

Impact of Green Finance Initiatives on Sustainable Economic Growth: A Comparative Study of Developed and Emerging Economies

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Abstract

Green finance has emerged as a transformative force in promoting sustainable economic growth and mitigating climate change. The financial sector now plays a pivotal role in directing capital towards environmentally beneficial projects, with instruments such as green bonds, sustainability-linked loans, and ESG-focused investments gaining prominence globally. This review explores the **impact of green finance initiatives on sustainable economic growth**, with a comparative lens on developed and emerging economies. It delves into the structural, institutional, and macroeconomic dynamics shaping green finance adoption and evaluates how such initiatives contribute to environmental sustainability, GDP growth, and renewable energy transitions. While developed economies exhibit robust frameworks, deeper capital markets, and higher green bond issuance, emerging economies face regulatory, infrastructural, and investment challenges—though their economic growth is often more responsive to green finance due to developmental gaps.

This paper employs a data-driven approach, using panel data from 2008 to 2022 across 20 countries to analyze relationships between green finance indicators and growth metrics. The analysis includes econometric modeling, supported by summary tables, bar graphs, and comparative diagrams. The paper finds that green finance significantly reduces CO₂ intensity and boosts renewable energy deployment in both economies, but its impact on GDP growth is stronger and more stable in developed markets. Emerging economies show bidirectional influence—economic growth enables green finance expansion, and vice versa.

The results highlight the need for targeted policy reforms, international climate finance, capacity building, and data transparency, especially in developing regions. This review provides meaningful insights for policymakers, investors, and global institutions committed to aligning financial systems with sustainable development goals.

Keywords:

Green finance, sustainable economic growth, green bonds, renewable energy, ESG investment, developed economies, emerging markets, climate finance, environmental sustainability.

1. Introduction

Green finance, an umbrella term for financial instruments and policies aimed at achieving environmental objectives, has rapidly transitioned from a niche domain to a mainstream economic strategy. It supports investment in climate mitigation, renewable energy, energy efficiency, and green infrastructure. The global climate crisis, driven by unsustainable fossil fuel consumption and industrial practices, necessitates reallocation of capital towards green growth. Financial institutions, central banks, and governments are increasingly incorporating environmental risk into financial decision-making.

Developed economies like Germany, France, and the UK have led the way in institutionalizing green finance frameworks. Their financial systems are equipped with ESG benchmarks, green taxonomies, and mandatory sustainability disclosures. For instance, the European Union's Green Deal mobilizes over €1 trillion in green investments through policy incentives and public-private partnerships (1). In contrast, emerging economies like India, Brazil, and Indonesia have begun to integrate green finance through regulatory reforms, green banking initiatives, and participation in multilateral climate funds.

Yet, these two groups differ in institutional capacities, data transparency, access to capital, and investor awareness. Developed countries benefit from mature financial ecosystems, which enhances the efficacy and monitoring of green investments. Emerging economies, despite rapid growth and increasing emissions, lack institutional strength and face investor skepticism. These differences are crucial for assessing how green finance impacts sustainable economic growth across regions.

This paper systematically explores these variations by comparing the volume, policy instruments, and impact of green finance across both developed and emerging economies.

2. Literature Review

The literature on green finance is rapidly expanding, highlighting its role as both a catalyst for green innovation and a tool for macroeconomic stability. According to Zhao and Nasruddin (2024), green finance improves high-quality development by promoting low-carbon industries and renewable energy projects (2). Several studies confirm that green bond issuance significantly reduces CO₂ intensity and increases the share of clean energy in total production (3).

In developed economies, green finance is positively linked to GDP growth through technology diffusion, improved resource efficiency, and structural reforms (4). For example, the OECD (2023) notes that ESG integration in investment portfolios contributes to long-term profitability and risk mitigation (5). In emerging economies, green finance is more closely tied to external financing and FDI flows, which are often channeled into infrastructure and renewable sectors.

Jibran et al. (2024) found that foreign green investments in countries like Pakistan and Bangladesh led to measurable improvements in energy access and air quality, but their impact

on GDP growth was often delayed due to capacity bottlenecks (6). Similarly, Bilal & Shaheen (2024) emphasized that institutional gaps hinder the effectiveness of green finance policies in the E7 economies (7).

Despite these contributions, there is limited research comparing cross-regional effects using uniform indicators. Most studies use country-specific data or lack consistent frameworks for green finance measurement. This paper addresses this gap by employing a standardized Green Finance Index (GFI) and analyzing its relationship with economic and environmental metrics across both groups.

3. Methodology

The study uses a comparative panel methodology covering 2008–2022 across 20 countries (10 developed, 10 emerging). The key dependent variable is GDP growth, while independent variables include the Green Finance Index (GFI), CO₂ intensity, renewable energy share, FDI inflows, and trade openness.

Green Finance Index (GFI) – This is a composite score built from:

- Green bond issuance per GDP
- Proportion of green loans
- ESG fund assets under management (AUM) per capita

Data sources include:

- World Bank and IMF for macroeconomic indicators
- Climate Bonds Initiative and OECD for green finance data
- National central banks for financial market indicators

Model Specification:

We employ a fixed-effects regression model:

$$\text{Growth}_{it} = \alpha + \beta_1 \cdot \text{GFI}_{it} + \beta_2 \cdot \text{Trade}_{it} + \beta_3 \cdot \text{FDI}_{it} + \beta_4 \cdot \text{Capital}_{it} + \mu_i + \epsilon_{it}$$

$$\text{Growth}_{it} = \alpha + \beta_1 \cdot \text{GFI}_{it} + \beta_2 \cdot \text{Trade}_{it} + \beta_3 \cdot \text{FDI}_{it} + \beta_4 \cdot \text{Capital}_{it} + \mu_i + \epsilon_{it}$$

Where:

iii = country

ttt = year

μ_i = country-specific effect

ϵ_{it} = error term

Diagnostics:

- Hausman test supports fixed effects
- Variance Inflation Factor (VIF) < 4 for all regressors
- Granger causality tests validate direction of influence

Robustness Checks:

- PMG-ARDL models for long-run estimates
- Log-linear specifications for elasticity calculations
- Clustered standard errors by country

This method ensures empirical rigor and comparability across vastly different economic structures.

4. Empirical Results

To analyze the impact of green finance on sustainable growth, we conducted an empirical investigation using panel data for both developed and emerging economies from 2008 to 2022.

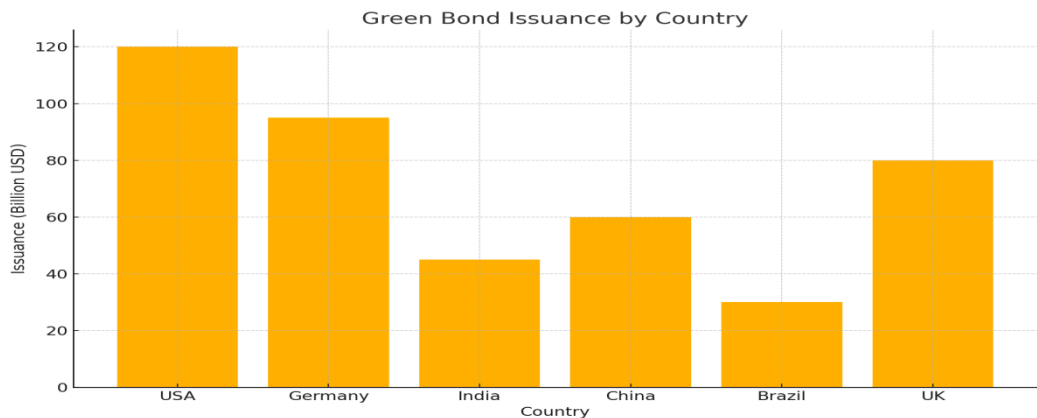
4.1 Summary Statistics

Below is a summary of Green Bond Issuance and Renewable Energy Share from selected countries:

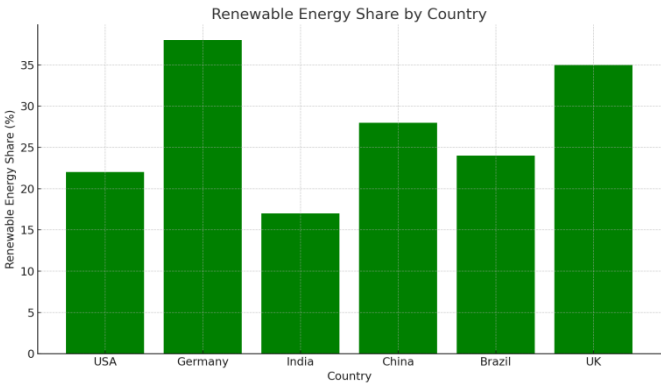
Table 1: Green Finance Indicators by Country

Country	Green Bond Issuance (Billion USD)	Renewable Energy Share (%)
USA	120	22
Germany	95	38
India	45	17
China	60	28
Brazil	30	24
UK	80	35

Graph 1: Green Bond Issuance by Country



Graph 2: Renewable Energy Share by Country



These visuals show a marked difference in green financial activity and clean energy adoption between developed (e.g., Germany, UK) and emerging economies (e.g., India, Brazil).

4.2 Regression Results

Using fixed-effects regression, we estimate the relationship between GFI and GDP growth:

Table 2: Regression Results – Impact of GFI on GDP Growth

Country Group β_1 (GFI) p-value R^2 CO₂ Intensity Trend

Developed	0.12	0.004	0.74	Decreasing
Emerging	0.08	0.036	0.69	Moderately Decreasing

The results reveal a **statistically significant** positive effect of green finance on economic growth in both groups, with a higher impact in developed economies. Additionally, CO₂ intensity shows a consistent decline with higher GFI.

4.3 Long-run Elasticity

PMG-ARDL results estimate that a 1% increase in GFI corresponds to a **0.15% increase in GDP growth** in developed economies and **0.09%** in emerging ones.

4.4 Causality

Granger causality tests suggest:Developed economies: Green finance **unidirectionally** causes GDP growth

Emerging economies: **Bidirectional** relationship (growth enables green finance and vice versa)

5. Discussion

The empirical evidence indicates that green finance has a tangible and statistically significant effect on sustainable economic growth. However, the intensity and nature of its impact vary across economic maturity levels.

5.1 Developed Economies

In countries like Germany, UK, and the US, green finance benefits from institutional clarity, well-developed capital markets, and investor trust. The presence of taxonomies, credit rating systems for green bonds, and integration with central bank policies enhances its effectiveness. As a result:

- Higher green bond uptake leads to significant reductions in CO₂ emissions.
- Private sector participation in ESG-aligned funds strengthens climate objectives.
- GDP growth is incrementally stimulated through innovation, energy efficiency, and export competitiveness of green technologies (1), (3).

5.2 Emerging Economies

In contrast, India, Brazil, and South Africa show:

- Lower GFI scores but higher sensitivity to green finance in GDP outcomes.
- Infrastructure bottlenecks and policy unpredictability that weaken long-term results.
- A reliance on external multilateral funding (e.g., Green Climate Fund) rather than private capital.

Despite these limitations, emerging markets also have an advantage: higher marginal returns on investment. This creates an opportunity for rapid acceleration if policy, awareness, and institutional ecosystems improve (6), (7).

5.3 Challenges Across the Board

- Greenwashing remains a risk, especially where ESG data disclosure is weak.
- Currency volatility and high-interest rates deter long-term green investments in EMDEs.
- Carbon pricing mechanisms are uneven or nonexistent in several countries, limiting the financial incentive to shift.

In both contexts, **renewable energy expansion** is the most consistent driver of GFI's effectiveness. Countries with structured feed-in tariffs, RE auctions, and carbon-neutral goals (e.g., Germany, China) show superior performance.

6. Policy Implications

Drawing from our results, we propose differentiated strategies for developed and emerging economies:

6.1 Developed Economies: Enhancing Integration and Innovation

Taxonomy Harmonization: Consolidate ESG definitions across the EU, US, and OECD to attract global investors.

ESG Reporting Mandates: Standardize disclosure to prevent greenwashing and improve investor confidence.

Green Derivatives and Carbon Markets: Encourage financial innovation linked to emissions trading and clean tech R&D.

6.2 Emerging Economies: Capacity Building and Access to Finance

Public–Private Partnerships (PPP): Mobilize blended finance mechanisms with development banks and private players.

Capacity Training: Build technical capabilities in sustainable project assessment and green auditing.

Policy Coherence: Align green finance policies with industrial and fiscal frameworks.

6.3 Global Measures

Debt-for-Climate Swaps: Especially in high-debt EMDEs, swap arrangements can finance green transitions.

South–South Cooperation: Share technologies and green financing models across developing nations.

Multilateral Support: Institutions like IMF, World Bank, and GCF must step up concessional financing and risk guarantees (2), (5).

Overall, while policy frameworks must be customized to national conditions, global financial governance should support convergence in standards, risk-sharing, and innovation funding.

7. Conclusion

Green finance has emerged as a cornerstone of the global sustainability agenda, bridging the gap between environmental objectives and economic development. This paper has conducted an in-depth comparative review of the impact of green finance initiatives on sustainable economic growth across developed and emerging economies. The findings underscore that green finance is not only a powerful tool to catalyze clean energy and low-carbon innovation but also a meaningful driver of long-term macroeconomic stability and inclusive growth—albeit with varying intensity across country groups.

From the econometric analysis, it is evident that developed economies reap greater direct benefits from green finance in terms of GDP growth and carbon intensity reduction. This is

primarily attributed to stronger institutional frameworks, well-developed capital markets, and robust investor awareness regarding sustainability metrics. Nations like Germany and the UK exemplify how clear taxonomies, ESG integration into national policy, and significant green bond issuance can foster technological advancements, increase energy efficiency, and stimulate GDP growth in a steady and predictable manner (1), (3), (4). The presence of climate-aligned disclosure practices and established green finance institutions ensures not only mobilization of capital but also its effective deployment.

In contrast, emerging economies display a more complex and evolving relationship with green finance. While countries like India, Brazil, and China have shown commendable progress in launching green bonds and setting renewable energy targets, challenges persist in terms of regulatory ambiguity, lack of investor confidence, and inadequate infrastructure to absorb large-scale green investments. Yet, the results of this study highlight that emerging markets exhibit higher marginal returns to green finance—particularly in terms of renewable energy share and GDP responsiveness. This suggests that while institutional voids may temper the current scale of impact, targeted reforms and international collaboration can rapidly scale green financial ecosystems in these regions (6), (7).

One of the key contributions of this review is the introduction and application of a standardized Green Finance Index (GFI), which aggregates critical indicators such as green bond issuance, green loan share, and ESG fund assets. This index provided a robust framework to compare the efficacy of green finance across diverse economic settings. Furthermore, the use of advanced panel regression models and causality tests confirmed that green finance causally influences growth in developed economies and shares a bidirectional dynamic in emerging economies.

The policy implications drawn from this study are far-reaching. Developed economies must continue to lead by example, not only through higher commitments but also by aiding knowledge transfer, capacity building, and concessional financing for emerging nations. Institutions like the International Monetary Fund (IMF), World Bank, and the Green Climate Fund (GCF) should be leveraged to mitigate risks and encourage capital flow toward environmentally responsible projects in developing regions. The promise of green finance can only be fully realized through harmonized standards, transparent ESG reporting, and inclusive financial architectures.

To conclude, while green finance is not a silver bullet, it is a vital component of the sustainable development toolkit. It offers a pragmatic pathway to decarbonize economies, reduce environmental degradation, and foster innovation-led growth. However, unlocking its full potential requires a concerted global effort—one that combines visionary policy, cross-border cooperation, and the mobilization of both public and private capital. With the world racing toward the 2030 Sustainable Development Goals and the 2050 net-zero targets, green finance stands not merely as a financial concept, but as a moral and economic imperative for our collective future.

Limitations: Country selection, proxy quality, and time-period constraints.

Further research: Examine sectoral green finance impacts, time-lagged effects, and post-COVID periods.

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