: Confronting the global climate crisis, the vigorous development of green finance has emerged as a critical instrument for advancing sustainable development. Against this backdrop, China has established the "dual carbon" strategic goals (carbon peaking and carbon neutrality) to facilitate economic green transition and sustainable growth.

Originality value: Green credit, an essential pillar of green finance, holds significant implications for fostering green industrial development and optimizing economic structures.

Keywords: Green credit, FinTech, green finance, Huzhou Bank, ESG, commercial banks, business performance.

JEL codes: G14, G21, O3.

Paper type: Research article.

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1. Introduction

On March 15, 2021, the Ninth Meeting of the Central Financial and Economic Affairs Commission emphasized that achieving carbon peaking and carbon neutrality constitutes an extensive and profound systemic transformation of the economy and society. It called for integrating these "dual carbon" goals into the overarching framework of ecological civilization construction, urging unwavering determination with tangible outcomes to advance their realization.

The development of green finance has become a strategic priority for the banking sector. As a cornerstone of green finance, green credit facilitates green economic growth by providing financial support to environmentally sustainable projects and industries. However, traditional credit models and risk management approaches increasingly fail to meet the evolving demands of green credit. Consequently, leveraging financial technology (FinTech) to enhance operational efficiency and risk mitigation has emerged as a critical pathway for the banking industry's green transition.

Green credit maintains a dominant position in China's green finance landscape, serving as a core business for commercial banks. With the rapid advancement of FinTech, an expanding number of institutions are integrating technologies such as big data, cloud computing, and artificial intelligence into credit operations. These innovations enable precise identification of green projects, data-driven risk assessment, and intelligent decision-making, thereby improving processing efficiency and risk control while bolstering green economic development.

Huzhou Bank, a regional city commercial bank headquartered in Huzhou, the birthplace of the "Two Mountains" philosophy (lucid waters and lush mountains as invaluable assets), has actively championed high-quality green credit development.

By adopting a "finance-green-technology-collaboration-risk control" strategic framework, the bank has embedded FinTech into its green credit ecosystem, establishing itself as an exemplar of technology-driven sustainable finance. This study explores the development strategy of Huzhou Bank's green credit business under FinTech empowerment, offering theoretical insights and actionable guidance to advance green credit innovation.

The theoretical value of this paper lies in its integration of two prominent and promising fields—fintech and green finance. It offers an in-depth analysis of the practical applications of fintech within the realm of green finance and explores the advantages and challenges fintech brings to green finance development from multiple perspectives. Based on these analyses, the paper proposes new pathways for fintech application and introduces fresh perspectives on green development, providing new inspiration for related academic research (Deceanu *et al.*, 2010).

On a practical level, the study constructs an operational scenario for fintech application, which helps drive innovation and optimization in financial services and supports sustainable economic development. This paper holds positive implications for guiding the practical development of the financial industry and promoting the continued progress of the economy and society (Thalassinos *et al.*, 2015).

This study adopts a case analysis approach, focusing on how Bank of Huzhou leverages fintech tools to advance its green credit business. By thoroughly investigating the growth trajectory, operational mechanisms, and challenges faced by the bank's green credit business under fintech innovation, the paper aims to extract valuable insights and strategies for industry reference.

It contributes to the optimization and upgrading of green credit practices across China's banking sector and holds both theoretical and practical significance for achieving the goals of carbon peaking and carbon neutrality.

2. Methods and Materials

Literature Review Method. By collecting, organizing, analyzing, and interpreting relevant literature, this method helps to comprehensively understand the current state of research on financial technology and green credit. Through a wide range of academic papers, research reports, and policy documents, it is possible to systematically outline the research framework, key viewpoints, and existing gaps in the field.

This lays a solid theoretical foundation and provides clear research directions for subsequent studies. It explores how financial technology can empower green credit operations, enhance financial institutions' capabilities and efficiency in green credit, and the mechanisms and pathways through which fintech promotes the development of green credit.

Case Study Method. Through in-depth analysis of specific cases, we can gain a deeper understanding of the relationship between financial technology and green credit, revealing the practical applications and challenges of fintech in green credit operations. Based on this, this paper selects Bank of Huzhou—a model example of fintech empowering green credit—as the research subject, conducting an in-depth analysis of the development outcomes of its green credit business following technological empowerment.

3. Literature Review

3.1 Research on Fintech

Yu Ping (2021) and Wang Ke (2017) pointed out that there is a nonlinear relationship between financial technology and bank risks, where risks initially increase but then

decrease. Tang Yiran and Dai Xianjun (2021) noted that the development of financial technology has significantly increased the scale of bank loans, with fintech having a significant positive impact on small and micro credit loans. Wang Ke (2019) emphasized that financial technology brings technological spillover effects to commercial banks, which in turn enhances total factor productivity.

In the field of supply chain finance, Caniato *et al.* (2016) stated that commercial banks use digital technologies to empower supply chain finance, helping to simplify processes, reduce costs, and provide more cost-effective services to clients.

Zhang Yu and Zheng Liansheng (2021) believed that by constructing digital trust, strengthening services, enhancing risk control capabilities, and building digital platforms, the expansion of service scope, process optimization, and creation of intelligent risk management systems can be achieved, forming a comprehensive ecosystem for the integration of industry and finance, which effectively improves the efficiency and effectiveness of supply chain finance.

In the retail business sector, Lee (2008) suggested that internet financial companies and traditional commercial banks have formed a competitive relationship in this field. Pousttchi and Dehnert (2018) observed that fintech has transformed the interaction model between banks and customers, evolving from traditional single-channel offline contact to multi-channel interactions, making services more diverse.

Hu Jun *et al.* (2021) conducted a quantitative evaluation of the fintech development level of 49 listed banks and explored how this level affects the scale and proportion of retail loans. The results showed that the advancement of fintech has significantly promoted the growth of retail loan scales and market share. Luo Jun (2024) believed that fintech empowering retail banking has driven high-quality economic development.

The research of the above scholars demonstrates the supporting role of financial technology in bank operations.

3.2 Research on Green Credit

Green credit has always been a core topic in green finance research. Cowan (1998) pointed out that green credit policies use economic tools to participate in environmental management, promote sustainable economic growth, and effectively solve environmental problems. Labatt and White (2002) pointed out the close relationship between green credit and environmental protection. Cilliers *et al.* (2010) pointed out that green credit is beneficial to environmental protection and improves the economic benefits of banks.

Wang Qianhong and Yang Shuhan (2024) pointed out that green credit promotes the improvement of commercial bank liquidity and profitability. In short, researchers

generally believe that green credit plays a positive role in environmental protection and the development of financial institutions.

3.3 Research on the Relationship between Financial Technology and Green Credit

Hu Yiju (2020) and Rao Kexuan (2022) analyzed panel data from various regions of China and found that financial technology can promote the development of green finance. Zheng Guozhong and Li Xiangwen (2022) found that financial technology allows financial institutions to develop green financial business more efficiently and securely.

Huang Zhuo and Wang Pingping (2022) analyzed the channels through which information technology empowers green finance, pointed out the challenges it faces in data statistics, information disclosure, information infrastructure, technological risks, and regulatory innovation, and proposed suggestions for improvement.

Lao Ziliang, Huang Xiaoyan, and Qi Guangyan (2024) found that financial technology has a promoting effect on green credit and helped city commercial banks alleviate the pain points in green credit development, namely the two major problems of information asymmetry and high transaction costs. In short, financial technology has a greater positive impact on the development of green credit.

3.4 Comments

Based on a review of both domestic and international literature, significant progress has been made in research on fintech and green credit. In the field of fintech, research has focused on supply chain finance and retail business, with the general consensus being that technology plays a positive role in both areas. Regarding green credit, most scholars agree that it benefits both environmental protection and the development of financial institutions.

While much of the research on the relationship between fintech and green credit is based on panel data from multiple regions, there is a lack of literature focused on individual banks, particularly from the perspective of technology empowerment in green credit. As two major directions for the development of the financial industry today, fintech and green credit demonstrate great potential in areas such as bank stability, risk management, business efficiency, as well as environmental and economic benefits.

In the future, as fintech continues to develop and innovate, its application in the green credit sector will become more widespread and in-depth, playing a greater role in achieving sustainable development in the financial industry and environmental goals. Therefore, this study selects Huzhou Bank as a case, as it is the first city commercial bank to establish a green credit management system. The aim is to

conduct an in-depth analysis of the development of its green credit business supported by fintech, extracting valuable insights to provide reference and guidance for innovation and progress in green credit within Chinese city commercial banks.

4. Results

4.1 The Development of Financial Technology

The integration of financial technology with other industries has become increasingly close, promoting industry upgrades and optimization, breaking traditional industry boundaries, and fostering various innovative practices. Across the country, the role of financial technology in multiple sectors has become increasingly significant, transforming it into a key driver of economic and social development. The development of financial technology in China can be divided into two stages:

Internet Finance Stage (2005-2015):

Initially, internet technology was primarily used to assist financial institutions in conducting traditional business, and a true internet finance business model had not yet been formed. With the gradual popularization of e-commerce, third-party payment institutions began to emerge. In 2011, the People's Bank of China initiated the process of granting third-party payment licenses, marking the beginning of a rapid growth phase for these institutions.

During this stage, third-party payment services greatly facilitated online payments and settlements and promoted the development of electronic currency. Starting in 2013, internet finance in China entered an explosive growth phase. P2P lending platforms rapidly emerged, and various crowdfunding platforms based on the internet also began to take shape.

Internet finance platforms primarily provided P2P (peer-to-peer) lending services, offering convenient borrowing and financing opportunities for individuals and small to medium-sized enterprises. In addition, new business models such as internet payments and internet fund sales gradually emerged, and the number of internet finance platforms increased rapidly.

Financial Technology Stage (2015-Present):

Beginning in 2016, the concept of financial technology started to spread domestically, giving rise to a new batch of emerging enterprises. Due to a lack of regulation during the exploratory period, the development of this sector had not yet been standardized, prompting the Chinese government to pay significant attention and introduce a series of plans and policies to guide the healthy development of financial technology.

For example, the People's Bank of China issued the "FinTech Development Plan

(2019-2021)" and the "Financial Technology Development Plan (2022-2025)" to promote financial institutions' full utilization of digital technologies and data elements, improving the quality and efficiency of financial services through innovative regulatory tools and pilot demonstrations.

With continuous technological advancements, the application of advanced technologies such as big data, artificial intelligence, and blockchain has made groundbreaking progress in areas such as financial risk management, customer service, and payment clearing.

These technologies have provided the financial industry with more efficient and intelligent solutions, guiding the industry toward digital transformation.

4.2 The Development of Green Credit

On July 30, 2007, the State Environmental Protection Administration, the People's Bank of China, and the China Banking Regulatory Commission jointly issued the "Opinions on Implementing Environmental Protection Policies and Regulations to Prevent Credit Risks." The aim was to control the unchecked expansion of high-energy consumption and high-pollution industries and promote the development of the environmental protection industry.

In 2012, the China Banking Regulatory Commission issued the "Guidelines on Green Credit," which clarified the principles and structure for implementing green credit. In 2020, the Ministry of Finance introduced the "Performance Evaluation Measures for Commercial Banks," incorporating green credit as a key evaluation indicator for China's economic development.

At the end of January 2023, the People's Bank of China announced that the support tools for reducing carbon emissions would continue until the end of 2024, including some local financial institutions and foreign financial institutions. This move aimed to further expand the scope of policy benefits and strengthen international cooperation in green finance.

In recent years, a series of domestic policies, including statistical systems and evaluation frameworks related to green credit, have been introduced to improve the green credit system.

These policies have provided strong support for the development of green credit and promoted the healthy growth of the domestic green finance market.

By the end of 2023, the balance of green loans in both domestic and foreign currencies reached 30.08 trillion yuan, a year-on-year increase of 36.5%, which is 26.4 percentage points higher than the growth rate of all types of loans. According to the "Fintech Driving the Development of China's Financial Industry: Cases and

Prospects (2023)" report, in terms of the scale of green financial products, China has become the largest green credit market in the world.

4.3 Application of Fintech in Green Credit

With the continuous advancement of technology, the role of fintech in green credit will be further strengthened. Fintech will increasingly permeate every aspect of green credit, driving the intelligentization and automation of the entire green credit process.

Strengthening the Construction of Fintech Platforms:

Zhongcheng Green Financial Technology Co., Ltd. has successfully developed China's first green credit automatic identification system, showcasing the tremendous potential and application value of fintech in the field of green credit. This system uses advanced technologies such as big data and artificial intelligence to enable fast and accurate identification of green credit projects.

Traditional green credit identification processes are cumbersome, inefficient, and prone to errors due to reliance on manual reviews and paper materials. Zhongcheng Green Financial Technology's automatic identification system can automate the collection, organization, and analysis of various environmental data, quickly filtering projects that meet green credit standards.

The company combines received certification materials and uses intelligent, specialized methods to build a closed-loop management system. This innovative measure addresses issues such as underreporting and misreporting in the green credit identification process, improving information quality and ensuring identification accuracy.

Innovating Credit Business Marketing Models:

Fintech drives the green credit business to achieve more precise marketing targeting. By analyzing and exploring big data, financial institutions can deeply understand customers' environmental needs, risk tolerance, and investment preferences, thereby accurately identifying target customer groups and tailoring a range of green credit products and services for them. This not only improves marketing efficiency but also enhances customer satisfaction and loyalty.

Fintech also helps green credit businesses achieve online and intelligent marketing. By leveraging cloud computing, artificial intelligence, and other technologies, financial institutions can create online marketing platforms to provide a full range of services for green credit products, including online display, application, approval, and disbursement.

At the same time, intelligent customer service and intelligent risk control systems can provide customers with more convenient and efficient service experiences,

further enhancing marketing effectiveness.

4.4 Current Status of Green Credit Business in China

The Preliminary Establishment of the Green Credit System:

The Improving Green Credit System Framework. In 2007, the State Environmental Protection Administration, the People's Bank of China, and the China Banking Regulatory Commission (CBRC) jointly issued the "Opinions on Implementing Environmental Protection Policies and Regulations to Prevent Credit Risk," aimed at curbing the unchecked expansion of high-energy consumption and high-pollution industries, while injecting strong momentum into the development of the environmental protection industry.

In 2012, the CBRC further released the "Green Credit Guidelines," providing clear direction and a solid framework for the implementation of green credit, giving financial institutions in the banking sector clear guidance in advancing green credit. In 2023, the central bank announced that carbon emission reduction support tools would continue until the end of 2024 and expanded the range of financial institutions covered by the policy. The issuance of these policies demonstrates the government's focus on green credit and provides robust policy support for financial institutions, boosting the development of green finance in China.

Improvements to the Green Credit Evaluation System. In 2014, the CBRC issued the "Key Evaluation Indicators for the Implementation of Green Credit," formally establishing the green credit evaluation system in the banking sector. In 2020, the Ministry of Finance released the "Commercial Banks Performance Evaluation Measures," signifying the important role of green credit in China's economic development.

In 2021, the central bank released the "Green Financial Evaluation Program for Banking Financial Institutions," which further revised and improved the evaluation system. This reform expanded the scope of evaluation and enhanced its scientific and effective nature, ensuring that the evaluation results better reflect the performance of banking financial institutions in the field of green finance.

The Growing Scale of Green Credit Business:

Green credit is the earliest, largest, and most mature green financial tool in China. In recent years, commercial banks, as the primary issuers of green credit, have continued to increase their support for green credit. Data shows that the growth rate of green credit has far outpaced the overall loan scale, and its outstanding balance has ranked first globally.

This highlights the deep concern of China's banking industry for green development and demonstrates the core role of green finance in driving the transformation of China's economic structure. According to the latest data from the People's Bank of

China, the balance of green loans in both domestic and foreign currencies grew from 8.23 trillion yuan at the end of 2018 to 22.03 trillion yuan by the end of 2022, with an annual compound growth rate of 27.91%, a year-on-year increase of 38.5%, 5.5 percentage points higher than the previous year-end, and surpassing the growth rate of all loans by 28.1%. The total increase in 2022 amounted to 6.01 trillion yuan (Figure 1).

Figure 1. China's green credit balance in 2020-2022



Source: The People's Bank of China

Distribution of Green Credit in Industries:

Green credit in China primarily focuses on large enterprises in the fields of energy conservation, emission reduction, and clean energy. In 2022, from an industry distribution perspective, the electricity, heat, gas, and water production and supply industry, as well as the transportation, storage, and postal services industry, became the primary recipients of green loans. The combined loan balance of these two industries reached 10.2 trillion yuan (Figure 2), accounting for nearly half of the total green loan amount.

In terms of loan usage, the infrastructure green upgrading industry and the clean energy industry are the main directions for the allocation of funds. Their combined loan balance reached 15.5 trillion yuan (Figure 3), accounting for more than 70% of the total green loan amount.

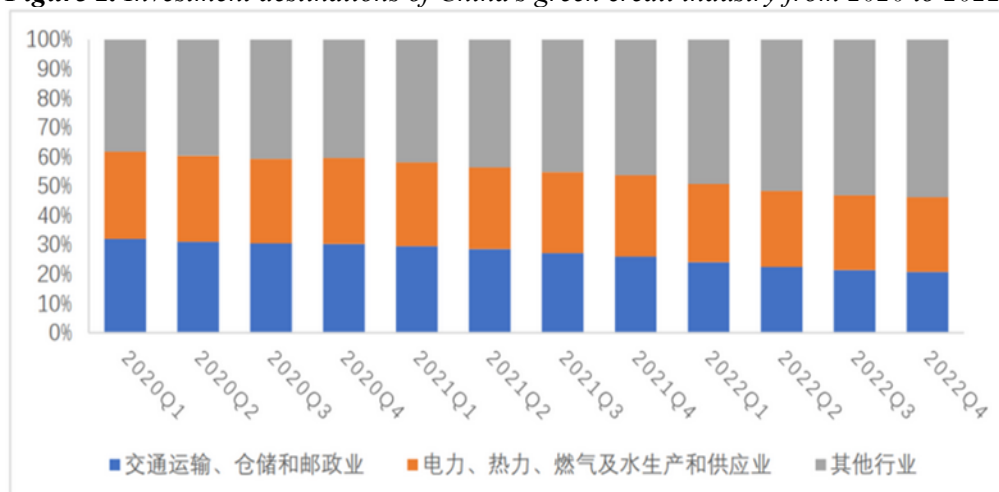
4.5 Green Credit Development of Huzhou Bank

Development Process:

Policy Implementation Stage: Since 2010, Huzhou Bank has leveraged its geographic advantages and actively responded to the national green finance development initiative. The bank began constructing and implementing related

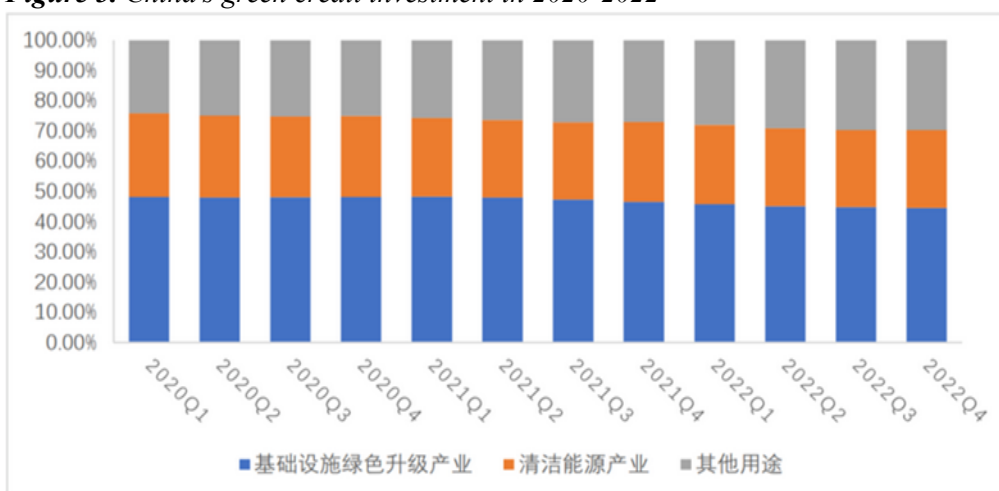
policies for green credit business. Over the span of five years, it refined credit policies, adhered to national industrial policy guidelines, and focused on the fundamental construction of the green credit system.

Figure 2. Investment destinations of China's green credit industry from 2020 to 2022



Source: The People's Bank of China

Figure 3. China's green credit investment in 2020-2022



Source: The People's Bank of China

This involved the formulation of green credit policies, the establishment of new green classification standards, the implementation of the “one-vote veto system” for environmental policies, the establishment of daily regulatory mechanisms for different industries, and strict enforcement of credit policies, continuously optimizing the green finance system. These measures effectively ensured the implementation of green credit standards within the system.

Strategic Planning and Implementation Stage: In 2016, Huzhou Bank positioned green finance as a key development focus for the next three years and established a dedicated green finance department, staffed with an experienced financial management team. In terms of system construction, the bank introduced a set of green credit guidelines and upgraded the “four-color labeling” system to facilitate the automatic identification and classification of green credit projects.

After three years of relentless effort, in 2019, Huzhou Bank successfully completed the process transformation of the “Equator Principles,” becoming the third domestic Equator Bank. In March of the same year, the bank launched the nation’s first green credit management system specifically designed for urban commercial banks. This system, utilizing advanced technologies such as big data, artificial intelligence, and cloud computing, enabled intelligent identification of green credit, environmental benefit assessment, environmental risk review, and dynamic tracking of post-loan funds.

Additionally, Huzhou Bank established the ESG default rate model and was the first to fully integrate ESG factors into credit approval and risk management processes, becoming a pioneer in the field. In 2020, the bank launched the first-ever ESG evaluation model for credit clients in China, making it the first commercial bank in the country to incorporate ESG concepts into credit management.

In 2021, Huzhou Bank successfully established a national-level green data center, becoming one of the first “carbon-neutral” pilot banks in Huzhou. In 2022, the bank executed the first domestic international commercial loan for the decarbonization of small and micro enterprises in partnership with the Asian Development Bank.

4.6 Development Scale Expansion

Huzhou Bank has always adhered to the concept of innovative finance, striving to achieve differentiated development. The bank has flexibly adjusted its business strategy, transforming ecological advantages into industrial advantages for economic development, thus fully demonstrating the economic value of green waters and green mountains. Driven by technological innovation, Huzhou Bank successfully developed and launched the country’s first green credit management system for urban commercial banks, pioneered the ESG default rate model, and set an example for technology-enabled green credit in the industry.

Huzhou Bank has consistently adhered to the concept of green development over the years. As shown in Table 1, from 2016 to 2022, the loan funding to environmental protection enterprises from Huzhou Bank has shown a steady growth trend. The amount of green credit disbursed increased from 2.9 billion yuan in 2016 to 4.409 billion yuan in 2021, with a growth rate of 52.03%. This significant growth not only reflects Huzhou Bank's firm commitment to green development but also effectively promoted the rapid development of local environmental protection enterprises,

making a positive contribution to achieving the dual goals of economic and environmental win-win outcomes.

Table 1. *The scale of green credit development of Huzhou Bank from 2016 to 2022*

YEAR		2016	2017	2018	2019	2020	2021	2022
Green Credit Balance (in billion yuan)		37.05	37.13	37.17	47.73	89.96	131.39	186.67
Total Assets (in billion yuan)		378.39	443.86	520.44	712.05	854.84	1013.99	1173.58
Percentage of Green Credit in Total Loans (%)		17.03	15.48	13.23	13.34	20.51	24.59	28.51

Source: *Huzhou Bank Annual Environmental Information Disclosure Report (2016-2022).*

4.7 The Green Credit Product Allocation is Diversified

Since 2016, Huzhou Bank has focused on green credit business and continuously made breakthroughs in this field. Figure 4 shows that in 2022, the scale of Huzhou Bank's green credit reached 18.667 billion yuan, accounting for 28.51% of the total loan portfolio, demonstrating outstanding performance in the green credit field and ranking among the top in the industry.

However, it is worth noting that the proportion of green credit decreased slightly in the first three years. This was mainly due to Huzhou Bank's increased efforts in financial product innovation in 2017, which led to a short-term redistribution of resources, giving more attention to other business areas. But in the long run, this investment in innovation laid a solid foundation for the steady development of green credit business.

Since 2019, the proportion of green credit at Huzhou Bank has steadily increased, indicating that the bank has consistently intensified its investment in green credit. Figure 5 provides a detailed breakdown of Huzhou Bank's green credit allocation in 2022. The main focus areas were ecological environment and infrastructure green upgrades, with these two areas collectively accounting for nearly 70%. This clearly shows Huzhou Bank's strategic positioning in green credit development, prioritizing projects that help improve the ecological environment and enhance the greening of infrastructure, thereby actively promoting the development of the green economy.

5. Discussion

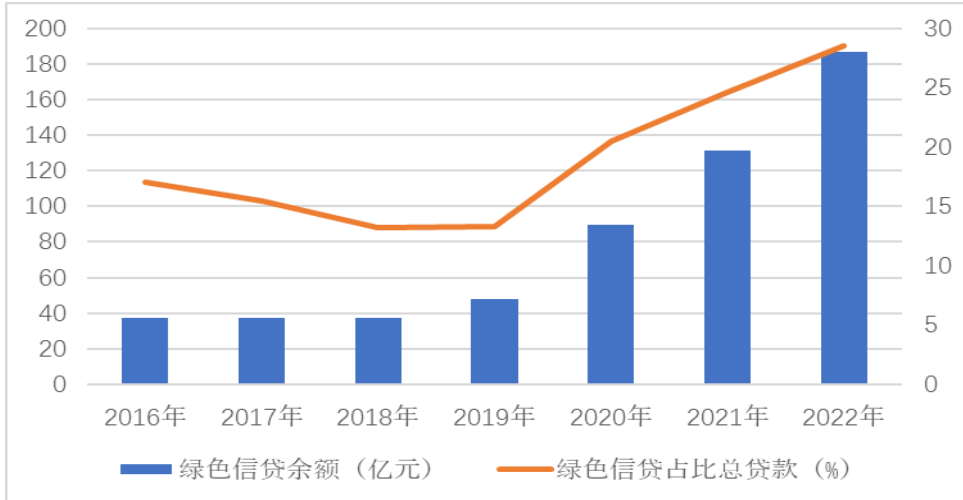
5.1 Huzhou Bank Green Credit Management System Case

5.1.1 "Three-Stage" Implementation Path

Stage 1: Intelligent Identification of Green Business: In the first stage, Huzhou Bank primarily used technological means to solve the problem of identifying and

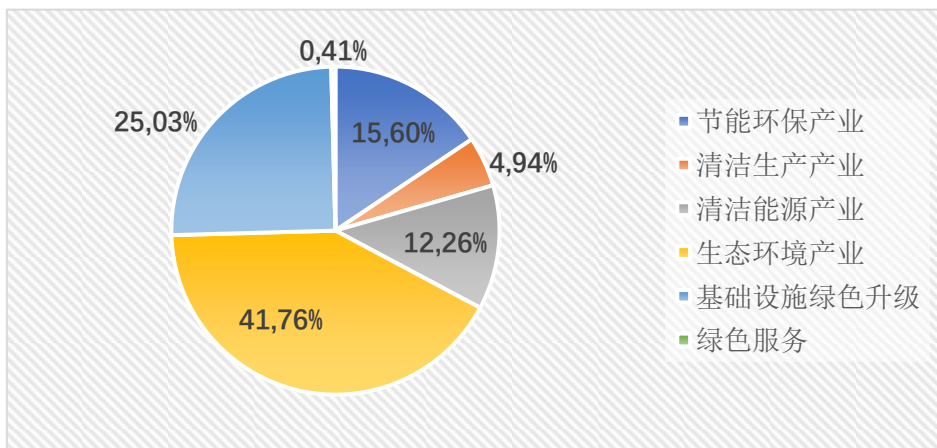
certifying green assets. Prior to this, the bank relied on manual identification of green businesses and added specific markers to the credit system for these businesses. This enabled the bank to promptly access detailed information and statistical data for green businesses, providing strong support for subsequent tasks.

Figure 4. Huzhou Bank's Green Credit Scale



Source: Huzhou Bank Environmental Information Disclosure Report (2016-2022).

Figure 5. Huzhou Bank's Main Green Credit Allocation Proportion



Source: Huzhou Bank 2022 Environmental Information Disclosure Report

Stage 2: Process Integration and Initial Consolidation: In the second stage, Huzhou Bank gradually built a comprehensive green finance framework, covering strategic planning, organizational structure, institutional systems, product innovation, risk management, green operations, and information system development. The bank focused on creating a green credit management system to automate the entire green finance business process. Through its digital transformation strategy, Huzhou Bank

successfully digitized and automated green business identification and environmental and social risk review processes, improving management efficiency. This transformation also supported real-time monitoring of green information by financial regulators and the formulation of relevant policies. The system features functionalities such as supporting the entire credit process with fintech, automatic identification of green credit, classification of environmental risks, and automatic alerts.

Stage 3: Intelligent Big Data Risk Control: In the third stage, Huzhou Bank used big data and artificial intelligence (AI) technologies to enhance green finance risk management and promote business growth. The bank adopted AI for the intelligent identification of green business, environmental benefit calculation, and ESG evaluation. In the area of environmental and social risk management, Huzhou Bank used big data algorithms and models to build an ESG default rate model, which was integrated into the bank's credit management.

The bank's use of fintech created a unique ESG corporate evaluation system and default rate calculation model, which were then converted into specific risk strategies and pricing mechanisms, providing strong support for the fine-tuned management of green finance across the bank. Other commercial banks could learn from Huzhou Bank's approach by innovating and developing standardized management tools, embedding sustainable development principles into green credit management, and using fintech to lead the bank's comprehensive green transformation.

5.1.2 Four Major Advantages

Enhanced Accuracy with AI and Machine Learning: Huzhou Bank significantly improved the accuracy of green project identification by applying AI and machine learning. The technology automatically determines a project's eligibility for green loans based on project data and combines manual review for corrections, constantly refining the accuracy of the judgment model.

The system's built-in environmental benefit calculation module also provides real-time calculations and continuous tracking of a project's environmental benefits, which serves as an important basis for green credit decision-making. This innovation enhances the intelligence of green credit management and injects new momentum into the development of green finance.

Timely and Accurate Environmental Risk Management: The system effectively improved the timeliness and accuracy of environmental risk management by using big data and intelligent recognition. It automatically extracts relevant information from vast data sources about companies penalized by regulatory authorities and uses intelligent analysis and processing to quickly identify and assess environmental risks, sending alerts when necessary.

Cost Reduction and Quality Improvement: By utilizing big data and intelligent evaluation technologies, Huzhou Bank significantly reduced the cost of green credit management while improving the management quality. This innovative approach freed staff from tedious manual tasks, reducing labor and time costs typically required in traditional management processes. Not only did this increase the efficiency of green credit management, but it also led to cost reductions and quality improvements.

Comprehensive Application Across All Credit Management Processes: The system is applied to all aspects of the bank's credit management process, effectively improving the bank's ability to identify green projects and enhancing its preference for green credit. Huzhou Bank has actively promoted the innovation and development of green financial products, enriching its green credit product line and contributing positively to green development and achieving sustainable development goals.

5.1.3 Two Major Functions

Green Credit Identification: The platform automatically categorizes loan projects according to national or local green criteria, with a manual review team to ensure accuracy. In response to the financial regulator's need for precise environmental benefit assessment, Huzhou Bank developed a specialized environmental benefit quantification model. This model accurately calculates the environmental benefit index of projects based on project-specific formulas and parameters and continuously tracks changes in their environmental benefits.

Environmental and Social Risk Management: The platform uses big data technology to gather information and automatically assess the environmental and social risk levels of companies. It automatically retrieves key certification information and provides proactive alerts for risks related to expiring or revoked permits. The platform also tracks a company's multi-angle environmental performance, issuing warnings for potential environmental risks, such as penalties or incidents, when necessary, thereby providing strong data support for the bank's risk management decisions.

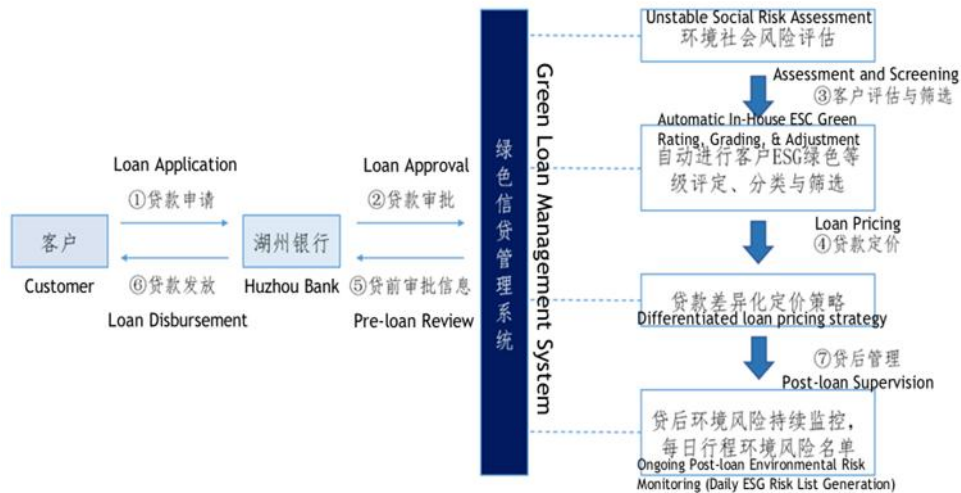
5.1.4 Practical Implementation

With the rise of big data and other cutting-edge technologies, traditional commercial bank operating models are facing challenges. In 2016, Huzhou Bank committed to exploring how to leverage technology to advance green credit business. In March 2019, the bank launched the industry's first comprehensive green credit management system covering all credit business processes, significantly improving management efficiency and breaking the limitations of traditional models.

Huzhou Bank rigorously adhered to the "Equator Principles" and integrated them into all stages of loan services, ensuring strict control over environmental and social risks and detailed classification of related projects. This greatly improved risk management capabilities. By transforming databases and innovating IT systems, the

bank ensured the accuracy and efficiency of risk prevention measures, especially in small and micro enterprise business operations.

Figure 5. Intelligent credit business processes embedded with green standards



Source: *Fintech Promotes the Development of Green Finance in China: Cases and Prospects.*

5.1.5 Using Big Data to Build a Green Credit Identification System

Big data technology plays a key role in the identification of green credit. Information asymmetry makes it difficult for banks to distinguish between genuine and fake green projects, but Huzhou Bank has successfully solved this problem through big data technology. By deeply analyzing massive amounts of data, the bank can accurately identify green projects and improve operational efficiency.

At the same time, Huzhou Bank has built a green credit identification system based on big data, utilizing an advanced workflow engine to mine enterprise information and automatically categorize and classify financing enterprises. Enterprises are divided into four categories, managed by a four-color label system. For green and blue enterprises, the bank provides policy support; for yellow and red loans, the bank applies credit compression and label management.

This management approach allows the bank to track the use of green funds by enterprises in real time and adjust labels as needed. Huzhou Bank also leverages its employees to check and correct system errors, improving the accuracy and efficiency of identification. By the end of 2021, the system had successfully identified over 42,000 transactions, with a significant growth in the amount of green credit and an accuracy rate of over 98%, showcasing Huzhou Bank's excellent performance in green credit identification.

5.1.6 Using Cloud Computing to Build an Environmental Benefit Calculation System

Cloud computing technology, with its excellent network storage and organizing capabilities, successfully converts massive amounts of data into easy-to-analyze programs and quickly provides feedback. After integrating environmental benefit calculation formulas and parameters into the system backend, Huzhou Bank achieved automatic calculation of project environmental benefits and flexible adjustment of credit policies.

To support low-carbon projects, the bank set up a fast-track approval channel and implemented dynamic post-loan monitoring. The cloud computing platform simplified the data input-output process, solving the challenge of calculating environmental benefits. By the end of 2021, the system had assessed nearly 700 project loans, reducing approval time to one-third of the original and saving over 30 million yuan in financing costs for enterprises. The optimization of the green credit data submission process reduced personnel and shortened processing times. Cloud computing technology significantly enhanced financial service efficiency and promoted financing for low-carbon enterprises.

5.1.7 Using Big Data and Artificial Intelligence to Create an ESG Risk Control Model System

Big data technology, with its powerful capabilities in data collection, storage, cleaning, processing, and analysis, provides Huzhou Bank with a massive amount of ESG data resources. The bank can easily access and track enterprise information in real time, integrating multi-dimensional data for one-click online retrieval.

The system uses intelligent evaluation to reduce human interference, making risk assessments more objective and accurate. Artificial intelligence technology is also applied to data analysis and modeling, enhancing the accuracy of risk assessments. Huzhou Bank has developed an ESG risk control model system by adopting mainstream domestic and international ESG evaluation methodologies, creating a logistic regression model that incorporates ESG factors:

$$y = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \dots$$

The system automatically analyzes ESG data using artificial intelligence, merging it with financial data to improve credit risk prediction and ensure loan safety.

Huzhou Bank's ESG risk control model system integrates into every aspect of the credit business, from pre-loan to post-loan, reflecting careful consideration of ESG risk factors. During the pre-loan stage, Huzhou Bank innovatively combines environmental credit ratings, corporate management levels, employee rights, and 81 four-level indicators with banking financial indicators, using quantitative analysis techniques to create a more comprehensive credit profile for enterprises, significantly enhancing the accuracy of default risk predictions.

During the loan and post-loan management stages, Huzhou Bank relies on the ESG risk control model to conduct regular risk assessments and automatic calculations, achieving proactive management of ESG risks in credit customers. By accurately predicting trends in loan quality changes, Huzhou Bank can quickly respond and effectively reduce credit risk.

Huzhou Bank creatively links the results of the default probability model with loan risk premium factors, directly influencing the loan execution interest rate for enterprises, thus constructing a mechanism to incentivize small and micro enterprises to engage in low-carbon transformation.

5.1.8 Effect analysis

Since the launch of the Green Credit Management System on March 7, 2019, Huzhou Bank has fully integrated the system into every aspect of its credit business. The introduction of this system has strengthened Huzhou Bank's ability to identify and evaluate green projects, ensuring that credit funds are directed towards projects that meet environmental protection, energy-saving, and low-carbon requirements.

This has enhanced the bank's work efficiency and reduced management costs. Through automated and intelligent data analysis, the bank can quickly identify potential green credit opportunities, reducing human intervention and misjudgments, thus optimizing the allocation of credit resources. In July of the same year, Huzhou Bank became the third Equator Principles bank in China, marking a significant step that demonstrates the bank's determination in promoting green finance development and fulfilling its social responsibility in green finance.

5.2 Analysis on the Effect of Green Credit Implementation of Huzhou Bank under the Empowerment of Financial Technology

5.2.1 Economic Effects

In order to explore the impact of financial technology on the green credit business of Huzhou Bank, this study compares the economic benefits of the bank's green credit before and after the application of financial technology. The analysis period is divided into two stages: 2010-2015, before the application of financial technology, and 2016-2022, after its application. The following is a comparison of the economic effects during these two periods:

(1) Improved Profitability

The three pillars of bank operating efficiency—net profit, operating profit, and interest income—are key indicators for evaluating its profitability. Looking back at the historical data from 2010 to 2015, Huzhou Bank's green credit business had not yet fully benefited from financial technology.

As a result, its development was somewhat limited, and both credit scale, asset

quality, and profitability showed a more conservative trend. During this period, both net profit and operating profit showed a downward trend, with declines of 8.37% and 14.42%, respectively. However, it is worth noting that interest income saw a strong growth during this time, with an increase of 75.17%.

By considering these data, it is evident that prior to the empowerment of financial technology, Huzhou Bank's profitability was relatively weak and in need of new forces to drive its business development and improve profitability (Figure 7).

Figure 6. Net Profit, Operating Profit, and Interest Income of Huzhou Bank Before Technology Empowerment (Unit: Billion Yuan)



Source: Wind Database.

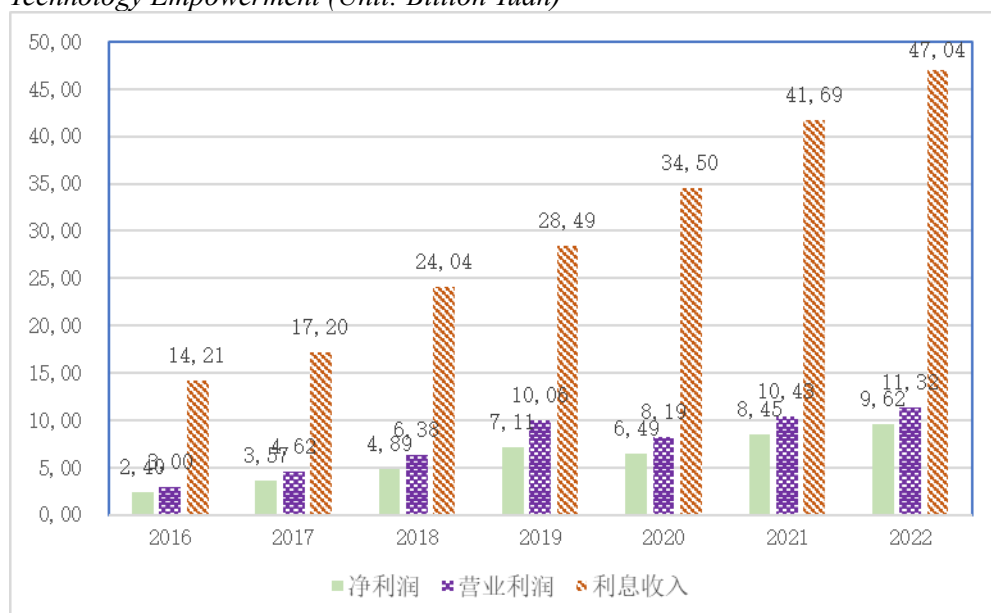
From the data between 2016 and 2022 (Figure 8), the full empowerment of financial technology has enabled Huzhou Bank's green credit business to achieve a qualitative leap in economic performance.

Not only has the credit scale expanded significantly, but asset quality has greatly improved, and profitability has also seen a substantial increase. Net profit surged from 240 million yuan in 2016 to 962 million yuan in 2022, an increase of 300.83%.

Operating profit grew from 300 million yuan to 1.133 billion yuan, representing a growth rate of 277.67%. Interest income also experienced rapid growth, rising from 1.421 billion yuan to 4.704 billion yuan, a growth rate of 231.03%. These figures show that with the support of technology, Huzhou Bank's net profit, operating profit, and interest income have all demonstrated strong, rapid growth.

If this trend continues, it is expected that in 2023, Huzhou Bank's net profit could surpass 1 billion yuan, operating profit will reach 1.3 billion yuan, and interest income will exceed 5 billion yuan, presenting a promising development outlook.

Figure 7. Net Profit, Operating Profit, and Interest Income of Huzhou Bank After Technology Empowerment (Unit: Billion Yuan)



Source: Wind Database.

(2) Improvement in Asset Quality

Asset quality is a crucial pillar for an enterprise's sustained and steady progress. Its importance cannot be overstated. Non-performing loan (NPL) ratio, as a key indicator of a bank's asset health, provides a static snapshot of the bank's asset quality. For example, the migration rate of normal loans shows the proportion of loans that shift from normal to non-performing.

Before financial technology injected new energy into Huzhou Bank, the disclosure of migration rates for the four types of loans was relatively conservative. Therefore, this study focuses on analyzing the changes in the non-performing loan ratio and the coverage ratio of non-performing loan provisions.

As seen in Table 2, Huzhou Bank's non-performing loan ratio showed an upward trend, while the coverage ratio of non-performing loan provisions experienced a significant decline, with a drop of 74.64%. It is clear that before the empowerment of technology, Huzhou Bank's asset quality had hidden risks that could not be ignored.

By organizing and analyzing the data from 2016 to 2022, it was found that Huzhou Bank made significant progress in loan risk identification. This is reflected in the decline in the migration rates of normal and watchlist loans, indicating that Huzhou Bank has made positive progress in risk prevention and control.

Table 2. *Non-performing Loan Changes Before Technology Empowerment at Huzhou Bank (Unit: %)*

YEAR	2010	2011	2012	2013	2014	2015
Normal Loan Migration Rate					0.82	0.65
Watchlist Loan Migration Rate					26.84	40.81
Substandard Loan Migration Rate					73.04	69.79
Doubtful Loan Migration Rate					17.01	27.66
Non-performing Loan Ratio (NPL Ratio)	0.19	0.57	1.18	1.42	1.19	1.26
Non-performing Loan Provision Coverage Ratio	1064.05	439.82	254.94	194.93	251.08	269.86

Source: *Annual Report Summary of Huzhou Bank Co., Ltd. (2010-2015).*

Although the migration rate of substandard loans showed a certain degree of increase, the significant rise in the migration rate of doubtful loans indicates that Huzhou Bank has developed greater sensitivity and accuracy in risk identification. The non-performing loan ratio of Huzhou Bank has shown a clear downward trend, demonstrating an enhancement in credit risk management. The provision coverage ratio has steadily increased, indicating that Huzhou Bank's ability to resist risks has improved, further confirming the continued improvement in its asset quality (Table 3).

Table 3. *Changes in Non-performing Loans at Huzhou Bank After the Empowerment of Technology (Unit: %)*

YEAR	2016	2017	2018	2019	2020	2021	2022
Normal Loan Migration Rate	4.46	1.87	1.33	0.94	1.46	0.66	1.02
Watchlist Loan Migration Rate	76.78	46.88	73.7	68.16	33.62	62.52	43.45
Substandard Loan Migration Rate	85.12	87.07	71.19	84.24	76.93	89.78	81.78
Doubtful Loan Migration Rate	25.7	36.34	44.46	15.82	95.14	87.7	91.57
Non-performing Ratio (NPL Ratio)	1.72	1.06	1.12	1	0.84	0.78	0.67
Non-performing Provision Coverage Ratio	200.64	373.79	395.74	352.6	405.94	424.94	490.52

Source: *Annual Report Summary of Huzhou Bank Co., Ltd. (2016-2022).*

(3) Reduction in Green Credit Identification and Risk Control Costs

Green credit projects, due to their long cycle and high uncertainty, increase the uncertainty of loan recovery and the risk of transaction costs for banks. Huzhou Bank, by leveraging big data technology, accurately identifies projects and integrates with government green finance platforms, enabling efficient system operation and precise labeling management, ensuring an accuracy rate of over 98%. The bank uses an advanced Activity workflow engine to reduce transaction costs. By combining artificial intelligence with big data, Huzhou Bank has pioneered an ESG

(Environmental, Social, and Governance) risk control system for city commercial banks, which monitors ESG events in real-time, quickly responds to risks, and indirectly reduces operational costs.

5.2.2 Social Effects

(1) Fulfilling Corporate Social Responsibility and Promoting Local Environmental Improvement

As the birthplace of the "Two Mountains" concept, Huzhou Bank has taken on the important role of being the only local legal entity city commercial bank. It has seamlessly integrated green credit with strategies to support small and micro enterprises, helping the micro-economy move forward steadily.

The stunning launch of the green credit management system has not only greatly increased the efficiency of credit business processing but also made remarkable contributions to environmental protection and social benefits. According to Huzhou Bank's Annual Environmental Information Disclosure Report (2022), the bank has achieved outstanding environmental results: reducing 35,000 tons of standard coal emissions, cutting 85,000 tons of CO₂ equivalent emissions, reducing chemical oxygen demand by 4,160.5 tons, and saving 287,000 tons of water.

These efforts have strongly promoted energy conservation, optimized natural resource usage, and reduced waste emissions, contributing to the improvement of local air quality.

(2) Responding to National and Government Calls, Enhancing Huzhou Bank's Corporate Reputation

In the Fifth Plenary Session of the 18th Central Committee, the Party made green development the core of the country's overall development strategy, pointing the way forward for all industries. When evaluating their own strength, companies now not only consider traditional indicators such as market share, profitability, and asset size but also increasingly recognize the importance of environmental contributions and public image.

As a key pillar of local financial services, Huzhou Bank has actively driven the economic and social development of the Huzhou area. Thanks to the rapid development of financial technology, Huzhou Bank has not only continuously expanded its business scale but also achieved remarkable results in the field of green finance.

Notably, in 2017, it became a pilot bank for environmental information disclosure in collaboration with the UK, and in 2019, it joined the Equator Principles, which enhanced the bank's position in the industry and earned widespread praise and recognition from society.

(3) Expanding Financing Channels for Small and Micro Enterprises and Extending the Reach of Financial Services

Traditional banking services are limited by offline branches and constrained by time and space. The rise of financial technology has driven the digital transformation of banking services, freeing them from dependence on physical branches. Online lending services reduce the time required for enterprises to secure financing by utilizing internet resources.

Technologies such as big data and artificial intelligence build efficient and convenient platforms to broaden financing channels. Financial technology has expanded the scope of financial services.

Huzhou Bank actively participates in this transformation, increasing investments in technology to provide diversified financing options for local green entities and small and micro enterprises.

The bank launched a green microloan project, offering convenient online financing, reducing time costs, and improving efficiency. It also established the Huzhou East Data Center, enhancing the efficiency of intelligent recognition for green project loans and the speed of environmental benefit calculations, achieving full-process green data management, improving risk control capabilities, and widely covering various sectors of society.

6. Conclusion

China has demonstrated unprecedented resolve toward achieving its "dual carbon" goals (carbon peaking and carbon neutrality). However, the country has yet to establish fundamental green production and consumption patterns, with insufficient progress in the efficient utilization of clean energy and environmental governance. These challenges render the realization of the "dual carbon" objectives a formidable task.

As China intensifies its focus on sustainable economic development, the concept of green finance has transitioned from theory to practice. Major Chinese banks have actively responded to national policies, prioritizing green credit initiatives. Simultaneously, in the era of digitalization, banks urgently need to integrate technological innovation into green credit operations to enhance management capabilities and establish digital green credit brands.

This paper selects Bank of Huzhou as a case study and conducts an in-depth analysis of how technological empowerment has improved the development of green credit business. The findings indicate that financial technology significantly promotes the development of green credit services at Bank of Huzhou.

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