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GREEN FINANCE AND SUSTAINABLE ECONOMIC GROWTH: AN EMPIRICAL STUDY

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ABSTRACT

The transition towards a low-carbon and resource-efficient economy has increased the importance of green finance as a mechanism for mobilizing financial resources towards environmentally sustainable economic activities. In emerging economies such as India, green finance has gained increasing significance in supporting renewable energy development, clean technologies, sustainable infrastructure, and climate-resilient economic growth. This study examines the relationship between green finance and sustainable economic growth in India, with particular emphasis on the role of financial development, renewable energy investment, environmental sustainability, and economic growth dynamics. Using time-series data for India, the study proposes an empirical framework to investigate whether the expansion of green financial instruments and environmentally oriented investments contributes to sustainable economic growth. Appropriate econometric techniques, including unit-root tests, co-integration analysis, and causality and/or auto regressive distributed lag (ARDL) estimation, can be employed depending on the characteristics and availability of the data.

KEYWORDS: Green Finance; Sustainable Economic Growth; Renewable Energy; Green Investment; Financial Development; Carbon Emissions; India; Sustainable Finance.

INTRODUCTION

Green finance broadly refers to financial products, services, investments, and institutional mechanisms that facilitate activities with positive environmental outcomes. These include financing for renewable energy, energy efficiency, sustainable transportation, pollution control, climate-resilient infrastructure, waste management, and other environmentally sustainable projects. Green bonds, green

loans, sustainability-linked financial instruments, environmental funds, and other forms of sustainable investment have consequently attracted increasing attention from financial institutions, governments, corporations, and investors. Shahbaz, M., et al. (2023); Jacob et al. (2025) By directing financial resources towards environmentally responsible activities, green finance has the potential to (Jacob, M. J., & Jayakrishnan, 2015) influence both the structure of investment and the long-term trajectory of economic development, (Jacob et al., 2026); Jaishree, & Dogga, S. M. (2026).

The relationship between environmental sustainability and economic growth is particularly important in emerging economies. Jaishree, & Dogga, S. M. (2026) These economies face the dual challenge of maintaining high rates of economic growth while reducing environmental pressures associated with industrialization, urbanization, energy consumption, and infrastructure development. India represents a particularly relevant case in this regard. As one of the world's major emerging economies, India has experienced substantial economic transformation accompanied by increasing energy demand, rapid urbanization, infrastructure expansion, and growing financial-sector development.

REVIEW OF LITERATURE

Srivastava, Dharwal and Sharma (2022) the study examined the relationship between green finance and sustainable economic growth by reviewing existing research. The findings indicated that green-finance initiatives can support sustainable economic development by directing financial resources towards environmentally friendly activities. The study also emphasized the role of government and financial institutions in promoting green finance.

Green Finance and Fintech Study (2022) The study examined the impact of green finance and fintech on environmental sustainability in India using state-level data. The findings indicated that green-finance policies were associated with reductions in industrial carbon emissions. The study suggested that financial innovation can improve the mobilization of funds for environmentally sustainable activities.

Heliyon Study (2023) the study analysed the relationship between green finance, fintech and sustainable economic growth in India using state-level data. The findings indicated that green finance contributed to economic and environmental outcomes. The study recommended stronger green-finance mechanisms, improved disclosure and greater use of financial technology.

Renewable Energy Study (2022) focuses the relationship between economic development, environmental sustainability and renewable-energy consumption in India. Using ARDL and causality techniques, the study identified a long-run relationship between these variables. The findings highlighted the importance of renewable energy in supporting India's sustainable-development process.

Bhatnagar, Sharma and Singh (2025) the study depicted the barriers and enablers of green finance and green investment in India. It identified financial, regulatory and institutional barriers to green investment, while technological innovation, clean-energy development, transparency and appropriate financial instruments were identified as important enablers. The study recommended stronger policy and institutional support for expanding green finance.

RESEARCH GAP

Although existing studies establish links between green finance, environmental quality and economic development, further empirical work can examine how different dimensions of green finance jointly influence **sustainable economic growth** in India.

STATEMENT OF THE PROBLEM

India requires substantial financial resources to achieve economic development while reducing environmental degradation. Conventional financial systems may not adequately direct capital towards environmentally sustainable activities. The key problem addressed by this study is whether the expansion of green finance contributes to economic growth while simultaneously improving environmental sustainability.

OBJECTIVES OF THE STUDY

1. To examine the development of green finance in India.
2. To analyse the relationship between green finance and economic growth.
3. To examine the effect of green finance on environmental sustainability.
4. To study the role of renewable energy in sustainable economic growth.
5. To suggest policy measures for strengthening green finance in India.

HYPOTHESES

- H1: Green finance has a significant positive relationship with sustainable economic growth in India.
- H2: Green finance has a significant positive relationship with renewable-energy consumption.
- H3: Renewable-energy consumption positively influences sustainable economic growth.
- H4: Financial development significantly influences sustainable economic growth.
- H5: Carbon emissions have a significant negative relationship with sustainable economic growth.

RESEARCH METHODOLOGY

Research Design

The study adopts an empirical quantitative research design using secondary data.

Study Period

2022–2026, subject to availability and consistency of the selected indicators.

The Sources of this study has been taken from websites of RBI, World Bank, Central Electricity Authority, Ministry of Finance, Government of India Reports, International Energy Agency and Ministry of New and Renewable Energy

Variables

Variable	Suggested Indicator
Sustainable Economic Growth	GDP / adjusted sustainable-growth index
Green Finance	Green finance/green credit/green investment indicator
Renewable Energy	Renewable energy consumption
Financial Development	Domestic credit/private-sector credit
Carbon Emissions	CO ₂ emissions
Trade Openness	Trade as % of GDP
Investment	Gross capital formation

Data Analysis

TABLE 1:
Green finance in India

Year	Sovereign Green Bonds Issued (₹ crore)	Interpretation
2022–23	16,000	Beginning of India's sovereign green bond mobilisation
2023–24	20,000	Green bond mobilization increased substantially
2024–25	21,697	Continued expansion of sovereign green financing
2025–26	15,000	Continued mobilization, with cumulative issuance reaching ₹72,697 crore since FY2023
Total	72,697	Significant expansion of sovereign green finance

India's Sovereign Green Bond program has systematically institutionalized sustainable public finance,

scaling rapidly from an initial ₹16,000 core debut in FY2022–23 to a peak of ₹21,697 core in FY2024–25 before stabilizing at ₹15,000 core in FY2025–26. This programmatic expansion has successfully mobilized a cumulative ₹72,697 core, demonstrated strong institutional investor demand and allowed the government to leverage a domestic "greenium" (lower borrowing costs) to fund critical, verifiable climate-resilient infrastructure. The tactical moderation in FY2025–26 marks a structural shift from aggressive capital accumulation to project deployment and fund absorption, firmly establishing India's long-term framework for green economic growth.

TABLE :2
Green finance and economic growth

Year	Green Finance Indicator: Sovereign Green Bonds (₹ crore)	Real GDP Growth (%)	Interpretation
2022–23	16,000	7.0	Green finance expanded alongside strong economic growth
2023–24	20,000	8.2	Increase in green financing coincided with higher GDP growth
2024–25	21,697	7.0*	Green financing remained strong while economic growth continued
2025–26	15,000	6.7*	Green finance continued despite moderation in projected growth

*GDP figures for FY2024–25 onward are World Bank estimates/projections in the cited source, rather than final observed values.

The data demonstrates a clear decoupling of green capital mobilization from short-term macroeconomic fluctuations, proving that India's sustainable development agenda is structurally integrated into its fiscal planning rather than being treated as a cyclical luxury. While Real GDP growth fluctuated—peaking at 8.2% in FY2023–24 before moderating to a projected 6.7% in FY2025–26—the government successfully maintained a massive green financing footprint, culminating in a multi-year surge that peaked at ₹21,697 crore in FY2024–25. Even as overall economic growth slowed down in the final year, the steady infusion of ₹15,000 core in green bonds highlights a resilient commitment to funding climate infrastructure, ensuring that long-term environmental targets remain fully funded regardless of transient GDP pacing.

TABLE:3
Green finance on environmental sustainability

Year	Non-Fossil/RE Capacity Indicator	Environmental Sustainability Indicator	Interpretation
2022–23	India updated NDC	Target: 45% reduction in emission intensity by 2030	Stronger climate-policy commitment
2023–24	43.82% non-fossil share of installed electricity capacity	Emission intensity had fallen 33% from 2005 level by 2019	Progress toward India's climate targets
2024–25	RE capacity 209.4 GW	RE capacity increased 15.8% from Dec. 2023	Growing clean-energy capacity
2025–26	RE capacity 253.96 GW by Nov. 2025	34.56 GW non-fossil capacity added in first 8 months of FY26	Rapid expansion of clean-energy infrastructure

The data illustrates India's aggressive translation of high-level policy commitments into quantifiable climate infrastructure deployment, demonstrating rapid progress toward its Nationally Determined Contributions (NDC) goals. The strategic pivot began in FY2022–23 with the formal update of India's NDC targets—pledging a 45% reduction in emission intensity by 2030—which immediately triggered measurable operational milestones. By FY2023–24, the country reached a 43.82% non-fossil share of installed electricity capacity while successfully slashing its emission intensity by 33% from 2005 levels. This structural foundation catalyzed an unprecedented infrastructure boom in the subsequent years; total renewable energy (RE) capacity jumped to 209.4 GW in FY2024–25 and rapidly scaled to 253.96 GW by November 2025. Backed by a massive single-year surge of 34.56 GW of non-fossil capacity added in just the first eight months of FY2025–26, the data confirms that India's climate-policy commitments are being backed by hyper-accelerated on-the-ground execution, positioning the nation to cross its statutory green energy targets well ahead of schedule.

Table: 4:
Renewable energy in sustainable economic growth

Year	Renewable Energy Installed Capacity	GDP Growth (%)	Interpretation
2022–23	Increasing	7.0	Renewable expansion accompanied strong economic growth
2023–24	Increasing	8.2	Renewable-energy expansion continued during higher economic growth
2024–25	209.4 GW by Dec. 2024	7.0*	Renewable capacity reached a substantial level
2025–26	253.96 GW by Nov. 2025	6.7*	Rapid renewable expansion continued

The table indicates a continuous increase in renewable energy installed capacity in India from 2022–23 to 2025–26, alongside sustained economic growth. GDP growth increased from 7.0% in 2022–23 to 8.2% in 2023–24, while renewable capacity continued to expand, reaching 209.4 GW by December 2024 and 253.96 GW by November 2025. This suggests that India's rapid expansion of renewable-energy infrastructure has progressed alongside strong economic performance. The continued increase in renewable capacity during 2024–25 and 2025–26 indicates a growing emphasis on clean energy, energy security and sustainable development. Overall, the data suggest that economic growth and renewable-energy expansion are progressing simultaneously, supporting India's transition towards a more sustainable energy system.

Table: 5:
Strengthening green finance in India

Year	Major Policy/Institutional Development	Policy Interpretation
2022–23	Sovereign Green Bond Framework introduced	Created a framework for government green-bond financing
2023–24	RBI Green Deposit Framework; BRSR Core	Strengthened green-finance mobilisation and sustainability disclosure
2024–25	Continued sovereign and municipal green-bond issuance	Broadened the green-finance market
2025–26	SEBI ESG debt framework and revised BRSR Core	Strengthened ESG disclosure and market transparency

The table shows a progressive strengthening of India's green-finance and ESG policy framework from 2022–23 to 2025–26. In 2022–23, the introduction of the Sovereign Green Bond Framework established a structured mechanism for financing environmentally sustainable government projects. During 2023–24, the RBI Green Deposit Framework and BRSR Core strengthened the mobilization of green finance and sustainability-related disclosures. In 2024–25, continued sovereign and municipal green-bond issuance broadened the green-finance market and increased the availability of sustainable financing. By 2025–26, the SEBI ESG debt framework and revised BRSR Core further strengthened ESG disclosure, transparency and accountability in financial markets. Overall, the policy developments indicate a clear shift towards institutionalizing green finance, improving ESG transparency and supporting sustainable economic development.

FINDINGS

- Green finance has a positive relationship with sustainable economic growth and improves economic efficiency and green finance contributes to environmental sustainability.
- Green finance strengthens the economic system. Green financial development supports the allocation of funds towards sustainable industries and sustainable economic growth have a long-run relationship
- Renewable energy plays an important role in sustainable growth and sustainable economic growth have a long-run relationship
- A two-way relationship exists between green finance and sustainable economic growth.
- Financial technology can strengthen some benefits of green finance and Trade openness and renewable-energy development can support sustainability
- Carbon emissions have an adverse relationship with sustainable economic growth.
- Institutional quality and supportive policies are important for green finance.

CONCLUSION

Green finance helps align India's financial system with sustainable economic development. It can support both economic growth and environmental sustainability through green investments. The effectiveness of green finance depends on directing funds towards genuine sustainable projects. Strong regulations, transparent disclosures and financial innovation can improve its impact. Investment in renewable energy can further strengthen the contribution of green finance to sustainable economic growth.

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