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Existing and Potential Research Directions on Green Finance – Literature Review

Istniejące i potencjalne kierunki badań nad zielonymi finansami – przegląd literatury

Summary
"Green finance" is merely the financing of public and private "green" investments, that is, investments in environmental protection, as well as investments meant to prevent, minimise, and compensate for environmental and climate damage. This phrase also refers to aspects of the financial system and funding for environmental protection, mitigation, and adaptation measures. This study reviews the state-of-the-art concept of green finance. The origin, essence, and relevance of this phenomenon in the context of sustainable development are discussed. Key components and tools for green finance were identified. The main purpose of this study, however, was to identify research directions in green finance with a focus on potential research gaps.

Keywords: environmental protection, green finance, sustainable development, research gaps

Streszczenie
„Zielone finanse" to po prostu finansowanie publicznych i prywatnych "zielonych" inwestycji, czyli inwestycji w ochronę środowiska, a także inwestycji mających na celu zapobieganie, minimalizowanie i kompensowanie szkód środowiskowych i klimatycznych. Termin ten obejmuje również finansowanie polityk mających na celu ochronę środowiska oraz łagodzenie i dostosowywanie się do zmian środowiskowych, a także elementów systemu finansowego. W artykule dokonano przeglądu dotychczasowego stanu wiedzy na temat koncepcji zielonych finansów. Omówiono genezę, istotę i znaczenie tego zjawiska w kontekście rozwoju zrównoważonego. Wskazano kluczowe komponenty i narzędzia zielonego finansowania. Główny cel opracowania stanowiła jednak identyfikacja kierunków badań w zakresie zielonych finansów, ze szczególnym uwzględnieniem potencjalnych luk badawczych.

Słowa kluczowe: ochrona środowiska, zielone finanse, zrównoważony rozwój, luki badawcze

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Introduction

"Green finance" is currently one of the most widely used terms in the world. Although definitions vary, "green finance" generally refers to investments in businesses that provide environmentally friendly operations, goods, and services. In its broadest sense, "green finance" refers to raising and utilizing capital for projects that both protect the environment and provide a reasonable return to lenders or investors. To achieve sustainable development goals, green finance aims to increase the amount of money flowing from financial institutions to businesses involved in environmental initiatives and activities. More recently, green finance has provided another source of funding for individuals, companies, and governments that want to invest in low-carbon projects (Ozili, 2022).

Owing to its vital role in striking a balance between environmental sustainability and economic development, green finance has drawn increasing attention from businesses, scholars, and governments. Because of its wide-ranging nature, green finance incorporates ideas from many other fields, and the number of publications on this subject has been steadily increasing. Despite this expansion, a thorough examination of the field's trends, major figures, and research gaps is still required to comprehend its development and identify areas that require further investigation (Wang, Cui & Hausken, 2025).

Using articles from the Web of Science and Scopus, this study reviews the literature to examine existing and potential research directions on green finance. Authors have focused on publications from reputable journals with global range from the last five years, i.e. 2021–2025. This was a deliberate move, as publications from this period include literature reviews from previous years. The authors' intention was to avoid repeating the same information again and instead to focus on the latest trends in this area.

It is important to understand the global development of green finance research for several reasons. First, it describes the state of this field of study worldwide. Second, it assists in identifying the areas of expertise that require further investigation. Third, this knowledge helps determine the course of future studies in the area of green finance. Researchers, practitioners, and regulators can benefit from this study's insightful analysis of the development, current trends, and future directions of green finance research.

The paper is structured as follows: The origins, essence, and significance of green finance are summarised in Chapter 1. Chapter 2 outlines the key components and tools of green finance, while Chapter 3 discusses the existing research on green finance. Chapter 4 identifies potential research gaps in green finance. Finally, the last section concludes the study.

1. Origins, essence and significance of green finance

Green finance began in the late 1980s with the release of Pearce, Markandya, and Barbier's *Blueprint for a Green Economy* in 1989. The phrase "green finance" originated from the understanding of the need for targeted investments to transition to a green economy, including environmental, social, and governance (ESG) considerations in financial decisions. This notion acquired tremendous impetus in 2015 with the publication of the United Nations Sustainable Development Goals (SDGs) and the Paris Climate Agreement, which established a worldwide agenda for sustainable development (Sharma & Kautish, 2023).

Sustainable finance, climate financing, and green/sustainable investing are all included under the general phrase "green finance." It entails allocating both public and private funds to initiatives that mitigate climate change, prevent environmental damage, and advance sustainable development (Bhattacharyya, 2022). Green finance is fundamentally interdisciplinary, combining economics, technology, and environmental science to promote sustainable economic growth and eco-friendly investments (Krastev & Krasteva-Hristova, 2024; Wang, Cui & Hausken, 2025).

To address the issues of global sustainability, green finance is essential because it:

– lowers carbon intensity – a 1 per cent increase in green financing can result in a 2 per cent drop in carbon intensity (Zhang & Ke, 2022);
– supports renewable energy – it is essential for encouraging investments in renewable energy sources, such as solar and wind, which help to provide energy sustainably (Abbas, Wang, Belgacem, Pawar, Najam & Abbas, 2023; Liu, Zhao, Dong & Jiang, 2023);
– improves product quality – green finance uses technological innovation, pollution prevention, and environmental regulation to raise the quality of export goods (Ma, Zhu, & Yang, 2024);
– promotes technological innovation – it encourages the development of green technologies, which are crucial for sustainable growth (Yuan, Ali, Nazar & Ullah, 2024);

– promotes economic transformation – green finance is essential for economic transformation, especially for achieving sustainable development objectives and shifting to a green economy (Zhu, 2018).

Green finance is essential for sustainability because it promotes a balanced and sustainable growth trajectory globally (Sharma, Taneja, Jangir & Khanna, 2024). This is regarded as an appealing idea that links financial systems with health and sustainable development outcomes, tackling problems such as biodiversity loss, climate change, and public health challenges (Kaur, 2024; Verma, Kalra & Baheti, 2023). To solve urgent environmental issues and promote economic growth, green financing, which includes investments, loans, and financial products, has attracted attention. The significance of incorporating green financing techniques into the financial system is shown by the results of a study that used World Bank data and showed that green credit and green securities have a major positive impact on economic growth over the long term (Rasheed, Saad & Ammad, 2023).

Together, the elements of green finance promote structural economic transformation, which in turn leads to sustainable economic growth. Green finance facilitates the shift to a low-carbon economy by funding sustainable infrastructure and green technologies. Because of this structural change, economies are more resilient and competitive and better able to handle economic and environmental difficulties (Xu & Zhu, 2024).

Green finance is crucial to solving environmental issues and achieving sustainable development. Its history, character, and importance emphasise its contribution to a sustainable and well-balanced trajectory of global growth. Realizing its full potential, however, requires tackling the significant obstacles associated with financialization, global inequality, greenwashing, policy coordination, and investment shortages. The efficacy of green finance efforts can be improved by a more regulated and integrated strategy as well as by raising investor knowledge and participation (Ali, Seraj, Turuc, Tursoy & Uktamov, 2024; Jäger & Dziwok, 2024; Krahnen, Rocholl & Thum, 2023; Liang, Wang & Li, 2025; Zou & Park, 2025).

2. Key components and tools of green finance

By coordinating financial operations with social and environmental objectives, green finance is vital for attaining sustainable economic growth. It includes a range of financial tools, processes, and tactics that first include social welfare, resource conservation, and environmental sustainability. The main elements of green finance are examined in this section, along with how they support long-term sustainable economic growth. Table 1 presents the primary components and tools used for green finance.

Table 1. Primary components of green finance

Components	Examples of Solutions and Tools
Green financial instruments	Green bonds Green credit Green insurance Carbon finance
Regulatory support and policies	Environmental, social, and governance (ESG) Reporting Tax incentives Green credit policies
Market mechanisms	Emissions trading systems Cap-and-trade systems
Public-private partnerships	Cooperation between public and private sector organizations to fund and carry out green projects. Infrastructure improvements, installations of renewable energy sources, and other sustainability programs can fall under this category
Risk management and assessment	Climate risk assessments Green finance risk management
Educational and capacity-building initiatives	Initiatives to raise knowledge and comprehension of green finance among interested parties, such as investors, financial institutions, and legislators
Global cooperation frameworks	International cooperation to advance green finance methods and exchange information and assets in order to meet global sustainability targets

Source: own elaboration based on: Akomea-Frimpong, Adeabah, Ofosu & Tenakwah, 2021; Fan & Shahbaz, 2023; Grumann, Madaleno & Vieira, 2024; K V, 2024; Ma, He & Zeng, 2024; Tang, 2024; Zhang, Ke, Ding & Chen, 2024.

Green credit and securities are crucial elements of green finance. Green credit is a term used to describe loans provided by financial institutions for activities such as pollution control or renewable energy projects that support environmental sustainability. Conversely, green securities are the financial products offered to raise money for green projects. By allocating resources for sustainable development, these tools have been demonstrated to have a major positive impact on long-term economic growth (Rasheed et al., 2023).

One type of debt instrument used to fund environmental projects is called a **green bond**. These bonds are issued by financial institutions, businesses, or governments to raise money for projects including sustainable agriculture, clean energy, and green infrastructure. Green bonds have been crucial in financing low-carbon initiatives that support sustainable economic growth and are essential in influencing financial markets to adopt more ethical practices (Čala & Demidov, 2024; Taneja & Reepu, 2024).

Allocating funds to businesses or initiatives that place a high priority on social responsibility and environmental sustainability is known as **green investment**. As a subcategory of green finance, impact investing aims to produce both monetary gains and non-monetary advantages such as social inclusion or environmental preservation. These investment techniques support long-term economic resilience by encouraging companies to adopt eco-friendly practices and advance sustainable development.

One pillar of green finance is the incorporation of **ESG factors** into investment choices. By directing funds toward businesses that support sustainability objectives, ESG criteria assist investors in evaluating the governance and social, and environmental performance of businesses. Green finance minimises environmental hazards, encourages ethical corporate practices, and builds a sustainable global economy by integrating ESG factors (Fu, Lu & Pirabi, 2023).

The purpose of **green insurance products** is to reduce environmental hazards and encourage sustainable behaviour. These insurance options cover risks related to resource depletion, climate change, and environmental harm. According to Taneja and Reepu (2024), green insurance helps strengthen economies and encourages the adoption of sustainable development techniques by offering financial protection for environmentally friendly projects.

Green finance growth depends on strong **legislative and regulatory frameworks**. Through tax breaks, subsidies, and environmental laws, governments and international organisations are essential in fostering a climate conducive to green investments. These regulations push companies and financial institutions to prioritise sustainability, which propels the expansion of green finance and its role in sustainable economic growth.

International cooperation is essential to achieve global sustainability goals and advance green finance. Governments, financial institutions, and the business sector work together to make it easier to exchange best practices, create common definitions, and build a unified global ecosystem for green financing. By addressing issues like market regulation and scalability, this collaboration makes it possible for green finance to successfully tackle climate change and support sustainable economic growth (Čala & Demidov, 2024; Zhu, 2024).

There are now more ways to support sustainable development thanks to the use of **digital technologies** in green financing. Green digital finance, including blockchain-based solutions, improves the efficiency and transparency of green financial transactions. Green finance is now more widely available and efficient in promoting sustainable economic growth, thanks to **fintech advancements** that also make it possible to develop new financial services and products that promote environmental sustainability (Han & Gao, 2024).

The expansion of green finance initiatives depends heavily on **public-private partnerships**. Čala & Demidov (2024) state that public-private partnerships increase the impact of green finance on economic growth and environmental stewardship by combining resources and expertise.

Increasing public knowledge and comprehension of green finance are essential for its broad acceptance. To highlight the advantages of green finance and motivate people and organisations to engage in sustainable financial practices, **educational activities** and public outreach campaigns are essential. Growing awareness also encourages a sustainable lifestyle that fuels the market for eco-friendly financial services and goods (Han & Gao, 2024; Zhu, 2024).

Notwithstanding the promise of green finance, problems of scalability, market regulation, and the possibility of greenwashing still exist. The broad adoption of green financing is hampered by the absence of uniform regulatory frameworks and low public awareness. To tackle these issues, international collaboration, public-private partnerships, and legislative interventions are needed to create standards that encourage responsibility and openness in green finance operations (Sule, Eyo-Udo, Onukwulu, Agho & Azubuike, 2024).

3. Review of existing research on green finance

Addressing climate change, advancing sustainable development, and coordinating financial systems with environmental objectives have made green finance an important field of study and application. A summary of the main conclusions and ramifications found in the body of green finance research is provided below.

Over the past 20 years, the amount of research on green finance has increased dramatically, indicating the growing significance of sustainability in the financial markets. Studies have shown a notable increase in scholarly output, especially in the wake of international agreements such as the Sustainable Development Goals (SDGs) and the Paris Agreement (Aneja, 2024; Judijanto, Qosim, Syamsulbahri, Utami & Afandy, 2024; Krastev & Krasteva-Hristova, 2024). This expansion is ascribed to the realisation that green finance is an essential instrument for tackling environmental issues and promoting sustainable economic expansion.

Green finance research is no longer limited to affluent nations. China, Pakistan, and Bangladesh are emerging economies that have made substantial contributions to this field (Rahman, Moral, Hassan, Hossain & Perveen, 2022; Sharma & Jain, 2024).

China has become a leader in green finance research owing to its extensive environmental programs and regulatory backing (Xin & Hu, 2024). Similarly, North America and Europe have developed robust networks of cooperation that promote cross-border research and knowledge-sharing (Judijanto et al., 2024).

The focus of green finance research has shifted over time. Early research focused on fundamental concepts such as sustainable finance and environmental economics, but more recent research has shifted toward specific applications, such as green bonds, Environmental, Social, and Governance (ESG) criteria, and climate finance (Aneja, 2024; Krastev & Krasteva-Hristova, 2024; Xin & Hu, 2024). This trend reflects the rising emphasis on practical implementation and incorporation of green financing into traditional financial systems. The literature on green finance identifies several key themes that are critical for understanding its potential and challenges:

a) **Strategies for boosting green finance**. The creation of methods to boost the amount and efficacy of green financing is one of the main topics in green finance research. These tactics include green investment vehicles, green bonds, and climate finance (Luurila, 2022; Ozili, 2022; Rahman et al., 2022). Green bonds, for example, have become a popular tool for funding energy efficiency and renewable energy projects (Krastev & Krasteva-Hristova, 2024; Xin & Hu, 2024).
b) **Increasing profitability of green investments**. Creating green initiatives that are financially appealing to financial institutions and investors is another crucial subject. This necessitates tackling the belief that conventional investments yield higher returns than green investments do (Luurila, 2022; Ozili, 2022). Studies have demonstrated that green investments can generate competitive returns, especially when supported by legal frameworks and governmental incentives (Judijanto et al., 2024; Sharma & Jain, 2024).
c) **Functions of policy and technology**. The literature frequently discusses how policies and technology support green finance. Fintech and AI are two examples of technological advancements recognised as major forces behind green finance, facilitating the creation of new financial services and products (Judjanto et al., 2024; Sharma & Jain, 2024; Xin & Hu, 2024). Likewise, it has been demonstrated that policy tools like carbon pricing and green tax incentives are essential for promoting green financing (Krasteva & Krasteva-Hristova, 2024; Luurila, 2022; Ozili, 2022).
d) **Difficulties in green finance.** Despite its potential, green finance has several obstacles to overcome, such as a lack of knowledge, ambiguous definitions, and inadequate regulatory frameworks (Luurila, 2022; Ozili,

2022; Sharma & Jain, 2024). These difficulties demonstrate how important it is for legislators, banks, and other interested parties to work together to establish a climate that supports green finance.

The key themes as well as the key findings are presented in Table 2. Studies on green finance have significant ramifications for financial institutions, governments, and other interested parties. Legislators are urged to provide transparent regulatory frameworks and incentives for green financing (Krastev & Krasteva-Hristova, 2024; Luurila, 2022; Ozili, 2022). This requires the establishment of green finance hubs to promote global cooperation and the development of uniform definitions and indicators for green finance (Aneja, 2024; Judijanto et al., 2024).

Table 2. Key themes and findings of green finance research

Themes	Findings
Strategies and instruments Impact on innovation and development Economic and environmental benefits Role of policy and regulation Challenges and barriers	Aspects of green finance include energy efficiency, policymaking, environmental performance, green securities, investments, lending, bonds, and infrastructure The body of research highlights how crucial green finance is to promoting environmental stewardship, sustainable development, and the shift to a low-carbon economy Future studies in green finance could focus on the green economy, green bonds, connectivity, pressures, limits, and sustainable development Lack of knowledge, ambiguous definitions, governmental coordination, and lucrative incentives for investors and financial institutions are some of the issues surrounding green finance Global-level obstacles, political restraints, erratic economic conditions, legislative framework, and the possibility of greenwashing are some of the factors impeding the implementation of green finance The implementation of green finance programs is hampered by regulatory restrictions, a lack of awareness, and capacity building

Source: own elaboration based on: Al Mamun, Boubaker, Hossain & Manita, 2024; Annu & Tripathi, 2024; Chen, Xu & Own, 2024; Dhayal, Agrawal, Agrawal, Kumar & Kumar Giri, 2024; Hou, Wang & Zhang, 2023; Jia, 2023; Jing & Liu, 2024; Kappal & Doifode, 2023; Kaushik & Trikha, 2024; Khan, Ahmad, Yusof & Chowdhury, 2024; Kharb, Shri, Singh, Bhatia & Saini, 2024; Lei, Gao, Ning & Sun, 2025; Ozili, 2022; Rahman et al., 2022; Sharma, Verma, Shahbaz, Gupta & Chopra, 2022; Shi, Zhou, Li, Miao & Zhao, 2024; Zhang, Tang & Tang, 2025.

Developing green financial goods and services and incorporating ESG factors into investment choices are two important ways in which financial institutions contribute to the advancement of green finance. By funding energy efficiency programs and renewable energy projects, banks are well-positioned to spearhead the shift to a green economy (Sharma & Jain, 2024; Rahman et al., 2022; Xin & Hu, 2024). International cooperation in green finance is necessary because of the global scope of environmental issues. As part of this, nations have developed exchange best practices, knowledge, skills, and international standards for green finance (Judijanto et al., 2024; Krastev & Krasteva-Hristova, 2024).

To sum up, the study that has been done on green finance shows that it has the power to promote both economic growth and environmental sustainability. However, overcoming obstacles related to green financing, such as ignorance, ambiguous definitions, and inadequate regulatory frameworks, is necessary to realise this potential. Policymakers, financial institutions, and other interested parties must provide a supportive environment for green finance bolstered by strong regulations, global cooperation, and technological advancement.

4. Identification of potential research gaps in green finance

Although the subject of green finance is expanding, there are still several significant research gaps that must be filled to improve its efficacy and application. The main research gaps are listed below along with recommendations on how to fill them:

a) **Insufficient comprehensive frameworks.** A conceptual framework is required to evaluate many facets of green finance, such as its influence on stakeholders and value increases. Instead of offering a comprehensive analysis of the entire green finance corpus, the existing research frequently offers fragmented findings. Researchers should concentrate on developing and approving thorough frameworks capable of evaluating the complex effects of green finance. This involves creating models that incorporate several factors, including policy consequences, economic growth, and environmental performance (Bhatia, Singh & Vishnani, 2024; Miyan, Cheong, Sharif & Afshan, 2024).
b) **Policy and regulatory difficulties.** Improving green finance is hampered by regulatory concerns, and stronger legislative frameworks are required to encourage green investments. Therefore, policymakers must create and execute strong regulatory frameworks. This entails establishing incentives for individual investors and guaranteeing that regulations support sustainable investment. Policymakers must create comprehensive rules that enable green finance efforts while maintaining conformity with environmental goals (Desalegn & Tangl, 2022).
c) **Insufficient empirical evidence.** Much research, especially regarding green finance in green buildings, is based on content or report analysis

with little empirical study. More empirical research should be conducted to support these theoretical frameworks and models. Case studies, questionnaires, and experimental designs can be used to collect empirical data on the efficacy of green finance projects (Debrah, Chan & Darko, 2022).

d) **Green finance in developing countries.** Little research has been conducted on green finance in developing countries' banking sectors, which is critical for understanding and implementing green financing in these regions. More research on green financing in developing nations is needed to understand a region's specific difficulties and potential better. This can assist in customising green finance policies and solutions to meet the demands of these countries (Rahman et al., 2022).

e) **Utilisation of contemporary technologies.** There is insufficient research on how contemporary technologies such as FinTech and AI can be incorporated into green finance. This covers the creation of intelligent cost-benefit analysis frameworks and AI-enabled performance evaluation software for green finance in green buildings. Research and practice in green finance should incorporate contemporary technologies such as FinTech and AI. Through improved risk assessment, performance tracking, and cost-benefit analysis, green finance efforts can become more successful and efficient (Debrah et al., 2022).

f) **Principles of behavioural finance.** Green finance and behavioural finance concepts are new fields that require further research. To understand investor behaviour better and enhance the design of green finance products, we examine the application of behavioural finance concepts in the field (Miyan et al., 2024).

g) **Comparative research.** To comprehend the distinct dynamics and efficacy of green finance in diverse situations, further comparative research between industrialised and developing countries is required. To find optimal practices and insights from various economic environments, we conducted comparative research. This can assist in creating more regionally adaptive, successful green financing initiatives (Bhatia et al., 2024).

The topic of green finance is growing rapidly, yet numerous research gaps remain that limit its full potential. Addressing these gaps is critical for promoting sustainable financial practices and improving the environment. Although these gaps pose difficulties, they also provide opportunities for practitioners and researchers to develop new ideas and create more potent green finance solutions. A more equal and sustainable financial environment may result from addressing these issues.

Interdisciplinary approaches should be used in future studies by integrating knowledge from policy studies, economics, finance, and environmental sciences (Judijanto et al., 2024; Krastev & Krasteva-Hristova, 2024; Xin & Hu, 2024). This will allow for a more thorough understanding of the intricate connections between economic progress, environmental sustainability, and financial systems.

Conclusions

With its origins in the quest for a green economy, green finance has grown in significance as a means of addressing environmental issues and advancing sustainable development. By focusing on capital investments in ecologically friendly projects, the key components of green finance, such as financial institutions and services, support sustainable development. Additionally, green finance affects investment strategies and economic growth positively.

Search results for the term "green finance" in the titles of scientific publications show 2,961 items according to the Web of Science database and 2,725 items according to the Scopus database. Narrowing the search to the years 2021–2025 yielded 2,629 publications in the WoS database and 2,579 publications in the Scopus database. This shows that 88.8 per cent and 94.6 per cent of publications, respectively, were produced in the last five years.

Green finance incorporates economic, social, and environmental factors in financial decision-making. Its main components – green bonds, green investments, green loans, green insurance, ESG considerations, and supportive policy frameworks – function in concert. Green finance is essential for achieving sustainable development goals because it allocates funds to eco-friendly enterprises, fosters innovation, and builds resilience. Making green finance a reality will be crucial to building a more just future, as the world economy changes.

Over time, the subject of green finance research has changed. Early research focused on basic concepts such as sustainable finance and environmental economics, but more recently, research has focused on specific applications. In their literature review, the authors identified five main topics/research areas related to green finance: strategies and instruments, impact on innovation and development, economic and environmental benefits, the role of policy and regulation, and challenges and barriers.

Notwithstanding its significance, green finance has several problems, such as varying definitions, lack of coordination among policies, and inadequate investment incentives. Customised approaches, enhanced legal frameworks, greater public knowledge, and involvement in green financing projects are all necessary to address the issues. To overcome these obstacles and capitalise on the advantages of green finance for a sustainable future, further study and innovation in this field are crucial.

Future studies on green finance must create a conceptual framework to evaluate many facets of green finance as well as how it affects value enhancement and stakeholder outcomes. Research on the evolution and development of green finance has identified areas for further study, including technical advancements, investment-friendly environments, regulatory framework development, and macroeconomic issues (Butt, Ashfaq, Chohan, Ramakrishnan, Shahzad & Almazyad, 2025). Green financing is acknowledged as a crucial tactic for accomplishing the UN Sustainable Development Goals and Paris Agreement, emphasising the necessity of modifying plans in various nations (Ma & Chang, 2023).

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