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BEYOND GREEN INVESTMENT: TO STUDY THE RELATIONSHIP BETWEEN ECONOMIC GROWTH, GREEN FINANCE AND ENVIRONMENTAL SUSTAINABILITY IN INDIA

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Abstract

India, which ranks second in the world in terms of population and 176th out of 177 countries on the 2026 Environmental Performance Index, faces a critical need to balance economic development with environmental sustainability. Given the growing population and ongoing environmental degradation, the country confronts significant challenges. It remains to be seen how India will navigate the dual challenge of fulfilling the commitments made under the Paris Agreement while simultaneously balancing energy supply and demand. In this context, 'green finance' emerges as a vital instrument for channeling capital toward environmentally friendly economic initiatives.

Based on secondary data, this research paper examines the interrelationships between environmental sustainability, green finance, and economic growth. It further explores mechanisms such as green bonds, green banking, corporate sustainability-linked loans, and investments in the energy sector—particularly in renewable energy—alongside public climate finance.

Some studies indicate that by 2025, India has made substantial progress in the energy sector, with renewable energy capacity reaching 220 gigawatts. Nevertheless, maintaining a balance between energy demand and supply continues to be a major challenge for the nation. Since the demand for energy exceeds its supply—a gap that continues to widen—we rely heavily on fossil fuels alongside clean energy sources to meet this demand. This research paper examines the role of 'green supply' in development, while also providing a comprehensive, in-depth analysis of environmental degradation, energy balance, and social equilibrium in relation to capital. Finally, the study offers recommendations that primarily focus on environmental and social standards, energy consumption, and the role of the private sector.

1.Introduction

India has set a target of becoming a five-trillion-dollar economy. To achieve this, the country is taking steps to bolster its industrial sector through initiatives like 'Make in India' and 'Made in India.' While India is carefully strategizing for long-term economic growth, it is equally crucial to consider the resulting environmental degradation. According to the 'State of Global Air' report, more than 1.6 million deaths in India have been attributed to pollution—a deeply concerning reality for the nation. As we establish large-scale industries in the name of development, we must reflect on whether this process—while creating

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jobs—is simultaneously eroding human values and human well-being; in essence, are we sacrificing human lives for the sake of infrastructure? Furthermore, some studies indicate that India is the world's third-largest emitter of greenhouse gases—a clear alarm bell regarding the environmental crisis that the nation must heed. To address this, India must rapidly pivot toward 'green finance.' The country has already begun this transition by integrating financial resources, promoting renewable energy, enhancing energy efficiency, developing sustainable public transport, and taking proactive measures within the banking and capital sectors. Notably, there has been a significant expansion of 'green bonds' in the financial markets. Additionally, India now allows 100% Foreign Direct Investment (FDI) via the automatic route for green energy projects, and the country's renewable energy capacity has reached 220 gigawatts (GW).

However, as we pursue these initiatives, it is essential to focus on green finance, the concept of a 'green GDP,' and the employment opportunities that can emerge from these efforts. We must also develop methods to accurately evaluate the true cost of environmental degradation in relation to our economic development.

2.Objectives of the Study

- To examine the relationship between economic growth, environmental sustainability, and 'green' initiatives.
- To study the link between economic growth and environmental degradation, and to analyze the relationship between renewable energy capacity and environmental sustainability.
- To analyze the role of sovereign green bonds and the Reserve Bank of India's (RBI) green deposits in investment and capital formation.
- To evaluate the contribution of green investments toward job creation, as well as their impact on corporate capital formation and growth in productive output in India.
- To study the relationship between the regulations and planning frameworks governing banks in India and their environmental impact.

3.Methodology

This research paper relies on secondary data, which has been analyzed, described, and examined. To understand the relationship between economic growth, green finance, and environmental sustainability, both quantitative and qualitative analyses covering the period from 2015 to 2025 have been conducted.

For this study, secondary data has been sourced from the following government-recognized and reputable institutions:

Reserve Bank of India (RBI): Data from the RBI was used to understand shifts in bank lending and sectoral credit allocation, as well as to gather information on green deposits and related aspects.

Securities and Exchange Board of India (SEBI): SEBI's data was utilized to obtain information on the registration of corporate green bonds and the volume of such debt instruments.

Central Electricity Authority (CEA) and the Ministry of New and Renewable Energy (MNRE): These sources provided data on annual capacity expansion, as well as information regarding power generation capacity and grid integration.

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Ministry of Finance: The Ministry of Finance was consulted to examine reports concerning the allocation of funds for green bonds.

International Energy Agency (IEA) and the World Bank: Databases from these organizations were used to analyze India's energy transition pace, energy intensity, and emission trends.

4. Analysis

4.1. Mobilizing Dynamic Green Capital

In India, green finance has been implemented as part of Corporate Social Responsibility (CSR). Financial regulators have acted as key catalysts for this transformation by taking strategic steps—such as defining what constitutes a 'green asset'—to reduce information asymmetry and curb 'greenwashing.' A significant shift in debt management has been the introduction of Sovereign Green Bonds.

To facilitate green lending, an important institutional pricing mechanism has been established; the Reserve Bank of India (RBI) has announced auctions for green bonds with tenors of five and ten years.

This enhances the availability of credit, making it more accessible to private-sector entities as well.

At the same time, the RBI's 'Green Deposit' framework, introduced in April 2023, addresses the process of financial intermediation within the commercial banking sector. By mandating that banks implement independent verification procedures and submit transparent reports on the allocation of funds, this policy safeguards the money of depositors. The available savings funds are directed toward various key functional areas:

Eligible Green Financing Category	Target Projects & Technology Frameworks	Main Economic Function
Renewable Energy	Solar arrays, wind farms, biomass plants, low-impact hydro	Power sector decarbonization
Clean Transportation	Electric vehicles (EV), charging grids, mass metro transit	Reduction in oil import costs
Energy Efficiency	Smart grids, energy-efficient commercial buildings	Industrial operating cost reduction
Sustainable Water Management	Micro-irrigation, wastewater treatment plants	Climate-resilient agriculture

However, an analysis of capital allocation reveals a stark structural concentration. A significant portion of private 'green debt' capital is directed toward large-scale, grid-connected solar and wind energy projects. These projects generate long-term, predictable revenue streams backed by government Power Purchase Agreements (PPAs). In contrast, critical, decentralized environmental initiatives—such as urban waste management, climate-resilient agriculture, and improvements in industrial energy efficiency—receive less than 15 percent of the total private capital. This indicates that capital markets favor large-scale, easily quantifiable energy projects over more complex, localized environmental endeavors.

4.2 Assessing the Impact of 'Green Finance' on Economic Growth

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'Green Finance' influences economic growth through three primary macroeconomic channels: capital formation, job creation, and changes in technological productivity.

Capital Formation and Production Capacity

India requires substantial investment to meet its 'Nationally Determined Contributions' (NDCs) and long-term 'net-zero' emission goals. According to NITI Aayog estimates, India needs an investment of at least $2.5 trillion between 2015 and 2030, and over $4.5 trillion by 2040, to overhaul the country's core industrial and energy infrastructure. 'Green Finance' serves as a key instrument for providing capital to such projects. Adding a capacity of 29.52 gigawatts (GW) annually necessitates large-scale procurement of industrial machinery, steel, glass, electrical engineering components, and logistics services. This expenditure generates significant domestic demand and boosts production across the associated industrial supply chains.

Job Creation in the Clean Energy Sector

The construction and maintenance of green energy projects create extensive employment opportunities. According to the International Renewable Energy Agency (IRENA) and domestic data, the renewable energy sector in India has provided employment to over one million people as of 2024, with the sector contributing approximately 5% to the country's overall GDP growth. 'Off-grid' solar energy projects alone have created over 80,000 jobs, primarily in remote rural areas.

However, when evaluating employment trends, it is essential to consider the 'net employment effect.' The expansion of clean energy shifts capital away from traditional fossil-fuel-based sectors—such as the coal-mining regions of eastern India—toward areas with greater solar potential, like Rajasthan and Maharashtra in western India. This geographical disparity can create local economic challenges; therefore, to ensure a smooth transition for the workforce, it is crucial to invest in re-training workers and reinvesting in the affected regions.

Technological Innovation and Industrial Productivity

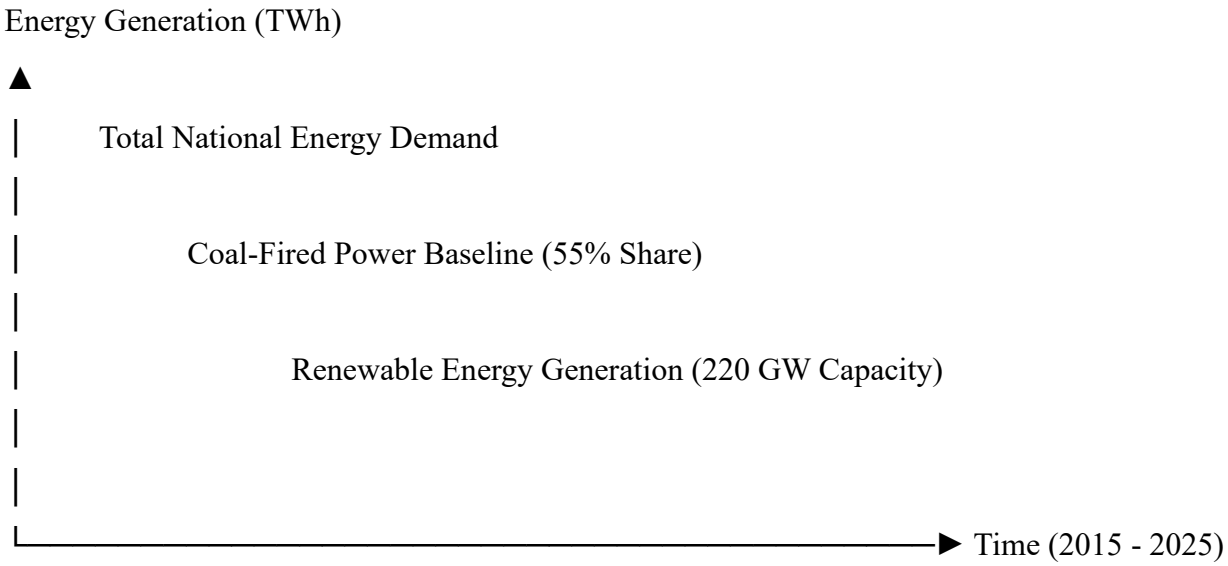
Through 'green finance,' access to credit is linked to standardized energy-efficiency criteria, encouraging companies to modernize their production facilities. The adoption of energy-efficient industrial equipment reduces electricity consumption per unit of output, thereby lowering direct operating costs and enhancing competitiveness in international trade. This momentum is further bolstered by green social venture funds and incubation networks, which provide early-stage equity to 'clean-tech' startups developing next-generation solutions, such as advanced Battery Energy Storage Systems (BESS).

4.3 Environmental Sustainability

The relationship between investments in green finance and environmental outcomes is complex. While expanding renewable energy infrastructure is a positive step, it does not necessarily lead to an immediate reduction in overall environmental degradation or a net decrease in greenhouse gas emissions.

This tension arises from the growth in total energy demand. As India pursues its path of economic development, a consistent increase in base-load power generation is required to sustain urban industrial hubs. As shown in the graph below, even during a period of rapid expansion in clean energy, conventional coal-based power generation continues to rise to meet the growing overall demand for base-load energy:

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If the total energy consumption grows faster than the capacity for green energy generation, then simply expanding the infrastructure—such as installing more turbines—will not suffice to achieve sustainable development. Initiatives labeled as "green" are only truly beneficial if they effectively displace the existing fossil-fuel-based energy grid.

Furthermore, environmental sustainability extends beyond the mere generation of electricity. Key areas of concern include urban waste management, the recycling of electronic waste, and pollution prevention. For instance, in the 2022–23 fiscal year, India generated approximately 100 kilotons of electronic waste from solar panels and wind turbines—a figure projected to reach 600 kilotons by 2030. Without automated circular economy systems in place to reuse and recycle these components, the rapid expansion of clean energy could inadvertently create a secondary crisis: a massive accumulation of waste.

4.4 Economic, Institutional, and Regulatory Barriers

As 'green finance' expands as a key instrument for funding, it faces several major challenges:

• Cost of Capital: In India, commercial bank loans come with high interest rates and relatively short tenures (typically around 10 years). In contrast, large-scale green infrastructure projects—such as pumped-storage hydropower—require a much longer horizon (15 to 25 years) to achieve a return on investment. This creates a structural mismatch, as the long-term nature of these projects does not align with the shorter-term financing structures offered by financial institutions.

• Challenges for MSMEs: While large entities can raise capital through 'green bonds,' Micro, Small, and Medium Enterprises (MSMEs) often struggle to access green loans. The administrative costs associated with regulatory compliance, reporting requirements, and meeting stringent ESG (Environmental, Social, and Governance) criteria often deter MSMEs from seeking or obtaining green financing.

• Fragmented Policy and Governance Framework: In India, energy and environmental management are distributed across various ministries. For instance, one sector might focus on the expansion of traditional coal-based mining, while another promotes renewable energy to meet decarbonization and emission-

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reduction targets. This fragmented structure hinders efficient resource allocation and complicates the pursuit of comprehensive macroeconomic objectives.

• Resource-Energy Interdependency Issues: Certain advanced renewable energy technologies, such as Concentrated Solar Power (CSP), require significant quantities of water—for instance, to cool solar panels and keep them clean—which can create challenges regarding resource availability. Such incidents have led to the emergence of victims, as the expansion of clean energy can place an additional burden on groundwater resources.

5. Findings

• Green Finance is a means, not an end: Financial instruments such as 'green bonds' and 'green deposits' serve as mechanisms for capital allocation. Their ultimate success depends entirely on the long-term operational performance of the projects, as well as independent monitoring and verification.

• Uneven capital allocation: Institutional green capital is primarily concentrated in large-scale solar and wind energy projects. Conversely, critical decentralized sectors—such as climate-resilient micro-irrigation, public waste management, and the modernization of Micro, Small, and Medium Enterprises (MSMEs)—consistently face a lack of funding.

• Integrating digitalization with ESG goals: The rapid digitalization of the Indian banking sector—notably the widespread adoption of real-time mobile payment systems (e.g., UPI/QR)—has made it easier to track transactions linked to green deposits. However, due to inconsistencies in reporting standards, linking transaction data to actual environmental impact remains a significant challenge.

• Regulatory Progress vs. Tax-related Hurdles: The Reserve Bank of India's (RBI) guidelines on 'green deposits' have significantly reduced the risk of 'greenwashing' (making false claims about being environmentally friendly). However, the absence of a unified 'green taxonomy' and tax incentives—such as tax exemptions on interest earned from green bonds—is slowing market growth, which in turn limits the participation of retail investors.

• The persistent gap between emissions and development: Although India has achieved a significant relative decoupling—reducing emission intensity in relation to GDP growth—the absolute volume of greenhouse gas (GHG) emissions continues to rise. This is because, as total energy demand grows, the addition of clean energy sources is not yet sufficient to replace the continued operation of traditional coal-based power plants.

Conclusion

Capital allocation, economic growth, and environmental conservation are key components of 'green finance.' These elements have served as catalysts for investment in infrastructure; for instance, India's renewable energy capacity has reached 20.10 gigawatts. This demonstrates that clean energy has become a vital pillar of the nation's development strategy, fostering job creation and boosting industrial output. However, the mere mobilization of financial resources and the expansion of infrastructure do not, in themselves, constitute definitive proof of environmental sustainability. Green finance serves as a fundamental tool for building a stable, low-carbon, and sustainable economic future.

It is crucial to verify whether green finance—beyond the hype and promotional rhetoric—genuinely creates employment opportunities across micro, small, medium, and large-scale enterprises. It is essential to assess

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whether India is truly deriving tangible benefits from this. Given the challenges India faces, it is fair to say that green finance represents a promising beacon on the path toward environmentally conscious economic development. Consequently, India's future strategic priorities should focus on enhancing the targeted allocation, transparency, and accessibility of green capital across all sectors of the economy.

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