International Journal of Innovative Research in Management Studies (IJIRMS)
Volume 7, Issue 10, December 2025. pp.1-10.

GREEN FINANCE INNOVATIONS: ESG, GREEN BONDS, AND SUSTAINABLE FINANCE AND THEIR IMPACT ON CLIMATE RISK

Vinayak Anand Teli[1], Ramya H P[2]

[1]*MBA Student, Department of Management Studies, Dayananda Sagar College of Engineering, Bangalore. Email: vinayakteli4321@gmail.com*

[2]*Assistant Professor, Department of Management Studies, Dayananda Sagar College of Engineering, Bangalore, Email: ramya-mbavtu@dayanandasagar.edu*

Abstract—*This paper assesses the contribution of green finance innovations—namely, Environmental, Social, and Governance (ESG) frameworks, green bonds, and sustainable finance instruments—to confront systemic climate risks. Based on academic research, policy briefs, and case studies, it dissects how these devices deploy capital toward low-carbon, climate-resilient development strategies. ESG frameworks are examined as a means of integrating non-financial risks into investment decision-making, increasing transparency, and fostering long-term value creation. Green bonds are rated as one of the most effective tools for funding climate adaptation and mitigation initiatives, although issues such as definitional uncertainty, greenwashing, and transaction costs are present. Wider sustainable finance techniques, such as carbon markets, impact investing, and blended finance, are presented as innovative means to de-risk investments and improve access, especially in developing economies. The results highlight the fact that green finance innovations, although holding high potential for climate risk mitigation, depend on regulation, uniform frameworks, and strong disclosure mechanisms to achieve their objectives. The chapter positions green finance both as an opportunity and a challenge to build resilient financial systems aligned with international climate objectives.*

Keywords: *Climate Risk Mitigation, ESG Frameworks, Green Bonds, Green Finance, Sustainable Finance.*

Introduction

Climate change has emerged as one of the most pressing system-level risks of the 21st century, with rising temperatures and intensifying natural disasters posing material threats to financial systems and economies. The UNEP Climate Risk Landscape Report (2024) stresses the urgent need for financial institutions to adopt climate risk analytics, scenario modeling, and disclosure frameworks in strategic planning. In this context, green finance has gained prominence as a proactive approach that aligns capital allocation with environmental sustainability, supporting projects that generate economic returns while fostering ecological resilience (Ozili, 2021). Its development is anchored in global sustainability agendas, notably the 2015 Paris Agreement and the UN Sustainable Development Goals (EBRD). Achieving climate mitigation pathways demands substantial capital mobilization—estimated in the trillions annually by the International Energy Agency (IEA) (Bishop, 2019). Innovations such as Environmental, Social, and Governance (ESG) frameworks, green bonds, and broader sustainable finance instruments have become central to closing this financing gap and addressing systemic climate risks (OECD, 2023). This paper examines green finance innovations across ESG approaches, green bonds, and wider sustainable finance practices, evaluating their effectiveness in managing physical and transition climate risks and fostering climate-resilient economies.

Literature review

In recent years, the burgeoning literature on green finance innovations demonstrates the growing interest of scholars and policymakers alike on the nexus of financial markets and the management of climate risks. This section outlines the evolution of key concepts like green finance, ESG, and green bonds within the greater sustainable finance literature and articulates their place and significance within the growing literature. Early green finance frameworks were developed in the mid-2000s, notably through the United Nations Environment Program Finance Initiative (UNEP FI), which emphasized the private financial sector's contribution to environmental sustainability (UNEP FI, 2007).

The 2015 Paris Agreement was a game-changer by formally connecting climate change mitigation and adaptation objectives with financial flows. Academics like Zhang et al. (2020) contend that green finance is a tool for solving both market failures and financing climate policy solutions. While initially based on socially responsible investing (SRI), the ESG investment model has now become a mainstream approach to incorporating non-financial risks into portfolio management. Friede, Busch, and Bassen (2015) performed a meta-analysis of more than 2,000 empirical studies and observed a positive correlation between ESG factors and corporate financial performance. Later studies highlight the ability of ESG to mitigate climate-related risks through increased transparency, accountability, and long-term value creation (Fatemi & Fooladi, 2013; Khan et al., 2016). In academic literature, green bonds have acquired a lot of attention and become one of the hot topics, catching the interest of institutional investors who regard them as fixed-income securities targeted at funding environmental projects. As Flammer (2021) observes, green bond issuance can give rise to a positive effect on an organization's reputation and engage a wider investor audience. However, issues continue to arise in relation to standardized frameworks, the complexity and cost of verification by third parties, and there is always a risk of using misleading information, as highlighted by Ehlers and Packer (2017). Sustainable finance literature extends beyond just green bonds; among the innovations are blended finance, impact investing, and carbon trading. Blended finance – involving public and private funds for risk sharing, supporting investment – has been identified as a primary tool for mobilizing climate finance in emerging markets (Bai et al., 2022). Also, research on impact investing brings to light the fact that it is essential to achieve quantifiable environmental and social outcomes along with financial gains (Jackson & Harji, 2013). Although there have been significant developments in this respect, some basic controversies still define academic conversation in this area. One of them is the effectiveness of ESG ratings, which tend to be marred by inconsistencies between rating agencies (Berg, Kölbel, & Rigobon, 2022). Another controversy relates to the degree to which green finance innovations actually reduce systemic climate risks or are tools for reputation-building. Generally speaking, the literature proves that although green finance innovations are promising in terms of marshalling capital into climate-compatible activities, their impact depends on governance arrangements, support from regulation, and transparency mechanisms. This overview sets the stage for the rest of this chapter, which delves more deeply into ESG, green bonds, and sustainable finance.

Research Gap

Most existing studies focus on the growth of green finance instruments but provide limited analysis of their actual effectiveness in reducing systemic climate risks. Research is also fragmented due to inconsistent ESG standards, diversified green bond definitions, and heterogeneous rating methodologies. While many papers discuss individual tools like ESG or green bonds, integrated assessment of how these innovations collectively influence climate resilience is lacking. Moreover, there is insufficient empirical evidence from emerging economies, where climate vulnerability is high, but green finance access remains limited.

Research Methodology

The study is grounded on a thorough examination of past studies on green financial innovations and climate risk. It includes previously published scholarly articles, policy briefs, and case studies pertaining to the given subject. This study aims to examine how financial instruments, such as green bonds, ESG frameworks, and climate-oriented investments, are being utilized to address environmental issues. The study performs a qualitative research methodology guided literature review to highlight key themes and trends, and contemporary practices. After considering multiple perspectives, the study examines the evolution of green finance along with its impact on sustainability and risk management and describes the implications.

Objectives

- To assess how green financial products like green bonds, sustainable finance, and ESG-linked investments help to mitigate climate-related risks.
- To examine how financial innovation drives sustainable development and environmental resilience.
- To analyze the extent to which green finance instruments help achieve global climate targets.

Green Finance

Hohne et al. (2012) define green finance as investments in sustainable development projects, environmental products, and policies that promote a more sustainable economy. Beyond climate finance, it addresses broader objectives such as pollution control, water and sanitation, and biodiversity protection. Mitigation finance reduces greenhouse gas emissions, while adaptation finance decreases vulnerability to climate impacts. Green financial innovation develops instruments,

strategies, and markets to fund projects like clean energy, organic farming, and pollution reduction, including green bonds, sustainability-linked loans, and insurance products incentivizing environmentally friendly behavior (Sustainability Directory, 2025). The Paris Agreement (2015) under the UNFCCC reinforces these goals, aiming to limit global warming below 2°C, promoting mitigation, adaptation, climate resilience, low-carbon financial flows, and support for vulnerable developing countries through finance, technology transfer, and capacity building (Agreement, P., 2015, December). Green finance adoption is growing, with initiatives like Bendigo Bank's green home loans in Australia and government-backed green mortgages in the Netherlands (Ozili, 2022). Its development is supported by banks, institutional investors, research institutions, central banks, regulators, international organizations, universities (Berensmann & Lindenberg, 2016; Ozili, 2019), and private sector players such as commercial banks and private equity funds (Oh & Kim, 2018; Ozili, 2023).

Key dimensions include financing green investments, supporting public environmental policies, and specialized instruments and institutions like green bonds and the Green Climate Fund (Berensmann & Lindenberg, 2016). Green finance drives sustainable development, carbon reduction, smart cities, inclusive growth, impact investing, and portfolio diversification (Sachs et al., 2019; He et al., 2020; Wang & Wang, 2020; Li et al., 2021; Tang & Zhang, 2020; Reboredo, 2018; Ozili, 2023).

Green Finance Innovations

This chapter examines key green finance innovations, including sustainable finance, ESG standards, and green bonds, highlighting their structures, functions, and roles in channeling capital and addressing climate risks globally.

1) Sustainable Finance

Sustainable finance integrates environmental, social, and governance (ESG) factors into investment choices with the view to promoting long-term financing of sustainable economic operations (Hasan, S. M., & Minhat, M., 2021). It usually involves three different dimensions: green finance, corporate social responsibility (CSR), and digitalization (Hasan et al., 2025). Sustainable finance directs capital into climate-resilient infrastructure, clean energy, and ecosystem restoration and contributes directly to SDG 13 (Climate Action) while catalyzing cross-sectoral integration by bringing together climate objectives with water, health, education, and biodiversity outcomes (Raman et. Al., 2025). Sustainability is significantly linked with human well-being, quality of life, and human progress; therefore, Sustainable finance focuses on the critical importance of environmental and social drivers in determining and fueling long-term economic growth (Ziolo et. al., 2019).

Finance and sustainability linkage

The financial system plays a crucial role in promoting sustainability by directing capital toward activities that generate long-term environmental and social value. Schoenmaker and Schramade (2018) highlight that finance is uniquely positioned to evaluate trade-offs among competing sustainability objectives and guide investments toward low-carbon and circular economic pathways. Banks contribute through lending policies that prioritize sustainable industries, while investors support responsible business practices through active governance and engagement. Techniques such as scenario analysis help financial institutions assess climate-related risks and future uncertainties, encouraging a shift from short-term profit orientation to long-term resilience. According to Schoenmaker and Schramade's framework, Sustainable Finance 1.0 emphasizes profit maximization with basic exclusions of harmful activities; Sustainable Finance 2.0 integrates the triple bottom line—people, planet, and profit—by internalizing environmental and social impacts; and Sustainable Finance 3.0 represents the most advanced phase, prioritizing shared societal benefits and driving systemic transformation toward sustainable development.

Sustainable finance instruments

Sustainable finance utilises specific tools to direct the capital to the projects benefiting the society and the environment. A list of the tools that are necessary to propel this transformation includes the following (Kanimozhi, V., & Suvitha, S.).

I) Green bonds finance projects with long-term environmental benefits such as renewable energy, green transport, and energy-efficient infrastructure. Issued by governments, corporations, and financial institutions, they resemble conventional bonds but require proceeds to be directed exclusively to certified green projects, often verified by bodies like the Climate Bonds Initiative.

II) Sustainability-Linked Loans (SLLs) tie interest rates to a borrower's sustainability performance. Firms meeting targets, such as lower emissions or higher renewable energy use, receive lower rates, while underperformance results in higher borrowing costs, encouraging broad ESG improvements.

III) ESG-integrated investment funds combine financial criteria with environmental, social, and governance factors, excluding harmful industries and prioritizing companies with strong sustainability profiles to manage long-term risks and opportunities.

IV) Carbon credits and emissions trading schemes assign a price to carbon, allowing firms with lower emissions to sell excess allowances and encouraging cost-effective mitigation through cap-and-trade or voluntary offset markets.

V) Social bonds mobilize capital for socially beneficial projects such as affordable housing, healthcare, and education, following ICMA principles to ensure transparent reporting and impact disclosure.

VI) Blended finance combines concessional public or philanthropic capital with private investment to support high impact but high-risk projects, particularly in developing countries, enabling greater capital mobilization and stronger social and environmental outcomes.

2) ESG Frameworks

Sustainable finance and ESG are closely linked, as ESG considerations provide a vital framework for guiding sustainable financial behavior. The ESG framework comprises three key dimensions: Environmental (E), Social (S), and Governance (G). Rooted in the Principles for Responsible Investment (PRI), ESG represents a strategy to incorporate environmental, social, and governance factors into investment decisions and active ownership. The Environmental pillar evaluates a firm's impact on the natural environment, including carbon footprint, energy efficiency, waste management, and climate risk mitigation, enabling stakeholders to assess long-term environmental sustainability. The Social dimension examines a company's engagement with employees, communities, and society, covering labor practices, human rights, diversity and inclusion, and corporate social responsibility initiatives. Governance focuses on internal accountability, transparency, board composition, executive compensation, audit practices, and shareholder rights, ensuring ethical decision-making, regulatory compliance, and investor protection. Together, these dimensions offer a holistic assessment of a firm's sustainability beyond traditional financial metrics (Agrawal, 2023). Rising global concern over climate change and sustainable development has shifted investor focus from purely financial performance to integrating non-financial analysis. ESG performance indices serve as key indicators of corporate sustainability, influencing portfolio construction and asset selection. Evidence shows that incorporating ESG factors can enhance long-term financial returns for institutional investors and asset managers, through methods like negative screening of low-rated firms, positive screening of high ESG performers, and integration into standard financial analysis. Regulatory authorities increasingly mandate ESG-related disclosures to provide investors with relevant sustainability information, though challenges persist due to reporting inconsistencies and difficulties in evaluating firm-specific ESG data. Nonetheless, ESG adoption is substantial; the Global Sustainable Investment Alliance (2018) reports over $30 trillion in ESG-oriented strategies, reflecting the mainstreaming of sustainable investment. Furthermore, platforms like the Green Finance Platform play a role in managing and educating stakeholders on green capital and sustainable trade (Green Finance Platform, Retrieved September 5, 2025).

Different standardised ESG frameworks are used by organizations that have the ambition to report their sustainability performance. These frameworks facilitate transparency, comparability, and accountability. They vary in scope, target audience, and depth of attention to materiality, although they all come together to lay the groundwork towards effective ESG reporting. These include; Global Reporting Initiative (GRI), Sustainability Accounting Standards Board (SASB), Task Force on Climate-Related Financial Disclosures (TCFD), International Sustainability Standards Board (ISSB), Carbon Disclosure Project (CDP), Integrated Reporting Framework (IR), United Nations Global Compact (UNGC).

ESG Ratings

Environmental, Social, and Governance (ESG) ratings assess how well organizations manage sustainability risks and their broader environmental and social impacts. Agencies differ in terminology and methodology, producing ratings, scores, or opinions based on varied analytical models. ESG ratings appear in several forms: composite ratings, which combine E, S, and G into one overall score; dimensional ratings, which evaluate specific aspects such as climate risk or biodiversity impact; materiality-based ratings, which assess either how sustainability issues affect the firm (single materiality) or both financial impact and societal impact (double materiality); framework-aligned ratings, which follow standards like SDGs, GRI, or TCFD; and methodology-driven ratings, based on either qualitative expert assessment or algorithmic data analysis. These ratings now play a critical strategic role: investors use them for sustainable portfolio

decisions, and companies use them to benchmark risks, identify opportunities, and improve ESG performance (European Commission). Major providers include MSCI, Sustainalytics, RobecoSAM, ISS, and RepRisk.

3) Green bonds:

Green Bond Principles (GBP, 2018) defines that a green bond is "any bond instrument where the proceeds will be exclusively applied to finance or refinance, in part or in full, new and /or existing eligible green projects." The green bonds are divided into four types: Standard Green Use of Proceeds Bond, Green Revenue Bond, Green Project bond, and Green securitized bonds. Proceeds from green bonds are used to finance leading-edge projects intended to offset the adverse environmental effects of world industrialization. Climate change remains a major force on human lifestyles as well as the world economy. Faced with the accelerating danger of global warming, many countries have ratified the Paris Agreement, pledging unilateral efforts towards reducing temperature increase and adapting to climate risks. China, as a signatory, has made clear targets for carbon peaking and reaching carbon neutrality, making sustainable development a national strategy. Such global and national policy systems not only provide strategic guidance for corporate climate action but also establish higher environmental accountability standards for all businesses globally. Numerous studies have proven that green bond issuance results in quantifiable carbon emission reductions, in addition to improving the overall environmental performance of businesses (Fatica, S., & Panzica, R. 2021) and have become one of the significant financial tools used to fight climate change risk.

Types of Green Bonds (Fatica, S., & Panzica, R., 2021).

Corporate (use-of-proceeds) bonds are issued by companies and backed by their overall balance sheet, while proceeds are allocated to specific green projects. Project bonds are supported by revenues from individual projects, often issued through an SPV to isolate project risk. Asset-Backed Securities (ABS) bundle multiple green assets, such as solar or wind installations, into a single investment vehicle. Covered bonds rely on a pool of collateral that remains on the issuer's balance sheet, providing strong repayment security. Financial sector bonds are issued by smaller institutions to support green lending. Supranational, sub-sovereign, and agency bonds, issued by MDBs, international bodies, or government agencies, fund cross-border or regional green initiatives. Municipal bonds support local green infrastructure such as transport, waste management, and climate-resilient projects.

Issuers of Green bonds

The green bond market has a diverse group of issuers from the private and public sectors (Fatica, S., & Panzica, R. (2021). The issuers help gather funds for climate-friendly and low-carbon projects. Private Sector Issuers include institutional investors like private pension funds and insurance companies, Commercial banks, private universities, utility firms, financial services companies, and private renewable energy generators. Public Sector Issuers include state-owned banks, public utilities, and municipalities that fund infrastructure and environmental development, Bilateral trading agencies, development banks, state universities, and education boards.

Standards in the Green Bond Market

Efforts to standardize the green bond market aim to improve clarity, comparability, and investor confidence. The Climate Bonds Standard and Certification Scheme define eligible green investments and provides a certification framework (Climate Bonds Initiative, 2018b). Regionally, the ASEAN Green Bond Standards guide for issuance in Southeast Asia (Arshad, 2018), while globally the EU's High-Level Expert Group is developing a unified green taxonomy for member states (European Commission, 2018). ISO is also creating an international green bond standard under ISO 14030 (Gould, 2018). These frameworks strengthen trust, reduce greenwashing risks, and support consistent disclosure for investors. However, challenges remain due to differing regional definitions and uneven adoption in developed and emerging markets. Regulatory roles are evolving fiduciary duty increasingly considering ESG factors where financial material (Richardson, 2011, 2013; Waitzer & Sarro, 2012). Regulators like the Bank of England now integrate climate risks into supervision, and China mandates climate-risk reporting by banks (Cui et al., 2018), helping reduce market risk and enhance investor confidence.

Climate Risk Mitigation: Role of Green and Sustainable innovations in finance

Green finance innovation addresses climate risks, which fall into physical risks, such as extreme weather, sea-level rise, and resource scarcity, and transition risks arising from policy, technological, and market shifts in low-carbon transitions (TCFD, 2017). Both impact asset values, creditworthiness, and long-term investment strategies. Green finance mitigates these risks by channeling capital to resilient projects and companies, while ESG integration helps investors assess

environmental practices. Firms with strong ESG performance face lower regulatory, legal, and reputational risks, reducing potential losses (Giese et al., 2019).

Sustainable debt instruments, including green bonds, fund climate mitigation and adaptation initiatives, such as renewable energy and climate-resilient infrastructure. Sovereign green bonds finance national climate plans and attract private investment (Ehlers & Packer, 2017). Carbon markets incentivize emissions reduction, while blended finance shares risk with the public sector, enabling climate-sensitive investments in emerging economies (Bai et al., 2022).

Climate risk disclosure via TCFD (2017) enhances transparency, enabling better risk pricing and capital allocation. Green finance also reduces systemic risk through portfolio diversification, and transition finance supports gradual decarbonization in hard-to-abate sectors (Caldecott, 2017).

Challenges of Green Finance Innovations

While green finance innovations hold significant potential for managing climate risks and promoting sustainable development, they face several challenges. Greenwashing is a major concern, where financial products or business operations are presented as more environmentally friendly than they are, undermining credibility and investor trust (Shishlov et al., 2016). Certain green bonds, for example, have been criticized for funding projects with questionable environmental impact, such as 'clean coal' initiatives. Lack of standardization further complicates the landscape. ESG ratings vary widely across agencies due to differing methodologies and weightings, and green bond frameworks differ between jurisdictions, making it difficult to assess genuine sustainability performance (Berg, Kölbel, & Rigobon, 2022). Regulatory gaps persist, particularly in emerging markets. Non-binding guidelines like the Green Bond Principles (ICMA, 2018) and TCFD (2017) offer guidance but lack enforceability, limiting consistent disclosure and accountability. Accessibility and market depth are also issues, as green finance remains concentrated in advanced economies. Developing countries face high transaction costs, low institutional capacity, and limited investor awareness, restricting their ability to access climate adaptation finance (World Bank, 2018). Additional challenges include short-termism, where investors prioritize immediate returns over long-term sustainability (Eccles & Klimenko, 2019), measurement difficulties in quantifying environmental and social impact (OECD, 2020), and the risk of overreliance on market-based solutions, which cannot substitute for public policy, technological innovation, and behavioral change (Caldecott, 2017).

Trends in Green Finance

The sustainable finance landscape is rapidly evolving due to shifting investor preferences, regulatory reforms, and technological advancements. Key trends include the integration of climate risk into investment analysis and the growing incorporation of ESG factors as core decision-making criteria. Green bond issuance continues to expand, alongside rising interest in impact-oriented investing and broader investor appetite for sustainable products. Social bonds and sustainability-themed indices are also gaining prominence. Additionally, innovations in clean technologies are creating new green investment opportunities, while banks increasingly adopt sustainable lending practices that support environmentally responsible projects and companies (Chandrashekara, T., 2022).

Conclusion

Green finance innovations are becoming essential tools in the global climate change agenda, delivering both financial and environmental benefits. ESG frameworks encourage investors and companies to integrate climate-related risks into governance and strategic planning, enhancing resilience and accountability. Supported by institutional and government backing, green bonds have mobilized significant capital for renewable energy, sustainable infrastructure, and climate adaptation projects. More advanced sustainable finance solutions, including impact investing and blended finance, further increase capital flows by linking state and private actors. However, challenges such as greenwashing, fragmented frameworks, policy gaps, and market concentration in developed economies undermine credibility and fairness. Addressing these issues requires enhanced international collaboration, a unified taxonomy, and mandated disclosure standards to ensure financial flows achieve tangible environmental outcomes. Initiatives like the TCFD and regional green bond standards integrate climate risk into financial regulation, improving market transparency. Overall, ESG models, green bonds, and sustainable finance extend beyond capital mobilization, aligning financial systems with environmental risks and fostering a resilient, low-carbon economy.

References:

[1] Agrawal, R., Agrawal, S., Samadhiya, A., Kumar, A., Luthra, S., & Jain, V. (2024). Adoption of green finance and green innovation for achieving circularity: An exploratory review and future directions. *Geoscience frontiers*, *15*(4), 101669.

[2] *Agrawal S. "ESG reporting: A theoretical framework". International Journal of Commerce and Management Research, Volume 9, Issue 3, 2023, Pages 118-121*

[3] Agreement, P. (2015, December). Paris agreement. In *report of the conference of the parties to the United Nations framework convention on climate change (21st session, 2015: Paris). Retrived December* (Vol. 4, No. 2017, p. 2). Getzville, NY, USA: HeinOnline.

[4] Arshad, A. (2018, January 4). The new ASEAN green bonds standards. East Asia and the Pacific on the Rise (blog). Retrieved from http://blogs.worldbank.org/eastasiapacific/new-asean-green-bonds-standards.

[5] Bai, C., Liu, Y., & Song, Y. (2022). *Blended finance for climate investment in emerging economies: Opportunities and challenges*. Journal of Sustainable Finance & Investment, 12(3), 215–230.

[6] Bai, Y., Faure, M., & Liu, J. (2022). Blended finance for climate change mitigation and adaptation. Environmental Policy and Governance, 32(1), 23–35. https://doi.org/10.1002/eet.1966

[7] Bank of England. (2018). Transition in thinking: The impact of climate change on the UK banking sector. London, UK: Bank of England.

[8] Berensmann, K., & Lindenberg, N. (2016). *Green finance: Actors, challenges and policy recommendations* (No. 23/2016). Briefing Paper.

[9] Berensmann, K., & Lindenberg, N. (2019). Green finance: Across the universe. In *Corporate social responsibility, ethics and sustainable prosperity* (pp. 305-332).

[10] Berg, F., Kölbel, J. F., & Rigobon, R. (2022). *Aggregate confusion: The divergence of ESG ratings*. Review of Finance, 26(6), 1315–1344. https://doi.org/10.1093/rof/rfac033

[11] Bishop, N. (2019). *Green bond governance and the Paris Agreement*. New York University Environmental Law Journal.

[12] Caldecott, B. (2017). Introduction to special issue: Stranded assets and the environment. Journal of Sustainable Finance & Investment, 7(1), 1–13. https://doi.org/10.1080/20430795.2016.1266748

[13] Chandrashekara, T. (2022). *Green finance and sustainable investment: Trends, challenges, and opportunities*. International Journal of Research and Analytical Reviews, 9(4), 114–120.

[14] Climate Bonds Initiative. (2018b). Climate bonds standard and certification scheme: Version 2.1. London, UK: Climate Bonds Initiative.

[15] Climate Bonds Initiative & SynTao Green Finance. (2021). China Green Finance Policy Analysis Report 2021. https://www.climatebonds.net/files/documents/publications/China-Green-Finance-Policy-Analysis-Report-2021.pdf

[16] Cui, Y., Geobey, S., Weber, O., & Lin, H. (2018). The impact of green lending on credit risk in China. Sustainability, 10(6), 2008. https://doi.org/10.3390/su10062008

[17] EBRD. (n.d.). *Green Economy Transition (GET) and Paris alignment*. European Bank for Reconstruction and Development.

https://www.ebrd.com/home/who-we-are/ebrd-values/ebrd-environmental-social-sustainability/EBRD-green/Green-Economy-Transition-Paris-alignment.html

[18] Eccles, R. G., & Klimenko, S. (2019). The investor revolution. Harvard Business Review, 97(3), 106–116.

[19] Ehlers, T., & Packer, F. (2017). *Green bond finance and certification*. BIS Quarterly Review, September 2017, 89–104. https://www.bis.org/publ/qtrpdf/r_qt1709h.htm

[20] European Commission. ESG rating activities. Finance. Retrieved September 5, 2025, from https://finance.ec.europa.eu/sustainable-finance/tools-and-standards/esg-rating-activities_en

[21] European Commission. (2018). Financing sustainable growth: Action plan. Brussels, Belgium: European Commission.

[22] Fatemi, A., & Fooladi, I. (2013). *Sustainable finance: A new paradigm*. Global Finance Journal, 24(2), 101–113.

[23] Fatica, S., & Panzica, R. (2021). Green bonds as a tool against climate change?. *Business Strategy and the Environment*, *30*(5), 2688-2701.

[24] Flammer, C. (2021). *Corporate green bonds*. Journal of Financial Economics, 142(2), 499–516. https://doi.org/10.1016/j.jfineco.2021.01.010

[25] Friede, G., Busch, T., & Bassen, A. (2015). *ESG and financial performance: Aggregated evidence from more than 2000 empirical studies*. Journal of Sustainable Finance & Investment, 5(4), 210–233. https://doi.org/10.1080/20430795.2015.1118917

[26] Giese, G., Lee, L. E., Melas, D., Nagy, Z., & Nishikawa, L. (2019). Foundations of ESG investing: How ESG affects equity valuation, risk, and performance. Journal of Portfolio Management, 45(5), 69–83. https://doi.org/10.3905/jpm.2019.45.5.069

[27] Global Risk Management Institute. What is ESG and why it's important for risk management? GRMI. Retrieved September 5, 2025, from https://grm.institute/blog/what-is-esg-and-why-its-important-for-risk-management/

[28] Gould, H. (2018, April 30). ISO develops new standards for green bonds. Environmental Finance. Retrieved from https://www.environmental-finance.com

[29] Green Finance Platform. *Environmental, social and governance (ESG)*. Retrieved September 5, 2025, from https://www.greenfinanceplatform.org/themes/environmental-social-and-governance-esg

[30] Hasan, S. M., & Minhat, M. (2021). Diversity in Ethical Funds. *Ethical Discourse in Finance: Interdisciplinary and Diverse Perspectives*, 125-147.

[31] Hasan, S. M., Islam, K. A., Tawfiq, T. T., & Saha, P. (2025). Triple pillars of sustainable finance: The role of green finance, CSR, and digitalization in bank performance in Bangladesh. *Banks and Bank Systems*, *20*(1), 38-50.

[32] He, Z., Liu, Z., Wu, H., Gu, X., Zhao, Y., & Yue, X. (2020). Research on the impact of green finance and Fintech in smart city. *Complexity*, *2020*(1), 6673386.

[33] Höhne, N., Khosla, S., Fekete, H., & Gilbert, A. (2012). Mapping of green finance delivered by IDFC members in 2011.

[34] ICMA. (2018). Green Bond Principles. International Capital Market Association. https://www.icmagroup.org/sustainable-finance/the-principles-guidelines-and-handbooks/green-bond-principles-gbp/

[35] International Capital Market Association. (2018). *Green Bond Principles: Voluntary process guidelines for issuing green bonds (June 2018 edition)*.

[36] Iqbal, M. A., Shaheen, W. A., Shabir, S., Ullah, U., Ionel-Alin, I., Mihut, M. I., ... & Han, H. (2025). Towards a green economy: Investigating the impact of sustainable finance, green technologies, and environmental policies on environmental degradation. *Journal of Environmental Management*, *374*, 124047.

[37] Jackson, E. T., & Harji, K. (2013). *Accelerating impact: Achievements, challenges and what's next in building the impact investing industry*. Rockefeller Foundation.

[38] Kanimozhi, V., & Suvitha, S. Financing a Greener Future: The Role of Sustainable Financial Instruments.

[39] Khan, M., Serafeim, G., & Yoon, A. (2016). *Corporate sustainability: First evidence on materiality*. The Accounting Review, 91(6), 1697–1724. https://doi.org/10.2308/accr-51383

[40] Li, Z. Z., Li, R. Y. M., Malik, M. Y., Murshed, M., Khan, Z., & Umar, M. (2021). Determinants of carbon emission in China: how good is green investment?. *Sustainable Production and Consumption*, *27*, 392-401.

[41] OECD. (2020). Developing sustainable finance definitions and taxonomies. OECD Publishing. https://doi.org/10.1787/134a2dbe-en

[42] OECD. (2023). *Report on green, social and sustainability bonds issued by multilateral development banks*. Organisation for Economic Co-operation and Development.

[43] Oh, D., & Kim, S. H. (2018). *Green finance in the Republic of Korea: Barriers and solutions* (No. 897). ADBI Working Paper.

[44] Ozili, P. K. (2021). Digital finance, green finance and social finance: is there a link?. *Financial Internet Quarterly*, *17*(1), 1-7.

[45] Ozili, P. K. (2022). Green finance research around the world: a review of literature. *International Journal of Green Economics*, *16*(1), 56-75.

[46] Ozili, P. K. (2023). Policy perspectives in promoting green finance. In *Sustainable Finance and the Global Health Crisis* (pp. 3-17). Routledge.

[47] Principles for Responsible Investment. *What is responsible investment?* United Nations-supported PRI. https://www.unpri.org/introductory-guides-to-responsible-investment/what-is-responsible-investment/4780.article

[48] Raman, R., Ray, S., Das, D., & Nedungadi, P. (2025). Innovations and barriers in sustainable and green finance for advancing sustainable development goals. *Frontiers in Environmental Science*, *12*, 1513204.

[49] Reboredo, J. C. (2018). Green bond and financial markets: Co-movement, diversification and price spillover effects. *Energy Economics*, *74*, 38-50.

[50] Richardson, B. J. (2011). From fiduciary duties to fiduciary relationships for social finance. Journal of Sustainable Finance & Investment, 1(1), 5–19. https://doi.org/10.1080/20430795.2011.556899

[51] Richardson, B. J. (2013). Fiduciary law and responsible investing: In nature's trust. Toronto, Canada: University of Toronto Press.

[52] Sachs, J. D., Schmidt-Traub, G., Mazzucato, M., Messner, D., Nakicenovic, N., & Rockström, J. (2019). Six transformations to achieve the sustainable development goals. *Nature sustainability*, *2*(9), 805-814.

[53] Sachs, J. D., Woo, W. T., Yoshino, N., & Taghizadeh-Hesary, F. (2019). Why is green finance important?

[54] Schoenmaker, D., & Schramade, W. (2018). *Principles of sustainable finance*. Oxford University Press.

[55] Shishlov, I., Morel, R., & Cochran, I. (2016). Beyond transparency: Unlocking the full potential of green bonds. IDDRI Study, 1–28.

[56] Sustainability Directory. (2025). *What is green financial innovation?* Climate → Sustainability Directory. https://climate.sustainability-directory.com/question/what-is-green-financial-innovation/

[57] Tang, D. Y., & Zhang, Y. (2020). *Do shareholders benefit from green bonds?* Journal of Corporate Finance, 61, 101427. https://doi.org/10.1016/j.jcorpfin.2020.101427

[58] Task Force on Climate-related Financial Disclosures (TCFD). (2017). Final report: Recommendations of the Task Force on Climate-related Financial Disclosures. https://www.fsb-tcfd.org/publications/final-recommendations-report/

[59] UNEP FI. (2007). *Green financial products and services: Current state of play and future opportunities.* United Nations Environment Programme Finance Initiative.

[60] United Nations Environment Programme Finance Initiative. (2024). Climate risk landscape: A comprehensive overview of tools and frameworks for financial institutions. UNEP FI. https://www.unepfi.org/themes/climate-change/2024-climate-risk-landscape/

[61] Waitzer, E. J., & Sarro, J. (2012). Fiduciary duties and climate change: The legal and policy challenges. Osgoode Hall Law Journal, 50(3), 623–660.

[62] Wang, X., & Wang, S. (2020). The impact of green finance on inclusive economic growth—Empirical Analysis Based on Spatial Panel. *Open Journal of Business and Management*, *8*(5), 2093-2112.

[63] World Bank. (2018). Financing climate action: Opportunities and challenges. World Bank Group. https://www.worldbank.org/en/news/press-release/2018/07/19/world-bank-group-exceeds-its-climate-finance-target-with-record-year

[64] World Bank Group. (2018). Green bond impact report 2018. Washington, DC: World Bank.

[65] Zhang, K., Wang, Y., & Huang, Z. (2021). Do the Green Credit Guidelines affect renewable energy investment? Empirical research from China. Sustainability, 13(16), 9331. https://doi.org/10.3390/su13169331

[66] Ziolo, M., Filipiak, B. Z., Bąk, I., & Cheba, K. (2019). How to design more sustainable financial systems: The roles of environmental, social, and governance factors in the decision-making process. *Sustainability*, *11*(20), 5604.

*****