Decoding The Confluence Of Green Finance & Climate Finance On Environmental Performance To Reinforce Sustainability

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Abstract

The world is grappling with serious challenges resulting from climate change and its far-reaching effects, such as extreme weather conditions, earthquakes, floods, and droughts. Amid these challenges, green finance & climate finance emerge as a sustainability-focused beacon of hope. It functions as a financial tool that supports governments and businesses in achieving economic growth while maintaining environmental sustainability. This mechanism channels financial resources toward climate action and sustainable development objectives. This research objective is to explore the confluence of green finance & climate finance on environmental performance, which is essential for fostering ecologically sustainable growth. This qualitative research employed a grounded theory approach to derive insights inductively, utilizing existing literature to assess the relationship between green finance& climate finance with ecological performance. The literature review revealed that green finance and climate finance is crucial in enhancing corporate and economic environmental performance. Investments in sustainable projects contribute to lowering carbon emissions, improving environmental quality, and reinforcing climate action efforts. The findings suggest that green finance& climate finance could be instrumental in improving ecological performance and advancing sustainability goals. Furthermore, both governmental and private sector entities must take a proactive role in advocating for green financial resources to overcome financial barriers. They should integrate green finance& climate finance considerations into policymaking, budget planning, and strategic decision-making to promote a more sustainable and environmentally responsible society.

Keywords: Green Finance, Climate Finance, Environmental Performance, Sustainability.

1.0 Introduction

The intensifying challenges of climate change, resource depletion, and surrounding deterioration have emphasized the critical requirement for approaches to sustainable development that align economic advancement with the protection of the environment.

Green finance has evolved as a transformative monetary framework among the tools advancing this transition. By integrating environmental considerations into financing decisions, green finance directs resources toward sustainable projects, technologies, and industries, fostering long-term economic and ecological benefits. From promoting renewable energy to reducing carbon emissions, green finance is pivotal in reshaping global economic activities to align with sustainability goals. Green Finance utilizes several financial instruments to accumulate funds for its allocation. Its instruments include:

Table 1: Green Finance's Instruments

Green Finance's Instruments		
Conventional Instruments	**Modern Instruments**	**Instrument exclusive to CCM***
Green Bonds	Green Capital Venture	Carbon offsets
Green Loan	Crowdfunding	Carbon Credit
Green Insurance		
Green Grants		

*CCM = Climate Change Mitigation

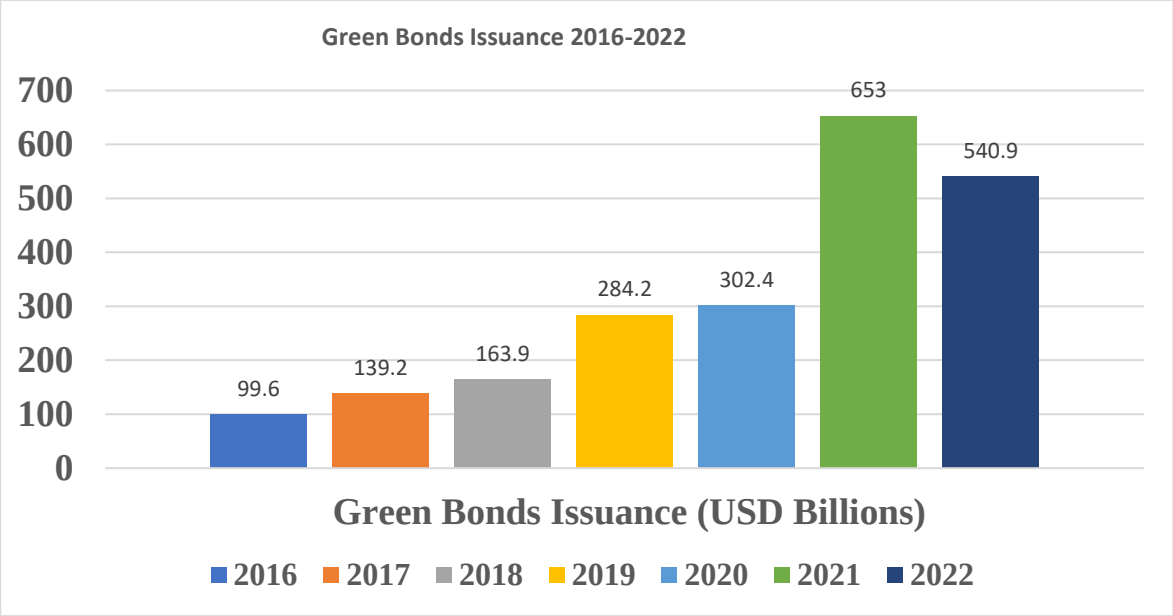

Figure 1: Green Bonds Issuance (USD Billions) from 2016-2022

[Sources: Refinitiv; Country authorities; IMF staff calculations.]

The above chart demonstrates the increases in the volume of green bonds vital for facilitating sustainable development.

Climate change represents a major risk to the world's sustainability, disproportionately affecting developing countries due to resource constraints and heightened vulnerability to environmental pressures (Arshadl, 2023).In response to this pressing challenge, climate finance emerged as a key mechanism for channelling financial and other forms of assistance from affluent countries to at-risk developing countries to aid in tackling climate change and its impacts. As per the definition of UNFCCC, climate finance encompasses local, national, or international financial resources allocated to support activities that mitigate or deal with the repercussions of climate change. This involves investments in clean energy, sustainable land use, climate-resilient infrastructure, and attempts to decrease the release of GHGs. Climate finance involves the deployment of financial support for efforts to address, adjust to, and withstand climate change strategies (Panda, 2023). It includes contributions from public, private, and international sources, directed toward lowering greenhouse gas emissions, improving climate adaptability, and driving sustainable progress. As a crucial enabler, climate finance supports the global shift toward low-carbon, climate-resilient economies and the execution of climate-related initiatives and policies (Pauw et al., 2021).

Table 2: Objectives of Climate Finance

• **Mitigation**	Allocating finance to projects and initiatives that curb & minimize carbon emissions, e.g.,

	promoting & harnessing clean energy and energy efficiency.
• **Adoption**	Supporting vulnerable nations and communities to tackle the aftermath of climate change effects, e.g., building earthquake-resistant, resilient infrastructure, flood defences, and climate-resistant crops.
• **Technology Transfer**	Enabling access to clean technology, green innovation, and capacity building to economically marginalized nations.
• **Equity and Justice**	Ensuring that developing and least-developed countries receive sufficient assistance from wealthier nations is essential, as they face it without polluting much.

The notions of green finance & climate finance are frequently used synonymously in academic research and professional practice, although some scholars have attempted to differentiate them (Bohnke et al., in press; Zadek & Flynn, 2013; Lindenberg, 2014; PwC, 2013; Hohne et al., 2012). Three main distinctions are generally recognized. First, green finance serves as an overarching concept encompassing financial activities aimed at environmental protection and the promotion of environmental goods and services. Second, climate finance is considered a component of green finance, specifically targeting measures aimed at curbing and coping with climate change. Third, while green finance encompasses a wide variety of financial sources—public, private, and others—with a particular emphasis on private sector involvement, climate finance typically centres on public funding and efforts to mobilize private investment. Climate finance is frequently directed toward higher-risk initiatives or technical assistance, which often lack clear revenue streams and thus attract limited private sector interest. Consequently, governments tend to provide support through grants or concessional loans, characterized by below-market interest rates or extended grace periods, to facilitate such investments (OECD, 2003).

At the heart of sustainable development is environmental performance, which measures an organization's ability to minimize its ecological impact while meeting economic and social objectives. Improved environmental performance is vital to lessening global environmental challenges and fostering a sustainable future. The key indicators of environmental performance often include:

Table 3: Environmental Performance Indicators

Environmental Performance Indicators	
Energy Efficiency	Incorporate energy-saving appliances and utilize renewable energy sources to enhance efficiency and sustainability.
Waste Management	Promote recycling, composting, and proper disposal methods.
Water Conservation	Implement water conservation methods, such as collecting rainwater and using efficient irrigation systems.
Greenhouse Gas Emissions	Transition to utilize cleaner energy sources and embrace sustainable practices.
Biodiversity Preservation	Protect natural habitats and enforce anti-poaching laws.

Green finance & climate finance intersect with environmental performance by enabling industries and organizations to adopt eco-friendly technologies, reduce emissions, and enhance resource efficiency. This confluence is increasingly recognized as a critical route to instate the United Nations Sustainable Development Goals (SDGs), specifically, those aimed at climate action and responsible production and consumption. This research seeks to explore the influence of green and climate finance on ecological outcomes, examining how financial mechanisms can drive improvements in ecological outcomes.

Adopting a qualitative and exploratory approach, the research employs grounded theory to inductively generate insights and develop a theoretical understanding of these eco-centric financial mechanisms with environmental performance. Furthermore, the analysis highlights the regulatory role of green and climate finance, including mechanisms such as imposing costs on polluters and offering motivation for eco-friendly practices across various industries. It also reveals a significant funding gap in addressing climate change and its effects, thereby emphasizing the crucial role of developed countries and the private sector, particularly in mobilizing climate finance. Nevertheless, the results offer insight and a comprehensive foundation for comprehending the synergies of green finance& climate finance with environmental performance. Future studies should tackle these gaps by assimilating quantitative analyses and expanding the scope to include additional factors influencing sustainability outcomes. This research endeavors to contribute to the ongoing discourse on sustainability by analyzing the framework through which green finance& climate finance enhance environmental performance. The insights derived from this research aim to guide policymakers, financial institutions, and businesses in leveraging green finance & climate finance as a strategic instrument to confront ecological issues, improve corporate environmental performance, and advance the global sustainability agenda.

2.0 Research Objectives

The objective of this study is to decode the:

a) Confluence of Green Finance on Environmental Performance.
b) Influence of Climate Finance on Environmental Performance.

3.0 Literature Review

3.1 Building a Sustainable Future: Green Finance and Climate Action

Green finance refers to financial and investment activities aimed at achieving environmental benefits, minimizing environmental risks, and encouraging sustainable practices (Labatt and White, 2003). It focuses on delivering financial services that support sustainable economic growth through innovative and tailored financial tools (Muganyi et al., 2021). Studies indicate that companies investing in sustainable technologies, such as carbon capture and emissions reduction, can obtain green finance via flexible options like private equity, angel funding, and bond issuance (Yang et al., 2021). Additionally, providers of these financial resources often offer expert guidance to green ventures, supporting their transition to cleaner production methods and digitalized operations.

Researchers examined the financial challenges of green innovation in China between 2001 and 2017, discovering that green finance was prominent in alleviating economic constraints for innovative firms and mitigating their financial vulnerabilities (Yu et al., 2021). Empirical research has examined the influence of green financing on commercial expansion and environmental sustainability. Zhang et al. (2021) found that public investment in green initiatives stimulates economic growth by advancing technology-driven manufacturing. Similarly, Zhou et al. (2020) assessed green finance development in China across four key areas—green loans, green securities, green outlay, and carbon finance—and concluded that higher levels of green finance contribute significantly to environmental enhancement.

From a social standpoint, green finance emphasizes augmenting financial backing for ecologically friendly sectors. Limiting capital access for polluting sectors shifts investments away from high-pollution businesses toward low-pollution alternatives, thereby establishing a foundation for promoting green investment (Force, 2015). From the perspective of companies, green financing successfully converts pollution into an economic burden for polluters, impacting their choice of action and creativity initiatives. This redirection enhances the allocation of enterprise funding to sustainable sectors, promotes green innovation, and strengthens competitive advantages (Xu et al., 2020). Many researchers studying green finance highlighted its positive impacts, suggesting that it can reduce financing costs while fostering green innovation and industrial transformation (He et al., 2019; Orman, 2015). Environmentally responsible firms are particularly motivated by access to sustainable financing, which

offers favourable conditions for green innovation projects. These include lower financing costs and longer repayment periods, enabling companies to drive industrial green transformation. The study of Tian et al. (2022) states that green money helps to alleviate financial constraints for environmentally sustainable initiatives. Furthermore, green finance imposes regulatory and punitive measures on heavily polluting enterprises (Liu et al., 2017). Raising funding barriers or increasing transaction costs for high-pollution enterprises incentivizes them to adopt green emission reduction strategies, thereby creating a scenario that benefits both economic systems and ecological health (Fan et al., 2021).

Sachs et al. (2019) suggest that green financing is essential for promoting sustainable development, as it effectively supports environmental solutions and advances progress toward these goals. Similarly, the research by Taghizadeh-Hesary & Yoshino (2020) explored the contribution of green finance and low-carbon energy to SDGs, concluding that significant investments in these areas can improve environmental outcomes and help nations achieve their targets. Zhang et al. (2021) investigated the correlation between civic expenditure and green economic growth, highlighting the intermediary function of green finance. Their results indicated that green money could enhance the effectiveness of government expenditure on sustainable economic development and contribute to better biological outcomes. According to Barua (2020), it is estimated that funding climate action and achieving the UN Sustainable Development Goals (SDGs) by 2030 would require annual investments amounting to several trillions of dollars. Moreover, Adhikari and Chalkasra (2021) estimate that developing climate-resilient infrastructure between 2030 and 2050 will require annual fund ranging from $300 billion to $500 billion. The 2015 Paris Agreement, in Article 9, commits wealthy nations to donate an annual amount of $100 billion per year by 2020 to aid developing countries in implementing climate action programs (UNFCCC, 2016). However, this funding goal has not been fully realized as planned. Green finance initiatives aim to bridge the investment gap, making collaboration with governments, the public, and the financial sector essential in these efforts. To enhance transparency for investors in green financial instruments, the International Capital Market Association (ICMA) has developed a framework that aligns each Sustainable Development Goal (SDG) target with a corresponding aspect of the Green Bond Principles, helping to clarify the allocation of funds (ICMA, 2019).

Accordingly, the research of Jha and Bakhshi (2019) examined the contribution of green finance to sustainable development in India, highlighting those strategic investments in green finance, particularly in renewable energy, may enhance environmental conditions, diminish carbon emissions, and guide the economy towards sustainability. Liu et al. (2020) evaluate the effects of green money on promoting the green economy and sustainable development in China. Their findings suggested that the efficient allocation and utilization of green finance could positively affect the environmental economy and foster regenerative development. Together, these studies highlight that strategic investment and green finance can strengthen the Eco-nation, improve environmental performance, and accelerate progress toward sustainable development goals. Furthermore, Huang and Watson (2015) assert that integrating ecological considerations into management systems enables enterprises to improve their environmental performance. Additionally, prior research suggests that corporate social responsibility (CSR) helps organizations develop environmental competencies, thereby promoting sustainable growth (Wong, 2013). In conclusion, green finance emerges as a crucial driver for promoting sustainable development, addressing environmental challenges, and enhancing corporate environmental performance through innovative financial mechanisms and strategic investments.

3.2 Conceptualization of Climate Finance

The international world confronts the pressing challenge of climate change, as demonstrated by the rising occurrence of natural disasters and severe weather phenomena, which disrupt ecosystems, economies, and societies (Zhao et al., 2022; Batten et al., 2016). The planet is currently grappling with a climate crisis primarily driven by fossil fuel use, which has substantially elevated greenhouse gas emissions and altered atmospheric composition. Since the pre-industrial era, this has contributed to a temperature rise of approximately 1.1°C (UNEP, 2023). In response, governments must reassess current economic and commercial systems, moving decisively toward renewable energy to align with the shift to a sustainable economy. This transition emphasizes integrating carbon management and decarbonization into sustainable business operations, such as eco-conscious distribution, precise emissions tracking, and reliance on alternative fuels (Seth et al., 2023). Furthermore, contemporary

businesses increasingly adopt environmentally friendly product development and sustainable practices to align with the growing green market demand (Yadav, P. et al., 2023).

Climate financing broadly refers to the financial resources raised at local, national, or global levels from government, private sector, and other sources to fund initiatives for climate change mitigation and adaptation (UNFCCC, 2021d). Likewise, the Standing Committee on Finance (SCF) suggests that climate finance lowers greenhouse gas emissions, enhances carbon sinks, and strengthens the ability of human and natural systems to with stand the detrimental consequences of climate change (UNFCCC, 2018). Although the UNFCCC broadly categorizes climate finance into public and private sectors, scholars have yet to agree on a precise definition. Terms such as sustainable finance, green finance, and climate finance are frequently utilized interchangeably, resulting in uncertainty (Debrah et al., 2023; Zhang et al., 2019; Shishlov & Censkowsky, 2022). According to Debrah et al. (2023), Climate financing emphasizes the efforts to reduce and adjust to climate change, while sustainable finance supports socially inclusive and environmentally sustainable initiatives. As a broader term, green finance encompasses sustainable, environmental, carbon, and climate finance, aiming to enhance environmental quality, combat and mitigate Climate change, and improve resource utilization. Shishlov & Censkowsky further argue that climate finance falls under green finance, which, in turn, forms part of sustainable finance.

Understanding the complexity of defining climate finance requires an analysis through the framework of climate finance architecture. The Climate Policy Initiative (CPI), in its periodic Landscape of Climate Finance reports (e.g., Buchner et al., 2021), adopts one of the most inclusive definitions of climate finance. These reports outline four key dimensions that define climate finance:

- **Providers and enablers of climate finance:** This includes various entities, such as governmental and private financial institutions, businesses, and individuals. These entities also encompass organizations supporting climate financing at local levels within a single country and globally through cross-border climate funding transfers.
- **Mechanisms employed to facilitate climate funding:** This may encompass grants, concessional and non-concessional loans, balance sheet financing, equity financing, and similar instruments.
- **Climate financing applications by activity classification:** These may encompass mitigation, adaptation, and hybrid applications.
- **The industries that gain from climate funding:** This may encompass, for instance, electricity production, energy efficiency, transportation, waste management, agriculture, and natural resources, together with other infrastructure sectors such as water, forestry, and land use.

While traditional approaches to climate-related environmental quality have been extensively discussed, the emerging domain of climate finance remains underexplored in academic literature. Since adopting the 1997 Kyoto Protocol, Industrialized nations have endorsed mitigation and adaptation initiatives in poor countries. Climate finance has emerged as a critical tool for aiding economically disadvantaged countries in combating climate change and has consistently been prioritized in global climate negotiations (Carfora and Scandurra, 2019). This study defines climate finance as financial flows aimed at fostering low-carbon and climate-resilient development, which directly or indirectly contribute to reducing greenhouse gas emissions or enhancing adaptation, thereby supporting the carbon-neutrality goals outlined in the Paris Accord and advancing eco-friendly development(Oxfam, 2020; Castro & Betzold, 2016). Recognizing the limited capacity of developing nations to tackle environmental sustainability challenges, climate finance is designed to play a crucial role in lowering global emissions by helping these countries align economic development with greenhouse gas reductions while incentivizing pathways toward low-carbon growth.

Donor countries provide comprehensive support to developing nations through climate finance, aiding efforts to promote low-emission initiatives and environmental conservation (Castro and Betzold, 2016). Climate finance is generally classified into two categories based on its goals: adaptation finance, which supports efforts to adapt to existing or expected climate changes and their impacts, and mitigation financing, which emphasizes the decline of GHG via investments in clean energy or initiatives to prevent deforestation (Pickering et al., 2017). From this standpoint, climate finance, especially mitigation funding, represents an innovative approach to addressing environmental degradation while encouraging low-carbon development pathways in economically disadvantaged countries. An expanding body of

literature has explored climate finance from multiple perspectives, alongside examining equity in the worldwide efforts to address climate change (Betzold & Weiler, 2017; Carfora & Scandura, 2019), a substantial body of research has also explored how climate finance influences the ability of recipient nations to adapt to the effects of climate change (Pickering et al., 2017; Bhandary etal., 2021; Klock and Nunn, 2019; Weiler et al., 2018; Scandura et al., 2020).

Many studies have emphasized the significant funding shortfall in meeting these objectives (UNCTAD, 2014; IPCC, 2018; Buchner et al., 2019). According to a recent evaluation, meeting adaptation needs would require an investment of $1.8 trillion, potentially generating economic gains totalling $7.1 trillion (Global Commission on Adaptation, 2019). However, the most recent projections show that adaptation funding currently amounts to only $30 billion (Buchner et al., 2019). Enhancing the mobilization and allocation of both public and private resources toward climate-focused goals is essential to bridge these financial gaps. Several challenges have hindered the deployment of private financing for climate change mitigation. These factors include the absence of strong incentives, reluctance of profit-driven companies to incorporate ecological costs into market decisions, uncertain or limited returns from CSR efforts, perceptions of high risk regarding low-carbon technologies by commercial banks and traditional financiers, a gap between the delayed returns from these ventures and the immediate financial expectations of most private investors, insufficient access to necessary data for assessing projects and their climate-related outcomes, and a shortage of strong low-carbon, adaptation, and resilience-focused project opportunities (Bhandary et al., 2021; Weiler et al., 2018; Scandura et al., 2020; Klock & Nunn, 2019; Pickering et al., 2017).

3.3Environmental Performance: A Blueprint for Sustainable Growth

Ecological sustainability has become a critical issue for the business sector, with both developing and industrialized nations being scrutinized for their respective roles in atmospheric deterioration, leading to various economic, social, and environmental threats (Amankwah-Amoah, 2020). Environmental performance refers to a company's effectiveness in managing its operations and products concerning the natural environment, forming a key aspect of environmental sustainability efficiency (Klassen & Whybark, 1999). Similarly, the study by Tung et al. (2014) highlighted that it is best assessed through the efficient use of materials.

Emission intensity has been used as a measure of a firm's environmental performance (Qi et al., 2014), demonstrating that environmental impact can be evaluated through various indices, rankings, or environmental scores. A firm's environmental performance significantly influences its sustainability priorities, shaping strategic objectives to meet the expectations of stakeholders, including investors, employees, customers, distributors, and local authorities, while ensuring compliance with legal and regulatory standards (Akter et al., 2018; Shaumya & Arulrajah, 2017; Risal& Joshi, 2018). Although ecological performance differs from an organization’s specific efforts in environmental protection, it takes a broader approach by focusing on achieving goals related to conserving natural resources and boosting business efficiency (Shaumya & Arulrajah, 2017). The banking sector has a crucial role in advancing green finance (GF), influencing ecological performance directly and indirectly (Rehman et al., 2021). Banks' environmental performance is assessed by reducing energy and paper usage, improving adherence to environmental regulations, decreasing carbon emissions, and offering staff training in energy efficiency and environmental protection (X. Zhang et al., 2022).

Studies by Nguyen et al. (2021) and Guo et al. (2021) suggest that effective management of environmental performance can provide substantial benefits by enhancing positive perceptions of green and eco-friendly products. This approach helps reduce pollution-related expenses while improving firm performance. They noted that inefficient manufacturing processes contribute to energy and resource wastage, further aggravating environmental pollution. Environmental performance denotes the extent to which organizations satisfy their stakeholders' expectations concerning environmental accountability (Ruf et al., 1998; Carroll, 2000). Researchers frequently assess biological performance by evaluating reductions in emissions, wastewater, and solid waste, improving resource efficiency, minimizing environmental incidents, and strengthening a company's ecological reputation. In addressing long-term environmental challenges, proactive corporate actions, for instance, pollution mitigation and the reduction of resource use and pollutants, are more efficient than relying solely on wastewater treatment

systems as a reactive measure. Existing research indicates that enhancing sustainable production processes and increasing productivity substantially improve the probability of attaining better ecological performance (Li et al., 2020; Seman et al., 2019; Wong et al., 2020).

Environmental sustainability performance reflects the outcomes of an enterprise's efforts, influenced by the usage of environmentally friendly materials (Abdul-Rashid et al., 2017) and the efficient utilization of resources (Vachon & Mao, 2008). A company's environmental performance depends on minimizing activities that fail to improve ecological conditions, as pollution and resource use are integral to its operations (Wang et al., 2015; Gimenez et al., 2012). This concept highlights the importance of reducing emissions and preventing environmental incidents (Zainul Abidin et al., 2020; Ball, 2015). According to Abdul-Rashid et al. (2017), achieving strong environmental sustainability performance requires the efficient use of resources to support sustainable manufacturing processes, such as incorporating recycled materials into industrial operations. In summary, environmental performance is a key determinant of a firm's sustainability, influenced by its initiatives to mitigate adverse environmental effects and improve resource efficiency, hence promoting sustained ecological and economic prosperity.

3.4 Green Finance as a Catalyst for Environmental Progress: Advancing an Eco-centric Perspective

As a reaction to the escalating risks of climate change and environmental issues, governments have introduced various policies to promote green innovation, including developing eco-friendly technologies and green brands (Yung et al., 2011; Hoffmann, 2007). Additionally, mechanisms such as green bonds have been established as part of green finance initiatives to combat ecological deterioration (Zhou et al., 2020; Lee et al., 2021). The research by Nassani et al. (20170 suggested that the green finance sector can improve the state of ecological health through the reduction of GHG emissions, Industrial effluents, and sewage are cited as key factors, a perspective backed by Zhao et al. (2019). The study conducted by Poberezhna (2018) investigated how the green economy effectively addresses environmental challenges, such as global water scarcity, by promoting environmentally sustainable technologies through green financing. Additionally, Gianfrate and Peri (2019)focused the importance of green finance in directing financial resources to reduce carbon emissions, thereby supporting the goals of the Paris Agreement. The study by Ziaei (2015) argued that green financial assistance helps lower carbon dioxide emissions by improving industrial infrastructure. Similarly, Wang and Zhi (2016) underscore that green financing serves as an essential mechanism for promoting the efficient utilization of energy and resources while supporting environmental protection efforts. Moreover, the research by Zhou et al. (2020) noted that government green funding can encourage private investment in renewable energy, which enhances environmental performance, as Romano et al. (2017) observed.

Table 4: Studies signifying the association between Green Finance and Environmental Performance

Authors	Findings
Ren et al., 2020; Su, Li et al., 2022; Hu et al., 2022; Su et al., 2023	It's noted that green finance enhances environmental quality by allocating financial resources to support sustainable initiatives.
Taghizadeh-Hesary and Yoshino (2020)	The research found that green finance has the potential to enhance environmental performance while also empowering nations to achieve their sustainable development goals.
Sachs et al. (2019)	This research found that green finance positively contributes to environmental solutions and supports achieving sustainable development goals.
Chen and Zheng (2021)	This study found that green money drives scientific and technological progress, boosts environmental investment, and lowers pollution when integrated with research and technology.

Wan et al. (2022) investigated the impact of environmentally focused property financing on emissions within the construction sector across 100 developed and developing nations. Their findings revealed a substantial inverse link between green funding and CO_2 emissions in the construction industry, particularly in developing nations. Similarly, Tran (2022) conducted a multivariate time series analysis in Vietnam, demonstrating that green investments effectively lower CO_2 emissions. Accordingly, Huang et al. (2022) recommended that financial institutions enhance funding for green energy projects to foster sustainable economic growth. Through its resource allocation effect, green finance can direct investments toward companies with low pollution levels and high efficiency, thereby reducing CO_2 emissions. Additionally, Khan et al.2022 highlighted that green financing enables firms, governments, regulators, and other stakeholders to invest in environmental research and development while addressing the risks associated with green policies.

The concept of green finance emphasizes the need to factor in ecological concerns when the investment and financing strategies of financial institutions (Gao et al., 2021; Ferrat et al., 2021; Ahmad et al., 2022). A key feature of green finance is its focus on delivering social benefits, particularly in promoting environmental health and public welfare. It evaluates the efficient utilization of resources as a critical measure of success, thereby advancing socio-economic and ecological progress by prioritizing health and well-being results. The correlation between green financing and ecological outcomes demonstrates its potential to address environmental challenges through financial mechanisms. Research by Wang et al. (2022), D'Orazio and Popoyan (2019), and Zhou et al. (2020) highlight the need for major global economies to expand green finance initiatives to achieve economic growth alongside environmental sustainability. Additionally, studies (Su et al., 2023; Hu et al., 2022; Wang et al., 2021; Su, Li et al., 2022; Ren et al., 2020)reveal that green finance enhances ecological condition by offering crucial financial resources.

Ren et al. (2020) emphasize the significance of green financing in reducing the release of carbon. By establishing a green finance index, they showed that progress in green finance facilitates the shift to renewable sources and reduces carbon intensity. Green finance is a tool for mitigating carbon footprints, promoting regenerative development, and addressing ecological and social challenges across international financial markets (Koczar et al., 2020; Huynh et al., 2022). Numerous nations have embraced sustainable finance strategies, including green bonds, to fulfil environmental and social responsibilities while promoting Sustainable Development Goals (Sinha et al., 2021; Zhang et al., 2022). Recent research has investigated the relationship between green financing (GF) and company eco-centric performance (Chen et al., 2022; Indriastuti & Chariri, 2021; Awawdeh et al., 2022; Zang et al., 2022). Xu et al. (2020) identified that green financing is crucial for advancing corporate environmental activities, whereas Awawdeh et al. (2022) highlighted the significance of technical innovation in improving environmental performance (EP). In summary, the association between green finance and eco-centric performance underscores the essential function of financial systems in promoting sustainable behaviours and attaining quantifiable enhancements in environmental results.

3.5 Assessing the Impact of Climate Finance on Environmental Sustainability

Climate finance is essential for advancing initiatives focused on lowering GHG emissions and adjusting to the effects of climate change (Hallegatte, 2020).Climate finance has significantly contributed to the global promotion of green power, supporting the growth of clean energy infrastructure and cutting down emissions.Support for systems like photovoltaic, wind turbine, and hydroelectric power has been mobilized through international climate funding mechanisms, development cooperation, and private sector investments (Chen et al., 2021).Climate finance has also been instrumental in promoting energy efficiency measures across multiple sectors, including buildings, transport, industry, and agriculture (Fekete et al., 2021). By channelling investments into energy-efficient technologies, infrastructure improvements, and programs encouraging behavioural change, it has contributed to curbing GHG, boosting energy independence, and fostering sustainability. For example, climate-financed retrofitting of buildings and industrial facilities has resulted in substantial energy savings and emission reductions, while simultaneously supporting economic development and job creation (Mungai, 2022).Similarly, past studies indicated that developing and low-income countries are the most vulnerable to the harmful impacts of climate change. These nations lack the resources to address environmental changes and face financial limitations in investing in eco-innovation. Therefore, climate finance from developed

countries, as outlined in the Cancun and Paris Agreements, is crucial for maintaining environmental balance (Pathan et al., 2024)

Climate finance has additionally facilitated the implementation of climate-smart agriculture and water management initiatives designed to improve agricultural productivity, strengthen food security, and enhance resilience against the impacts of climate change (Matteoli, 2020).Numerous empirical investigations have demonstrated that climate finance contributes to improved environmental quality by lowering GHG emissions(Gu & He, 2012; Jalil & Feridun, 2011). Guo et al. (2022), focusing on China, emphasize the critical role of carbon emission reduction in meeting the nation's "peak carbon" and "carbon neutrality" objectives. Their findings indicate that green finance has a markedly negative effect on carbon emissions at the provincial level; however, its influence on neighbouring provinces is relatively negligible. Similarly, Shahbaz et al. (2013) highlight that financial development can promote technological innovation and increase environmental awareness, both of which are instrumental in mitigating greenhouse gas emissions. Lin and Qiao (2022) examined the incorporation of green energy into daily life to lower individuals' environmental footprints. Their study found that affordable green electricity can incentivize public adoption, thereby contributing to lowering carbon dioxide emissions in China. Nonetheless, the authors contend that substantial government investment in the green energy sector is necessary to ensure the widespread availability of low-cost green electricity, ultimately discouraging reliance on carbon-intensive energy sources.

A significant amount of research has consistently emphasized the crucial role of climate finance in addressing climate change mitigation and adaptation at the national level (Klock & Nunn, 2019; Weiler et al., 2016; Nakhooda & Norman, 2014; Huang et al., 2023a; Rishikesh et al., 2021; Sjostedt & Povitkina, 2017). Climate finance supports the transition to a low-carbon economy and promotes more fair and efficient responses to climate change, especially in developing countries (Long et al., 2023; Pickering et al., 2017).

Zhu et al. (2022) analysed the influence of green energy resources on CO_2 emission reduction, specifically in the context of fossil fuel consumption in rural China from 2007 to 2018. Their findings reveal that the expansion of green energy plays a crucial role in promoting long-term environmental sustainability in rural regions. Notably, the study makes a significant contribution by validating the applicability of the IPAT framework within this context. Climate finance plays a crucial role in channelling investment toward low-carbon sectors, thereby supporting the transformation and modernization of urban industrial systems to reduce carbon emissions (Bai et al., 2022). It acts as a driving force for sustainable economic growth by broadening financial access for environmentally friendly encouraging the growth of low-carbon businesses while also limiting investments in energy-intensive and highly polluting industries, thereby promoting emission reductions and transition efforts. It generates beneficial spill over effects that support continuous structural transformation, such as facilitating the shift to cleaner energy and evolving from traditional to more modern, automated, and smart production systems. Additionally, it functions as a financial tool that accelerates the expansion of emerging industries, aids in phasing out outdated sectors, and propels the transition toward a low-carbon, high-quality economic development model, thereby contributing to carbon emission mitigation (Yan & Tan, 2023). Therefore, by guiding the allocation of financial resources, climate finance promotes Pareto-efficient outcomes, drives the restructuring and upgrading of industrial systems, and helps in the overall reduction of carbon emissions in urban areas.

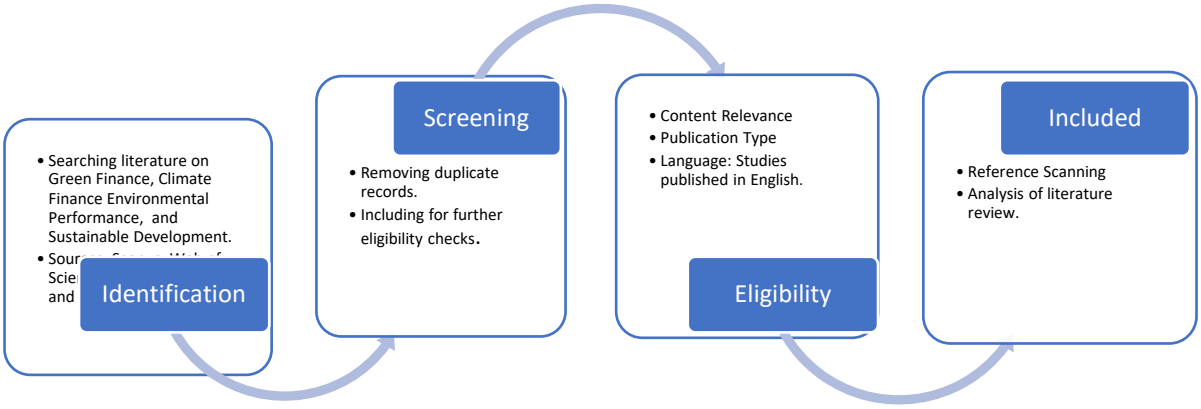

Figure 2: Flowchart for filtering of relevant literature review

4.0 Research Methodology

This study adopted a qualitative approach to examine the impact of green financing & climate finance on environmental performance, employing grounded theory to inductively generate insights. The exploratory nature of the research aimed to elucidate the confluence of green finance and climate finance on ecological performance by analyzing existing literature. Through the application of an inductive methodology, the study provided a theoretical understanding of the topic. Secondary data sources were utilized to construct the theoretical framework, drawing on a thorough examination of scholarly literature, government publications, and industry reports related to green finance, climate finance, and environmental performance. Key databases, including Scopus, Web of Science, and Google Scholar, were used to identify and compile relevant research. Keywords such as "green finance," “climate finance,” "environmental performance," and "sustainable development" facilitated data extraction. The analysis emphasized concepts of commonality and homogeneity to derive the study's conclusions. However, like other qualitative studies, this research is subject to limitations, such as the absence of hypothesis testing and the exclusion of interrelated factors, including green innovation and corporate social responsibility, in connection with environmental performance. Future studies should address these gaps by incorporating these dimensions into their analysis.

5.0 Findings

The analysis of the literature revealed potential outcomes stemming from the relationship between the identified variables.

- The analysis of the study indicated that green finance offers monetary assistance to environmentally sustainable initiatives while simultaneously compelling polluting enterprises to embrace more sustainable practices through financial and regulatory constraints. This dual strategy seeks to enhance both the economy and the environment.
- The literature review highlighted that green finance and renewable energy investments are essential tools for promoting sustainable development. These financial strategies support environmental initiatives and enable countries to achieve their sustainability goals.
- The present study showed that the effective investment and utilization of green finance can strengthen the green economy, elevate environmental performance, and promote advancement toward sustainable development objectives. It is contended that incorporating ecological factors into management systems allows organizations to enhance their environmental performance.
- Climate finance is vital for helping economically disadvantaged nations tackle climate change, enabling them to align economic growth with emissions reduction and address sustainability challenges, making it a central focus in global climate discussions.
- The study reveals a major funding gap, with $1.8 trillion needed for adaptation but only $30 billion currently available, highlighting the urgent need to enhance mobilization and allocation of public and private funding for climate objectives.

- The study found key barriers to mobilizing private finance for climate mitigation, including a lack of clear incentives, profit-driven disregard for environmental externalities, uncertain returns from CSR efforts, and perceived high risks of low-carbon technologies by banks and financial institutions.
- This research indicated that effectively managing environmental performance can yield significant advantages by fostering positive perceptions of environmentally friendly products. This approach reduces pollution-related expenses while improving organizational efficiency. Conversely, inefficient industrial practices lead to wasted energy and resources, further aggravating environmental damage.
- The literature disclosed that the green finance sector may enhance environmental quality by decreasing greenhouse gas (GHG) emissions, industrial waste, and wastewater. The green economy efficiently tackles environmental issues, like global water shortages, by advancing sustainable technology via green funding.
- The literature emphasized the necessity of incorporating environmental factors into the financing and investing strategies of financial organizations. A fundamental attribute of green finance is its emphasis on social advantages, especially for environmental health and public welfare.
- The literature review suggested that major global economies need to dedicate significant resources to green financing to foster economic development while ensuring environmental sustainability. To achieve the SDGs, many governments have implemented sustainable financial strategies, such as green bonds, to tackle their ecological and social obligations.
- This research revealed that the banking industry is crucial in promoting green financing, affecting environmental performance both directly and indirectly. To comply with regulatory mandates and enhance their image, banks aim to finance sustainable projects at discounted rates and extended payback terms, facilitating enterprises in their industrial green transformation.
- The literature emphasizes that climate finance catalyses sustainable economic growth by improving access to funding for environmentally focused and low-carbon businesses. It supports ongoing structural transformation, fosters the expansion of emerging industries, supports the phase-out of outdated sectors, and accelerates the transition toward a high-quality, sustainable development.

6.0 Discussions

The study found that green finance encourages sustainable initiatives and projects by providing incentives, while, on the other hand, it discourages heavily polluting businesses through regulatory frameworks, raising funding barriers, or increasing transaction costs, as observed in the studies by Fan et al. (2021) and Liu et al., (2017). The study further revealed that green finance and investments in renewable energy are vital in promoting sustainable development. These financial strategies support environmental initiatives and enable countries to achieve their sustainability goals. This observation is consistent with the findings of Jha and Bakhshi (2019).Similarly, this study has identified green finance and investments in renewable energy as key instruments in advancing sustainable development. This aligns with the findings of Taghizadeh-Hesary and Yoshino (2020), who analysed the significance of green finance and renewable energy in attaining SDGs. They concluded that substantial investment in these areas can enhance environmental performance and empower nations to meet their sustainability targets. The study also emphasized that leading global economies must allocate significant resources toward green financing to promote economic growth while maintaining environmental sustainability. This aligns with the commitment stated in Article 9 of the 2015 Paris Accord, in which rich countries vowed to allocate $100 billion annually by 2020 to help developing nations with implementing climate action measures (UNFCCC, 2016).The findings also highlighted that the fundamental characteristic of green finance is its focus on social benefits, especially in terms of ecological and societal well-being. This aligns with previous research, which emphasizes that green finance focuses on environmental and ecological advantages over purely economic outcomes. While financial returns are considered, the foremost emphasisis on the positive environmental impacts of these projects (Lagoarde-Segot and Paranque, 2018; Deng, 2008; Wang and Zhi, 2016; Zhang et al. 2019).

Moreover, this study highlights the significant role of the banking sector in advancing green finance, influencing environmental performance both directly and indirectly. This resonates with the findings of Volz (2017), who advocated using policy tools such as capital regulations and interest rate controls by central banks to facilitate green financing.

7.0 Conclusion

This study highlights the crucial importance of green money in tackling urgent environmental challenges and advancing sustainability objectives. Through a comprehensive review of the literature, it was revealed that green finance and climate finance serve as a dual-purpose mechanism, providing critical monetary support to environmentally sustainable initiatives while imposing financial and regulatory constraints on high-polluting sectors. This strategy fosters a transition toward a greener economy and enhances environmental performance by promoting sustainable practices across industries.

The research findings indicate that investments in green finance and renewable energy are instrumental in driving progress toward the SDGs. By channelling financial resources toward eco-centric initiatives, green finance mitigates greenhouse gas emissions, reduces industrial waste, and enhances ecological quality. Additionally, incorporating ecological considerations into management systems and decision-making processes improves corporate environmental performance and fosters positive stakeholder perceptions, thereby enhancing organizational efficiency and reducing pollution-related costs. Moreover, literature revealed that climate finance has been crucial in promoting clean energy worldwide by supporting the growth of clean energy systems and reducing emissions. Investing in energy-saving technologies, improving infrastructure, and encouraging behavioral changes has contributed to reducing GHGs, enhancing energy security, and fostering sustainability. It also highlighted that mobilizing private finance for climate change mitigation faces several obstacles, including weak incentives, reluctance among profit-oriented firms to internalize environmental costs, and unclear returns from corporate social responsibility. Additionally, low-carbon technologies are often seen as high-risk by mainstream financiers, while long project payback periods conflict with investors' short-term focus. Other barriers include limited project information, inadequate assessment of climate impacts, and a scarcity of viable low-carbon and resilience-focused initiatives.

The study highlights the importance of the banking sector, the private sector, and developed nations in advancing green financing and climate finance. Banks are significant in facilitating industrial green transformation through financial incentives such as discounted rates and extended repayment periods for sustainable projects. These practices not only comply with regulatory mandates but also contribute to improving environmental performance and strengthening the green economy. Despite these promising findings, this research acknowledges certain limitations, including the exclusion of interrelated factors such as green innovation and Corporate Social Responsibility in analyzing environmental performance. Future research should address these gaps by integrating these dimensions and employing empirical approaches to test the theoretical framework developed in this study.

In conclusion, green finance and climate emerge as a transformative tool in fostering environmental sustainability. Its effective implementation necessitates cooperative endeavours among governments, commercial entities, and private enterprises. Policymakers should prioritize integrating green finance and climate finance into policy frameworks, while financial organizations must align their strategies with environmental goals. By doing so, the global community can enhance environmental performance, drive green innovation, and achieve a long-lasting and fair future.

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