



Evolution of Green Finance: Historical Insights and Sustainable Finance Integration Framework Development

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Abstract— The field of green finance plays a crucial role in global sustainability transitions, yet it remains conceptually fragmented and lacks an integrated framework that connects its historical evolution with contemporary sustainable financing practices. While existing literature highlights key developments such as ethical investment, regulatory reforms, and green financial instruments, these have not been synthesised into a coherent model to guide policy and investment. This study examines the historical trajectory of green finance and proposes a unified framework based on qualitative analysis of policy documents, institutional reports, market data, and academic literature. The findings identify five key drivers: regulatory evolution, investor behaviour, financial innovation, technological enablers, and sustainability outcomes. Persistent challenges include fragmented taxonomies, inconsistent ESG data, greenwashing risks, and unequal access to finance in emerging markets. The study introduces a Sustainable Finance Framework comprising inputs, processes, enablers, and outcomes, demonstrating how historical insights can inform policy, investment strategies, and alignment with SDGs and Net Zero goals.

Keywords— Green Finance; Green investment; Sustainable development; Sustainable finance; Environmental sustainability; Economic growth; Framework

I. INTRODUCTION

In response to escalating environmental challenges, green finance has become a fundamental component of advancing sustainable financial markets. [1]. This financial mechanism aims to facilitate investments that promote environmental conservation and sustainable development by funding projects in clean mobility, energy efficiency, renewable energy, climate-resilient agriculture, and sustainable water management. [2], [3].

This research work is aiming for examining the historical development of Green Finance and use these insights to construct an integrated framework for sustainable finance through the following objectives:

- To identify key historical milestones in the evolution of green finance.

- To analyse the main drivers shaping sustainable finance today.
- To assess current gaps and challenges in sustainable finance practice.
- To develop a coherent framework that supports policy creation and investment decision-making.

The above concepts mentioned by Wang et al [4], clarify how past developments inform modern sustainable finance systems, through which modern sustainable finance systems, often referred to synonymously as Green Finance, are conceptually informed by the fusion of economic theory and practice [4]. This development allows for the restructuring of the financial industry's management practices and operations, emphasizing sustainable development and environmental preservation. In this respect, key ways this conceptual foundation informs modern sustainable finance by:

1-Dual Linkages and Transformation: The resulting system serves as a transformative instrument by creating dual linkages between environmental imperatives and financial investments. This enables both the economic change necessary for sustainability and the sustainable expansion of finance itself.

2-Focus on Environmentally Beneficial Operations: This framework directs funding to support environmentally beneficial operations. These operations include implementing measures to reduce carbon emissions and focusing on ecologically sustainable ventures, such as clean transport networks, renewable energy systems, energy-efficiency programs, sustainable water resource management, and climate-resilient agriculture.

3-Fundamental Implication: Despite varying interpretations within the academic community, this concept consistently pertains to the operations of financial institutions. Ultimately, financial institutions, together with individual users and the household sector, determine the supply and demand for finance within these monetary systems.

Sustainable finance is also referred to using terms like "environmental financing", "ecological finance" and "carbon finance". Historical analysis is essential for understanding the evolution and relevance of green finance by evaluating it as an instrumental tool that links financial and environmental projects and assessing how green finance affects financial management policies and institutional operations toward environmental sustainability and sustainable development for sustainable economic growth. Financial institutions, individual users, and household sectors together determine the supply and demand for money in monetary systems. The financial sector lacks completely unique products or services which constitute green finance since this concept represents money-based services that support funding environmentally beneficial operations like renewable energy systems, together with energy efficiency programs, clean transport networks and sustainable water resource control and climate-resilient agriculture according to the "United Nations Environment Programme endorsement" [5]. Green finance serves as a transformative instrument for the dual linkages between environmental and financial investments. Green funding is executed by focusing on ecologically sustainable ventures and implementing measures to reduce carbon emissions [6].

Through the lenses of sustainable development and environmental preservation, green finance, which arises from the fusion of economic theory and practice, restructures financial industry management practices and corporate operations. It can accomplish both the sustainable expansion of finance itself and economic change simultaneously. Consequently, green finance is referred to as "environmental financing," "sustainable finance," "ecological finance," or "carbon finance." Despite varying interpretations within the academic community, the fundamental implication consistently concerns the operations of financial institutions [4].

II. LITERATURE REVIEW

Sustainable financing takes the form of green finance, which evolves at the fastest rate. Public funds, along with commercial loans and micro-lending mechanisms, function together as a system to establish the basic level of sustainability. The link between green finance and sustainability is a fundamental solution to global environmental issues and supports medium-term economic development alongside social health. [6].

Green finance is a fundamental component of sustainable development plans, ensuring environmental priorities are integrated into economic expansion strategies worldwide. This approach aligns financial profitability with environmental sustainability by investing in green initiatives while adhering to financial rules that support sustainable development. The section explores diverse definitions of green finance used by researchers to demonstrate its complex nature and significance for leading toward economic sustainability:

Wang & Zhi [7], believed that green finance are an innovative financial paradigm that merges environmental conservation with economic profitability, highlighting the contentious themes of "green" and "finance. Also, the term "green finance" describes an idea that blends business and finance with environmentally friendly methods. It serves as a

platform for several participants, including producers, investors, lenders, and both individual and corporate clients.

Moreover, Mohd & Kaushal [8] argued that green finance encompasses green credit. It relates to a set of administrative regulations that require commercial banks and other financial institutions to do research and development in order to build facilities for treating pollutants and to take part in ecological conservation and restoration projects.

Green Finance has been shown to reduce corporate environmental violations and improve environmental performance [9].

In addition, Agarwal and Jain (2024) noted that green finance is an emerging economic paradigm that integrates environmental conservation with financial gain. The concepts "green" and "finance" are antagonistic. The term "Green finance" refers to the integration of finance and business with environmentally sustainable practices. It is considered a financial endeavour aimed at achieving superior conservation outcomes. It entails inherently adaptive investments and methodologies, recognised as essential tools for achieving environmentally sustainable economic growth.

III. HISTORICAL EVOLUTION OF GREEN FINANCE

As global economies confront the challenges of climate change and environmental sustainability, green finance has become an essential vehicle for aligning financial systems with ecological objectives. The incorporation of sustainability into financial decision-making has acquired considerable traction, promoting investments that emphasise environmental accountability [10]. This section explores the significance of green finance, its role in tackling economic and environmental issues, and its historical progression, emphasising significant milestones in its advancement:

Green finance represents a noteworthy notion because it is the first coordinated attempt by the financial sector to combine financial success with a good influence on the environment. This makes green finance very relevant. Financial products that are environmentally friendly are now being created in order to attain sustainability [11]

Green finance refers to sustainable initiatives and investments that benefit the environment. The current overuse of technology has created difficulties for economies worldwide. Environmental effects and financial urgency are two major issues that economies are now dealing with. Therefore, funding is necessary to address the two concerning issues that could otherwise worsen. Environmental degradation is thought to be solved through green money. In addition to bridging the gap between the economy and the environment, green finance places heavy emphasis on sustainability and ecological growth [12]

As a means of tackling the combined issues of supporting economic growth and mitigating climate change, "green finance" emerged as a very important tool in the worldwide quest for sustainable economic development. A major outburst in green finance research occurred over the period of 2019 to 2022, which coincided with an increase in worldwide efforts to accomplish climate targets as referred to in the Paris Agreement. China has been contributing to research production throughout this time period, which is a reflection

global capital markets. Consequently, Investment flows tend to favour already green assets in developed countries rather than supporting high-emission developing regions [17].

V. METHODOLOGY

A. Research Design

This research adopts a qualitative, conceptually driven design to examine the function of Environmental, Social, and Governance (ESG) criteria in sustainable finance and the financial industry more broadly. Positioned as descriptive and exploratory, the study synthesises established literature and theoretical perspectives to advance understanding in the field. As a conceptual inquiry, it is grounded entirely in secondary data and theoretical constructs, with no primary empirical data collection. The methodology elaborates on the research design and analytical strategies used to evaluate the incorporation of ESG criteria in financial-sector practices.

B. Data Collection

The study defines its “population” as the comprehensive body of scholarly literature and regulatory documents pertaining to sustainable finance and ESG practices. Data collection followed a literature review approach, employing purposive sampling to identify the most relevant and substantive materials. The resulting sample spans the past decade, ensuring the inclusion of contemporary research and policy developments in ESG and sustainable finance. The data is collected using the following key sources:

- **International policy documents:** These documents contained reports from authoritative institutions such as the United Nations and the World Bank, in addition to other relevant papers, [18].
- **Global regulatory frameworks:** The research collected documentation from financial regulatory bodies and investigated frameworks such as the EU taxonomy, visions related to the construction of national green taxonomies, and guidance from institutions such as the European Central Bank (ECB) on risk management.
- **Institutional sustainability reports:** the review encompassed documentation and directives pertaining to reporting obligations- most notably the requirements articulated by the Corporate Sustainability Reporting Directive (CSRD) – and incorporated examples from institutional reports outlining climate-aligned activities.
- **ESG disclosure standards:** The examination included widely adopted global ESG reporting frameworks, such as the Global Reporting Initiative (GRI), the Task Force on Climate-related Financial Disclosures (TCFD), and the Sustainability Accounting Standards Board (SASB). In addition, it assessed compliance with the International Capital Market Association (ICMA) 's compliance principles, including the Green Bond Principles.
- **Peer-reviewed academic studies:** The research is based Peer-reviewed Journal articles, books collected from academic databases, especially synthesising recent empirical studies and theoretical frameworks. [10]

C. Data Analysis

The analysis for this conceptual study employed a combination of qualitative techniques applied to the collected secondary data:

- **Thematic coding and synthesis:** The primary analytical approach was thematic analysis, a qualitative method, well-suited to conceptual research. This involved coding the literature and organising findings into key themes such as the influence of ESG on financial performance and the role of regulatory dynamics. Through this process, insights were synthesised across multiple studies to generate new perspectives aligned with the research objectives.
- **Historical Documents analysis:** Historical analysis was conducted to understand the evolution of market and regulatory conditions, particularly the transition from Socially Responsible Investing (SRI) to contemporary ESG investment practices. This entailed systematically reviewing national policy documents and evaluation frameworks to assess their rigor and historical scope.
- **Comparative Analysis of Regulatory and Market Developments:** Comparative techniques were used to examine differences in ESG adoption across markets and regulatory systems. Including contrasts between developed economies (e.g., Europe and Japan) and emerging markets. The analysis also compared various ESG taxonomies (such as those of Bangladesh, China, Mongolia, CBI, and the EU) and the methodologies employed by ESG rating agencies. This comparative scrutiny strengthens the validity of the study’s conclusions by grounding them in the broader evidence base.

D. Key Drivers Identified from Historical Evidence

The main obstacles and difficulties that green financing projects face will be examined in this section. It will look at investor views, market hurdles, legal and policy restrictions, and the absence of standardised frameworks for measuring and reporting. It will also draw attention to issues with financial structures, SMEs' limited access to capital, affordability challenges, and technological barriers. Understanding these obstacles is essential to formulating effective strategies to enhance the uptake and impact of green financing on sustainable economic expansion.

Green finance initiatives face numerous challenges and barriers, including regulatory and policy challenges, market barriers, investor perception, lack of awareness, measurement and reporting standards, financial structuring and product innovation, access to finance for SMEs, affordability, and technological and data challenges. Regulatory standards are often based on varying definitions and criteria, making it difficult to establish standardised global guidelines. Market barriers include perceived risks and returns, lack of awareness, and insufficient data on environmental, social, and governance factors. Measurement and reporting standards are also complex due to the complexity of ecosystems and social dynamics. Financial structuring and product innovation are also challenging, as complex structures make them less accessible to retail investors. Technological infrastructure and data processing and analysis are also significant challenges [19]

Additionally, financial institutions face many challenges in making environmentally friendly financing more accessible in developing countries. These obstacles include legislative gaps and inadequate incentives for local businesses to embrace more ambitious climate targets. IFC has published a paper that examines how developing-market enterprises seeking access to sustainable financing may overcome hurdles and meet their requirements [3]

Green finance faces several obstacles, notably the lack of a definitive framework, which may lead to "green-washing," when issuers make deceptive claims about the environmental benefits of their assets. Additionally, savers' and investors' short-term orientation diverges from the long-term characteristics of green investment initiatives, which often last more than 10 years. Moreover, distinct constraints encountered by diverse stakeholders impede the advancement of green finance [22]. According to Sundararajan & Vivek (2016), the obstacles to green financing encompass:

1) *Mispricing of Risks*: In many nations, financial markets inadequately assess the risks associated with green development, especially those related to emerging technologies and the consistency of domestic regulations.

2) *Market Distortions*: Energy market pricing is distorted by ongoing fossil fuel subsidies and the inability to integrate environmental externalities, which reduces the attraction of green energy initiatives. Furthermore, there is an insufficiency of varied green finance products and trading marketplaces.

3) *Competing Objectives*: Private investors target profit maximisation, public green finance providers emphasise environmental enhancement, and policymakers seek optimum developmental results, resulting in competing objectives.

4) *Legislative Gaps*: Inadequate legislative and technological frameworks for measuring and analysing green business strategies provide substantial obstacles to the evolution of green financing.

E. Future trends as well as opportunities in green finance

This section's examination of the issues that will influence green finance going forward emphasises the expanding convergence of sustainability, innovation, and technology. It examines key topics, including blue finance, circular-economy financing, nature-based solutions, and transition finance, highlighting how they can reduce carbon footprints and advance environmental sustainability. Along with regulatory changes and improvements in effect assessment, new trends such as climate resilience financing, grassroots fundraising, and technology-driven green finance will also be covered. To adapt their strategies to the changing environment of sustainable finance, investors, financial institutions, and regulators must have a thorough understanding of these changes.

According to Goyal & Anand [19] the future of green finance is bright, driven by sustainability, innovation, and technological integration. To contribute to a sustainable and successful future, stakeholders, governments, financial institutions, and investors must align their plans with the trends outlined in Table 2.

TABLE II. TRENDS FOR SUSTAINABLE FINANCE [19].

Future Trends in Green Finance	Description	Opportunities
Transition Finance	Funding activities that help high-carbon-intensive sectors transition to low-carbon alternatives.	Bridges the gap between traditional industries and sustainable solutions, reducing carbon footprints.
Nature-Based Solutions (NbS)	Utilising natural ecosystems to tackle climate change, biodiversity loss, and water scarcity.	Investments in reforestation, sustainable land use, and wetland restoration offer environmental and financial returns.
Circular Economy Financing	Supporting projects that focus on waste reduction, recycling, and resource efficiency.	Encourages sustainable business practices while generating financial returns.
Blue Finance	Sustainable use of ocean and marine resources, such as fisheries, conservation, and renewable ocean energy.	Supports economic growth while preserving marine ecosystems and biodiversity.
Climate Resilience Finance	Funding projects that enhance climate resilience, including infrastructure and disaster risk reduction.	Reduces vulnerability to extreme weather events, ensuring long-term sustainable development.
Community and Grassroots Financing	Directing funds toward small-scale, community-led sustainability initiatives.	Empowers local communities, fostering economic growth and environmental stewardship.
Technology-Enabled Green Finance	Integrating emerging technologies like blockchain, AI, and data analytics into green finance.	Enhances transparency, reduces transaction costs, and broadens access to green finance.
Sustainable Real Estate Financing	Funding energy-efficient buildings, green infrastructure, and sustainable real estate projects.	Promotes environmentally friendly building practices, reducing energy consumption and increasing property value.
Policy-Driven Green Finance Expansion	Growing regulatory focus on sustainable finance, including new policies, tax incentives, and disclosure requirements.	Ensures compliance, reduces risk, and creates new opportunities for investing in green finance.
Impact Measurement & Reporting Advancements	Development of standardised metrics for measuring the environmental and social impact of investments.	Enables better decision-making, builds investor trust, and directs funds toward high-impact projects.

It can be deduced that future green finance hinges on sustainability, technology integration, and innovation. The table emphasizes the importance of green financial products that promote environmental protection, efficient resource use, and climate resilience. It also indicates the expanding significance of technology, regulation frameworks, and impact reporting requirements, which enhance the

effectiveness and transparency of green financial systems. These innovations offer significant opportunities for investors, financial institutions, and policymakers to drive sustainable economic growth and address international environmental concerns.

VI. SUSTAINABLE FINANCE INTEGRATION FRAMEWORK DEVELOPMENT

A. The Dynamic Sustainable Finance Alignment (DSFA) Framework

1) Conceptual Background

Sustainable finance has evolved from a marginal ethical concern to a central mechanism for achieving global climate and development goals. Financial capital is required to achieve international commitments such as the Paris Agreement and the Sustainable Development Goals (SDGs) of the United Nations. [19] [20] Prior studies have identified key elements of sustainable finance, such as green financial instruments, disclosure requirements, and climate risk assessments. But these elements are often treated separately, limiting their systemic explanatory [21] [22] [3]. This study introduces the Dynamic Sustainable Finance Alignment (DSFA) Framework, which conceptualises sustainable finance as a dynamic, feedback-driven system rather than a static set of tools.

2) Core Conceptual Contribution

A primary contribution of the DSFA Framework is its formulation of a Virtuous Cycle of Sustainable Finance, which illustrates how financial systems are continuously aligned with sustainability objectives through iterative feedback mechanisms. Inputs, Processes, Enablers, and Outcomes form the basis of the framework, which explains how measurable sustainability outcomes reinforce the original drivers of financial alignment. The DSFA Framework emphasises systemic coherence and reinforcement in contrast to linear or compliance-oriented models, enabling sustained alignment with decarbonisation pathways, climate resilience, and Sustainable Development Goals.

3) Structure of the DSFA Framework

a) *Inputs: Drivers of Change:* The inputs represent the external forces that initiate and shape sustainable finance activities. Regulatory mandates, national and international climate policies, investor demand for ESG-aligned assets, and targeted financial incentives are among these factors. Sustainable financial transformation requires both a legal mandate and an economic motivation.[2].

b) *Processes: Financial Transformation:* Inputs are operationalised within financial systems through processes. In accordance with TCFD recommendations [23], these include the deployment of green and transition finance instruments, strategic capital allocation decisions, and the incorporation of climate-related financial risks into lending and investment models.

c) *Systemic Integrity Enablers:* In order to ensure credibility and effectiveness, enablers provide the institutional, technological, and governance foundations. Greenwashing risks are reduced through digital reporting systems, AI-driven analytics, standardised disclosure frameworks, and independent governance and auditing structures [24].

d) *Outcomes: Implications for the real world:* The outcomes of the framework are measurable in terms of their environmental, economic, and social impacts. Among these are progress toward decarbonisation and Net Zero targets, improved climate and economic resilience, and tangible contributions to the Sustainable Development Goals. The outcomes serve as a mechanism for validating and reinforcing future regulatory ambition and investor confidence. Table 3 summarises the framework.

TABLE III. COMPONENTS OF THE DYNAMIC SUSTAINABLE FINANCE ALIGNMENT (DSFA) FRAMEWORK

Component	Role	Key Elements
Inputs	Drivers of change	Regulation, climate policy, investor demand, and financial incentives
Processes	Financial transformation	Green instruments, capital allocation, climate risk integration
Enablers	Systemic integrity	Digital systems, AI analytics, disclosure standards, governance
Outcomes	Real-world impact	Emissions reduction, resilience, SDG achievement

In order to show the process, Figure 3 shows the flowchart for this framework. Figure 2 DSFA Framework Flowchart (Input–Process–Output Logic)

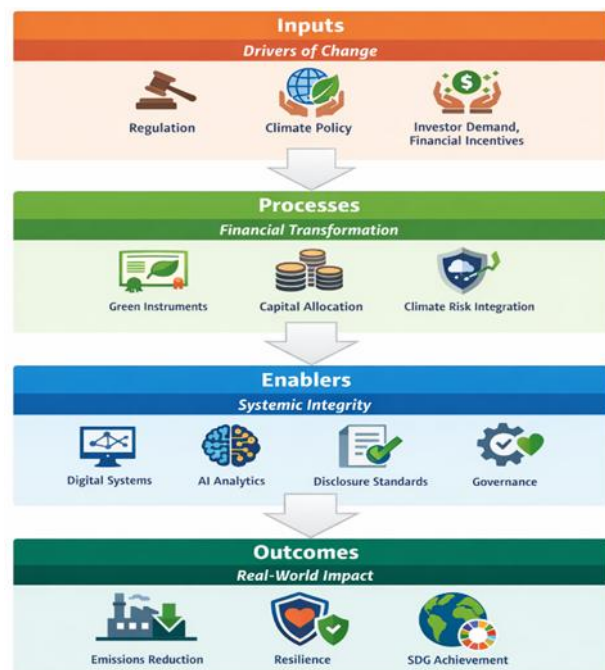


Fig 2 Sustainable Finance Integration Framework.

e) *Importance of the framework:* The DSFA Framework advances sustainable finance theory beyond static classifications by explicitly linking drivers, financial mechanisms, systemic enablers, and real-world impacts. In alignment with Net Zero commitments and global

sustainability goals, it provides policymakers, regulators, and financial institutions with a coherent framework for designing, evaluating, and scaling sustainable finance strategies.

VII. CONCLUSION

A. Key Historical Insights Shaping the Framework

The Dynamic Sustainable Finance Alignment (DSFA) Framework was built based on a few key lessons from the past:

1) *Moving to the Centre Stage:* In the past, sustainable finance was just a small “ethical concern” on the sidelines. Now, it is seen as a key tool for achieving major global goals, such as the Paris Agreement and the UN Sustainable Development Goals.

2) *Connecting the Dots:* Previously, experts examined different aspects of green finance, such as green loans and climate rules, separately. The problem was that studying these parts alone didn’t explain how the whole system worked together.

3) *Need for Both law and Money:* History shows that to really change the financial system, you need two things at the same time: laws that force change (“legal mandate”) and financial reasons that make people want to change (“economic motivation”)

4) *Original Contribution:* A Unified, Integrated Sustainable Finance Framework

The main new contribution of this framework is that it looks at sustainable finance as a “dynamic, feedback-driven system” rather than just a fixed list of tools.

Instead of a straight line where you just follow the rules, this framework creates a “Virtuous Cycle” where good results today encourage more investment tomorrow. It brings four simple steps to make this happen:

- 1- **Inputs (The Spark):** The outside forces that start the action, such as government regulations or investors asking for green products.
- 2- **Process (The Action):** How the financial system actually uses money, such as issuing green bonds or choosing where to invest capital.
- 3- **Enablers (The Safety Checks):** The tools that make sure the system is honest and works well. This includes using technology like AI and strict rules to stop “greenwashing” (faking sustainability).

Outcomes (The Results): The real-world impact, such as lowering emissions or hitting Net Zero targets. When these results are good, they build confidence and strengthen the system for the future. By linking all these parts, the framework gives leaders a clear map to design strategies that actually work to solve real-world problems.

In conclusion, the paper provides the following recommendations for future research based on the Dynamic Sustainable Finance Alignment (DSFA) Framework:

B. Empirical Testing of the Framework

1) *Validate the Feedback Loop:* Investigate real-market data to confirm the "Virtuous Cycle," specifically,

whether positive sustainability outcomes statistically reinforce the original drivers of financial alignment.

2) *Assess Enablers:* Measure the effectiveness of "systemic integrity enablers"—such as digital reporting and "AI-driven analytics"—in reducing greenwashing and improving market confidence.

C. Sector-Specific Applications

1) *Customize Processes:* Analyses how "strategic capital allocation decisions" and green instruments must be tailored for different industries (e.g., energy vs. services) to meet specific "decarbonization pathways".

D. Cross-Regional Comparisons:

1) *Compare Inputs:* Evaluate how the mix of "regulatory mandates" versus "financial incentives" affects success rates in different jurisdictions, identifying which combinations generate the best "real-world impacts".

E. Integration with Quantitative Models

1) *Quantify Outcomes:* Research methods to translate qualitative "real-world impacts" (like Net Zero progress and SDG contributions) into standardized data for mathematical modelling.

2) *Model Climate Risk:* Develop algorithms that utilize "climate-related financial risks" and AI analytics to predict how changes in policy inputs alter investment flows.

REFERENCES

- [1] Kwilinski, A., Lyulyov, O. and Pimonenko, T. (2023) ‘Spillover effects of green finance on attaining sustainable development’, *Computers*, 11(10), p. 199. Available at: <https://www.mdpi.com/2079-3197/11/10/199> (Accessed: [12 September 2025]).
- [2] European Commission (2020) ,Regulation (EU) 2020/852 of the European Parliament and of the Council of 18 June 2020 on the establishment of a framework to facilitate sustainable investment (EU Taxonomy Regulation). Official Journal of the European Union. Available at: <https://eur-lex.europa.eu/eli/reg/2020/852/oj> (Accessed: [15 June 2025]).
- [3] International Finance Corporation (IFC) (2023) Challenges of green finance: Private sector perspectives from emerging markets. Available at: <https://www.ifc.org/content/dam/ifc/doc/2023/challenges-of-green-finance.pdf> (Accessed: [21 April 2025]).
- [4] Wang, L., Qiu, X.M., Zhang, X.X., Ma, R.H. and Jiang, Y.H. (2019) ‘Development status and environmental impact evaluation of China’s green finance’, *Applied Ecology & Environmental Research*, 17(5), pp. 12245–12258. Available at: https://www.aloki.hu/pdf/1705_1224512258.pdf (Accessed: [12 April 2025]).
- [5] Ali, F., Sayal, A., Suri, P., Ahmad, V., Chauhan, S.S. and Panwar, D. (2024) ‘The emergence of green finance: a conceptual framework for environmental sustainability: innovation viewpoint’, *F1000Research*, 13, p. 1312. <https://doi.org/10.12688/f1000research.157894.1>
- [6] Fathihani, J.S., Saputra, J., Che Haat, M.H., Yusliza, M.Y., Muhammad, Z. and Bon, A.T. (2021) ‘A review of sustainable green finance literature: Mini-review approach’, in *Proceedings of the 11th Annual International Conference on Industrial Engineering and Operations Management (IEOM)*, Singapore, pp. 3194–3203.
- [7] Wang, Y. and Zhi, Q. (2016) ‘The role of green finance in environmental protection: Two aspects of market mechanism and policies’, *Energy Procedia*, 104, pp. 311–316. Available at: <https://doi.org/10.1016/j.egypro.2016.12.053> (Accessed: [15 October 2025]).

- [8] Mohd, S. and Kaushal, V.K. (2018) 'Green finance and sustainable development', *MUDRA Journal of Finance and Accounting*, 5(1), pp. 59–74.
- [9] Zhang, Y. and Lu, J. (2022) Green finance and corporate environmental violations: a test from the perspective of illegal pollution discharge behaviors, *Environmental Science and Pollution Research*, 29(32), pp. 48477–48490. Available at: <https://doi.org/10.1007/s11356-022-19228-5>
- [10] Hassan, A.A., Mokhtar, N., Husin, M.S.H. and Hassan, F. (2024) 'Sustainable finance and the financial sector: A conceptual exploration of ESG's role', *International Journal of Research and Innovation in Social Science*, 8(9), pp. 1240–1257.
- [11] Mohanty, S. et al. (2023) 'Emerging research trends in green finance', *Journal of Risk and Financial Management*, 16(2), p. 108.
- [12] Sunil, A. and Momany, M.T. (2020) 'Impact of green finance', *International Journal of Management*, 11(8), pp. 1112–1120.
- [13] Marín-Rodríguez, N.J., González-Ruiz, J.D. and Botero, S. (2024) 'Evolution of green finance', *Journal of Risk and Financial Management*, 17(11), pp. 1–32.
- [14] World Bank (2020) *Developing a national green taxonomy: A World Bank guide*. Washington, DC: World Bank. Available at: <https://documents1.worldbank.org/curated/en/953011593410423487/pdf/Developing-a-National-Green-Taxonomy-A-World-Bank-Guide.pdf> (Accessed: [15 September 2025]).
- [15] People's Bank of China (2015). *Green Bond Endorsed Project Catalogue*
- [16] European Central Bank (ECB) (2022) *Walking the talk: Banks gearing up to manage risks from climate change and environmental degradation – Results of the 2022 thematic review on climate-related and environmental risks*. Frankfurt: ECB, November. Available at: <https://www.bankingsupervision.europa.eu> (Accessed: [14 December 2025]).
- [17] Portfolio Alignment Team (2021) *Measuring portfolio alignment: Technical considerations*. TCFD Knowledge Hub. Available at: <https://www.tcfdhub.org/resource/measuring-portfolio-alignment-technical-considerations/> (Accessed: [14 december 2025]).
- [18] Snyder, H. (2019) 'Literature review as a research methodology: An overview and guidelines', *Journal of Business Research*, 104, pp. 333–339. Available at: <https://doi.org/10.1016/j.jbusres.2019.07.039> (Accessed: [12 June 2025]).
- [19] UNFCCC (2015) *The Paris Agreement*. Bonn: United Nations Framework Convention on Climate Change. Available at: https://unfccc.int/sites/default/files/english_paris_agreement.pdf (Accessed: [14 June 2025]).
- [20] United Nations (2015) *Transforming our world: the 2030 Agenda for Sustainable Development*. New York: United Nations. Available at: https://www.un.org/ohrls/sites/www.un.org.ohrls/files/2030_agenda_for_sustainable_development_web.pdf (Accessed: [14 June 2025]).
- [21] Schoenmaker, D. and Schramade, W. (2019) *Principles of sustainable finance*. Oxford: Oxford University Press. Available at: <https://ssrn.com/abstract=3282699> (Accessed: [15 April 2025]).
- [22] Berensmann, K. and Lindenberg, N. (2016) *Green finance: actors, challenges and policy recommendations*. Bonn: German Development Institute (DIE). Available at: <https://www.idos-research.de/briefing-paper/article/green-finance-actors-challenges-and-policy-recommendations/> (Accessed: [15 April 2025]).
- [23] Financial Stability Board (FSB) (2017) *Recommendations of the Task Force on Climate-related Financial Disclosures*. Basel: FSB. Available at: <https://www.fsb-tcfd.org/wp-content/uploads/2017/06/FINAL-2017-TCFD-Report.pdf> (Accessed: [16 June 2025]).
- [24] International Sustainability Standards Board (ISSB) (2023) *IFRS S1 General Requirements for Disclosure of Sustainability-related Financial Information and IFRS S2 Climate-related Disclosures*. London: IFRS Foundation. Available at: <https://www.ifrs.org/issued-standards/ifrs-sustainability-standards/> (Accessed: [18 July 2025]).