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GREEN FINANCE AND SUSTAINABLE ECONOMIC DEVELOPMENT IN EMERGING ECONOMIES: EVIDENCE, MECHANISMS, AND POLICY CONDITIONS

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Abstract

Green finance has evolved from a relatively specialised segment of sustainable investment into a broader component of financial and development policy. It encompasses green bonds, green credit, sustainable investment, climate-risk management, renewable-energy finance, development finance, sustainability-oriented financial innovation, and mechanisms through which environmental information is incorporated into financial decisions. This article provides an expanded structured synthesis of evidence on the relationship between green finance and sustainable economic development, with particular attention to emerging economies. The analysis brings together financial-market evidence on green-bond pricing, ownership, investor preferences, and issuer behaviour with recent evidence on resource efficiency, green economic growth, technological innovation, energy transition, environmental sustainability, digital finance, and inclusive green growth [1–20]. The evidence suggests that green finance can influence sustainable development through a sequence of interconnected channels: environmental preferences and information shape investor demand; financial instruments influence the cost, availability, and allocation of capital; financing affects firm investment, technological innovation, renewable-energy deployment, and resource efficiency; and these changes can ultimately contribute to environmental and developmental outcomes. However, the evidence does not support the proposition that simply increasing the volume of labelled green finance automatically produces superior environmental or economic outcomes. Effectiveness depends on credible taxonomies, disclosure and verification, institutional quality, financial-market depth, technological capacity, project additionality, and access to finance. The article therefore develops a conditional transmission framework that distinguishes financial mobilisation from genuine real-economy additionality. It also highlights the particular challenges faced by emerging economies, including shallow capital

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markets, financing constraints, policy fragmentation, weak implementation capacity, and limited access for small and medium-sized enterprises. The paper concludes that green finance should be understood as a transmission mechanism within a broader financial-system and development strategy rather than as an end in itself. The evidence base is structured rather than formally systematic, and the article does not claim exhaustive coverage or a new causal estimate.

1. INTRODUCTION

Financial systems play a central role in economic development because they mobilise savings, allocate capital, price risk, provide liquidity, and influence the sectors and activities that receive long-term investment. The transition toward environmentally sustainable development introduces an additional dimension to this allocation process. Economies must finance renewable-energy generation, energy efficiency, low-carbon transport, resilient infrastructure, cleaner industrial production, sustainable agriculture, and technological transformation while simultaneously maintaining employment, productivity, financial stability, and inclusive economic growth. Green finance emerges within this context as an approach to financial intermediation that incorporates environmental objectives and climate-related information into decisions concerning capital allocation and risk management [13,16].

The concept is considerably broader than the issuance of green bonds. Green finance includes green lending and credit allocation, sustainable investment strategies, climate-oriented development finance, sustainability-linked instruments, renewable-energy financing, environmental-risk assessment, and financial practices that incorporate information about climate and environmental performance. Green bonds nevertheless remain an important instrument because their use-of-proceeds structure can create a relatively visible connection between financial resources and designated environmental projects. The financial literature, however, indicates that the value associated with a green label is neither uniform nor automatic. Pricing effects differ across issuers and markets, and verification and issuer characteristics can affect investor responses [1–7].

The question is especially significant for emerging economies. These economies frequently face substantial infrastructure and development financing needs at the same time that they confront environmental pressures, energy insecurity, climate vulnerability, foreign-exchange constraints, limited fiscal space, and comparatively shallow domestic capital markets. Recent evidence also identifies financing barriers for small enterprises, fragmented policy environments, limited private-sector participation, and institutional weaknesses as obstacles to the effective expansion of green finance [17]. Consequently, the policy challenge is not simply to increase the supply of capital labelled as green. It is to establish financial and institutional conditions under which that capital reaches productive investments that would otherwise remain underfunded and produces measurable environmental and developmental benefits.

The empirical literature has expanded substantially beyond the initial focus on green-bond markets. Recent research examines the relationships between green finance and resource efficiency, green economic growth, environmental sustainability, green technological innovation, low-carbon energy transition, digital inclusive finance, and inclusive green growth [10,14–20]. These studies provide important evidence, but they do not always point to identical conclusions. Differences in country characteristics, institutional quality, financial development, income levels, technological readiness, and the type of investment being financed can change the magnitude and even the direction of observed relationships [14–16,19].

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Against this background, the present article has four objectives. First, it synthesises the financial-market evidence concerning green financial instruments, particularly green bonds and sustainable investment. Second, it examines recent evidence connecting green finance with growth, innovation, energy transition, resource efficiency, and environmental outcomes. Third, it identifies the institutional and market conditions that help explain heterogeneity across emerging economies. Fourth, it develops a policy-oriented framework that distinguishes financial expansion from real-economy additionality. The article's contribution is therefore primarily analytical and synthetic: it connects evidence that is often examined in separate literatures and shows how financial-market mechanisms may transmit into firm-level, environmental, and broader development outcomes.

2. Evidence Base and Review Approach

This study adopts a structured literature-synthesis approach. The evidence base consists of the foundational studies retained in the manuscript together with recent literature from 2023–2026 supplied for the present revision, including peer-reviewed journal research and the 2026 Springer volume on green financing in emerging economies [1–20]. The sources were retained because they directly address one or more dimensions of green finance relevant to the research objectives: green bonds and green credit; sustainable investment and asset pricing; climate-related financial risk; green technological innovation; resource efficiency and green growth; renewable-energy finance; environmental outcomes; digital or inclusive green finance; and institutional conditions affecting effectiveness.

The approach deliberately retains influential earlier contributions where they establish mechanisms that remain important to the current debate. A focus on recent publication dates alone would risk excluding studies that provide the theoretical and empirical foundations for understanding green-bond pricing, investor preferences, ownership, and issuer behaviour [1–9,11–13]. Recent studies are therefore used to extend and contextualise the foundational evidence rather than to replace it solely on the basis of publication year.

The review should not be interpreted as a formal PRISMA systematic review or statistical meta-analysis. The manuscript does not invent database-search counts, duplicate-removal totals, screening ratios, or risk-of-bias scores. Such claims would require a documented and reproducible search protocol, complete search strings, predefined eligibility criteria, and a formal screening process. The present design is more appropriately described as a structured evidence synthesis. This distinction is important because it places appropriate limits on the scope of the conclusions: the article identifies consistent mechanisms and patterns in the selected evidence but does not claim exhaustive coverage of every study published through 2026.

For analytical purposes, the selected literature is organised around four stages of transmission. The first stage concerns financial-market preferences and information. The second concerns financial allocation, pricing, ownership, and financing constraints. The third concerns firm and project responses, including investment, innovation, renewable-energy deployment, and resource efficiency. The fourth concerns environmental and developmental outcomes, such as emissions reduction, green growth, productivity, resilience, and inclusion. Institutional quality, disclosure, verification, market depth, policy coherence, and access to finance are treated as conditioning factors that can strengthen or weaken the transmission process.

3. Conceptual and Analytical Framework

A central proposition of this article is that green finance should be analysed as a transmission mechanism rather than as a final development outcome. The existence of a green financial product does not by itself establish that additional environmental investment has occurred. A larger volume of labelled securities may represent genuine new investment, refinancing of existing

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activities, portfolio reclassification, or combinations of these processes. Accordingly, the analytical framework distinguishes between financial mobilisation, financial-market effects, real-economy investment, and measurable sustainability outcomes.

The first stage begins with environmental preferences, information, regulation, and certification. Investors may value environmental characteristics and may respond to credible information concerning the environmental performance of assets. The sustainable-investment literature provides a theoretical basis for understanding how such preferences can affect equilibrium prices, expected returns, and demand for green assets [8,9]. In practice, however, preferences can influence capital allocation only when investors can identify credible environmental characteristics. Disclosure, taxonomies, verification, and comparable information are therefore integral components of the financial mechanism rather than peripheral administrative requirements [5,7,13,17].

The second stage concerns the allocation and conditions of finance. Green bonds, green credit, and other sustainable instruments may influence financing costs, ownership patterns, investor demand, and access to capital. Evidence from green-bond markets shows that a green characteristic can matter financially, but the magnitude of the effect is heterogeneous [1–7,11,12]. This finding cautions against treating the existence of a greenium or any observed pricing differential as a universal law.

The third stage is the investment and innovation response. Once capital reaches firms and projects, it can support renewable-energy capacity, energy efficiency, cleaner production, research and development, and green technological innovation. Recent evidence links green finance to resource efficiency, green growth, green innovation, and low-carbon transition, although these relationships remain conditional on institutional and technological conditions [10,14,15,18,20].

The fourth stage concerns real-economy outcomes. If financed projects are additional and productive, they may contribute to lower emissions, greater resource efficiency, improved productivity, energy transition, resilience, and broader sustainable development [10,14–16,19,20].

Institutional filters operate across every stage of this chain. Taxonomies determine what qualifies as green; disclosure affects information quality; third-party verification can affect credibility; financial-market depth determines which firms can access capital-market instruments; banking structures influence the importance of green credit; and institutional quality shapes implementation and enforcement. The emerging-economy literature therefore supports a conditional interpretation in which financial instruments are embedded within broader institutional systems [14,15,17–20].

Transmission stage	Key mechanism	Potential outcome	Important conditioning factors
1. Preferences and information	Environmental preferences, disclosure, certification and investor information influence demand	Changes in demand for sustainable assets and financial-market behaviour	Information quality, verification, taxonomy credibility
2. Financial allocation	Green bonds, green credit and sustainable investment affect financing conditions and capital allocation	Changes in pricing, ownership, credit availability and financing constraints	Market depth, issuer quality, banking structure

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3. Firm/project response	Finance supports investment, innovation, renewable energy and resource efficiency	Higher green investment and technological transformation	Project quality, technology, regulation, access to finance
4. Environmental/development outcome	Investment changes production, energy use and resource allocation	Emissions reduction, green growth, productivity, resilience and inclusion	Institutional quality, implementation capacity, additionality

4. Green Bonds: Pricing, Ownership, and Issuer Effects

Green bonds provide one of the clearest settings in which the interaction between environmental objectives and financial markets can be examined. Their defining feature is generally the designation of proceeds toward eligible environmental or climate-related activities. This structure potentially allows investors to align financial portfolios with environmental preferences while enabling issuers to communicate a specific use of proceeds. Corporate evidence indicates that green-bond issuance can be associated with changes in issuer behaviour and investment, suggesting that the instrument may influence corporate decisions rather than merely changing the label attached to existing financing [1].

The shareholder dimension adds another layer to the analysis. Evidence indicates that green-bond issuance can generate market attention and shareholder responses, although the magnitude of these responses varies across firms and market conditions [2]. This heterogeneity is important because it demonstrates that financial-market reactions are shaped by the characteristics of the issuer, the credibility of the environmental commitment, and the information available to investors.

Pricing evidence is more nuanced. Some research finds evidence consistent with investors accepting lower yields on particular green bonds, which is often described as a green premium or greenium [3]. Other matched-security evidence finds only a small pricing differential between green and conventional bonds [6]. A systematic review likewise concludes that the evidence for a persistent and universal green premium is mixed [7]. Research examining issuer characteristics and third-party verification further indicates that the observed pricing relationship depends partly on credibility and institutional arrangements [5].

These findings have two implications. First, the green label can possess financial value because environmental preferences can affect demand. Second, the value of the label is conditional. A credible label supported by transparent disclosure and independent verification may carry greater informational value than an unsupported designation. Consequently, policymakers should avoid building green-finance strategies around the assumption that all green bonds will automatically reduce borrowing costs. The more defensible objective is to create market conditions in which credible environmental characteristics can be priced efficiently and where financial incentives are connected to genuine environmental performance [3,5–7,11,12].

Evidence dimension	Evidence-supported conclusion	Policy significance
Issuer behaviour	Green issuance is associated with observable issuer and investment effects [1].	Green bonds can influence corporate behaviour when financing is linked to credible environmental objectives.

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Shareholder response	Issuance can generate market attention and shareholder effects, with heterogeneous magnitudes [2].	Investor communication and credibility can affect the market consequences of issuance.
Pricing	Evidence of a green premium exists in some settings but is not universal [3,6,7].	Policies should not assume that green status automatically produces cheaper finance.
Verification	Issuer characteristics and third-party verification affect credibility and pricing [5].	Verification and disclosure are central components of market integrity.
Ownership and label value	Environmental characteristics can influence ownership and pricing in some markets [11,12].	Market structure and investor composition should be considered when designing policy.

5. Sustainable Investment and Asset Pricing

The sustainable-investment literature provides an important theoretical bridge between environmental objectives and financial-market behaviour. When investors derive utility from environmental outcomes or prefer assets with stronger environmental characteristics, those preferences can become relevant to equilibrium prices and expected returns [8,9]. The financial implication is that environmental characteristics may enter asset valuation even when they are not captured fully by conventional financial statements.

For emerging economies, however, the transmission of environmental preferences into capital allocation depends heavily on information credibility. Investors require reliable and comparable information to distinguish firms and projects that deliver genuine environmental benefits from those that simply use sustainability-oriented labels. Where disclosure is weak or environmental standards are inconsistent, information asymmetry can reduce the effectiveness of investor preferences. Green finance therefore requires a supporting information architecture comprising credible taxonomies, transparent reporting, verification mechanisms, and consistent definitions [5,7,13,17].

This also highlights a broader point about sustainable investment. Financial preferences alone cannot finance a transition if the underlying supply of investable green projects is weak. Effective green financial systems require both demand-side willingness to hold sustainable assets and supply-side capacity to generate credible, bankable, environmentally beneficial projects. This interaction between investor preferences, financial infrastructure, and real-economy project quality is particularly important in emerging economies, where capital markets may be less developed and the pipeline of finance-ready projects may be constrained by technical, regulatory, or institutional barriers.

6. Recent Evidence on Growth, Innovation, Energy Transition, and Environmental Outcomes

Recent research substantially broadens the green-finance literature beyond the pricing of labelled securities. Evidence on resource efficiency and green economic growth examines whether financial resources directed toward environmental objectives are associated with more efficient use of resources and broader growth outcomes [10]. This strand is important because sustainable development requires more than emissions reduction: economies must also improve

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productivity and resource use while maintaining economic activity.

Evidence from emerging Asian economies examines the interaction among green finance, low-carbon energy transition, economic growth, and environmental investment [14]. This literature suggests that financial policy and energy-sector transformation should be considered jointly. Financing can support the expansion of cleaner energy, but the effectiveness of that financing depends on complementary conditions such as energy infrastructure, regulatory stability, technology, and the capacity of firms and public institutions to implement projects.

Green technological innovation represents another important transmission channel. Evidence from developing economies examines the relationships among green finance, green technological innovation, and institutional quality, highlighting the role of institutional conditions in determining environmental outcomes [15]. Recent evidence also links green-bond issuance with corporate green technological innovation [18,20]. These findings shift attention from the quantity of financing to the technological direction of investment. If green finance helps firms undertake research, adopt cleaner technologies, or overcome financing constraints associated with long-term innovation, its developmental contribution can extend beyond the immediate environmental project financed.

Digital finance introduces an additional mechanism. Research on green and digital inclusive finance considers whether digital financial infrastructure can improve access to finance and contribute to sustainable economic development [16]. Evidence concerning FinTech and green economic recovery in South Asian economies similarly points toward the potential importance of digital channels in expanding the reach of green financial opportunities [19]. Digitalisation should not be treated as a substitute for sound financial regulation, but it may reduce transaction costs, improve access to information, and connect smaller firms and households to financial services that would otherwise be difficult to obtain.

Environmental outcomes remain heterogeneous. Recent evidence indicates that green finance can be associated with cleaner production and lower environmental pressure, but the magnitude of these effects varies with financial development, income, technology, and institutional quality [14–16,19,20]. This heterogeneity is not necessarily a weakness of the literature. Rather, it reinforces the proposition that green finance operates within an economic and institutional system. A financial instrument can be available without being equally accessible, and financing can be mobilised without necessarily generating additional investment. Evaluation must therefore move beyond aggregate financial volumes toward project-level and real-economy outcomes.

Evidence area	Main finding from selected literature	Interpretation
Resource efficiency and green growth	Green finance is associated with dynamic relationships involving resource efficiency and green economic growth [10].	Finance can influence development through efficiency as well as environmental channels.
Energy transition	Evidence examines green finance alongside low-carbon energy transition and environmental investment in emerging Asia [14].	Financial policy should be coordinated with energy-sector policy.

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Green technological innovation	Green finance and institutional quality are examined as factors associated with environmental sustainability and innovation [15].	Institutions condition the effectiveness of financial mechanisms.
Digital inclusive finance	Green and digital inclusive finance are examined in relation to sustainable economic development [16].	Digital access may strengthen the transmission of green finance to underserved participants.
Corporate green innovation	Recent evidence examines whether green-bond issuance promotes enterprise and corporate green technological innovation [18,20].	Capital-market instruments can affect the technological direction of corporate investment.
Inclusive green growth	Quasi-natural-experiment evidence examines green-finance policy and inclusive green growth [19].	Policy design may have distributional as well as aggregate developmental effects.

7. Financial Regulation, Banking, and Climate-Related Financial Risk

Green finance is not solely an opportunity for investment; it is also connected to financial risk. Climate-related risks can affect the value of assets, the quality of collateral, borrowers' repayment capacity, and the stability of financial institutions. Physical risks arise from climate-related events and environmental degradation, while transition risks can emerge when changes in policy, technology, consumer preferences, or market conditions reduce the value of carbon-intensive activities. Sustainable-finance frameworks therefore increasingly treat environmental information as relevant to risk management as well as to investment allocation [13].

The banking system is particularly important in emerging economies because bank-based finance can be more significant than deep corporate bond markets. A strategy centred exclusively on green-bond issuance may therefore reach only a relatively narrow group of large firms and projects. Green credit, climate-risk assessment, supervisory expectations, development-finance institutions, credit enhancement, and risk-sharing mechanisms may be equally important for broadening access to sustainable finance [13,17].

The institutional dimension is again critical. Evidence on emerging economies identifies fragmented policies, financing barriers, limited private-sector participation, and the need for coordinated policy and financial innovation [17]. These constraints can prevent capital from reaching productive green investments even when the overall supply of sustainable capital is increasing. Effective regulation should therefore combine market development with prudential oversight, credible disclosure, appropriate classification standards, and mechanisms that reduce unnecessary barriers to entry for viable projects.

A balanced regulatory approach is necessary. Overly weak standards may facilitate greenwashing and undermine market confidence, whereas overly complex requirements may increase compliance costs and exclude smaller firms. Regulation should therefore aim for proportionality: standards must be sufficiently robust to protect market integrity while being implementable by firms with different levels of financial and technical capacity. This is particularly important in emerging economies,

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where administrative and institutional resources may be constrained.

8. Renewable-Energy Finance and Long-Term Investment

Renewable-energy projects frequently involve high upfront capital requirements, long project horizons, and revenue streams that depend on regulatory and market conditions. These characteristics make access to long-term finance particularly important. Earlier evidence concerning renewable-energy bond financing in Asia identifies debt markets as one mechanism through which long-term resources can be mobilised [13]. More recent evidence linking green finance with low-carbon energy transition and environmental investment in emerging Asia reinforces the importance of integrating finance and energy policy [14].

Finance, however, cannot substitute for sound energy-sector fundamentals. Grid capacity, transmission infrastructure, project preparation, technology costs, regulatory stability, foreign-exchange exposure, tariff structures, and the credibility of public policy all influence whether financing becomes productive investment. A green-finance instrument may lower a financing barrier, but it cannot by itself resolve weak project design or inadequate infrastructure. For this reason, public policy should focus on creating a pipeline of credible, bankable projects while using financial instruments to mobilise additional private capital.

Risk-sharing mechanisms may be particularly valuable where investors face risks that are difficult to diversify domestically. Development-finance institutions can potentially support project preparation, credit enhancement, and longer maturities. Such interventions should be designed carefully so that public resources catalyse additional private investment rather than simply replacing financing that would have occurred without policy support. The concept of additionality is therefore relevant not only to environmental outcomes but also to the design of public financial interventions.

9. SMEs, Inclusion, and Access to Green Finance

A persistent concern in the green-finance literature is the concentration of attention on large corporations and financially developed markets. The 2026 Springer volume identifies comparatively limited SME-focused evidence in Africa and Latin America and highlights barriers including collateral requirements, limited financial literacy, fragmented policy, and institutional constraints [17]. These barriers matter because small and medium-sized enterprises constitute a substantial part of economic activity in many emerging economies, yet may have limited capacity to meet the technical and reporting requirements associated with specialised green financial products.

A green-finance market can therefore expand while remaining highly concentrated. If eligibility standards, certification costs, reporting requirements, and minimum issuance sizes are designed primarily for large firms, smaller businesses may be excluded even when they undertake environmentally beneficial activities. A more inclusive approach should maintain credible environmental standards while using proportional requirements, credit support, technical assistance, and digital financial channels to reduce avoidable barriers [16,17].

Inclusion also has a broader distributional dimension. The emerging literature on inclusive green growth suggests that the developmental effects of green-finance policy may vary across income groups and institutional environments [19]. The assessment of green finance should consequently consider not only the aggregate amount of capital mobilised or the aggregate environmental effect but also who obtains access to financing, technology, productive employment, energy services, and climate resilience. This perspective is particularly important because the transition to a greener economy can generate both opportunities and adjustment costs across firms, workers, regions, and households.

The principle of proportionality provides a useful policy direction. Smaller firms should not be exempted from environmental standards, because

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weak standards would reduce credibility and increase greenwashing risks. However, compliance systems should recognise differences in size, capacity, and risk. Simplified reporting templates, pooled financing structures, technical assistance, digital reporting tools, and targeted credit mechanisms can potentially improve participation without weakening environmental integrity [16,17].

Policy problem	Recommended response	Evidence basis
Weak environmental definitions	Develop credible taxonomies, clear eligibility criteria, and consistent classification standards.	[5,7,13,17]
Information asymmetry and greenwashing risk	Strengthen disclosure, independent verification, environmental reporting, and comparability.	[5,7,13,17]
Uncertain green-bond pricing effects	Avoid assuming a universal greenium; improve transparency and market comparability.	[3,6,7,11,12]
Climate-related financial risk	Integrate physical and transition risks into financial supervision and risk management.	[13]
Shallow capital markets	Develop domestic green-debt markets alongside broader financial-market infrastructure.	[4,13,17]
High upfront renewable-energy costs	Use long-term finance and appropriately designed risk-sharing and project-preparation mechanisms.	[14,17]
SME exclusion	Use proportionate disclosure, credit support, digital finance, and technical assistance.	[16,17]
Weak institutional capacity	Coordinate financial, environmental, energy, and development policies and strengthen implementation institutions.	[15,17,19]
Weak project pipeline	Improve project preparation, feasibility assessment, technical assistance, and investment readiness.	[13,14,17]
Limited monitoring of real outcomes	Track investment additionality, innovation, environmental performance, and distributional outcomes rather than finance volume alone.	[3,6,7,10,19]

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10. Institutional Quality and Policy Coherence

Institutional quality is one of the most important conditions determining whether green finance translates into sustainable development. Financial instruments operate within legal, regulatory, administrative, and political environments. Where institutions are capable of defining standards, monitoring compliance, enforcing contracts, coordinating policy, and producing reliable information, financial resources are more likely to be directed toward credible projects. Conversely, fragmented policies and weak implementation can weaken the connection between financial mobilisation and real investment [15,17].

Policy coherence is particularly important because green finance sits at the intersection of several policy domains. Financial regulators influence disclosure and risk management; environmental authorities define environmental objectives; energy agencies determine the regulatory environment for renewable investment; development institutions support infrastructure and project preparation; and fiscal authorities shape incentives and public investment. If these institutions pursue inconsistent objectives, financial-market development may not translate into a coherent transition strategy.

A coherent policy architecture should therefore align financial classification, environmental standards, energy-transition priorities, and development objectives. It should also define responsibilities for monitoring and enforcement. This does not require every institution to perform the same role. Rather, it requires a clear division of responsibilities and information-sharing arrangements so that financial incentives support, rather than undermine, broader environmental and development policy.

11. Research Gap and Contribution

The literature has expanded rapidly, but several important gaps remain. The first is fragmentation. Financial-market studies often focus on bond pricing, investor behaviour, or ownership, while firm-level studies examine innovation and investment, environmental-economics research considers emissions and sustainability, and development-finance research examines access and growth. Because these literatures use different outcomes and levels of analysis, the complete transmission mechanism is not always visible within individual studies.

The second gap concerns geographical representation. The recent emerging-economy literature remains unevenly distributed, with substantial attention directed toward China and other Asian economies and comparatively less evidence from Africa and Latin America, particularly regarding SMEs [17]. This limits the extent to which results from deeper and more developed financial systems can be generalised to economies with different institutional structures and capital-market conditions.

The third gap concerns the distinction between financial expansion and real-economy additionality. An increase in labelled green finance is an important intermediate indicator, but it does not establish that additional environmental investment has occurred. The pricing literature demonstrates why this distinction matters: a green label can influence financial-market behaviour without, by itself, proving that new environmental activity has been created [3,6,7]. Future empirical work should therefore trace financing from issuance or lending through investment and project implementation to measurable environmental outcomes.

The fourth gap concerns distributional effects. A green-finance strategy can generate aggregate environmental benefits while leaving smaller firms, lower-income households, or less-developed regions with limited access to capital and technology. Recent work on inclusive green growth and digital inclusive finance begins to address this issue [16,19], but further evidence is needed to determine how financial-system design affects who benefits from the transition.

This article contributes by integrating these strands into a single conditional framework. It distinguishes four stages—financial preferences and information, financial allocation, investment

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and innovation, and environmental/development outcomes—while treating institutions, market depth, information quality, technology, and inclusion as conditioning factors. The contribution is therefore conceptual and synthetic rather than a claim of a new causal estimate.

12. Discussion

The combined evidence supports a conditional theory of green finance. At the market level, environmental preferences and information can affect demand, pricing, and ownership [3,8,9,11,12]. At the firm level, green finance can influence financing constraints, investment, and technological innovation [1,10,18,20]. At the macro-development level, green finance can contribute to green growth, resource efficiency, energy transition, and environmental improvement, but the magnitude of these effects varies with financial development, institutional quality, income level, and technological capacity [14–16,19].

This conditionality helps explain why apparently different findings can coexist. A green-bond study may identify a small or temporary pricing differential, whereas a firm-level study may identify stronger effects on innovation. These results address different stages of the transmission process and should not be interpreted as contradictory estimates of a single underlying effect. Similarly, a policy may increase green lending without producing proportionate environmental gains if financed projects are not additional, if implementation is weak, or if environmental standards are poorly monitored.

The evidence suggests that green-finance evaluation should follow a hierarchy of indicators. The first level is financial mobilisation: how much capital is raised or allocated. The second concerns financing conditions, such as access, maturity, pricing, and risk allocation. The third concerns additional investment and project implementation. The fourth concerns technological change and resource efficiency. The fifth concerns environmental outcomes. The sixth concerns broader developmental and distributional outcomes. As evaluation moves further along this chain, stronger evidence is required because the distance between a financial product and a final development outcome becomes greater.

This hierarchy also improves policy accountability. Reporting only the volume of green bonds issued can create incentives to maximise labelled financing without demonstrating corresponding environmental benefits. A more comprehensive framework would require financial institutions and policymakers to report, where feasible, the destination of capital, the additionality of financed projects, implementation status, technological outcomes, environmental performance, and access across different categories of firms and beneficiaries. Such an approach would make green finance more closely connected to measurable development objectives.

A further implication is that financial-system development and environmental policy should be treated as complementary rather than separate agendas. Deepening domestic capital markets can expand the investor base, while strong environmental standards improve the credibility of sustainable assets. Digital financial infrastructure can improve access, while prudential supervision can protect financial stability. Development-finance institutions can help overcome project-preparation and risk constraints, while private capital can provide scale. The effectiveness of green finance therefore depends on coordination across these components rather than on any single instrument.

13. Policy Implications for Emerging Economies

The evidence suggests several policy priorities for emerging economies. First, governments and financial regulators should establish credible definitions of green economic activities. Taxonomies and eligibility criteria reduce uncertainty and help investors compare assets. They also provide a foundation for disclosure and supervision [5,7,13,17].

Second, disclosure and verification should be strengthened. Because information asymmetry can

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weaken the value of environmental preferences, transparent reporting and credible verification are central to market integrity. The objective should not be to create unnecessary administrative burdens, but to ensure that environmental claims are sufficiently reliable to support informed investment decisions [5,7].

Third, policy should support a diversified green-finance ecosystem. Green bonds are important, but emerging economies may obtain broader benefits from combining bond markets with green bank lending, development finance, credit guarantees, project-preparation facilities, and other mechanisms suited to local financial structures [13,17].

Fourth, green-finance policy should be integrated with energy and industrial policy. Renewable-energy financing is more effective when supported by reliable infrastructure, predictable regulation, and a credible pipeline of bankable projects [14]. Financial policy should therefore be embedded within a wider strategy for energy transition and technological upgrading.

Fifth, governments should address SME access. Smaller firms may face constraints in collateral, technical capacity, reporting, and financial literacy [17]. Proportional disclosure, digital finance, targeted credit, technical assistance, and pooled financing mechanisms can improve access while preserving environmental standards [16,17].

Sixth, climate-related financial risks should be incorporated into financial supervision. Physical and transition risks can affect asset quality and financial stability, meaning that climate considerations are relevant not only to sustainable investment but also to prudential risk management [13].

Finally, policy evaluation should prioritise additionality and outcomes. Green-finance targets should not be limited to the amount of capital labelled green. Policymakers should also monitor whether financing supports new or expanded sustainable investment, whether it reaches underserved firms and sectors, whether it contributes to innovation and energy transition, and whether environmental outcomes are measurable. This approach would reduce the risk that market expansion becomes an end in itself.

14. Limitations and Future Research

This article has several limitations. First, it is a structured evidence synthesis rather than a formal systematic review or statistical meta-analysis. Although the reference base has been expanded with recent 2023–2026 material, it remains selective rather than exhaustive. A formal systematic review would require a reproducible database-search protocol, complete search strings, predefined eligibility criteria, duplicate removal, screening records, and quality appraisal.

Second, the geographical distribution of evidence remains uneven. Several recent studies focus on China and Asian economies, while the 2026 emerging-economy synthesis emphasises the relative scarcity of SME-focused research in Africa and Latin America [17]. Future research should therefore expand country-specific evidence from South Asia, Sub-Saharan Africa, Latin America, and other emerging markets. Comparative research would be especially valuable because institutional differences can alter the effectiveness of otherwise similar financial instruments.

Third, future studies should distinguish carefully between labelled finance, additional investment, and measurable environmental outcomes. Firm-level causal designs, project-level data, matched financing records, longer panels, and credible policy experiments could help determine whether green finance changes investment behaviour rather than simply changing the classification of existing investment. Such research would strengthen the evidence on additionality, which remains central to the policy debate.

Fourth, more evidence is required on distributional consequences. Green finance may generate productivity and environmental gains while producing unequal access to capital and technology. Future research should therefore examine employment, income distribution, SME access, gender and regional inclusion, energy affordability, and the distribution of transition

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costs alongside conventional financial and environmental indicators [16,17,19].

Finally, future research should investigate how digitalisation interacts with green finance. Digital platforms may reduce information and transaction costs, but they can also introduce new forms of exclusion, data risk, and regulatory complexity. Understanding when digital finance strengthens the reach and effectiveness of green finance would be particularly relevant for emerging economies where traditional financial infrastructure is unevenly developed.

15. Conclusion

Green finance has become an increasingly important component of the debate over how financial systems can support sustainable economic development. The evidence reviewed in this article indicates that green finance can operate through several interconnected mechanisms. Environmental preferences and information can influence financial-market behaviour; green financial instruments can affect financing conditions and capital allocation; finance can support investment, green technological innovation, renewable-energy deployment, and resource efficiency; and these changes can contribute to environmental and developmental outcomes [1–20].

At the same time, the evidence does not support a simple proposition that green finance automatically produces cheaper capital, greater investment, or superior environmental outcomes. The effects of green financial instruments are heterogeneous, and their effectiveness depends on credible standards, information quality, verification, financial-market depth, institutional capacity, technological readiness, project quality, and the additionality of financed investment [3,5–7,14–17].

For emerging economies, the central policy challenge is therefore to build financial systems that connect sustainable capital with productive real-economy investment. This requires credible taxonomies and disclosure, effective verification, climate-risk supervision, domestic market development, long-term renewable-energy finance, green credit, digital financial access, SME-oriented mechanisms, and coordinated environmental and development policy [13–17]. The objective should not simply be to expand the volume of labelled green finance, but to improve the quality, reach, credibility, and measurable impact of sustainable investment.

The central conclusion of this article is that green finance is best understood as a transmission mechanism rather than an end in itself. Its developmental value depends on whether financial resources are converted into additional, productive, measurable, and broadly accessible sustainable investment. This interpretation provides a more rigorous basis for evaluating green-finance policies and highlights the importance of institutional and market conditions in determining whether financial innovation can contribute meaningfully to sustainable economic development in emerging economies.

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