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Sustainable Banking and ESG Integration: A Systematic Review of Green Finance Practices in Global Banking Systems

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Abstract: This study critically examines the historical evolution, scholarly development, and empirical integration of Environmental, Social, and Governance (ESG) principles within global banking practices over 92 years (1933–2025), with a specific focus on advancing sustainable banking practices in emerging markets. The study explicitly analyses ESG practices in the banking sectors of emerging markets. A systematic review methodology and analysis of 1,104 publications guided the research in documenting the evolution of economic stabilisation models into structured ESG-based financial systems. The study highlights a significant shift in 2016, which led to the emergence of rapidly growing publications alongside the introduction of ESG regulations, such as the SFDR and green credit requirements in the EU and China, as well as new developments in digital financial practices for ESG implementation. Despite this progress, the study identifies notable geographic and methodological gaps, particularly the underrepresentation of Africa, Latin America, and certain parts of Southeast Asia, as well as the scarcity of studies employing causal inference methods. Recommendations include fostering multi-country, longitudinal research, prioritising digital ESG innovations in underserved markets, and designing actionable, context-specific ESG frameworks to support equitable and scalable financial sustainability globally.

Keywords: Global banking system, green financing, sustainable banking, sustainability, corporate social responsibility.

1. Introduction

The global banking system has undergone a profound transformation over the past few decades, driven by shifts in societal values, environmental concerns, and the pressing need for improved governance practices (Onunka et al., 2023). This transformation is most visible in the rise of sustainable banking, the integration of environmental, social, and governance (ESG) factors into financial decision-making, and the growing emphasis on green finance. As climate change, social disparities, and governance failures converge into systemic global threats, banking institutions have increasingly recognised the need to realign their operations with long-term sustainable development goals (Mackay et al., 2025). These changes are not merely cosmetic; they mark a paradigmatic shift in how financial value is perceived, assessed, and delivered in the 21st century.

Sustainable banking emerged during the wave of social activism in the 1960s and 1970s when activists demanded ethical investment policies, particularly targeting institutions that facilitated apartheid and conflict (Whyle & Olivier, 2023). The United Nations Environment Programme Finance Initiative (UNEP FI), established in 1992 as an institutional mechanism, played a key role in developing the sustainable banking framework that supports sustainable development. Central global banks established the Equator Principles in 2003 as a critical milestone, introducing standardised procedures for managing environmental and social risks in project finance. Schulte & Knuts (2022) explain that banks need to transition from being passive to proactive agents of

sustainable development, demonstrating their movement from basic compliance to strategic integration.

A financial crisis occurred between 2007 and 2008, prompting organisations across the sector to reassess their risk management systems. Existing financial risk models demonstrated an inability to predict future systemic failures, including those resulting from environmental degradation and social instability (Zeghal & Aoun, 2016). ESG factors gained increased attention from stakeholders as they evolved from ethical considerations into substantial financial risks. The integration of ESG factors requires organisations to embed environmental, social, and governance aspects into their core financial evaluation and strategic decision-making processes. The statement from Chen et al. (2023) emphasises that ESG issues have evolved into fundamental business matters that are important to both corporate performance and investor interests.

The integration of ESG principles encompasses three primary practices: negative screening for companies with poor ESG records, positive screening for high ESG performers, and thematic investing for specific sustainability objectives (Shen et al., 2023). Research into these approaches has been expanding in the academic domain. The Heliyon journal published Yin et al.'s (2023) research, which demonstrated that companies with high ESG performance on financially relevant matters generate annual stock return outperformance of 3–6%. The study confirms that ESG integration supports fiduciary responsibility because it leads to long-term value creation. According to the Global Sustainable Investment Alliance (GSIA, 2022), global sustainable investment assets totalled $35.3 trillion in 2022, accounting for 36% of professionally managed assets. International banking giants BNP Paribas, alongside HSBC and Standard Chartered, have established comprehensive ESG risk assessment systems. BNP Paribas has completely withdrawn its funding from coal projects in OECD nations while establishing ESG scoring systems to evaluate all credit and investment choices. The financial risk management strategy has evolved to treat environmental liabilities as equally crucial as traditional credit defaults and liquidity constraints (Furness, 2025; Segal, 2023).

Green finance serves as a direct implementation of ESG integration by funding environmentally beneficial projects, including renewable energy initiatives, pollution management, sustainable farming, and resilient infrastructure that mitigates the impacts of climate change. The growing green finance sector represents a tangible implementation of sustainable finance principles. The Climate Bonds Initiative documented that green bond issuance grew exponentially from $11 billion in 2013 to $517 billion in 2021, while investor interest significantly increased, reaching $1-5 trillion by 2025 (Climatebonds, 2022). The European Investment Bank (EIB) initiated the green bond movement in 2007, and now over 150 financial institutions are active in green bond markets (European Investment Bank, 2022).

The Network for Greening the Financial System (NGFS), established in 2017, comprises over 130 central banks and regulators committed to integrating climate risk into financial supervision (Lee, 2024). As Mark Carney, former Governor of the Bank of England, observed, "Climate change represents a tragedy of the horizon" (Carney, 2015), emphasising the temporal disconnect in financial responsibility between present and future generations—a gap that green finance seeks to bridge.

The Task Force on Climate-related Financial Disclosures (TCFD), supported by over 3,000 institutions, encourages standardised disclosures of climate-related risks to increase transparency and comparability. Nevertheless, green finance and ESG investing continue to face criticism, particularly regarding the inconsistency of ESG ratings. Bissoondoyal-Bheenick et al. (2024) found that the highest correlation between ESG rating agencies is 0.61, indicating that their methodologies differ and that investors cannot fully trust them. Moreover, the issue of greenwashing has become increasingly acute. The 2022 regulatory investigation of DWS Group, which revealed exaggerated ESG statements with serious reputational and regulatory implications, further substantiates this point.

The implementation of sustainable finance also highlights structural inequalities between developed and developing economies. Emerging markets are plagued by systemic challenges, including a lack of a robust ESG data infrastructure, policy gaps, and insufficient expertise (Wang, 2024). According to Anantharajah and Setyowati (2022), the overall effect will be undermined as long as sustainable finance flows are concentrated in the Global North, leaving regions that need green investment the most overlooked.

However, the future of banking is inextricably linked to sustainability. Institutions are adopting climate fintech, AI, and blockchain to enhance the accuracy of ESG data and improve transparency. For example, the Singapore Exchange permitted HSBC to experiment with blockchain-based green bonds, enabling real-time monitoring of environmental impacts (Abdel-Qader, 2019). The initiative for global sustainability standard harmonisation, as pursued by the International Sustainability Standards Board (ISSB) and the EU Taxonomy, is expected to minimise definitional ambiguity and limit greenwashing (Krivogorsky, 2024).

The banking industry is undergoing a paradigm shift that seeks to bring financial, human, and environmental capital into harmony. According to Nobel laureate Joseph Stiglitz, economic systems should not be the masters of their communities, but rather the other way around (Bellagio, 2024). Green finance and ESG integration are no longer incompatible with profitability; they are, in fact, key drivers of profitability.

The increasing need to evaluate and unite existing knowledge about sustainable banking, ESG integration, and green finance systems across the banking sector justifies this study. The academic literature demonstrates a robust dedication to these fields; however, research gaps persist regarding their conceptual pathways, theoretical frameworks, and regional empirical research methods. This review grounds its analysis in previous studies, examining the financial implications of ESG and investigating green financial products, such as green bonds and sustainability-linked loans (Climate Bonds Initiative, 2021), under the influence of institutional elements, regulatory forces, and market adoption. This study examines ongoing barriers to ESG execution stemming from ambiguous metrics and the phenomenon of greenwashing. It emphasises the urgent need to prioritise the needs of emerging markets at the forefront of the financial sector's agenda. The research aims to develop a unified scientific framework and provide operational recommendations for banking regulatory changes to promote ESG alignment.

1.1 Problem statement

Although academic interest in green finance, ESG integration, and sustainable banking has increased significantly, the literature remains disjointed and conceptually inconsistent. While global financial institutions align with the Paris Agreement and the SDGs, there is a lack of consistency in the implementation of ESG across jurisdictions and institutions. Differences in regulatory frameworks and interpretative strategies have hindered the emergence of a unified operational model for sustainable finance. According to Hasan et al. (2022) and Katini & Amalanathan (2022), mobile banking and psychological sustainability are increasingly relevant topics; however, these aspects have not been studied in connection with ESG outcomes. Similarly, although Alieksieiev & Mazur (2022) focus on environmental policy and resource management in banking, they fail to link these to financial risk assessment, revealing a gap between normative intentions and institutional practice. Furthermore, there is no single theory currently used to explain the relationship between green fintech adoption and changing regulatory environments.

Significant regional differences in ESG research further exacerbate the problem. According to Khamisu & Paluri (2024), more than 70 per cent of ESG-finance research is based in North America and Western Europe, while Africa, South America, and Southeast Asia are underrepresented. Such an imbalance threatens to misapply Global North models in different socio-economic and

institutional contexts. For example, the ESG-financial performance model by Dragomir et al. (2022), which is based on EU banking systems, is not particularly applicable to informal economies or state-owned banks in Africa. Additionally, most available studies are descriptive or normative, lacking the temporal or causal depth necessary for in-depth analysis. These studies lack empirical reliability because they do not include actual financial and climate risk data. As a result, the policy and investment prescriptions derived from this literature are often based on shaky foundations, making them less applicable and practical in real-life sustainability transitions.

Therefore, this study aims to combine different research by grouping their constructs, variables, and theories, while also identifying research gaps and missing regions. Consequently, it seeks to develop a more comprehensive, integrated, and practical model for examining the relationship between sustainable finance and banking innovation.

1.1.1 Research questions

The research design adheres to the guidelines established by Hiebl (2023) and Tranfield et al. (2003) to ensure that the study is methodologically sound and feasible to replicate. This systematic review aims to address four critical research questions:

- RQ 1: How has the conceptual understanding of sustainable banking evolved, and what are the key theoretical foundations underpinning ESG integration in global banking systems?
- RQ 2: What empirical evidence exists regarding the adoption of green finance instruments?
- RQ 3: What institutional, regulatory, and market factors drive ESG integration in global banking practices, and how do these factors vary across different regions and financial ecosystems?
- RQ 4: What research agenda and practical recommendations can be proposed to enhance ESG-aligned sustainable banking practices, particularly in emerging markets that remain under-researched?

2. Methodology

The research framework incorporates logical scientific rigour as it examines the comprehensive landscape of sustainable banking and ESG (Environmental, Social, and Governance) practices, analysing their applications within the global banking system. The study employed a systematic literature review (SLR) methodology, an accepted approach for evidence-based synthesis in multidisciplinary fields of study.

Although the best practices in SLR suggest searching multiple databases to increase coverage and minimise bias, the use of Scopus alone in the current study is methodologically appropriate. Scopus has a vast index of over 27,000 peer-reviewed journals in areas such as business, finance, sustainability, and management, which are the primary areas of interest in this research. Its search features, strong metadata, and strict indexing standards ensure the quality and relevance of the literature. Furthermore, Scopus has a high overlap with other large databases, which reduces the chance of overlooking essential studies. It is compatible with PRISMA protocols and citation tools, allowing for transparency and replicability. The narrow scope of the research and the reliability of the database are sufficient to conduct a credible systematic literature review using Scopus alone. To maximise the breadth of relevant studies while maintaining focus, two search strings were developed. The first string comprised the keywords: "sustainability OR green AND finance AND banking," which yielded 847 documents. The second string included: "environmental AND finance OR corporate AND social AND responsibility AND banking," returning an additional 307 documents. The combined search resulted in a total of 1,154 articles.

To enhance the relevance and quality of the data pool, a refinement of the initial results was conducted using the Scopus filtering tools. The filters applied were: LIMIT-TO (LANGUAGE, "English") AND LIMIT-TO (PUBSTAGE, "final"), which reduced the list to 1,134 peer-reviewed

articles, books, book chapters, and reviews. A thorough screening process removed irrelevant studies, starting with 13 articles that diverged from the research scope, followed by 12 duplicate entries and five publications from non-credible or unreviewed journals. The curation process yielded 1,104 scholarly articles published between 1933 and 2025, retrieved on April 21, 2025. The historical foundations and contemporary progress in sustainable finance depend on the wide range of publication dates that capture its developmental path. The research application employed a standardised, multi-stage protocol for screening, followed by coding to ensure comprehensive data collection. The initial review process examined titles and abstracts to verify their connection to sustainable banking, ESG integration, or green finance practices. The researchers conducted a full-text analysis of selected articles to assess their usefulness in answering the research questions above. The research team used data-extraction forms to gather systematic information from each study about the author(s), publication year, journal, geographical coverage, theoretical foundation, research methodology (qualitative, quantitative, mixed methods), main findings, and sustainable banking implications.

The analysis of quantitative synthesis included descriptive research on publication patterns, geographical study locations, and methodological choices throughout different periods. The researchers employed thematic synthesis to identify common themes and gaps that emerged from the analysed literature. The research employed meta-analytical methods to combine empirical evidence on the effectiveness of ESG strategies and green finance practices, where possible.

To maintain transparency and reduce researcher bias, the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) flow diagram (see Figure 1) was used to illustrate the search and screening process.
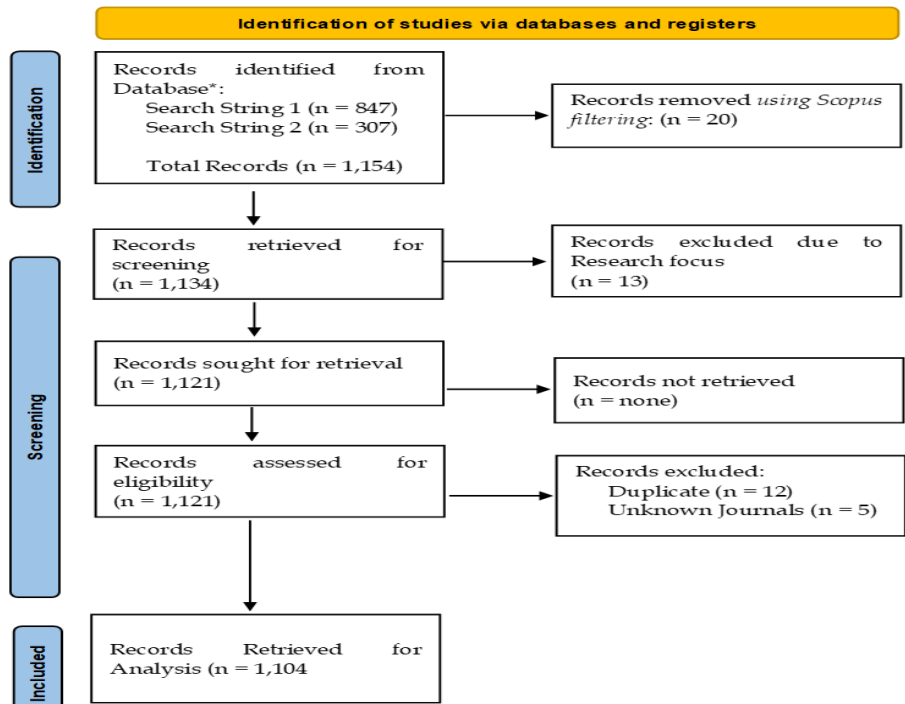

Figure 1: *Data extraction process (PRISMA flow)*

2.2 Ethical consideration

This was an independent study that did not undergo review by an ethics committee; however, it was conducted in accordance with the WHO's research ethics guidelines. Only publicly available, peer-

reviewed secondary data were used, and there were no human subjects or sensitive information involved. The APA 7th edition was used to cite all sources, and principles of academic honesty, transparency, and non-maleficence were adhered to. A systematic review method was employed to ensure objective results. Scopus was utilised as a source of literature due to its extensive and high-quality coverage of green finance and sustainability. Study selection was based on the inclusion and exclusion criteria outlined in the methodology above (see section 2), which helped reduce bias and ensure the relevance of the studies. Various studies were consulted to provide a balanced opinion. Qualitative content analysis was employed to analyse the data, which was coded and thematically organised around ESG integration, governance, and policy effects. This systematic synthesis yielded valid, objective, and ethically acceptable conclusions.

3. Presentation of Results

This section presents the study's findings in response to the research questions that guided the investigation. The results from 1,104 peer-reviewed journal articles, which underwent a thorough screening process, provide descriptive and thematic information about sustainable banking development, ESG integration, and green finance practices in global banking systems.

3.1 Performance analysis

As an essential tool in literature review, performance analysis provides quantitative assessments of productivity, influence, and scholarly activities across various fields of study. The quantitative evaluation of scientific work, along with research outcomes and academic influence, is referred to as performance analysis, as noted by Chigbu et al. (2023). Performance analysis is crucial for this research because it delineates how scholarly work in the field has evolved over an extended period.

3.1.1 Performance metrics

Scholarly interest in this field remains high, as evidenced by the sustained impact of 1,104 research papers across 92 years (1933–2025) of academic investigation. The corpus demonstrates enduring academic interest, with 21,528 citations, averaging 19.5 citations per paper and 234 citations annually. The research environment exhibits moderate collaboration, as indicated by the 2,875 authors who contributed to an average of 2.8 papers each. The research demonstrates a strong cumulative influence, as evidenced by its h-index of 77, g-index of 117, and h-c-index of 73, indicating lasting scholarly significance. The exceptionally high figures of 9,335.03 citations per author and 523.17 papers per author suggest that a small number of influential scholars have made significant contributions to the field.

Table 1: Metric for performance analysis

Metric	Description	Result
Total Publications (TP)	Number of total publications	1104
Total Citations (TC)	Aggregate number of citations	21,528
Number of Contributing Authors (NCA)	Total counts of Authors' Contributions	2,875 (hI-index and AWCRpA)
Number of Active Publication Years (NAY)	Timespan of reviewed studies	92 years (1933–2025)
Average Citations per Year (AC/Year)	Citations per year	234
Average Citations per Paper (C/Paper)	Citation per publication ratio.	19.5
Total Citations per Author (C/Author)	Citations per author ratio.	9,335.03
Papers per Author (P/Author)	Publications per author ratio.	523.17
Authors per Paper (A/Paper)	Authors per paper ratio.	2.8

h-index (h)	Number of documents with at least h citations, measuring cumulative influence	77
g-index (g)	Largest number such that the top g articles received at least g² citations, indicating impact	117
hc-index	Contemporary h-index accounting for recency-weighted citations	73

3.1.2 Top 20 contributing authors and journals

Performance analytics of the top 20 author contributors and journals present primary academic findings on scholarly influences and publishing activities across the domain. Elsevier Ltd. published the research by Yu et al. (2021), which has established an outstanding academic record with 749 citations and an annual average of 187.25 citations. Their research achieves immediate relevance and widespread academic adoption due to the high number of citations it receives. Buallay (2019) demonstrates the growing scholarly prominence of sustainability and finance research, as evidenced by Emerald Group Holdings Ltd., which has accumulated 501 citations and maintained an average of 83.5 citations per year. The original timeframes of these publications continue to affect scholarly research over extended periods. The work by Mahoney & Thorn (2006), Mahoney & Thorne (2005), and Scholtens & Dam (2007) has received 222 and 210 citations, respectively. However, it demonstrates annual citation rates of 10.5–12.33, as their foundational work continues to support theoretical and empirical advancements.

The research data demonstrates how Elsevier, MDPI, and Emerald Group maintain their positions as leading outlets for influential academic research. Interdisciplinary platforms and open-access models from MDPI and Elsevier enable their affiliated authors, such as Taghizadeh-Hesary & Yoshino (2020), to achieve 370 citations at a rate of 74 per year. In contrast, Bătae et al. (2021) receive 230 citations annually, at a rate of 57.5 per year, due to these models. The contemporary publishing landscape allows emerging scholars, such as Akomea-Frimpong et al. (2022), to garner 241 citations within a brief period (approximately 80.33 citations per year) when they focus on essential topics, including financial resilience and SME development in emerging economies.

Table 2: Top 20 contributing authors and journals

Authors	Year	Total Citations	TC Per Year	Publisher
Yu, X. Wu, D. Zhang, S. Chen, J. Zhao	2021	749	187.25	Elsevier Ltd
A. Buallay	2019	501	83.5	Emerald Group Holdings Ltd.
E. Campiglio	2016	460	51.11	Elsevier
F. Taghizadeh-Hesary, N. Yoshino	2020	370	74	MDPI AG
A.W.H. Yip, N.M.P. Bocken	2018	253	36.14	Elsevier Ltd
G. Birindelli, S. Dell'Atti, A.P. Iannuzzi, M. Savioli	2018	248	35.43	MDPI
I. Akomea-Frimpong, D. Adeabah, D. Ofosu, E.J. Tenakwah	2022	241	80.33	Taylor and Francis Ltd.
E. Nizam, A. Ng, G. Dewandaru, R. Nagayev, M.A. Nkoba	2019	232	38.67	Elsevier B.V.
O.M. Băftae, V.D. Dragomir, L. Feleagăf	2021	230	57.5	Elsevier Ltd
B. Scholtens, L. Dam	2007	222	12.33	Journal World Development
L.S. Mahoney, L. Thorne	2005	210	10.5	Journal of Business Ethics
L.S. Mahoney, L. Thorn	2006	209	11	Journal of Business Ethics

A. Geddes, T.S. Schmidt, B. Steffen	2018	205	29.29	Elsevier Ltd
F. Gangi, A. Meles, E. D'Angelo, L.M. Daniele	2019	199	33.17	John Wiley and Sons Ltd
P. D'Orazio, L. Popoyan	2019	193	32.17	Elsevier B.V.
T. Yigitcanlar, F. Cugurullo	2020	192	38.4	MDPI
M.H. Shakil, N. Mahmood, M. Tasnia, Z.H. Munim	2019	184	30.67	Emerald Group Holdings Ltd.
M. Hong, Z. Li, B. Drakeford	2021	180	45	MDPI AG
A. Hoepner, I. Oikonomou, B. Scholtens, M. Schroder	2016	174	19.33	Blackwell Publishing Ltd
L. Chiaramonte, A. Dreassi, C. Girardone, S. PiserÃ	2022	157	52.33	Routledge

3.2 Annual scientific publications

Academic research on ESG and sustainable banking topics has experienced rapid growth over the past decade, as indicated by temporal publication patterns. Interest in this subject remained minimal throughout the 1930s until the early 2000s, with researchers publishing only two to three papers per year. The number of scholarly publications began to increase modestly after 2005, as the world started to discuss corporate responsibility and sustainable finance. Annual publications surpassed 20 papers starting in 2016 and reached a peak after 2020. In particular, the years 2023 and 2024 combined produced 449 articles, accounting for more than 40% of the entire research collection. This highlights the subject's rapid growth due to worldwide sustainability goals (e.g., the UN SDGs and the Paris Agreement) and increasing regulatory requirements.
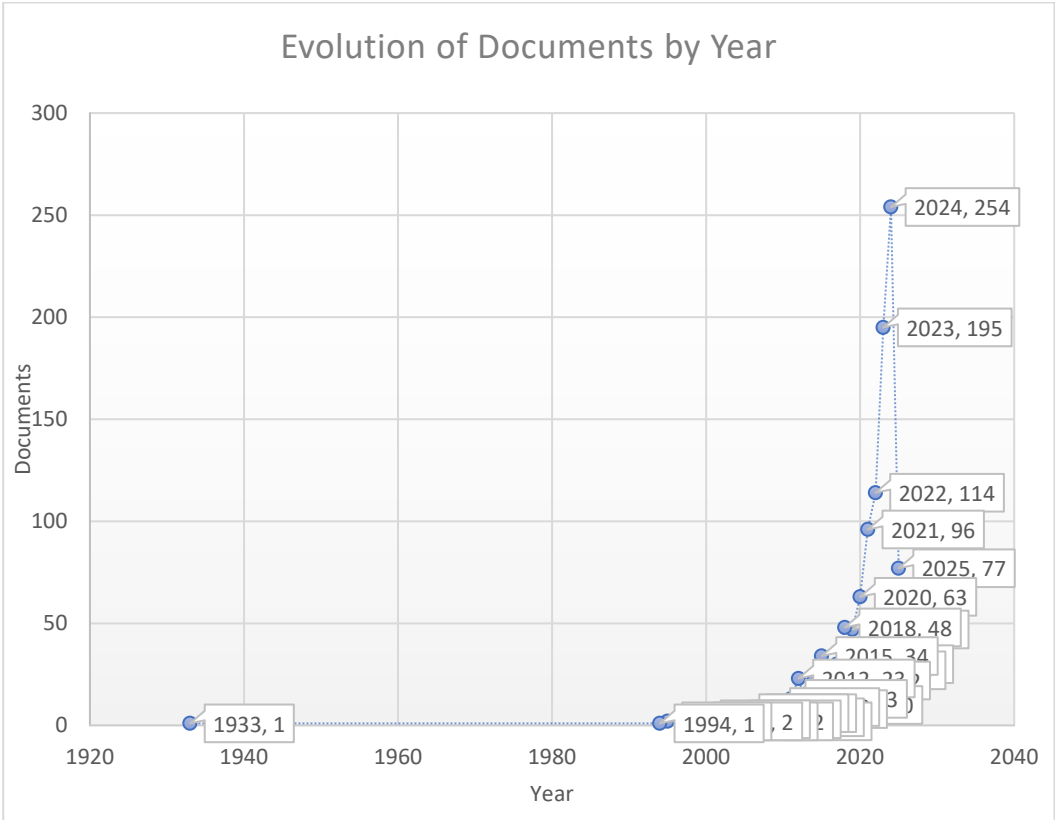

Figure 2: *Annual scientific publications (Source: Field Study, 2025)*

3.3 Distribution of documents by country

Research on ESG and sustainable banking reveals an uneven geographical distribution, with China (141 papers) and India (129 papers) leading the way, as these countries have focused on policy initiatives related to green finance and emerging intellectual capabilities in sustainability. Traditional Western researchers, such as those from the United Kingdom (95 papers), Germany (54 papers), and France (50 papers), continue to produce substantial research consistent with the SFDR and CSRD requirements established by the European Union. The United States exerts market-driven leadership through 81 publications on ESG innovation. However, Malaysia leads in Islamic sustainable finance research, with 82 papers, and remains a frontrunner in Islamic finance in Southeast Asia. The ESG discourse has become global, with contributions from middle-power countries such as Italy (71), Indonesia (65), Pakistan (46), and Saudi Arabia (36), while peripheral states, including Romania (24) and Vietnam (26), are demonstrating emerging academic strength. Research productivity in African and Latin American countries remains limited, as evidenced by South Africa's 19 publications, Nigeria's 12, and Colombia's 6, highlighting ongoing research capacity limitations within these regions.
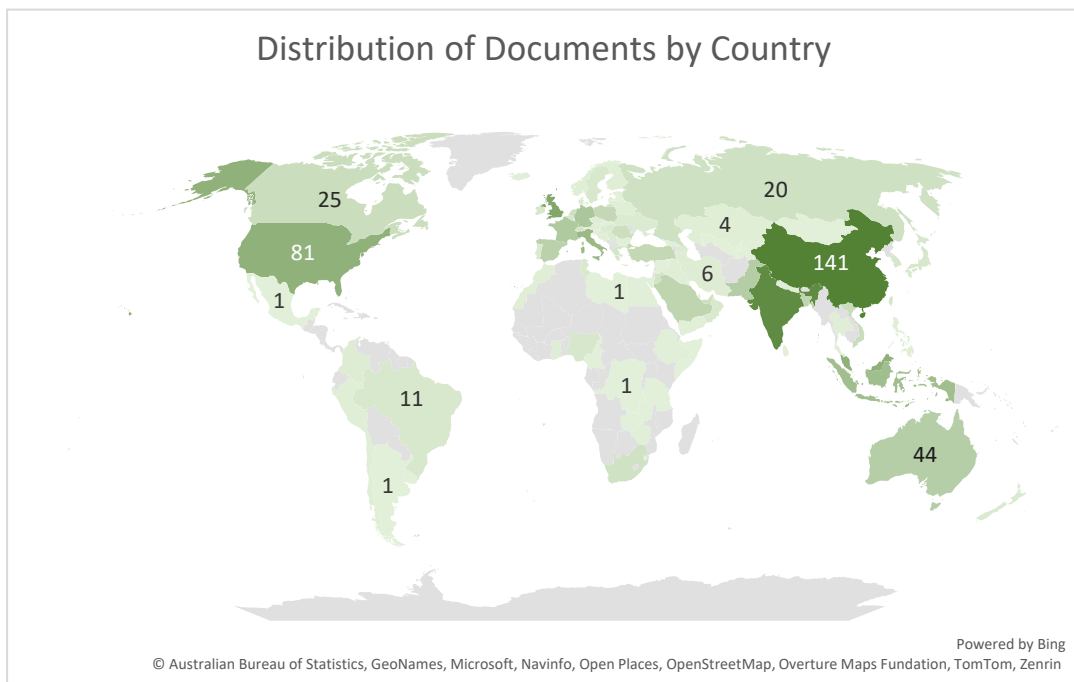

Figure 3: Distribution of papers by country (Source: Field Study, 2025)

4. Discussion of Findings

4.1 Conceptual understanding of sustainable banking evolution

The conceptual understanding of sustainable banking has evolved over nearly a century of academic inquiry, transitioning from implicit socio-economic concerns to explicit, multi-dimensional frameworks centred on environmental, social, and governance (ESG) performance. This development is evident not only in the pluralisation of theoretical approaches but also in the quantity, influence, and organisation of academic work. The performance measures, based on an extensive literature review spanning 1933 to 2025, provide fascinating insights into the maturation of this field. The scholarly discourse is both historical and current, comprising 1,104 publications that have yielded more than 21,500 citations, with an average of 19.5 citations per publication.

This advancement in knowledge is underpinned by strong performance measures, with an h-index of 77 and a g-index of 117, indicating that a substantial number of studies have had a long-term scholarly impact. The modern h-index of 73 suggests that recent studies also have a significant impact. The ratio of citations per author (9,335.03) and the extremely high papers per author measure (523.17) indicate that intellectual leadership has clustered in the hands of a small number of prolific authors whose work has guided conceptual progress over the years. These trends validate the fact that sustainable banking is not a fleeting academic fad, but a growing and evolving discipline with identifiable thought leaders and an ever-increasing number of authors per paper (averaging 2.8 authors).

The concept of sustainable banking in the early decades, particularly before 2000, was closely tied to financial access, institutional stability, and recovery from crises. This is evident in the pioneering studies of Shylendra (1995) on rural banking, Barrett (1999) on minority access to finance, and Eken & Helbling (1999) on economic stabilisation. These contributions were based on institutional banking and behavioural finance, while sustainability was viewed more as a side effect of financial equity and inclusion. At that time, the number of publications per year was small, with two to three papers being published annually, indicating an early stage of theoretical experimentation with no established conceptual understanding.

Since 2005, the publication trend has undergone a dramatic shift, accompanied by a sharp increase in the number of scholarly publications, consistent with the global rise in awareness of corporate responsibility and sustainable finance. This period marked a conceptual reframing of sustainable banking, alongside the introduction of Corporate Social Responsibility (CSR) and Stakeholder Theory. The works of scholars such as Mahoney & Thorne (2005, 2006) and Scholtens & Dam (2007) are foundational and continue to contribute to theoretical development, as they are still cited at a rate of 10.5-12.33 citations per year. Their focus on stakeholder involvement and ethical responsibility indicates a shift from passive inclusion to active, ethical governance.

Since 2015, ESG frameworks have been institutionalised, alongside global sustainability agendas such as the Paris Agreement and the UN Sustainable Development Goals (SDGs). Publication rates were high during this period, with 2023 and 2024 alone accounting for 449 publications, representing more than 40 percent of the total corpus and indicating an explosion of interest driven by regulatory and market forces. Empirical rigor and methodological innovation have been hallmarks of this phase in the field, as demonstrated by the work of Yu et al. (2021) which received 749 citations and 187.25 citations per year, and Buallay (2019) with 501 citations and 83.5 citations per year. This highlights the relevance of empirical studies of ESG performance. These high-impact contributions signify a shift toward quantifiable, data-driven ESG integration, grounded in frameworks such as the Triple Bottom Line, the Resource-Based View, and stakeholder performance assessment models.

The high status of interdisciplinary journals, such as those published by Elsevier, MDPI, and the Emerald Group, has also contributed to the rapid spread of sustainable banking ideas. These platforms have helped establish scholars and new voices. For example, Taghizadeh-Hesary & Yoshino (2020) and Batae et al. (2021) have established open-access models and interdisciplinary readerships, with the former garnering 370 citations and the latter 230 citations in a relatively short period. The fact that newer researchers such as Akomea-Frimpong et al. (2022) have managed to accumulate 241 citations and 80.33 citations per annum highlights that the academic environment now allows knowledge to spread rapidly, especially regarding high-priority topics, including SME resilience, digital finance, and green lending in emerging economies.

The theoretical knowledge of sustainable banking has evolved into a complex, empirically grounded discipline with a high degree of theoretical consistency, rather than a disjointed collection of concepts related to economic inclusion and institutional recovery. This shift is supported by a wide range of performance indicators and citation analyses, which confirm the field's maturity, relevance, and

growing influence. The practice of ESG frameworks in banking is no longer hypothetical; it is now implemented, quantified, and strategically integrated into contemporary financial institutions. With current trends in publications and the increased sophistication of theoretical frameworks, sustainable banking is likely to become a key pillar of financial innovation, resilience, and accountability in the 21st century.

4.2 Empirical evidence on green finance instrument adoption: A review

The extensive review of the 100 highest-contributing research papers (see Appendix 1) reveals the wide-ranging development of scholarship in the areas of green finance, ESG performance, and banking sustainability models. The majority of studies employ quantitative research methods, including panel data regression, structural equation modelling, and econometric analysis, to verify the relationship between ESG integration, financial performance, and stability. Research conducted by Nizam et al. (2019) and Yu et al. (2021) demonstrates that green finance policies can help alleviate bank financing constraints and enhance bank profitability. These studies employ stakeholder theory, agency theory, innovation economics, and sustainability valuation models as their operational foundations to explain how sustainability is integrated into financial structures. Theoretical models such as green credit theory, macroprudential regulation theory, and triple bottom line models enrich the conceptual framework of the field, enabling the examination of sustainability transitions at both firm- and bank-specific micro, systemic, and regulatory macro levels.

Research activities are primarily concentrated in China, Europe, and selected emerging markets, including Bangladesh and India, following a dominant thematic pattern. Studies by Hong et al. (2021) and Zhou et al. (2022) focus specifically on China's green credit programmes, while Birindelli et al. (2018) and Gangi et al. (2021) concentrate on European banking systems. The failure to analyse different regions across studies prevents researchers from obtaining universal results that could be replicated beyond their specific fields of study. The practical implementation of research is limited due to a lack of empirical evidence surrounding qualitative or conceptual studies (e.g., Campiglio, 2016; D'Orazio et al., 2024), although these studies possess substantial theoretical value. A methodological gap exists between theoretical advancements and empirical verification, as research on diverse financial systems necessitates multiple countries, long-term studies, and varied methodological approaches to establish conceptual-to-observational connections.

The study of causes and impacts displays a fragmented structure as the main finding in this area. Research shows that ESG engagement generates better financial performance (Buallay, 2019), but studies examining the causal link between the two factors use few natural experiments, instrumental variables, or dynamic panel models. Such limited epistemological foundations hinder policy development because robust causal evidence is required to support recommendations and strategic implications that arise from these studies. Most examinations of sustainability transitions at scale lack a comprehensive analysis of systemic and policy-level factors because they concentrate their research either at the firm or bank level. Environmental risks, regulatory actions, and modifications to international financial systems require enhanced empirical investigation, as central banks and supervisory bodies incorporate climate risk assessment into their financial monitoring frameworks.

Current sustainable finance research is transforming due to emerging technological paradigms, including FinTech, blockchain, and both artificial intelligence and big data technologies. Fernandez-Vazquez et al. (2019) and Mirza et al. (2023) demonstrate that new technologies lead to significant improvements in ESG disclosure, green lending optimisation, and sustainability traceability. The field of technological studies remains underdeveloped because research tends to focus on specific geographic areas, particular sectors, and short periods. Future research has the potential to analyse digital financial innovation alliances with ESG integration in various market sectors and additional financial entities throughout developing countries and small banking domains.

The current analytical sample reveals positive evolutionary trends in awareness of sustainable banking governance, as well as diversity and ethics in sustainability practices. Research by Gurol & Lagasio (2023) and Menicucci & Paolucci (2022) demonstrates the beneficial relationship between diverse boards and ESG performance, along with disclosure procedures that support existing corporate governance theories. Research continues to analyse ESG factors as a unified group without distinguishing between environmental, social, and governance effects in individual studies. Future research should employ detailed methods to identify which ESG components yield the most significant financial, environmental, and social outcomes, thereby enhancing both academic knowledge and practical implementation methods.

4.3 Factors that drive ESG integration in global banking practices

The integration of Environmental, Social, and Governance (ESG) principles into global banking practices is shaped by a constellation of institutional, regulatory, and market factors, which manifest differently across regions and financial ecosystems. The geographical spread of academic literature and the temporal trend in scholarly production on ESG and sustainable banking highlight these variances. A review of the data indicates that, until the early 2000s, the number of publications related to ESG was minimal, typically two to three papers per year. However, since 2005, the number of publications on sustainable banking has increased steadily, and by 2016, the annual output had surpassed 20 publications. This expansion has accelerated exponentially since 2020, with 2023 and 2024 alone contributing 449 papers, which account for over 40 per cent of the total research body. These time spikes are well correlated with international regulatory trends, particularly the operationalisation of the UN Sustainable Development Goals (SDGs), the Paris Agreement, and the growing number of sustainability reporting requirements.

4.3.1 Institutional factors

Institutionally, national central banks and supranational regulators have become key players in promoting ESG integration. An example of this is the climate risk analysis and preferential green credit programmes of the European Central Bank (ECB) and the People's Bank of China (PBOC). The 2023 directive from the ECB, which requires banks to consider climate risk in their capital adequacy assessments, illustrates how regulatory bodies can incorporate ESG into prudential standards. Similarly, the PBOC encourages green financing by offering preferential rates and classifications. Such actions starkly contrast with the more conservative approach of the U.S. Federal Reserve, highlighting the politically divided discussion of ESG in the American financial system (Antomarchi & Arrifi, 2024). The disparities in scholarly output also reflect these institutional patterns: China dominates with 141 publications, largely due to its centralised green finance initiatives, whereas India follows closely with 129 papers, driven by national sustainable development agendas and increasing academic interest in ESG.

High-quality ESG research that aligns with institutional requirements, including the Sustainable Finance Disclosure Regulation (SFDR) and the Corporate Sustainability Reporting Directive (CSRD), continues to be published in Western Europe, particularly in the UK (95 papers), Germany (54), and France (50). Such policies create a compliance-oriented ESG environment, evident in the well-developed ESG disclosure frameworks in Europe. In contrast, the U.S. market, with 81 contributions, adopts a more market-driven approach to ESG, characterised by voluntary disclosures, investor activism, and decentralised federal regulation. This institutional difference results in inconsistent ESG practices worldwide, where Europe emphasises top-down regulatory convergence, while the U.S. relies on bottom-up and investor-led approaches.

4.3.2 Regulatory factors

One of the most observable forces of ESG integration in banking is regulatory factors. Both the SFDR of the EU and the future ISSB standards will require strict ESG disclosures, including Scope 3

emissions and the incorporation of sustainability into fiduciary responsibilities (European Commission, 2024). These frameworks not only impose transparency but also increase the comparability of institutions, thereby standardising ESG risk assessment. Conversely, new markets tend to develop ESG frameworks that prioritise national goals over international consistency. For example, although the green finance regulations in China encourage green credit reporting, they do not place a strong emphasis on broader ESG aspects. Similarly, ASEAN countries have not integrated climate considerations into their prudential regulations, which is indicative of regulatory immaturity across the region.

Another primary regulatory tool that influences ESG integration is the development of a taxonomy. The EU Taxonomy and China's national green classification system have established consistent criteria to determine environmentally sustainable activities. Nevertheless, these taxonomies also introduce fragmentation to regulation. In the U.S., for example, the lack of a standard taxonomy has created definitional ambiguities and inconsistencies in ESG reporting, resulting in weaker systemic comparability and diminished investor confidence. The absence of a robust ESG regulatory framework in some regions of Africa and Latin America is also reflected in their low academic output, with notable examples including South Africa (19 papers), Nigeria (12), and Colombia (6), which highlights persistent institutional and capacity limitations.

4.3.3 Market factors

Market forces also play a significant role in the adoption of ESG in banking worldwide. Institutional investors, such as BlackRock, Vanguard, and Norway's sovereign wealth fund, have exerted considerable pressure on banks in Europe and North America to implement ESG frameworks. Such market-driven dynamics can be observed in the spread of ESG-linked financial products, such as green mortgages in the EU and sustainability-linked loans to U.S. multinationals provided by ING. In addition, the brand reputation associated with ESG performance is crucial in influencing consumer behaviour and competitive positioning, as demonstrated by Nordea's success in its ESG-based marketing efforts in Scandinavia.

On the other hand, the limited number of institutional investors in regions such as Africa hinders ESG momentum, not due to ideological opposition, but rather because of inadequate financial infrastructure and underdeveloped capital markets. Customer demand is also a variable factor. In high-income markets, increased environmental awareness and consumer activism drive the demand for green financial products. Conversely, in countries such as India, low financial literacy and purchasing power limit the widespread adoption of ESG-aligned retail products, even with the support of national policy.

Unique institutional and cultural models also shape the integration of ESG. Malaysia, with 82 publications, exemplifies a successful combination of Islamic finance principles and ESG goals, including the issuance of a green sukuk by Maybank for $1 billion (Liu & Lai, 2021). In Saudi Arabia, the social aspects of ESG are emphasised more than environmental factors due to religious and cultural priorities, illustrating how ESG frameworks are adapted to local socio-economic environments. Meanwhile, middle-income economies such as Italy (71 papers), Indonesia (65), and Pakistan (46) are showing increasing interest in ESG, both academically and in policy; however, actual practice remains uneven.

Regional heterogeneity in ESG integration not only highlights regulatory asymmetries and the stages of market development but also reveals deeply entrenched political, economic, and cultural logics. In the EU, ESG integration is driven by robust regulation, coordination of public policy, and the involvement of civil society. Capitalist market logic, shareholder activism, and fragmentation of the federal system define the U.S. context. In Asia, ESG innovation is driven by the state and is combined with traditional religious finance and the constraints of emerging markets. ESG is in its infancy in

Africa and Latin America, where capacity shortages and limited access to sustainable finance infrastructure present significant challenges.

Global banking ESG integration is not a singular phenomenon but rather depends on a complex interrelationship of institutional imperatives, regulatory frameworks, and market forces. These dynamics are evident in the dramatic increase in ESG-related academic literature over the last few years, particularly between 2023 and 2024, which has given rise to a rapidly growing discourse defined by global commitments, regional experimentation, and local adaptation. Understanding these divergent trajectories will be crucial in developing effective and context-specific sustainable banking models worldwide as ESG practices continue to evolve.

5. Conclusions

Research advancements in this field have progressed from occasional discussions of social equity to a detailed, empirical, and multi-theoretical analysis of banking operations through the lens of sustainability principles. Contemporary financial institutions demonstrate their value by generating sustainable outcomes, achieved through a commitment to environmental sustainability, governance excellence, and social impact. These institutions are undergoing fundamental societal shifts in customer expectations, driven by academic advancements, market-driven regulatory and technological developments, and responses to global sustainability needs.

6. Research Agenda and Practical Recommendations

The impressive development of sustainable banking and ESG integration over the past century necessitates that researchers advance both academic and practical work towards unexplored emerging markets while addressing substantive methodological and conceptual issues. The research literature requires a systematic analysis of the institutional and cultural factors affecting ESG adoption in various emerging economies across multiple nations. The academic investigation of ESG within China and India constitutes the leading studies from emerging markets, whereas other areas, including Sub-Saharan Africa and Latin America, alongside several Southeast Asian territories, show limited scholarly interest (South Africa: 19 papers, Nigeria: 12 papers, Colombia: 6 papers). Further research should yield trustworthy findings through multijurisdictional, long-term, mixed-methods studies that combine econometric methods with field interviews to observe detailed transnational ESG movements and modification processes.

Studies need to focus on creating causal inference frameworks that will help establish the financial and social effects of ESG integration. The quality of research related to ESG integration has improved through studies such as Yu et al. (2021) and Nizam et al. (2019); however, further analysis using advanced measurement methods, including natural experiments, difference-in-differences models, or instrumental variable regressions, still requires development. Establishing robust causal links between ESG engagement and bank performance is crucial, particularly in markets where regulatory oversight and financial reporting standards are less stringent. Detailed investigations should utilise regulatory changes, such as new green bond guidelines or ESG disclosure rules, as these events create natural experimental conditions to measure the influence of ESG approaches on business sustainability and investor actions.

Additionally, research needs to conduct detailed empirical studies regarding how macroprudential regulation sustains banking operations. While academic investigations into ESG practices at the firm level are prevalent, research on ESG integration within the monetary and regulatory frameworks of central banks and development banks in emerging markets remains scarce. Studies should analyse specific instances, such as the climate risk oversight strategy of the South African Reserve Bank and the green banking rules of the Bangladesh Bank, to demonstrate the effects of regulatory advancements on private sector ESG integration.

The revolution in technological systems is a crucial development point. Current research on AI, blockchain, and FinTech applications in ESG practices primarily focuses on developed economies, as noted in the works of Vuong et al. (2025) and Mirza et al. (2023). Academic investigations should examine how digital finance platforms in emerging market regions, such as East Africa and Latin America, facilitate the tracking of ESG practices while promoting financial accessibility for all stakeholders in green financial activities. This endeavour will both develop new theoretical frameworks, particularly the Innovation Diffusion Model, and create applicable structures for ESG solutions capable of large-scale implementation in areas with limited resources.

The assessment of ESG dimensions through environmental, social, and governance factors should take into account regional specificities, such as socio-economic conditions. Current ESG analysis combines diverse indicators into unified indices, which produce minimal differentiation of important regional priorities because social factors typically weigh more heavily than environmental factors among specific population groups. Additional studies are needed to break down ESG measurements into individual components and then examine which areas have the most significant effects on unique emerging market scenarios. The research by Gurol and Lagasio (2023) serves as a valuable example for conducting detailed examinations of the impact of board diversity on ESG performance.

Practical, action-oriented research remains essential in current circumstances. Future research should shift from identifying the ESG gap to proposing practical solutions, including training programmes for small financial institutions and sustainability education for small and medium-sized enterprises, as well as economic mechanisms to channel private funds towards sustainable banking objectives. Academics, policymakers, and financial institutions should form partnerships to conduct field experiments and pilot programmes that translate research findings into practical strategies, thereby accelerating ESG integration on the ground.

Future research should limit its focus mainly to advanced economies' ESG integration documentation and shift to examining and enhancing ESG-aligned banking practices in emerging markets that have received minimal study. Scientific research methods, incorporating comparative analysis, technological applications, and practical implementation, will lead to the complete realisation of sustainable banking throughout the global financial system.

7. Declarations

Data Availability Statement: This review is based entirely on publicly available data and information sourced from peer-reviewed articles, reports, and other academic publications cited in the manuscript. No new primary data was generated or analysed during this study. Readers may refer to the cited sources for detailed information.

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Appendix 1

Table 5: Factors that drive ESG integration

Factor Category	Key Drivers	Regional Variations	Examples & Mechanisms
Institutional Factors	**1. Central Bank Policies** - Climate stress tests - Green monetary policies - ESG disclosure mandates	**EU:** ECB climate stress tests (2022+) **Asia:** PBOC green lending targets **US:** Fed's cautious, voluntary ESG guidance	ECB's 2023 climate risk assessment for banks; PBOC's relending programs for green projects
	2. Multilateral Agreements - Paris Agreement alignment - UN Principles for Responsible Banking (PRB)	**EU:** PRB signatories (90% of major banks) **Emerging Markets:** Lower adoption, focus on local SDGs	BBVA (EU) ties loans to ESG metrics; Indian banks lag in PRB adoption
	3. Corporate Governance - Board ESG committees - Executive compensation linked to ESG	**EU/UK:** Mandatory ESG committees **US:** Shareholder pressure (BlackRock, Vanguard) **Asia:** Family-owned banks resist	HSBC ties 25% of exec pay to ESG; Saudi banks lack transparency
Regulatory Factors	**1. Disclosure Requirements** - SFDR (EU) - TCFD/ISSB global standards - Local ESG reporting rules	**EU:** SFDR strict enforcement **US:** SEC climate disclosure proposals (delayed) **China:** Green finance guidelines	EU banks report Scope 3 emissions; Chinese banks use "green credit" classifications
	2. Capital Requirements - Green supporting factors (lower risk	**EU:** Green asset ratio (EBA) **UK:** Climate capital buffers	Crédit Agricole benefits from EU green mortgages; ASEAN banks lack incentives

	weights) - Brown penalizing factors	**ASEAN:** No risk-weight adjustments	
	3. Taxonomies - EU Taxonomy - National green classifications (China, Malaysia)	**EU:** Detailed technical screening **China:** Focus on renewables **US:** No federal taxonomy	EU banks align loans with Taxonomy; China's "green bond" definitions differ
Market Factors	**1. Investor Pressure** - ESG fund growth - Shareholder activism - Green bonds	**EU/US:** Large ESG fund inflows **Japan:** GPIF pushes ESG **Africa:** Minimal institutional demand	BlackRock's 2025 ESG AUM target; Nigerian banks face low investor pressure
	2. Customer Demand - Green retail products - Corporate sustainability-linked loans (SLLs)	**EU:** Green mortgages (ING) **US:** SLLs for Fortune 500 **India:** Limited retail interest	Dutch bank ASN's 100% sustainable portfolio; Indian SLLs rare
	3. Competitive Dynamics - First-mover advantages - Reputational risks	**Scandinavia:** Nordea leads in ESG **GCC:** Islamic banks adopt green finance late	Nordea's ESG brand premium; UAE banks lag on coal financing
Regional Ecosystems	**1. Developed Markets (EU/US)** - Strict regulation + high investor demand	**EU:** Regulatory push dominates **US:** Market-driven, patchy regulation	EU's CSRD vs. US state-level laws (e.g., California)
	2. Emerging Markets (Asia/Africa) - Policy-led green finance - Limited private capital	**China:** State-controlled green credit **South Africa:** JSE ESG reporting voluntary	China's "green credit" > $500B; Kenyan banks lack ESG tools
	3. Islamic Finance (GCC/SE Asia) - Shariah-ESG overlap - Sukuk green bonds	**Malaysia:** Leading in green sukuk **Saudi Arabia:** Slow ESG adoption	Maybank's $1B green sukuk; Saudi banks focus on social (not environmental)

Appendix 2

Table 3: Empirical review of the top 100 most contributing studies

Author (Year)	Main Objectives	Methodology	Theory/Model	Main Findings	Research Gaps

Yu et al. (2021)	To examine how green finance alleviates financing constraints and encourages green innovation in Chinese firms.	Quantitative; firm-level panel data econometrics.	Financing constraint theory; innovation theory.	Green finance policies significantly reduce financing constraints, promoting green innovation.	Focuses on listed Chinese firms; lacks cross-country comparison.
Buallay (2019)	To assess the link between ESG disclosure and financial performance in European banks.	Quantitative; regression analysis using ESG and financial data.	Stakeholder theory; legitimacy theory.	Positive association found between ESG reporting and return on equity and assets.	Lacks causal inferences; limited to European context.
Campiglio (2016)	To explore the influence of banking and monetary policy on financing the low-carbon economy.	Qualitative; theoretical and policy analysis.	Post-Keynesian; environmental macroeconomics.	Monetary and financial policies can play key roles beyond carbon pricing in climate finance.	No empirical validation; theoretical scope only.
Taghizadeh-Hesary & Yoshino (2020)	To identify mechanisms to increase investment in renewable energy through green finance.	Mixed methods; case studies and quantitative modelling.	Risk-sharing and public-private finance models.	Innovative de-risking and blended finance models are essential for financing renewable projects.	Geographically focused on Asia; lacks application to other regions.
Yip & Bocken (2018)	To develop sustainable business model archetypes for banking institutions.	Qualitative; conceptual analysis and synthesis.	Sustainable business model theory.	Identifies archetypes such as green asset portfolios, shared value models, and social mission integration.	Conceptual model; lacks empirical validation.
Birindelli et al. (2018)	To investigate how board characteristics influence ESG performance in banks.	Quantitative; regression analysis on European banks' data.	Agency theory; stakeholder theory.	Board diversity and activity positively affect ESG performance.	European focus; does not explore causality.
Akomea-Frimpong et al. (2022)	To review existing literature on green finance in banking and identify research gaps.	Systematic literature review.	Not specified.	Highlights fragmented approaches and lack of harmonized models.	Needs more empirical studies and research in developing economies.
Nizam et al. (2019)	To analyze the global relationship between social/environmental sustainability and bank performance.	Quantitative; panel regression using global bank data.	Sustainability-performance hypothesis.	ESG positively impacts financial performance globally.	Does not control for institutional differences.
BÄƒtae et al. (2021)	To assess the triadic relationship among environmental, social, and financial	Quantitative; econometric modeling.	Triple bottom line.	Environmental and social performance are positively related	Regional focus; limited generalizability.

				to financial metrics.	
				Adopters display higher transparency and environmental management standards.	
Scholtens & Dam (2007)	To evaluate differences between banks that adopted Equator Principles vs. non-adopters.	Comparative case study; cross-sectional analysis.	Institutional theory; voluntary governance.		Cross-sectional approach limits causal interpretation.
Mahoney & Thorne (2005)	To study how CSR relates to executive compensation in Canadian firms.	Quantitative; empirical analysis using executive pay data.	Stakeholder-agency theory.	Long-term compensation schemes are positively linked with CSR disclosures.	Canadian focus; firm-level not bank-specific.
Mahoney & Thorn (2006)	To examine the structure of executive compensation and its alignment with CSR strategies.	Quantitative; multivariate regression on Canadian data.	Agency theory; CSR-performance alignment.	Structured compensation supports sustained CSR commitment.	Focuses on structural variables; lacks behavioural insights.
Geddes et al. (2018)	To analyze the role of state investment banks in low-carbon energy finance in three countries.	Comparative case study; qualitative analysis.	Developmental state theory.	State banks play key roles in risk-sharing and long-term capital provision.	Limited to Australia, UK, and Germany; generalizability concerns.
Gangi et al. (2019)	To investigate whether environmentally responsible banks exhibit lower risk levels.	Quantitative; risk-return analysis and regression models.	Risk mitigation theory.	Environmentally friendly banks are less risky.	Fails to establish directionality of causality.
D'Orazio & Popoyan (2019)	To explore how macroprudential policies can foster green investment and mitigate climate-related risk.	Conceptual; policy analysis and theoretical synthesis.	Macroprudential regulation theory.	Green-focused prudential tools could bridge financial stability and climate objectives.	Lacks empirical validation or pilot testing.
Yigitcanlar & Cugurullo (2020)	To examine the sustainability implications of AI in smart cities from an urbanistic perspective.	Qualitative; thematic and conceptual review.	Urban sustainability and innovation theory.	AI poses sustainability opportunities and risks in city design.	Urban context; not banking-specific.
Shakil et al. (2019)	To assess the impact of ESG performance on financial performance in emerging market banks.	Quantitative; cross-country regression analysis.	Triple bottom line; ESG-performance link.	Positive correlation between ESG performance and ROA/ROE.	Limited longitudinal data; institutional heterogeneity.
Hong et al. (2021)	To explore the effects of green credit guidelines on green technology innovation in China.	Quantitative; difference-in-differences analysis.	Green credit theory; innovation economics.	Green credit guidelines significantly promote corporate green innovation.	Limited to policy in China; firm-level impact only.
Hoepner et al. (2016)	To investigate the impact of corporate	Quantitative; international	Sustainability valuation theory.	Higher sustainability	Limited sectoral breakdown;

	and national sustainability indicators on the cost of debt.	dataset and econometric modeling.		scores lead to reduced borrowing costs.	banking-specific impacts not detailed.
Chiaramonte et al. (2022)	To examine the role of ESG strategies in enhancing bank stability during financial crises.	Quantitative; panel data econometrics.	Resilience and stakeholder theory.	ESG-integrated banks exhibit greater stability during turmoil.	European focus; limited to public data disclosures.
Cui et al. (2018)	To analyze the impact of green lending on credit risk in Chinese banks.	Quantitative; regression analysis using bank-level data.	Credit risk theory; green banking framework.	Green lending reduces credit risk by improving borrower environmental practices.	Focus on China; lacks long-term impact analysis.
Lee (2020)	To investigate green finance's contribution to achieving SDGs in China.	Qualitative; policy analysis and secondary data synthesis.	Sustainable development theory.	Green finance plays a critical role in SDG implementation through targeted investments.	Case-specific; limited empirical validation.
Yigitcanlar et al. (2020)	To explore the perception and application of AI in urban development in Australia.	Mixed methods; surveys and expert interviews.	Innovation diffusion theory; urban sustainability.	AI adoption is perceived as transformative but uneven across urban sectors.	Geographic limitation; not directly banking-focused.
Miralles-QuirÃ³s et al. (2019)	To evaluate ESG performance and shareholder value in banks across countries.	Quantitative; panel data regression.	Shareholder value theory; ESG integration framework.	Strong ESG performance enhances shareholder value, varying by region.	Variability in ESG standards across jurisdictions.
Sobhani et al. (2012)	To examine sustainability disclosures in annual reports and websites of Bangladeshi banks.	Qualitative; content analysis.	Legitimacy theory; stakeholder theory.	Inconsistent and minimal sustainability disclosures across banks.	Limited to descriptive analysis; no performance linkage.
Zhou et al. (2021)	To assess CSR's effect on bank financial performance, moderated by green credit.	Quantitative; moderated regression analysis.	CSR-performance theory; green finance framework.	Green credit strengthens the positive impact of CSR on performance.	Limited to Chinese banks; time scope constrained.
Sood et al. (2022)	To explore the transformative role of big data in the insurance industry.	Qualitative; thematic analysis.	Digital transformation theory.	Big data enhances predictive accuracy and risk management.	Insurance-specific; generalizability to banking unclear.
Jan et al. (2021)	To propose an Islamic corporate governance framework for sustainability assessment.	Conceptual; framework development.	Shariah governance; sustainability performance models.	New governance framework links Islamic principles with sustainability metrics.	Lacks empirical validation.

Corson et al. (2013)	To investigate the commodification of environmental governance through green markets.	Qualitative; case studies and discourse analysis.	Political ecology; environmental governance theory.	Green finance risks reinforcing inequities via market-based mechanisms.	Lacks quantitative data; ideological critique focus.
Deschryver & de Mariz (2020)	To assess the challenges and potential of green bond markets globally.	Policy review and expert interviews.	Market development theory; green finance mechanisms.	Green bond markets face fragmentation and credibility challenges.	No empirical modeling; focused on market structure.
Castree & Christophers (2015)	To explore spatial dynamics in green financial infrastructure investment.	Conceptual; geographical analysis.	Spatial political economy; ecological fix theory.	Capital switching into green infrastructure creates spatial inequalities.	High-level theoretical; not applied to specific sectors.
Coupland (2006)	To examine the content and tone of CSR reports by banks on the web.	Content analysis.	Impression management; CSR communication theory.	Web-based CSR often vague and symbolic, lacking concrete metrics.	No linkage to performance outcomes.
Wickens (2012)	To present a macroeconomic theory using dynamic equilibrium models.	Theoretical modeling.	Dynamic stochastic general equilibrium (DSGE) models.	Provides foundational understanding for macro-level financial dynamics.	Not sector-specific; lacks sustainability integration.
Sharma & Choubey (2022)	To explore green banking initiatives in India.	Qualitative; semi-structured interviews with bank managers.	Sustainability engagement theory.	Indian banks implement green practices inconsistently due to policy ambiguity.	Sample size small; lacks quantitative backing.
Weber (2005)	To benchmark sustainability practices in European financial institutions.	Comparative benchmarking study.	Benchmarking and best practice theory.	Wide variation in ESG adoption; leadership critical for progress.	Survey-based; lacks in-depth qualitative insights.
Ecer & Pamucar (2022)	To assess sustainability in developing country banks using a hybrid MCDM model.	Quantitative; LOPCOW-DOBI multi-criteria decision-making method.	Multi-criteria decision theory.	Provides a robust ranking of sustainability performance among banks.	Tool is complex; limited adoption in real institutions.
Khan et al. (2011)	To assess CSR disclosures of major Bangladeshi banks using GRI standards.	Qualitative; GRI-based content analysis.	Stakeholder theory.	Banks show inconsistent compliance with GRI standards.	Focus on disclosure quantity; lacks impact analysis.
Taghizadeh-Hesary et al. (2021)	To analyze post-COVID green bond market characteristics.	Descriptive statistics; market trend analysis.	Market efficiency theory; risk pricing.	Recovery led to shifts in green bond risk premiums and structure.	Descriptive nature; lacks causal inference.
Finger et al. (2018)	To compare environmental risk management practices and performance in global banks.	Cross-country quantitative analysis.	Risk management theory.	Banks with proactive ERM outperform in financial metrics.	Institutional context not fully explored.

Raut et al. (2017)	To conduct a strategic sustainability analysis of the banking industry.	Quantitative; multi-criteria decision analysis (MCDA).	Strategic sustainability management theory.	Sustainability indices help prioritize bank initiatives.	MCDA tools are data-intensive and may lack adaptability.
Liu et al. (2021)	To explore how fintech moderates the CSR-financial performance relationship in banks.	Quantitative; moderation analysis using structural equation modeling.	Stakeholder theory; technology mediation model.	Fintech adoption strengthens the positive CSR-financial performance relationship.	Relatively new field; limited longitudinal evidence.
Tan et al. (2022)	To investigate stock market volatility and green finance dynamics during COVID-19.	Quantitative; volatility spillover models.	Volatility transmission theory.	Pandemic increased volatility in green finance markets and slowed recovery.	Short-term data span; post-COVID impact remains unexplored.
Munkhdalai et al. (2019)	To compare ML methods for credit assessment in banking.	Quantitative; comparative machine learning model evaluation.	Predictive analytics; credit risk modeling.	Advanced ML models outperform traditional methods in credit scoring accuracy.	No interpretability comparison; limited to one region.
Zheng et al. (2021)	To assess the impact of green finance on sustainability in Bangladeshi financial institutions.	Quantitative; survey and regression analysis.	Green finance theory; institutional sustainability framework.	Green finance adoption significantly improves sustainability scores.	Relatively small sample; Bangladesh-specific.
De La Cuesta-GonzÃ¡lez et al. (2006)	To propose a framework for analyzing social performance using public data in Spain.	Quantitative; performance indicator development and testing.	Social performance measurement model.	Framework feasible for assessing CSR in banking via public sources.	Need for integration with private/qualitative data.
Dell'Atti et al. (2017)	To examine CSR engagement and its impact on bank reputation.	Quantitative; survey and regression analysis.	Reputation theory; CSR value creation model.	CSR significantly boosts reputation, especially when aligned with stakeholder expectations.	Focus on perception rather than long-term financial effects.
Belal et al. (2015)	To trace ethical reporting in Islami Bank Bangladesh over three decades.	Longitudinal qualitative analysis.	Ethical disclosure framework; legitimacy theory.	Incremental improvement in ethical reporting with increased stakeholder pressure.	Single case study; limited generalization.
Aliyu et al. (2017)	To review literature on Islamic banking sustainability and chart future directions	Systematic literature review.	Islamic finance principles; triple bottom line.	Research is nascent; gaps in performance metrics and sustainability models.	Lack of empirical studies and practical frameworks.
Jeucken (2010)	To provide a foundational understanding of	Conceptual; book-length synthesis.	Sustainable banking maturity model.	Banks evolve through sustainability	Predates ESG quantification;

				phases: defensive, proactive, sustainable.	needs empirical re-evaluation.
Wang et al. (2022)	To examine whether green finance promotes CSR achievement in Chinese firms.	Quantitative; structural modeling using firm-level data.	CSR theory; green investment models.	Green finance positively mediates CSR implementation in firms.	Limited sectoral analysis; focused on industrial firms.
Decker (2004)	To evaluate CSR's role in reshaping financial service structures.	Qualitative; case-based investigation.	Organizational change theory.	CSR drives internal changes and stakeholder engagement across functions.	Lacks large-scale empirical support.
Chen et al. (2021)	To investigate how regional banks affect environmental pollution in China.	Quantitative; spatial econometric modeling.	Environmental impact theory; financial geography.	City commercial banks reduce pollution when incentivized to lend green.	Focus on pollution, not comprehensive ESG impact.
Mirza et al. (2023)	To evaluate fintech's role in enhancing green finance and profitability in EU banks.	Quantitative; panel data analysis.	Fintech-disruption theory; ESG integration.	Fintech complements ESG practices and improves profitability.	Limited to Eurozone; emerging markets not explored.
Murè et al. (2021)	To assess ESG's role in bank reputation during scandals.	Qualitative; case analysis of Italian banks.	Reputation repair theory.	Strong ESG frameworks mitigate reputational damage during sanctions.	Limited sample; lacks quantitative backing.
Abad-Segura et al. (2020)	To review FinTech trends and management implications.	Systematic literature review.	Technology adoption lifecycle.	Emerging trends include AI, blockchain, and big data in ESG finance.	Lacks empirical case integration.
Zheng et al. (2021)	To assess green finance development in Bangladesh's private commercial banks.	Mixed-method; surveys and regression.	Green finance framework.	PCBs have improved in green lending and sustainability reporting.	Focuses on PCBs; lacks comparative public bank data.
Weber & Feltmate (2016)	To examine how banks manage social and environmental impacts.	Qualitative; case-based strategy review.	CSR management theory.	Banks use impact management tools such as environmental assessments and stakeholder engagement.	Lacks outcome measurement validation.
Lock & Seele (2015)	To compare CSR reporting in the banking, chemical, and insurance sectors.	Content analysis; sectoral comparison.	Sector-specific CSR theory.	Banking sector lags in social disclosures compared to others.	Focuses on quantity over disclosure quality.
Amidjaya & Widagdo (2020)	To explore how governance, ownership, and	Quantitative; regression analysis.	Corporate governance	Stronger governance and digital strategies	Country-specific; causality not established.

	digital banking affect sustainability reporting in Indonesian banks.		theory; digital adoption model.	enhance sustainability disclosures.	
McDonald & Lai (2011)	To assess the impact of CSR initiatives on Taiwanese bank customers.	Quantitative; customer survey and analysis.	Customer loyalty and CSR perception theory.	CSR engagement improves brand loyalty and trust among customers.	Cultural bias and generalizability concerns.
Yuan et al. (2021)	To analyze the impact of financial innovation on green innovation across OECD industries.	Quantitative; industry-level econometric analysis.	Innovation diffusion theory; finance-growth model.	Financial innovation enhances green innovation through better capital allocation.	Focus on OECD; emerging economies not included.
Matuszak et al. (2019)	To explore the effect of corporate governance on CSR disclosure in Polish banks.	Quantitative; regression on governance and CSR data.	Agency theory; disclosure theory.	Audit committee independence positively affects CSR disclosure levels.	Single-country study; limited time horizon.
Raberto et al. (2019)	To model how banking regulations affect green finance in the Eurace model.	Agent-based simulation.	Complex systems theory; macroprudential regulation.	Tight credit regulation encourages green investments under systemic risk constraints.	Theoretical model; requires empirical validation.
Fijałkowska et al. (2018)	To study the relationship between social-environmental and financial performance in CEE banks.	Quantitative; correlation and regression analysis.	Triple bottom line.	CSR initiatives are moderately linked to profitability in the long term.	Limited generalizability beyond CEE.
Ortas et al. (2013)	To examine the link between socially responsible investment and cleaner production in Asia-Pacific.	Quantitative; cross-country analysis.	SRI theory; environmental efficiency models.	SRI supports cleaner production but varies widely by country.	Lacks sector-specific findings; broad regional scope.
Menassa (2010)	To explore CSR disclosure quality in Lebanese commercial banks.	Qualitative; content analysis of annual reports.	Legitimacy theory; stakeholder accountability.	CSR disclosure was superficial, with low standardization.	Exploratory study; lacks financial linkage.
Zheng & Siddik (2023)	To examine Fintech's effect on green finance and environmental performance during COVID-19.	Quantitative; SEM modeling and survey data.	Technology-environment-performance model.	Fintech adoption accelerates environmental performance via green innovation.	Focused on one region; pandemic period only.
Abu-Baker & Naser (2000)	To assess corporate social disclosure practices in Jordan.	Content analysis; descriptive statistics.	Social contract theory.	Disclosures are often symbolic, with little strategic substance.	Early study; lacks integration with modern ESG frameworks.
Al-Qudah et al. (2023)	To evaluate how green lending impacts credit risk in UAE banks.	Quantitative; regression analysis.	Credit risk theory; green finance mechanisms.	Green lending lowers credit risk and improves asset quality.	Limited dataset; UAE focus only.

Author (Year)	Objective	Methodology	Theory/Framework	Findings	Limitations
Chen et al. (2022)	To evaluate green banking's impact on environmental performance and green finance.	Quantitative; structural equation modeling (SEM).	Green banking model; stakeholder theory.	Green banking practices significantly improve environmental performance.	Focused on Southeast Asia; cross-country variability not addressed.
Zhou et al. (2022)	To investigate the link between green lending and credit risk under China's green credit policy.	Quantitative; panel data regression.	Green credit theory; credit risk models.	Green lending reduces risk and enhances credit portfolio quality.	China-specific data; limited temporal scope.
Durrani et al. (2020)	To analyze central banks' role in scaling sustainable finance in the Asia-Pacific.	Qualitative; policy interviews and content analysis.	Central banking theory; green monetary policy.	Central banks support sustainability, but face legal and institutional barriers.	Policy-focused; lacks market impact evaluation.
Urban & Wójcik (2019)	To critique the sustainability gap in global banking practices.	Qualitative; institutional and discourse analysis.	Financial geography; critical sustainability theory.	Banking institutions often fail to integrate sustainability beyond branding.	Normative approach; lacks empirical outcomes.
Khan et al. (2015)	To explore legitimacy and CSR marketing in MNCs in developing economies.	Qualitative; case study analysis.	Institutional legitimacy theory.	CSR strategies are driven by global norms and local adaptation.	Non-financial sectors; limited to marketing practices.
Yan et al. (2022)	To analyze FinTech's impact on banking sustainability performance through green innovation.	SEM and artificial neural network (ANN) hybrid model.	Technology-sustainability-performance framework.	FinTech adoption indirectly enhances sustainability via green innovation.	Complex model; requires replication in different settings.
Paltrinieri et al. (2020)	To examine the relationship between Islamic finance development and ESG scores.	Cross-country panel regression.	Islamic finance theory; ESG disclosure standards.	Islamic finance positively correlates with ESG performance in most contexts.	Cultural and regulatory diversity not fully accounted for.
Menicucci & Paolucci (2023)	To assess ESG dimensions' effects on Italian bank performance.	Quantitative; regression analysis on ESG and ROE data.	ESG valuation framework.	Social and governance dimensions significantly improve bank returns.	National context only; causality remains ambiguous.
Kong et al. (2021)	To investigate how CSR shapes employees' environmental attitudes in banking.	Quantitative; employee surveys and regression.	CSR internalization model.	CSR improves employee motivation for sustainable workplace behaviors.	Focuses on perception; behavioral outcomes not measured.
Khan et al. (2020)	To assess regulatory influence on CSR practices in emerging market banks.	Qualitative; interviews with compliance officers.	Regulatory compliance theory; CSR implementation models.	Banks largely comply with CSR to meet regulatory requirements, not strategic vision.	Limited sample; lacks longitudinal impact.

Belu (2009)	To rank corporations based on sustainable and responsible practices using DEA.	Quantitative; Data Envelopment Analysis (DEA).	Efficiency analysis; sustainability ranking.	DEA is effective in benchmarking corporate sustainability.	Static analysis; lacks dynamic updates.
Demir & Danisman (2021)	To investigate how banks responded to COVID-19, considering internal and policy factors.	Quantitative; regression on cross-country banking data.	Crisis response theory.	Bank-specific fundamentals and government responses influenced resilience.	Pandemic-specific; lacks post-crisis trajectory.
Mirza et al. (2023)	To analyze green lending's impact on bank performance in BRIC countries' SME portfolios.	Quantitative; panel data econometrics.	SME credit theory; green finance frameworks.	Green SME lending improves financial performance and reduces risk.	Focus on BRIC only; sectoral differences unexamined.
Kiliç (2016)	To evaluate online CSR disclosure practices in Turkish banks.	Content analysis; cross-sectional.	Disclosure theory; legitimacy theory.	CSR content is mostly symbolic and lacks standardization.	Static design; lacks user perception analysis.
Gurol & Lagasio (2023)	To explore the effect of women board members on ESG disclosure in European banks.	Quantitative; multivariate regression.	Gender diversity theory; ESG performance model.	Women on boards enhance ESG disclosure, especially social indicators.	Focused on gender; intersectional factors not included.
Zeidan et al. (2015)	To develop a sustainability credit scoring system for companies.	Qualitative; framework development and expert input.	Credit scoring models; sustainability integration.	Introduces non-financial metrics in credit evaluation.	Requires empirical testing in credit markets.
Chen et al. (2022)	To evaluate local government debt's effect on green innovation in China.	Quantitative; fixed effects panel regression.	Public finance theory; innovation stimulus theory.	Excessive local debt hampers corporate green innovation.	Focused on manufacturing; regional comparisons needed.
Neitzert & Petras (2022)	To examine the relationship between CSR and bank risk.	Quantitative; risk-return econometrics.	CSR-risk mitigation theory.	CSR lowers bank risk, especially under environmental disclosure frameworks.	Global generalization limited; disclosure quality not analyzed.
Weber & Remer (2011)	To explore the future role of social banks in sustainable finance.	Qualitative; comparative case study.	Social banking theory.	Social banks align closely with sustainability values but face scalability limits.	Limited to niche institutions; lacks systemic impact study.
Kim et al. (2020)	To study the relationship between carbon emissions and financial development.	Quantitative; time-series econometric modeling.	Finance-growth-environment nexus.	High financialization correlates with increased carbon emissions.	Does not explore mitigation policies or sectoral variance.
Schwab et al. (2019)	To simulate SME financial sustainability during growth periods.	Simulation modeling.	Financial sustainability modeling.	Sustainable growth depends on synchronized	Focus on SMEs; banking linkage limited.

Author(s)	Objective	Method	Theory	Findings	Limitations
				capital structure planning.	
Ma et al. (2023)	To study green finance and environmental sustainability in G-20 economies.	Panel data econometrics.	Green growth theory.	Green finance enhances green economic growth and pollution control.	Aggregate-level findings; lacks policy breakdown.
Davies & Green (2010)	To trace the evolution of central banking and its sustainability roles.	Historical review; narrative synthesis.	Central bank evolution theory.	Central banks may support sustainable finance through mandates and regulation.	Exploratory; lacks empirical application.
Li & Liao (2020)	To explore how financial development affects green total factor productivity.	Panel data modeling with interaction terms.	Financial development theory; green productivity.	Financial development improves green productivity if accompanied by green policy.	Policy heterogeneity not fully captured.
Comyns & Franklin-Johnson (2018)	To develop CSR crisis response theory using the Rana Plaza case.	Qualitative; theoretical development via case study.	CSR crisis response theory.	CSR strategies evolve dynamically during reputational crises.	Non-banking context; requires financial sector replication.
Jouffray et al. (2019)	To identify leverage points in finance for seafood sustainability.	Mixed methods; stakeholder interviews and systems mapping.	Systems leverage theory.	Banking criteria and insurance can drive marine sustainability.	Sector-specific; banking role requires deeper financial data.
Laguir et al. (2018)	To explore reverse causality between financial and environmental performance in banks.	Quantitative; causality testing.	Reverse causality theory in CSR.	High profitability may drive stronger environmental disclosure.	Does not account for external stakeholder pressure.
Sarma & Roy (2021)	To conduct a scientometric review of green banking literature from 1995–2019.	Scientometric analysis.	Knowledge mapping frameworks.	Research in green banking is growing but fragmented across journals.	Descriptive; lacks theoretical synthesis.
Rizzi et al. (2018)	To structure emerging approaches in social finance.	Qualitative; case-based classification.	Social impact finance models.	Identifies hybrid models supporting environmental and social goals.	Taxonomy under development; application varied.
Menicucci & Paolucci (2022)	To study board diversity and ESG performance in Italian banks.	Quantitative; board characteristics vs. ESG score analysis.	Board diversity theory; ESG disclosure framework.	Gender and skill diversity are positively related to ESG scores.	Limited to Italy; time span narrow.
Fernandez-Vazquez et al. (2019)	To map blockchain applications in FinTech and their	Systematic mapping study.	Blockchain innovation theory.	Blockchain holds high potential in	Exploratory; empirical studies

| sustainability relevance. | ESG traceability, but adoption lags. | on banking impact missing. |