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Climate Risk, Financial Stability, and Green Investment in Emerging Markets: Evidence, Mechanisms, and Policy Imperatives

Abstract

The growing materialization of climate-related financial risks has placed emerging market economies in an increasingly precarious position, caught between the imperatives of sustainable development and the structural vulnerabilities inherent in their financial systems. This article offers a comprehensive, evidence-based synthesis of recent Scopus-indexed research spanning the period 2010–2026, examining how physical and transition climate risks destabilize banking systems, equity markets, and shadow financial intermediaries in developing economies. The paper evaluates the mitigating capacity of macroprudential policy frameworks and green finance instruments—principally green bonds and ESG (Environmental, Social, and Governance) assets—while systematically mapping the institutional and regulatory barriers that constrain the broader adoption of sustainable finance. A distinguishing feature of this synthesis is its integration of the education–technology–economy nexus (Mammadov et al., 2026) and geopolitical risk–green finance interactions (Dilanchiev et al., 2023) as foundational preconditions for effective sustainable investment. Seven testable research hypotheses are advanced and evaluated through the synthesized evidence. The findings carry substantive implications for financial regulators, central banks, government policymakers, and the international development community.

Keywords: *climate risk, financial stability, green investment, green bonds, ESG performance, macroprudential policy, emerging markets, education–technology nexus, sustainable finance*

Introduction

The past decade has witnessed a fundamental reorientation in how economists, financial regulators, and policymakers understand the relationship between environmental change and systemic financial risk. Climate change is no longer treated as an externality remote from the concerns of finance; it has become a first-order determinant of credit quality, asset valuations, liquidity conditions, and macroprudential stability.

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This transformation is especially consequential for emerging market economies, which face a distinctive combination of exposures: high physical climate vulnerability, limited institutional capacity to absorb transition shocks, structural dependence on carbon-intensive industries, and financial systems that remain shallow relative to the scale of investment required for a sustainable transition.

The convergence of these vulnerabilities has been compounded by rapid urbanization, the digitalization of financial services, and mounting fiscal pressures—particularly in the aftermath of the COVID-19 pandemic, which simultaneously depleted sovereign fiscal space and accelerated awareness of systemic risk. The growing body of empirical literature emerging in the post-Paris Accord period has begun to map these linkages with increasing precision, yet the field remains fragmented across disciplines and geographies, and comprehensive syntheses that bridge macroprudential finance, green investment theory, and development economics are comparatively rare.

Research

This article responds to that gap by drawing exclusively on Scopus-indexed empirical research published between 2010 and 2026. The synthesis spans three interlocking domains: the destabilizing effects of climate risk on emerging market financial systems; the role of macroprudential policies and green investments in mitigating these effects; and the institutional, regulatory, and human capital barriers that condition the effectiveness of sustainable finance interventions. The paper further integrates recent work on the education–technology–economy nexus (Mammadov et al., 2026) and on geopolitical risk and green finance interactions (Dilanchiev et al., 2023)—contributions that speak to foundational preconditions for effective green finance adoption that are often neglected in the mainstream finance literature.

The paper proceeds as follows. Section 2 presents the theoretical background and advances seven research hypotheses. Section 3 reviews empirical evidence on climate risk and financial stability. Section 4 examines green investment as a mechanism for climate risk mitigation. Section 5 addresses the financial stability implications of green finance. Section 6 explores the human capital and technological preconditions for sustainable finance. Section 7 identifies research gaps. Section 8 presents policy implications, and Section 9 concludes.

2. Theoretical Background and Research Hypotheses

2.1 Conceptual Framework

The analytical framework adopted in this paper rests on three foundational concepts. Climate risk denotes the financial and economic risks arising from climate change, encompassing physical risks (extreme weather, chronic temperature changes, sea-level rise) and transition risks (policy shifts, technological disruption, market repricing of carbon-intensive assets) (Shaik et al., 2026; Liu et al., 2024). Financial stability refers to the resilience of financial systems to withstand shocks while continuing to perform core intermediation functions (Varadi et al., 2026). Green investment denotes capital allocation to projects and assets that support environmental sustainability—renewable energy infrastructure, green bonds, and ESG-screened portfolios (Rabbani et al., 2025).

The transmission channels between these concepts are multiple and interacting. Physical climate shocks impair collateral values, increase default probabilities among exposed borrowers, and generate correlated losses across financial portfolios. Transition risks introduce uncertainty about future carbon costs and regulatory environments, affecting asset pricing and investment horizons. Green finance instruments, by redirecting capital toward lower-risk, climate-resilient activities, can interrupt these transmission channels—but their effectiveness is conditioned by institutional quality, governance frameworks, and the human capital endowments of the economies in question.

This last point connects the green finance literature to the development economics literature on education and technological capacity. Mammadov et al. (2026), examining the education–technology–economy nexus across developing countries, demonstrate that human capital and digital infrastructure are primary determinants of macroeconomic performance—a finding that implies important spillover effects on the institutional capacity required for sophisticated green finance

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market operation. Countries investing in their educational systems and digital transformation are, we argue, simultaneously building the analytical and regulatory infrastructure required to implement complex sustainable finance instruments effectively.

The geopolitical dimension adds a further layer of complexity. Dilanchiev et al. (2023) demonstrate that geopolitical risk significantly disrupts green finance flows and crowds out sustainable investment in natural resource-dependent economies—a finding with obvious relevance for the many emerging markets whose developmental trajectory remains anchored in fossil fuel extraction. The interaction between geopolitical risk, resource dependence, and green finance development represents an underexplored but policy-critical nexus that subsequent research must address.

2.2 Research Hypotheses

Drawing on the conceptual framework and the synthesized empirical literature, this paper advances seven testable hypotheses:

H1: *Physical and transition climate risks significantly increase banking instability—as measured by non-performing loan ratios, reduced Z-scores, and heightened credit risk—in emerging market economies, with effects intensifying in the post-Paris Accord period.*

This hypothesis draws on the theoretical prediction that climate shocks impair borrower creditworthiness through asset devaluation and income disruption, while transition risks introduce balance sheet uncertainty through stranded asset exposures. The empirical basis is provided by Syed (2026), Lang et al. (2023), and Ben-Ammar (2025).

H2: *Liquidity-based macroprudential instruments—specifically reserve requirements and currency controls—are more effective than capital-based tools in reducing bank risk under climate uncertainty in emerging market economies.*

The differential effectiveness of macroprudential tool categories has direct policy implications. Jeon et al. (2024) provide the primary empirical foundation for this hypothesis, with implications for supervisory toolkit design in emerging Asia and beyond.

H3: *Green finance development reduces the negative impact of climate risk on banking stability, with the moderating effect being stronger in countries with lower initial financial stability.*

This hypothesis formalizes the countercyclical stabilization function of green finance articulated by Nguyen (2025) and Jadoon et al. (2021). The conditional nature of the effect—stronger where financial systems are more fragile—implies that green finance is most impactful precisely where climate vulnerability is greatest.

H4: *Green bond issuance in Southeast Asian economies generates a significant positive effect on renewable energy consumption, with wind energy exhibiting the largest response relative to other renewable technologies.*

Drawing on panel evidence from Dong et al. (2023) and Tsipas et al. (2024), this hypothesis tests the specificity of green bond transmission mechanisms, distinguishing between energy technology categories. The expected differential response reflects differences in capital intensity, investment horizon, and regulatory maturity.

H5: *Firm-level ESG performance significantly buffers against the negative effects of climate policy uncertainty on corporate financial performance, with the protective effect mediated by reduced information asymmetry and improved investor confidence.*

This hypothesis integrates the ESG-performance and climate policy uncertainty strands of the literature. Brahim and Romdhane (2025) and Xu et al. (2024) provide evidence consistent with both the direct buffering effect and the information asymmetry mechanism.

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H6: *Green bonds provide significant hedging and safe-haven benefits for equity investors during acute financial crises, though the magnitude of these benefits diminishes during post-crisis normalization periods.*

The time-varying nature of green bond hedging properties, documented by Arif et al. (2022) and Ren et al. (2023), is important for understanding when climate-aligned portfolios genuinely reduce systemic risk versus when their benefits are more limited.

H7: *Countries with higher educational attainment and greater technological readiness exhibit stronger green finance market development, reflecting the complementarity between human capital, digital infrastructure, and sustainable investment capacity.*

This hypothesis extends Mammadov et al.'s (2026) finding—that education and technology jointly drive economic performance—into the sustainable finance domain. Countries that have built strong human capital and digital capacity are, we argue, better positioned to design, implement, and scale the institutional machinery required for effective green bond markets and ESG investment ecosystems. Dilanchiev et al.'s (2023) findings on geopolitical risk and green finance flows provide a complementary perspective on the structural preconditions for sustainable investment.

3. Climate Risk and Financial Stability in Emerging Markets

3.1 Banking Sector Vulnerabilities

The empirical literature on climate risk and banking stability has expanded rapidly since the Paris Accord, producing broadly consistent findings across diverse country contexts. Climate risk negatively affects bank soundness through multiple interrelated channels: non-performing loan ratios increase as borrowers in climate-exposed sectors face income disruptions; Z-scores decline as earnings volatility rises and capital buffers are eroded; and credit risk premiums widen as lenders price newly recognized exposures.

Syed (2026) provides a comprehensive pre- and post-Paris Accord comparison, documenting that banking regulation and supervisory quality significantly moderate the adverse effects of climate uncertainty on bank stability. This finding has a direct policy implication: the regulatory architecture constructed in response to the Paris Agreement has been effective in partially buffering financial systems against climate-related shocks, but further calibration is needed. Lang et al. (2023)—in a study that explicitly credits the role of Mirza and Umar in developing the emerging market banking-climate risk framework—demonstrate that both physical and transition risks exert meaningful pressure on bank liquidity, with smaller banks and institutions in low-income countries facing particularly acute challenges.

Ben-Ammar (2025) establishes that country-level institutional factors—governance quality, regulatory capacity, rule-of-law indicators—play a crucial moderating role, with stronger institutions enabling more effective absorption of climate shocks. Yu et al. (2025) decompose bank liquidity responses into precautionary hoarding and flight-to-safety components, finding that larger banks benefit disproportionately from the latter mechanism, effectively drawing liquidity away from smaller institutions during climate stress events—a redistributive dynamic that amplifies systemic vulnerability in banking systems with large institutional size disparities.

3.2 Capital Markets and Shadow Banking

Climate risk transmission extends well beyond the banking sector. In equity markets, Derbali (2026) documents that climate risk increases required returns and systematic risk (beta) in climate-sensitive industries, with fossil fuel-intensive firms exhibiting the sharpest vulnerability. The shadow banking sector presents an underexplored transmission channel: Lan et al. (2025) find that climate risk dampens shadow banking activities while simultaneously weakening corporate resilience and inducing capital structure adjustments, with implications for the significant portion of credit intermediation that occurs outside the supervised banking perimeter.

Geographically specific vulnerabilities are important. Prabheesh and Rasheed (2025) demonstrate that small island economies face unique fiscal and credit risk configurations during climate disasters,

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with sovereign creditworthiness becoming intimately linked to climate event frequency and severity. In Sub-Saharan Africa, Amo-Bediako et al. (2025) find more limited direct climate-banking linkages, attributing this partly to financial system shallowness—a finding that underscores the importance of developmental context in interpreting climate-financial research.

3.3 Physical Versus Transition Risks

Physical and transition risks operate through different channels and require distinct policy responses. Physical risk research has documented that temperature shocks increase stock market risk premiums in India (Srivastav and Kannadhasan, 2026) and Brazil (Barasal Morales et al., 2025), with firm-level innovation capacity providing partial mitigation. Akshaya and Gopalakrishna (2025) show that temperature anomalies amplify short-run equity volatility while precipitation anomalies have a stabilizing long-run effect—a temporal heterogeneity that carries implications for the appropriate horizon of climate risk assessment.

On the transition risk side, Usmani et al. (2026) establish that climate policy uncertainty elevates short-term market volatility and depresses equity returns, while generating strong positive spillovers to green asset markets. Kumari et al. (2024) document that climate agreements and environmental regulations produce negative abnormal returns in oil and gas sector stocks globally—a finding with direct relevance for fossil fuel-dependent sovereign wealth funds and pension systems in emerging economies. Agrawal et al. (2025) introduce a behavioral dimension, documenting that policy uncertainty alters investor cognition in ways that may amplify market overreaction beyond what fundamental risk assessments would justify.

3.4 Macroprudential Policy Responses

Jeon et al. (2024) find that liquidity-based macroprudential instruments outperform capital-based tools in emerging Asian economies under climate uncertainty, supporting Hypothesis 2. This finding suggests that existing macroprudential toolkits may require rebalancing toward liquidity instruments in climate-stressed environments. Bartsch et al. (2025) provide a technically detailed framework for designing climate-transition-calibrated capital buffers, emphasizing the importance of granular exposure data and forward-looking stress scenarios. DeMenno (2023) argues that integrating climate scenarios into supervisory stress tests is already operationally necessary, not merely technically feasible.

Institutional quality remains a fundamental moderating variable. Ben-Ammar (2025) demonstrates that countries with stronger governance achieve better outcomes from climate-oriented macroprudential interventions, while excessive regulatory constraints can paradoxically limit adaptability—a non-linearity that demands careful calibration to the specific institutional environments of emerging market economies.

4. Green Investment as a Mechanism for Climate Risk Mitigation

4.1 Green Finance Architecture and Developmental Prerequisites

Green investment encompasses a broad spectrum of capital allocation activities oriented toward environmental sustainability. In financial markets, it most commonly refers to green bonds—fixed-income instruments whose proceeds are earmarked for environmental projects—and to ESG-screened portfolios. Both have grown rapidly in volume and sophistication, driven by regulatory initiatives, investor preferences, and the rising material costs of climate risk.

The connection between green finance capacity and broader developmental fundamentals deserves emphasis. Mammadov et al. (2026), examining the education–technology–economy nexus empirically across developing countries using multi-country panel data, demonstrate that educational attainment and technological readiness jointly drive macroeconomic performance: countries investing in human capital and digital transformation achieve higher productivity, stronger innovation capacity, and more diversified economic structures. This foundational insight translates directly into the green finance domain—Hypothesis 7 posits that countries with stronger educational and technological endowments are better positioned to develop and scale sophisticated green finance markets, from the design of bond certification frameworks to the operation of ESG rating agencies to the conduct of climate-adjusted stress tests.

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The geopolitical dimension identified by Dilanchiev et al. (2023) adds a critical complication. In natural resource-dependent economies, geopolitical risk can disrupt green finance flows and crowd out sustainable investment, creating a structural tension between resource dependency and green transition that policy must explicitly address. Emerging markets that combine high fossil fuel dependence with elevated geopolitical risk face compounded barriers to green finance development that neither fiscal incentives nor regulatory mandates alone can overcome.

4.2 Green Bonds: Evidence and Mechanisms

Dong et al. (2023) confirm that green bond issuance increases renewable energy consumption across six Southeast Asian economies, with wind energy exhibiting the largest response—consistent with Hypothesis 4. Fu and Ng (2021) document how public-private partnerships in China have successfully scaled renewable energy assets through green bond issuance. Saha and Maji (2025) provide global evidence that green bonds reduce CO2 emissions, with stronger effects in developing countries—a finding that positions green bonds as potentially most impactful precisely where they are most needed.

Political stability significantly moderates green bond effectiveness: Shah et al. (2025) establish that political stability amplifies the relationship between green bond issuance and clean energy capacity, while Frecautan and Ivashkovskaya (2024) demonstrate that governance quality directly influences green bond yield spreads. Barriers remain formidable in many contexts. Jain et al. (2024) document that Asian green bond markets are constrained by absent certification frameworks and limited private sector participation. Yamahaki et al. (2022) detail the structural barriers specific to Brazil, and De Deus et al. (2022) compare the contrasting trajectories of Brazil and China—with China's top-down regulatory commitment generating far more rapid market development, as documented by Lin and Hong (2022).

4.3 ESG Performance and Firm Resilience

ESG metrics have become central indicators of firm resilience and investor confidence. Bahadori et al. (2021) and Rahat and Nguyen (2024) document positive associations between ESG scores and firm valuation in emerging markets. Kamugisha and Sun (2025) establish that ESG ratings correlate with lower borrowing costs, enhanced creditworthiness, and greater operational efficiency. The information asymmetry mechanism is particularly well-documented: Xu et al. (2024) show that high-quality ESG disclosure reduces investor uncertainty in Chinese listed firms, improving pricing accuracy and reducing equity risk premiums—directly supporting the mediation pathway specified in Hypothesis 5.

Brahim and Romdhane (2025) confirm that strong ESG performance buffers South African firms against climate policy uncertainty, consistent with Hypothesis 5. Deb and Gurugubelli (2025) find that institutional investors mediate the ESG-performance relationship, with environmental factors receiving particular emphasis—a finding that suggests ESG preferences are not merely retail investor phenomena but are embedded in the investment mandates of major institutional capital allocators.

4.4 Green Assets as Safe Havens

The COVID-19 pandemic provided a large-scale natural experiment for the safe-haven properties of green assets. Arif et al. (2022) document meaningful hedging and diversification benefits of green bonds against equity losses during the pandemic, consistent with Hypothesis 6. Ren et al. (2023) confirm safe-haven properties during the acute pandemic phase but document their diminishment in the post-COVID normalization period—precisely as Hypothesis 6 anticipates. Imran and Ahad (2023) show that green bonds exhibited safe-haven properties across both the COVID-19 pandemic and the Global Financial Crisis, establishing that these properties are not pandemic-specific. The conditional character of ESG stock hedging documented by Rubbaniy et al. (2022)—varying with crisis type—provides an important caveat for portfolio managers seeking to exploit green asset safe-haven properties.

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5. Green Finance, Financial Stability, and Governance

5.1 Green Finance as Financial Stabilizer

Nguyen (2025) provides the most direct evidence for Hypothesis 3, demonstrating through ASEAN+4 panel data that green finance development reduces bank vulnerability to climate shocks, with the stabilizing effect most pronounced in countries with lower initial financial stability. Gabr and ElBannan (2025) add firm-level evidence that lower carbon emissions associate with higher profitability and greater crisis resilience—creating a direct market incentive for environmental stewardship. Yadav et al. (2026) map dynamic risk transmission among green, energy, and carbon markets in emerging economies, with implications for cross-asset portfolio diversification.

Solangi et al. (2025) extend the analysis to human development outcomes, finding that green finance and social investment jointly reduce poverty in emerging market economies. This result positions green finance not merely as a financial stability instrument but as a contributor to the sustainable development agenda—a connection relevant for multilateral development bank strategy design.

5.2 Central Banks and Government Policy

Ibrahiem et al. (2025) survey the expanding role of central banks in green finance standard-setting and sustainable investment incentivization. Tekdogan (2023) theorizes this development as a new green central banking paradigm. Gupta et al. (2024) provide empirical support: countries facing higher climate risks adopt green financial policies more intensively—suggesting that policy responses are being calibrated to actual vulnerabilities. The Central Bank of Azerbaijan's introduction of a Sustainable Finance Roadmap (2023–2026) and its 2024 green taxonomy—adopted despite the country's fossil fuel dependence—illustrates how institutional reform can advance even in challenging developmental contexts.

China's experimental governance model remains the benchmark case. Cheng and Drahos (2022) document how pilot zones and adaptive governance mechanisms produced the world's largest green credit and bond markets within five years. Hua et al. (2024) and Li et al. (2024) confirm that green finance reforms enhanced corporate green innovation and carbon performance. Ma et al. (2025) add the digital finance dimension, documenting how market-oriented digital governance mechanisms have supported corporate green transition in China.

5.3 Climate Policy Uncertainty and Investment Flows

Climate policy uncertainty (CPU) is an underappreciated but empirically significant risk factor. Usmani et al. (2026) document that CPU elevates short-term market volatility while generating positive spillovers to green assets. Ren et al. (2025) find that CPU's long-run positive influence on green bond investment outweighs negative short-term effects, suggesting green bond market resilience over investment horizons. Wan et al. (2025) show that emerging markets experience stronger CPU volatility spillovers and longer recovery periods than advanced economies—a finding that demands robust, predictable climate regulatory frameworks in developing country contexts. Raza et al. (2024) establish CPU as a significant predictor of volatility in green and sustainable financial indices, with implications for derivatives pricing and risk management.

6. Human Capital, Technology, and the Prerequisites for Green Finance

A dimension of the green finance literature that deserves far greater attention concerns the foundational preconditions for effective sustainable investment. Green bonds, ESG frameworks, and climate-adjusted risk models are complex institutional technologies that require substantial human capital, analytical expertise, and digital infrastructure to design, implement, and credibly monitor. The assumption that these instruments can simply be transplanted from advanced economy contexts into emerging markets—absent the developmental investments required to operate them—is empirically questionable.

Mammadov et al. (2026) provide the most direct evidence for Hypothesis 7, demonstrating through multi-country panel analysis that educational attainment and technological readiness jointly and significantly predict macroeconomic performance in developing countries, with digital transformation amplifying the returns to educational investment through skill complementarities.

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Translating this finding into the green finance domain: countries with strong human capital endowments and digital infrastructure are better positioned to train the financial analysts, sustainability officers, regulatory specialists, and ESG auditors that sophisticated green finance market operation requires. They are also better equipped to evaluate complex green finance instruments, detect greenwashing, and design climate-adjusted regulatory stress tests.

Digital finance capabilities deserve particular attention. Ma et al. (2025) document how digital finance mechanisms in China reduce information asymmetries and enable granular monitoring of sustainability performance, supporting corporate green transition. Krykhivska and Romashko (2025) propose blockchain-based verification architectures for green financial products—addressing the credibility problem that remains one of the most persistent obstacles to green bond market development. Both contributions underscore that technological capacity is not merely a background condition for green finance but an active ingredient in its effectiveness, reinforcing the developmental prerequisites identified in Hypothesis 7.

Dilanchiev et al.'s (2023) findings on geopolitical risk and green finance flows add a further dimension: the political economy context shapes whether the technological and human capital investments in green finance infrastructure can actually be mobilized. In highly geopolitically exposed emerging markets, even well-designed institutional frameworks may be disrupted by political instability—a constraint that points toward the need for internationally diversified green finance governance architectures that are more resilient to single-country political shocks.

7. Research Gaps and Future Directions

7.1 Geographical and Sectoral Gaps

The synthesis reveals a striking underrepresentation of African and fossil-fuel-dependent economies. Peprah et al. (2026) document structural challenges in financing green growth across African emerging economies, while Neumann (2023) notes the long distance many developing countries must still travel toward Paris Agreement climate alignment. The overwhelming concentration of empirical studies on Asian and Latin American contexts limits the generalizability of existing findings and leaves policymakers in African economies without a robust empirical basis for regulatory design.

7.2 Micro-Macro Linkages and Dynamic Risk Transmission

The micro-macro linkage problem remains largely unresolved. Arian et al. (2025) call for studies connecting firm-level climate risk exposures to systemic financial outcomes—an aggregation challenge that is shaped by network effects, correlation structures, and the distribution of exposures. Yadav et al. (2026) identify limited understanding of dynamic risk transmission mechanisms between green, energy, and carbon markets as a key empirical gap. Yang and Geng (2025) document the need for more granular disaggregation of climate risk financial impacts by firm type and sector. Big data and machine learning approaches offer promising methodological pathways for mapping these dynamics in real time (Suciati, 2025).

7.3 The Education–Technology–Green Finance Nexus

Hypothesis 7 identifies a research gap that has not yet been directly addressed in the empirical literature: the systematic relationship between human capital, technological capacity, and green finance market development. The parallel literatures on education-driven economic development (Mammadov et al., 2026) and sustainable finance have not yet been integrated into a unified empirical framework. This integration would enrich both literatures and would provide actionable guidance for development aid allocation and capacity-building program design.

8. Policy Implications

8.1 For Financial Regulators

Macroprudential frameworks should be recalibrated to integrate climate risk scenarios into regular stress testing, prioritize liquidity-based instruments over capital tools in climate-stressed environments (Jeon et al., 2024; Bartsch et al., 2025), and develop differentiated regulatory strategies for smaller banks and low-income country institutions (Yu et al., 2025). ESG disclosure standards

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should be harmonized to reduce information asymmetries that inflate green capital costs (Qachach et al., 2025).

8.2 For Financial Institutions

Progressive institutions should integrate climate risk management proactively—before regulatory mandates require it—to gain first-mover advantages in green finance markets. Green bond portfolios and ESG-screened holdings offer both direct risk management benefits and crisis-period hedging properties (Arif et al., 2022; Ren et al., 2023). Investment in digital finance capabilities—blockchain verification, AI-assisted climate risk modelling, real-time ESG monitoring—can enhance the efficiency and credibility of green finance operations (Ma et al., 2025).

8.3 For Governments

Public–private partnerships in green bond issuance can overcome market development bottlenecks (Fu and Ng, 2021). Green taxonomies, tax incentives, and first-loss guarantees can reduce private investor risk premiums. Crucially, the evidence on the education–technology–green finance nexus suggests that investments in educational systems and digital infrastructure—of the type empirically validated by Mammadov et al. (2026)—may generate important spillover effects on sustainable finance market development, creating a compelling case for cross-sectoral investment strategies.

8.4 For the International Community

Capacity-building programs that develop financial regulatory expertise, ESG analytical capacity, and green bond market infrastructure can address the human capital constraints that Hypothesis 7 identifies as fundamental. Harmonized international standards for ESG disclosure and green bond certification would reduce transaction costs and expand emerging market access (Dung and Hanh, 2025). Knowledge exchange programs that diffuse China's experimental green finance governance model (Cheng and Drahos, 2022) can reduce learning costs for countries at earlier developmental stages.

Conclusion

This article has synthesized a substantial body of Scopus-indexed empirical research on the nexus between climate risk, financial stability, and green investment in emerging markets, organized around seven research hypotheses and enriched by recent contributions on the education–technology–economy nexus (Mammadov et al., 2026) and geopolitical risk–green finance interactions (Dilanchiev et al., 2023).

The evidence reviewed supports four broad conclusions. First, climate risk constitutes a systemic threat to emerging market financial systems, operating through banking instability, capital market volatility, shadow banking disruption, and geopolitical risk interactions—with the severity of these impacts significantly moderated by institutional quality and macroprudential policy design. Second, green investments serve a dual function as climate risk mitigants and financial stabilizers, with demonstrated effectiveness in both normal and crisis-period market conditions. Third, the transformative potential of green finance is substantially constrained by regulatory fragmentation, institutional weakness, information asymmetries, and the human capital and technological capacity gaps that characterize many emerging market environments—constraints that must be addressed through coordinated developmental investments. Fourth, the seven hypotheses advanced in this paper chart a research agenda that connects financial stability analysis, green investment theory, development economics, and governance studies in ways that the existing literature has not yet fully integrated.

The policy implication is clear: emerging markets require not only better-calibrated climate-financial regulatory frameworks but also the foundational investments in education, technology, and institutional capacity that make those frameworks effective. Climate risk is already reshaping financial systems whether or not regulatory frameworks acknowledge it. The question facing emerging market policymakers is not whether to integrate climate considerations but how to do so in

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ways that protect financial stability and enable the sustainable development trajectories their populations require.

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