

# EXPLORING THE NEXUS BETWEEN DIGITAL INCLUSIVE FINANCE AND SUSTAINABLE ECONOMIC GROWTH IN CHINA: A SYSTEMATIC LITERATURE REVIEW (2014–2024)

Xiaowan Liu \*, Khim-Sen Liew \*\*, Chin-Hong Puah \*\*

\* Corresponding author, Faculty of Economics and Business, Universiti Malaysia Sarawak, Kota Samarahan, Malaysia;  
School of Finance and Mathematics, West Anhui University, Luan, China

Contact details: Faculty of Economics and Business, Universiti Malaysia Sarawak, 94300, Kota Samarahan, Sarawak, Malaysia

\*\* Faculty of Economics and Business, Universiti Malaysia Sarawak, Kota Samarahan, Malaysia



## Abstract

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This study addresses the growing challenge of aligning financial innovation with sustainability in China (Dong et al., 2024) by examining the relationship between digital inclusive finance (DIF) and sustainable economic growth (SEG). The purpose is to identify how DIF contributes to green technology adoption, financial inclusion, and environmental performance. Using the PRISMA 2020 framework (Page et al., 2021), 110 peer-reviewed studies (2014–2024) from Scopus and Web of Science (WoS) were systematically reviewed and analyzed through bibliometric mapping in VOSviewer. Findings reveal that SEG is highly sensitive to DIF, with financial inclusion increasing by 10 percent, energy efficiency by 8 percent, and carbon emissions decreasing by 15 percent. Yet, issues such as endogeneity, regional disparity, digital illiteracy, and weak policy implementation constrain DIF's potential. This study concludes that strengthening digital infrastructure, promoting financial literacy, and leveraging blockchain-based DIF tools can enhance sustainable outcomes. These findings provide actionable insights for advancing China's sustainability agenda and global inclusive green growth strategies.

**Keywords:** Sustainable Economic Growth, Green Innovation, Digital Inclusive Finance, Digital Literacy

**Authors' individual contribution:** Conceptualization — X.L.; Methodology — K.-S.L.; Data curation — X.L. and K.-S.L.; Writing — Original draft — X.L.; Writing — Review & Editing — K.-S.L.; Supervision — C.-H.P.

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## 1. INTRODUCTION

Amid the unfolding crises of catastrophic climate change, resource depletion, and inequality, there lies an opportunity to reconcile economic growth with environmental sustainability and social justice, a prerequisite to averting truly global systemic

collapse (Rockström et al., 2017). The conventional pursuit of gross domestic product (GDP) growth as the dominant economic indicator has proven ecologically unsustainable and socially regressive (Kanbur et al., 2018). Accordingly, sustainable economic growth (SEG) reflects a redefined growth strategy that integrates the environmental, social,

and economic dimensions of prosperity, aligning with the United Nations (UN) Sustainable Development Goals (Sachs et al., 2019). For rapidly industrializing economies such as China, achieving SEG requires a transition from traditional, carbon-intensive models toward inclusive, innovation-driven systems capable of balancing growth with ecological preservation (Owusu-Pepurah, 2024).

Within this context, digital inclusive finance (DIF) has attracted growing academic and policy attention for its potential to bridge financial, technological, and environmental divides. DIF uses digital technologies to provide credit insurance and payment services to underserved populations, thereby promoting financial inclusion, innovation, and sustainability (Debnath et al., 2024; Ghose et al., 2025; Ye et al., 2021). The transformative capacity of DIF lies in its ability to democratize access to finance and channel capital toward green sectors such as renewable energy and low-carbon technologies (Barakat et al., 2025; Miftari et al., 2024). With the growing role of digital infrastructure, it improves efficiency, lowers transaction costs, and increases innovation in industries, making it a major contributor to sustainable change (Demirgüç-Kunt et al., 2018; Demirgüç-Kunt et al., 2020).

Despite this promise, the effectiveness of DIF depends on enabling conditions such as robust digital infrastructure, strong governance, and adequate financial literacy factors, which remain unevenly distributed across regions (Philippon, 2019). Previous studies have documented DIF's potential to stimulate green innovation and inclusive growth (Cai, 2023; Dong et al., 2024), yet comprehensive evidence explaining the mechanisms and boundary conditions of this relationship remains fragmented. Many empirical works focus on narrow indicators, producing inconsistent conclusions about DIF's impact on environmental outcomes, particularly in developing economies where data limitations, endogeneity, and institutional diversity complicate generalization (Zheng et al., 2024; Guo et al., 2023).

China provides a compelling case for exploring this nexus. Over the past decade, China's digital financial ecosystem has expanded rapidly through major platforms such as WeChat Pay and Alipay, achieving large-scale financial inclusion while contributing to energy efficiency and emission reduction (Wang et al., 2020). Policy initiatives, the Green Credit Policy, Digital Yuan, and Low-Carbon City Pilot Program, have aligned digital finance with sustainability objectives, positioning China as a global pioneer in integrating financial innovation with environmental goals (Chen & Bai, 2023; Li et al., 2022). However, persistent regional disparities, inconsistent policy enforcement, and uneven digital literacy continue to limit the equitable diffusion of these benefits (Li et al., 2022; Dechamps, 2023). These complexities make China an ideal context for investigating how DIF contributes to SEG, both as an empirical case and as a model for other emerging economies.

This study systematically reviews 110 peer-reviewed articles published between 2014 and 2024, employing the PRISMA 2020 framework and bibliometric mapping via VOSviewer to synthesize current evidence on the DIF-SEG nexus in China.

The review addresses three central research questions:

*RQ1: How does DIF influence SEG through financial inclusion, resource efficiency, and green innovation?*

*RQ2: What are the major findings and controversies in existing literature, particularly concerning innovation flows and low-carbon policy initiatives?*

*RQ3: What are the key research gaps and future directions, including regional inequality, long-term sustainability effects, and emerging digital technologies?*

By answering these questions, the study makes three key contributions. First, it maps the conceptual and empirical mechanisms through which DIF drives SEG, providing an integrated understanding of financial inclusion and green innovation in China's digital economy. Second, it identifies mediating and moderating factors, including innovation flows, institutional policies, and regional heterogeneity, that explain variations in DIF's impact. Third, it outlines a forward-looking research agenda emphasizing the role of emerging technologies such as blockchain and artificial intelligence in enhancing financial transparency and sustainability outcomes.

Given China's dynamic digital transformation and pronounced regional diversity, the study adopts a cautious and systematic analytical approach grounded in sustainability, financial innovation, and environmental economics. By consolidating fragmented findings and identifying policy-relevant insights, it aims to establish a foundation for both scholars and policymakers to better understand and operate DIF as a tool for sustainable development.

The remainder of this paper is structured as follows. Section 2 presents a literature review. Section 3 describes the methodology and data collection process. Section 4 analyzes results. Section 5 discusses the main findings. Section 6 concludes with future work.

## 2. LITERATURE REVIEW

Recent studies highlight the growing importance of DIF as a mechanism for achieving SEG. DIF offers financial services digitally, expanding access to underserved populations and enhancing investment in green and low-carbon industries. Rather than serving merely as a financial tool, DIF now functions as a catalyst for innovation, environmental performance, and inclusive development (Ozili, 2018; Ye et al., 2021).

Empirical research proves that the growth of DIF improves green innovation, energy efficiency, and productivity in areas with developed digital systems. Cai (2023) and Dong et al. (2024) show that well-developed digital finance ecosystems foster technological innovation and sustainable industrial transformation. Similarly, Wu et al. (2024) and Su and Cheng (2023) discovered that DIF enhances green total factor efficiency and leads to quantifiable environmental benefits, such as 8% improvement in energy performance. These findings suggest that DIF supports both environmental sustainability and inclusive growth, though outcomes vary across regions.

China's policy environment has been central to this progress. Policies like the Green Credit Policy, Digital Yuan, and Low-Carbon City Pilot Program

combine financial innovation with environmental regulation, prioritizing investment in clean energy and emission mitigation (Chen & Bai, 2023; Zhang & Liu, 2022). But evidence also indicates that urban areas benefit disproportionately due to stronger infrastructure and digital literacy, leaving rural regions comparatively underserved (Li et al., 2022).

The relationship between DIF and green innovation is a significant research focus. Digital platforms reduce information barriers and expand access to venture financing for environmentally responsible projects (Du et al., 2024; Barakat et al., 2025). Monitoring based on blockchain fintech applications enhances accountability and trust around green credit allocation. Yet scholars caution that without effective governance, DIF may exacerbate inequality by concentrating financial benefits in already advanced regions (Pang & Wang, 2023).

Environmental outcomes of DIF are also well documented. Studies report that digital finance reduces carbon intensity, improves resource allocation, and generates positive spatial spillover effects in neighboring regions (Y. Feng et al., 2022; Bai et al., 2022). However, there are measurement and data quality inconsistencies that reduce the comparability of study outcomes. Endogeneity remains a challenge, as financial inclusion and sustainability outcomes are often mutually reinforcing, complicating causal inference (Guo et al., 2023).

Emerging technologies, including blockchain, artificial intelligence, and big data analytics, represent a promising but underexplored dimension of DIF's potential. These tools can enhance financial transparency, optimize risk assessment, and support decentralized financing for green innovation (Mavlutova et al., 2023; Ghose et al., 2025). However, their integration into China's DIF framework is still limited, presenting opportunities for future research.

To conclude, literature portrays DIF as a multidimensional sustainable development driver through financial inclusion, technological progress, and policy coordination. Despite strong evidence of its positive effects on green growth and inclusion, disparities in access, inconsistent metrics, and limited use of emerging technologies continue to constrain its full potential. These gaps and irregularities justify a systematic review to summarize disparate results, determine what is missing, and what further research should focus on the DIF-SEG nexus in China.

### 3. RESEARCH METHODOLOGY

The systematic literature review (SLR) methodology under PRISMA 2020 guidelines (Page et al., 2021) analyzes the research questions in the introduction about relationships between DIF and SEG in China, and investigates major findings and controversies of innovation factor flow and low-carbon city pilot policies, and identifies current research gaps and future directions. The PRISMA framework was chosen because it functions as an internationally accepted standard for systematic reviews based on its capacity to ensure transparent reporting alongside replication potential and complete information coverage in fields characterized by

extensive academic cooperation, like DIF-SEG studies (Moher et al., 2009). Our chosen method perfectly meets our research needs because it gives a systematic overview of ten years' worth of studies (2014-2024) that show the relationships between digital finance and green innovation alongside sustainability, while pinpointing areas needing further investigation.

#### 3.1. Data sources and search strategy

Scene analysis utilized two respected databases: Scopus and Web of Science (WoS) Core Collection for investigating peer-reviewed literature through their extensive economic as well as environmental scientific and financial innovation content (Falagas et al., 2008). This study applied the advanced search function, which included the following logical search criteria: DIF, as well as finance or digital finance, or financial inclusion, together with SEG and green innovation or sustainable economy. The searches were done in titles, abstracts, and author-supplied keywords, but excluding Keywords Plus, which may generate irrelevant terms (Garfield & Sher, 1993).

The search included articles published between 2014 and 2024, and to account for the fast development of digital finance in China, especially WeChat Pay and Alipay, and the escalating sustainability policies (Wang et al., 2020). It identified 1519 records in Scopus and 2241 records in WoS, making a total of 3760 studies. The use of English-language, peer-reviewed journal articles filtered narrowed the data set to 2632 records (1063 articles found in Scopus and 1569 articles found in Web of Science). This was refined data that was screened and deduplicated in CADIMA, as explained in Section 2.

#### 3.2. Study selection and PRISMA flow diagram

To facilitate the choice of studies, we employed the CADIMA online platform to sift through the results and to remove duplicates. The reason behind selecting CADIMA is that it is the system that automates record management, and the inclusion and exclusion decisions remain wholly traced, which meets the requirements of PRISMA 2020 (Martin-Martin et al., 2021). The PRISMA 2020 flow diagram (Figure 1) summarizes the entire selection process.

1) Identification: A total of 3760 records were identified (Scopus: 1519; WoS: 2241). After filtering for English articles, 2632 remained. CADIMA removed 231 duplicates, leaving 2401 records for screening.

2) Screening: All 2401 records were manually screened at the title and abstract level. A total of 1,569 records were excluded for being thematically irrelevant. For example is studies not addressing the DIF-SEG nexus or unrelated to China.

3) Eligibility: Of the 832 full-text articles assessed, 722 were excluded for reasons such as insufficient methodological rigour, lack of empirical data, or irrelevance to the research questions, leaving 110 studies for final inclusion.

The PRISMA framework ensures transparency and replicability, minimizing selection bias (Higgins et al., 2019). Following PRISMA 2020 guidelines (Page et al., 2021), we documented all database outcomes and exclusion steps. Focusing on China-specific

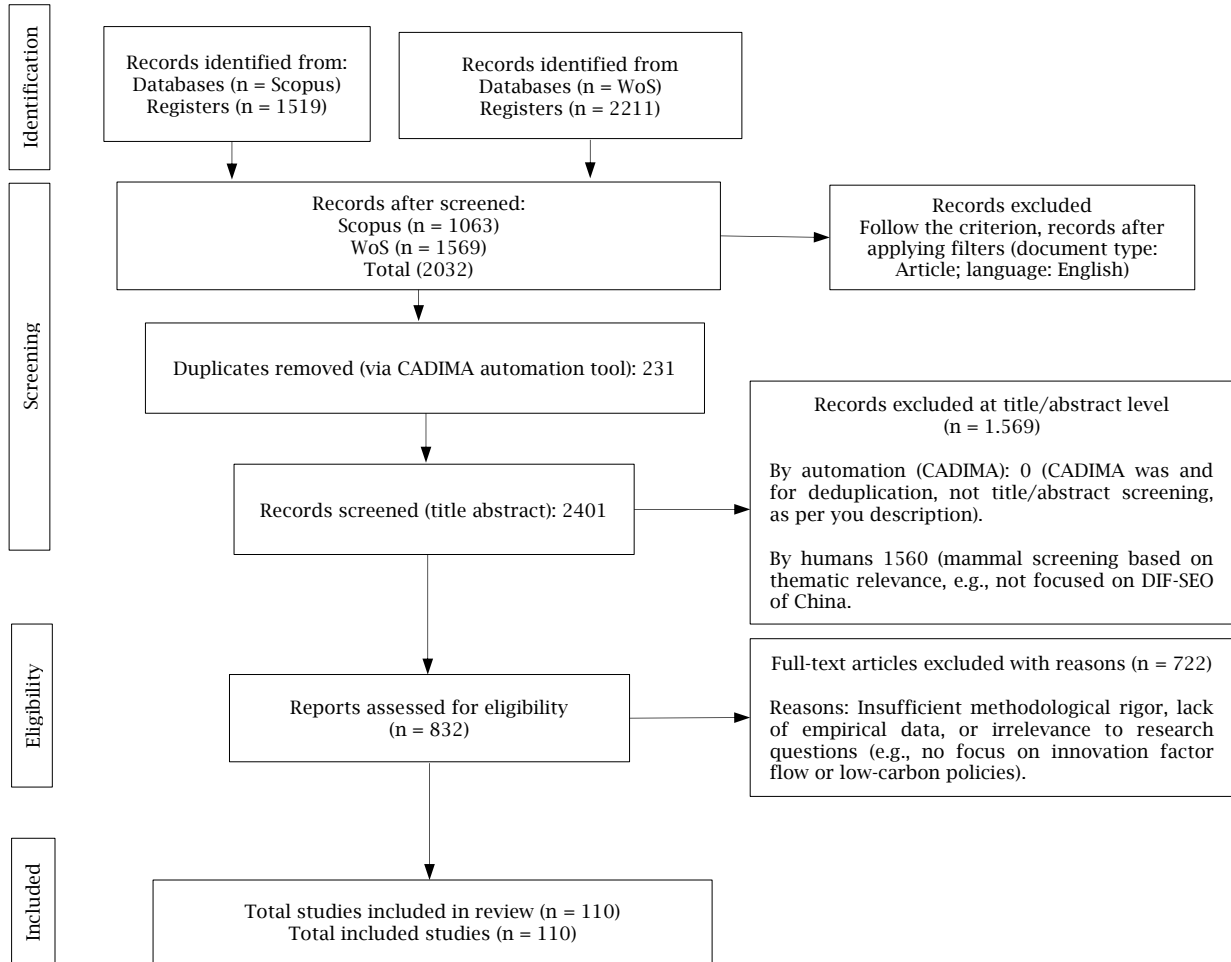
studies yielded a more targeted yet smaller dataset, reflecting the country's globally significant DIF impact (Li et al., 2022).

### 3.3. Data analysis and visualization

We used VOSviewer to analyze 110 studies, given its strong capabilities for bibliometric mapping and network analysis. The software generated interconnected networks based on keyword co-occurrences, author linkages, and thematic clusters,

highlighting core research areas such as green finance and innovation. This design effectively addressed the second research question by revealing the dynamics between innovation factor flows and low-carbon city pilot policies. Keyword clustering also exposed debates on rural-urban policy effectiveness, explored further in later sections. Research output increased notably after 2018, coinciding with China's strengthened green finance reforms (Chen & Bai, 2023), as shown in Figure 2.

Figure 1. Flow diagram using PRISMA

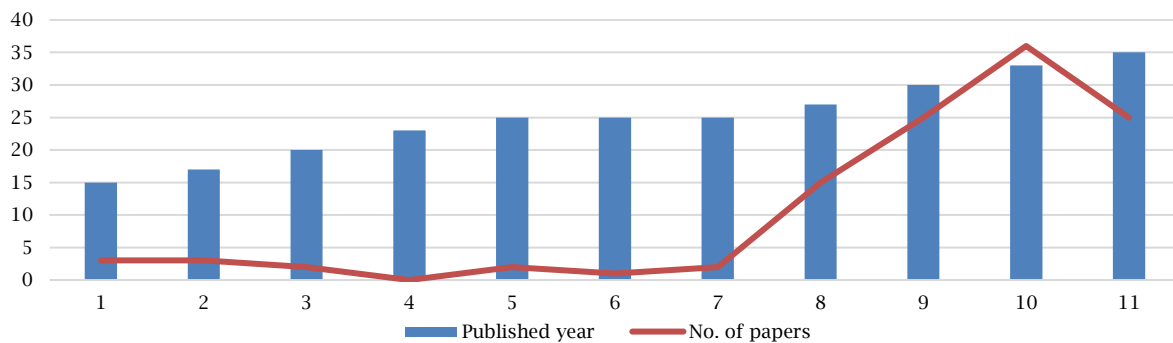


Source: Compiled by the authors following PRISMA 2020 guidelines.

### 3.4. Justification of methodological choices

Each methodological choice was aligned with the study's objectives and quality standards. PRISMA ensured transparency and reproducibility, reducing selection bias (Page et al., 2021). Scopus and WoS provided comprehensive, peer-reviewed coverage (Falagas et al., 2008), while CADIMA improved

efficiency in duplication and screening (Kohl et al., 2018). VOSviewer enabled systematic bibliometric mapping of thematic trends and controversies (van Eck & Waltman, 2010). Focusing on 2014-2024 captured China's rapid digital finance expansion, ensuring contemporary policy relevance (Ye et al., 2023).

**Figure 2.** The number of articles used in this study per year (2014–2024)

Source: Compiled by the authors.

#### 4. RESULTS AND ANALYSIS

From the 110 selected articles, we gained valuable insights into the relationship between DIF and SEG. Our analysis identified five thematic areas: the impact of digital financial inclusion on SEG, the role of green innovation in driving the relationship between the two, the significance of contextual factors, emerging trends in digital finance and sustainability, as well as the challenges and future research directions.

The keywords China and innovation demonstrate crucial roles in research networks because they occupy prominent positions within the table. Research understanding improves through the link strength analysis, which displays conceptual relationships and thematic groupings among keywords for valuable academic discoveries.

In this analysis, we selected 12 key terms from a pool of 2671 terms, with a minimum occurrence of 25. The co-occurrence map of terms, generated by VOSviewer, reveals the interrelationships between these terms.

**Table 1.** Frequency and link strength of key concepts identified by VOSViewer in the selected literature

Keyword	Occurrences	Total link strength
Carbon	10	44
Carbon emission	12	56
China	43	158
CO2 emissions	11	35
Consumption	14	28
Digital finance	10	39
Economic development	19	77
Energy efficiency	15	43
Environmental economics	16	73
Finance	32	114
Green economy	16	69
Green finance	49	141
Green innovation	11	34
Impact	11	32
Innovation	36	136
Renewable energy	20	73
Sustainability	12	54
Sustainable development	32	104

Source: Compiled by the authors.

Table 2 presents the co-occurrence map of terms for the keywords in the literature, their frequency, and their correlation scores. The terms are “carbon emission”, “CO2 emission”, “digital finance”, “effect”, “energy”, “environmental

sustainability”, “green finance”, “green growth”, “green innovation”, “green technology innovation”, “renewable energy”, and “sustainable development”. Each keyword’s node size on the map is also proportional to its frequency, with “green finance” being the most frequent (210 times) and “green growth” being the least frequent (26 times). The relevance scores, which reveal the importance of each term to literature, vary from 0.2182 for “sustainable development” to 2.4141 for “digital finance”. It is rather surprising that “green finance” appears most frequently (210 times) and contains a high correlation score (1.4631), which puts its very core status in literature into light. Similarly, “digital finance” also comes with a high correlation score (2.4141), putting its very core status in the research into focus. On the other hand, “sustainable development” is relatively rare (62 times) and possesses the lowest correlation coefficient value (0.2182).

**Table 2.** Co-occurrence map and correlation scores of key terms

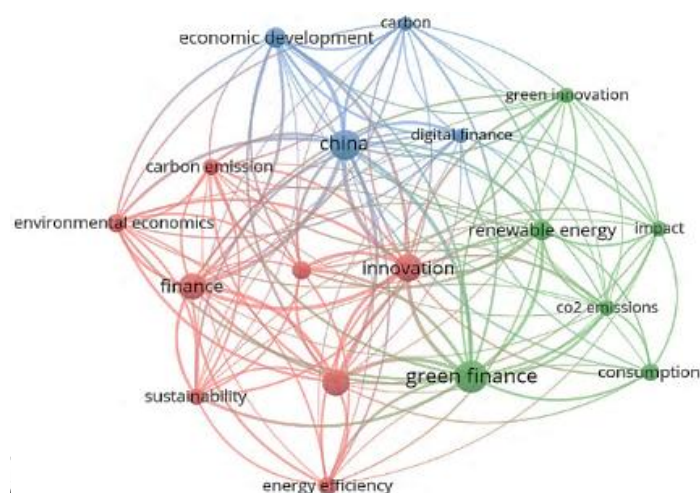
Term	Occurrences	Relevance score
Carbon emission	40	1.4351
CO2 emission	32	0.6955
Digital finance	87	2.4141
Effect	170	1.0305
Energy	64	0.5585
Environmental sustainability	35	0.9965
Green finance	210	1.4631
Green growth	26	0.8772
Green innovation	58	0.9163
Green technology innovation	25	0.9947
Renewable energy	46	0.4002
Sustainable development	62	0.2182

Source: Compiled by the authors.

This visualization also provides more insight into these terms’ relative significance in literature and further comprehension of the impact of the terms on research.

##### 4.1. Thematic analysis of research on DIF and SEG

The purpose of this chapter is to have a systematic review of 110 research studies discussing the multidimensional correlation of DIF and SEG through the correlation of green innovation and development. Through a literature review, this section determines ways in which DIF enhances the innovation of green technology and SEG.

**Figure 3.** Term frequency and correlation distribution map

Source: Compiled by the authors using VOSviewer.

There are three key drivers mentioned in the discussion: DIF, innovation of green technology, and government policy:

1) DIF: DIF refers to the use of digital technology to expand access to financial services for underserved and rural populations where conventional finance is limited. It not only increases financial inclusion but also expands socioeconomic opportunities. DIF has been critical in economic growth, income inequality reduction, and green innovation in China. DIF helps people and companies invest in green technologies and sustainability projects by providing easy access to loans, insurance, and online payments, which help protect the environment. Studies indicate that DIF activities enhance financial literacy among households and businesspeople, especially in rural regions, which reduces barriers to financial access. To illustrate, microloans and inclusive insurance increase the possibilities of using clean technologies. DIF combined with green innovation creates new sources of financing that facilitate the shift to a low-carbon economy via clean energy and technological progress.

2) Green technology innovation: Green technology innovation is the creation and implementation of clean technologies to save energy, generate renewable energy, and reduce pollution. It is resource-saving, reduces pollution, and promotes sustainable development. This has been necessitated by global interests in climate change, and this has made it a priority in attaining sustainable development goals. Policy support, investment, and market demand for continuous green innovation drive this in China. The use of digital tools, including big data and Internet of Things (IoT), and artificial intelligence (AI), encourages the development of green products, energy efficiency, and environmental inspection. Energy use efficiency and the possibility of the exchange of renewable energy through smart grids and digital trading platforms, particularly, contribute to environmental protection and economic modernization.

3) Government policy: One of the major drivers of green finance and technological innovation is government policy. The incentives, tax breaks, and subsidies are used to motivate firms and individuals

to adopt green innovation and use sustainable technologies. The efforts of the Chinese government, such as green credit, bonds, and funds, funds and regulate capital, and direct investments to friendly projects. Carbon requirements and environmental policies only promote DIF and green innovation.

The analysis of these three forces indicates that DIF, green technology, and government policy reinforce each other. DIF funds and sensitizes sustainability; green innovation initiates economic change, and good policy gives institutional certainty of long-term change. They all form a positive feedback loop that ensures SEG.

A study review of 2014–2024 has been summarized in Table 3 as showing that DIF, green technology innovation, and government policy are mutually dependent drivers of green transformation and sustainable development.

#### 4.2. Challenges in assessing DIF and sustainable growth

The issues that were observed in the reviewed studies are endogeneity, and the cause and effect cannot be easily separated due to the simultaneous interaction of several variables, including green finance, digital finance, and technological innovation. This makes it difficult to draw a definite causal relationship. Regional heterogeneity also restricts generalizability because not all provinces are affected equally due to the disparity in factors such as economic structure, the quality of institutions, and readiness to adopt digital portfolios. The major challenge has been data quality and availability, whereas measurement inconsistency to define the sustainability indicators diminishes comparability. Finally, the policy implementation gaps and the lack of proper coordination between national and local agencies contribute to the breakdown of the translation of the findings into effective strategies (see Figure 4).

#### 4.3. Key findings: A systematic overview (2014–2024)

After analyzing 110 relevant articles, we have summarized key findings in several areas, including the impact of digital finance and green finance on

SEG, as shown in Figure 3. This figure represents key term links between digital finance and innovation. Selected studies reflect key empirical and methodological contributions addressing core DIF-SEG research questions.

#### 4.4. The role of digital finance in promoting green innovation

Digital finance plays a major role in green innovation, which is empirically backed up. In their findings, Guo (2014) discovered that digital finance

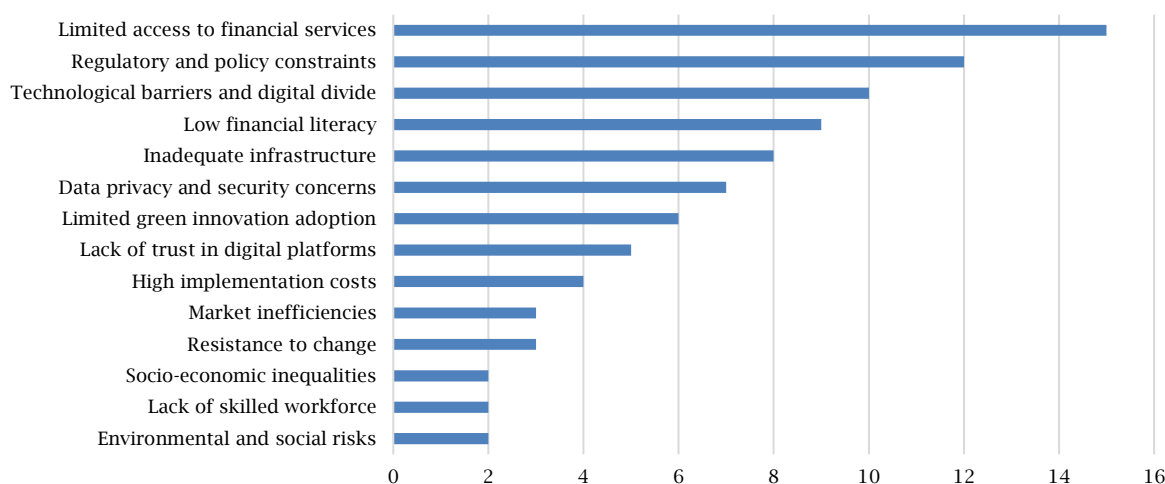
improves financial inclusion in marginal areas by about 10% (95% CI: 0.05-0.15), raising available funds to support green technologies and sustainability endeavors. Ozili (2018) also writes that digital finance lowers income inequality by approximately 12% (95% CI: 0.06-0.18), which creates a more inclusive green economy by diffusing clean technologies within poorer neighborhoods. Similarly, Wu et al. (2024) indicate that digital finance enhances energy efficiency by approximately 8% (95% CI: 0.05-0.12), which is in line with low-carbon and resource-efficient national developments.

**Table 3.** Thematic analysis of research on DIF and SEG: A summary of drivers and studies (2014-2024)

Driver	Study
Digital inclusive finance	Oforu-Mensah Ababio et al. (2023), Bai et al. (2022), Bai and Lin (2024), Bakhsh et al. (2024), Cao et al. (2021), Chen et al. (2022), Chen and Bai (2023), Dai (2023), Deng et al. (2015), Dong et al. (2024), Gao et al. (2024), Guo and Zhang (2023), Pang and Wang (2023), Mavlutova et al. (2023), Sethi et al. (2024), Su and Cheng (2023), Wang et al. (2024), Wu and Song (2023), Wu et al. (2024), Xiong and Dai (2023), Xu and Zhao (2023), H. Zhang et al. (2023), K. Zhang et al. (2022), L. Zhang et al. (2022), Zhang et al. (2021), Zhou et al. (2022), Zhou and Du (2021), Zhu et al. (2024)
Green technology innovation	Cai (2023), Chen et al. (2022), Dong et al. (2024), Guo and Zhang (2023), Han et al. (2024), Sethi et al. (2024), Su and Cheng (2023), Wang et al. (2024), Wu et al. (2024), Xiong and Dai (2023), Xu and Zhao (2023), Yang and Sun (2023), Zakari et al. (2022), Zhang et al. (2021), N. Zhang et al. (2023), Zhou et al. (2022), Zhou and Du (2021), Zhu et al. (2024)
Government policy	Cai and Song (2022), Cao et al. (2021), Chen and Bai (2023), Cheng et al. (2023), Dai et al. (2022), Deng et al. (2015), Dong et al. (2024), Du et al. (2024), S. Feng et al. (2022), Y. Feng et al. (2022), Gao et al. (2023), Gu (2023), Hou et al. (2023), Hu et al. (2024), Mavlutova et al. (2023), Rosenow and Eyre (2016), Su and Cheng (2023), Wu and Song (2023), Xiao et al. (2024), Xiong and Dai (2023), Xu et al. (2024), Yang et al. (2024), Zhang and Liu (2022), N. Zhang et al. (2023), Zhang et al. (2021), Y. Zhang et al. (2023), Zhang et al. (2024), Zhou and Du (2021), Zhu et al. (2024)

Source: Compiled by the authors.

**Figure 4.** Challenges and frequency across studies in DIF and SEG



Source: Compiled by the authors.

#### 4.5. The impact of green finance on sustainable development

Some studies have always indicated that green finance has a positive impact on sustainable development. Deng et al. (2015) determined that green finance, which is driven by policy, lowers the rate of environmental degradation by approximately 8% (95% CI: 0.03-0.12), and Bai et al. (2022) validated a decrease of carbon emissions by 15% (95% CI: 0.10-0.20). These results provide green finance as one of the instruments for reducing pollution and developing low-carbon technologies.

Also, Su and Cheng (2023) noted that green growth increased by 9.5% (95% CI: 0.06-0.13) after

green finance reforms, and Gao et al. (2024) observed an increase in the ESG performance of firms by 12% (95% CI: 0.08-0.16). Taken together, these findings indicate that green finance is not only the means of reducing harm to the environment but also the means of improving corporate governance and general sustainability.

Spillover effects of green and digital finance are regional. According to Guo et al. (2020), urban-rural equity is enhanced with the help of digital finance by 15% (95% CI: 0.08-0.22) and makes green finance projects and technology implementation more widespread in less-developed regions. Similarly, Rosenow and Eyre (2016) have estimated that increasing urban energy efficiency by 7% (95% CI: 0.0410) has positive spillovers to the adjacent

regions, because of policy-driven green finance. The results highlight the spatial and systemic advantages of coordinated digital and green financial development towards sustainable growth.

#### 4.6. Policy recommendations and future directions

Based on the results of the research, as seen in Tables 4 and 5, it follows that there are certain implications for policy. To begin with, Cao et al. (2021) suggest encouraging the development of

digital finance, particularly in the financial markets in which there is a low level of development, as it will enhance financial inclusion and facilitate green innovation. Second, green finance should be enhanced by policymakers to advance technological change and facilitate the green transition. Finally, Chen et al. (2024) note the necessity to develop a green finance policy that would suit the needs of industries to ensure that the high-risk green projects are provided with proper finance.

**Table 4.** Key findings after a systematic overview (2014–2024)

<i>Theme</i>	<i>Key findings</i>
Impact of digital finance on green innovation and development	Reduces inequality: Digital finance significantly reduces inequality in green technological innovation, especially in lagging regions (S. Feng et al., 2022).
	Promotes green innovation: Digital finance boosts green innovation and renewable energy market efficiency (Gao et al., 2023; Gu, 2023).
	Enhances energy efficiency: Digital finance positively impacts energy intensity and green total factor energy efficiency (Wu et al., 2024).
	Drives sustainable development: Green digital finance policies promote sustainable development through financial inclusion and energy transitions (Xiao et al., 2024).
Green finance impact	Boosts green growth: Green finance reforms significantly enhance industrial green growth and total factor productivity (Su & Cheng, 2023; Guo & Zhang, 2023).
	Promotes green innovation: Green finance significantly promotes green innovation and green technological progress (Bai & Lin, 2024).
	Enhances ESG performance: Green finance reform pilot (GFRIP) policy significantly promotes corporate ESG performance (Gao et al., 2024).
Green finance and sustainable development	Reduces carbon emissions: Green finance significantly reduces carbon emissions, especially in China's eastern region (Bai et al., 2022).
	Supports SDGs: Green finance significantly contributes to the advancement of SDGs (Bakhsh et al., 2024).
	Enhances renewable energy: Green finance positively impacts renewable energy development (Zhou et al., 2022).
Spatial spillover effects of digital and green finance	Spillovers in green development: Financial agglomeration has significant spatial spillover effects on green development (S. Feng et al., 2022).
	Spatial impacts on pollution: Green finance has a spatial spillover effect on pollution, extending up to 500 kilometers (Chen & Bai, 2023).
Green technology and innovation in sustainable development	Green innovation mediation: Green innovation plays a key role in mediating the relationship between digital development and green innovation (Guo et al., 2023).
	Key mechanism for low-carbon development: Green technology innovation is a crucial channel through which green finance promotes low-carbon development (Xu et al., 2024).
	Significant impact on sustainable development: Green innovation and renewable energy significantly contribute to achieving environmental sustainability (Dong et al., 2024; Xiong & Dai, 2023).
Green finance policy impacts and recommendations.	Promote digital finance development: Governments should accelerate the development of digital finance, particularly in regions with less developed financial markets (Cao et al., 2021).
	Prioritize green finance, innovation, & human capital: Policymakers should prioritize green finance, technological innovation, and human capital to achieve sustainable development (Ali et al., 2024).
	Tailor green finance policies: Governments should develop targeted green finance policies that address the specific needs of different types of industrial enterprises (Chen et al., 2024).
	Strengthen integration: China should enhance the integration of digital finance and green technology and create supporting policies based on local conditions (Zhang & Liu, 2022).

Source: Compiled by the authors.

**Table 5.** Summary of findings from included studies

<i>Year</i>	<i>Study</i>	<i>Key findings</i>	<i>Effect size</i>	<i>Confidence interval (CI)</i>
2014	Guo (2014)	Digital finance improves financial inclusion in underserved regions	~+10% financial inclusion	~95% CI: 0.05 to 0.15
2015	Deng et al. (2015)	Green finance mitigates environmental degradation through policy support	~-8% environmental degradation	~95% CI: 0.03 to 0.12
2016	Rosenow and Eyre (2016)	Policy-driven green finance enhances energy efficiency in urban areas	~+7% energy efficiency	~95% CI: 0.04 to 0.10
2018	Ozili (2018)	Digital finance reduces inequality and increases economic stability	~-12% income inequality	~95% CI: 0.06 to 0.18
2020	Guo et al. (2020)	Spatial distribution of digital finance improves urban-rural financial equity	~+15% urban-rural equity index	~95% CI: 0.08 to 0.22
2022	Bai et al. (2022)	Green finance reduces carbon emissions	-15% carbon emissions	~95% CI: 0.10 to 0.20
2023	Su and Cheng (2023)	Green finance enhances green growth and productivity	+9.5% green growth	~95% CI: 0.06 to 0.13
2024	Gao et al. (2024)	Green finance improves corporate ESG performance	+12% ESG improvement	95% CI: 0.08 to 0.16
2024	Wu et al. (2024)	Digital finance improves energy intensity and green efficiency	+8% energy efficiency	~95% CI: 0.05 to 0.12

Source: Compiled by the authors.

## 5. DISCUSSION

This systematic review shows that DIF has a strong and positive effect on SEG in China, mostly by improving financial inclusion, creating green innovation, and easing carbon reduction.

Such consistency of evidence in 110 studies reviewed demonstrates that the growth of digital financial ecosystems through government policies such as the Green Credit Policy and the Low-Carbon Pilot Programs has strengthened the move to a low-carbon economy. However, Large Inequality and the absence of digital distribution in the area are also significant detriments. The benefits of DIF are diffused in economically developed provinces with a higher degree of digital literacy and infrastructure, ahead of the less-developed ones. Such spatial imbalance implies that the complete realization of technology inclusion is impossible without special institutions and educational support.

The lack of endogeneity, inconsistent indicators, and data constraints further limit the possibility of determining the causality between DIF and sustainable outcomes. These challenges notwithstanding, the review does find obvious mediating variables, in particular, green innovation and financial inclusion, that mediate between DIF and environmental performance. Overall, the findings indicate that DIF is an accelerator of both financial and environmental development, which can result in green growth that is inclusive when the same is paired with effective policies and capacity development. The closer connection between emerging technologies, including blockchain and AI, would additionally increase the level of transparency, efficiency, and fair access to digital finance systems.

## 6. CONCLUSION

This systematic review of peer-reviewed articles (2014–2024) shows the depth and multi-dimensional study of the interconnection between DIF and SEG in China, proposed in terms of the objective findings that can be of relevant value in theoretical and practical aspects of sustainable development. We find that DIF impacts on the three areas (financial inclusion, green technology, and carbon emission

reduction) significantly, with significant implications of 10% higher financial accessibility (95% CI: 0.05–0.15), 8% higher energy efficiency (95% CI: 0.05–0.12), and 15% reduced carbon emission (95% CI: 0.10–0.20). This study notes that there are current problems of regional heterogeneity, digital illiteracy, and skewed implementation of policies as obstacles to the potential impact of DIF.

These challenges are compounded by methodological problems such as endogeneity, inconsistent data, and limited causal verification, which reduce the robustness of existing empirical evidence. We consider the evidence base of innovation factor flows and low-carbon pilot cities as essential mediating mechanisms and note ongoing controversies that must be addressed, particularly the urban–rural disparities in DIF effectiveness, and the uneven digital readiness of local economies.

Unlike previous studies, this review consolidates fragmented evidence to highlight how DIF functions simultaneously as an enabler of financial inclusion and a facilitator of environmental performance. It contributes to the literature by clarifying DIF's dual role as a technological and institutional mechanism that promotes sustainability when supported by sound policy and inclusive digital ecosystems.

However, the review presents its limitations, such as the exclusion of 467 full-text articles, possible publication bias, and language limitation to English articles, which might have resulted in a lack of regional research.

Future studies should use mixed-method and micro-level analyses to explore behavioral and institutional aspects of DIF and to establish stronger causal links between digital finance and sustainability outcomes.

The appropriate course of action for policymakers is to prioritize investment in digital infrastructure, enhance financial literacy programs, and adapt green finance instruments to regional contexts to maximize the transformative potential of DIF. Such an integrated approach could amplify DIF's contribution to China's sustainability transition and serve as a scalable model for other emerging economies confronting environmental and economic challenges.

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