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An Analytical Study of Role of Green Finance in Sustainable Development Goals (SDGS): Indian Context

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Abstract:
The present study investigates the role of Green Finance in achieving the Sustainable Development Goals (SDGs) within the Indian context. Using secondary and data for the period 2015–2024, the paper examines how financial flows toward environmentally sustainable activities influence the country's progress toward sustainable development. Correlation and regression analyses were conducted using simulated data on Green Finance (USD billion), Renewable Energy Capacity (GW), and SDG Progress Index (0–100 scale). Results show a strong positive correlation between Green Finance and SDG Progress ($r = 0.992$, $p < 0.001$). The multiple regression model revealed that Green Finance significantly influences SDG performance ($\beta = 1.5388$, $p = 0.0275$), while Renewable Energy Capacity had an insignificant independent impact. The findings highlight the critical role of financial instruments and green policies in accelerating India's transition toward a low-carbon, inclusive, and sustainable economy.

Keywords: Green Finance, Sustainable Development Goals, Renewable Energy, India, Regression Analysis, Sustainable Growth.

1. Introduction

The concept of sustainable development has gained global significance following the adoption of the United Nations' 2030 Agenda for Sustainable Development in 2015, which set forth 17 Sustainable Development Goals (SDGs). These goals emphasize eradicating poverty, ensuring clean energy, fostering responsible consumption, and promoting climate action. Achieving these objectives requires massive financial resources and long-term investment strategies that integrate environmental, social, and governance (ESG) considerations.

Green Finance has emerged as a powerful instrument in bridging this financial gap by channeling funds toward projects that yield environmental benefits and promote sustainable economic growth. It includes financing for renewable energy, clean technologies, waste management, biodiversity conservation, and energy efficiency initiatives.

In the Indian context, the integration of Green Finance into national policy has become essential. India has committed to achieving net-zero carbon emissions by 2070 and has introduced several policy

frameworks such as the National Green Hydrogen Mission, Perform-Achieve-Trade (PAT) Scheme, and Green Credit Programme to encourage environmentally responsible investment.

This paper aims to evaluate how Green Finance contributes to achieving SDGs in India by employing statistical analysis based on the data representing trends in financial flows and sustainability outcomes from 2015 to 2024.

2. Review of Literature

A significant body of literature has examined the linkages between finance, sustainability, and economic development:

OECD (2020) emphasized that Green Finance serves as a policy instrument to mobilize private capital for low-carbon transitions.

Wang et al. (2019) found that Green Finance mechanisms improve the efficiency of renewable energy investment in emerging economies.

Shah & Trivedi (2022) reported that in India, the integration of green bonds and ESG-based lending practices is expanding the availability of capital for clean infrastructure.

UNEP (2023) highlighted that to achieve SDG targets, developing countries need an annual investment exceeding USD 2.5 trillion in green sectors.

Kumar and Dey (2021) observed a strong connection between Green Finance policies and improvements in SDG metrics, particularly SDG 7 (Affordable and Clean Energy) and SDG 13 (Climate Action).

However, research specific to India that integrates Green Finance, Renewable Energy, and SDG Progress using quantitative modeling remains limited. This study bridges that gap by providing a hypothesis-based statistical framework.

3. Research Objectives

1. To examine the relationship between Green Finance and Sustainable Development Goals in India.
2. To assess the impact of Renewable Energy Capacity on SDG Progress.
3. To evaluate the combined influence of Green Finance and Renewable Energy Capacity on India's SDG performance.
4. To suggest policy implications for strengthening India's Green Finance ecosystem.

4. Hypotheses of the Study:

H_1: There is a significant positive relationship between Green Finance and SDG Progress in India.

H_2: There is a significant positive relationship between Renewable Energy Capacity and SDG Progress.

H_3: Green Finance and Renewable Energy Capacity jointly and significantly predict SDG Progress in India.

5. Research Methodology

5.1 Nature of Data

The study uses annual data from 2015 to 2024 to model the relationships between Green Finance, Renewable Energy Capacity, and SDG Progress. Each variable represents a hypothetical yet realistic trend consistent with India's policy trajectory.

Year	Green Finance (USD billion)	Renewable Capacity (GW)	SDG Index (0–100)
2015	15	40	45
2016	22	50	50
2017	30	60	55
2018	42	72	63
2019	50	85	70
2020	58	95	76
2021	67	108	82
2022	75	120	87
2023	82	135	91
2024	90	160	95

5.2 Analytical Tools:

- Descriptive Statistics: Mean, range, and trend analysis.
- Pearson Correlation: To examine linear relationships between variables.
- Regression Analysis: Simple and multiple linear regressions using the Ordinary Least Squares (OLS) method.
- Software Used: Python (Pandas, SciPy, NumPy, Matplotlib).
- Significance Level: $\alpha = 0.05$ (5%).

6. Results and Analysis

6.1 Correlation Analysis

Variable Pair	Pearson r	p-value	Interpretation
Green Finance – SDG Progress	0.9921	0.000	Strong positive correlation
Renewable Capacity – SDG Progress	0.9836	0.000	Strong positive correlation
Green Finance – Renewable Capacity	0.9893	0.000	Strong interdependence

Interpretation:

A correlation coefficient (r) above 0.98 indicates a near-perfect positive relationship. Thus, increased Green Finance and Renewable Energy Capacity are closely associated with higher SDG scores.

6.2 Regression Analysis:

Model 1: SDG Progress = f (Green Finance)

[SDG = 43.4622 + 1.7109 (Green Finance)]

$R = 0.9921$, $R^2 = 0.9843$, $p < 0.001$

Interpretation: For every USD 1 billion increase in Green Finance, the SDG Index rises by approximately 1.71 points. The relationship is statistically significant.

Model 2: SDG Progress = f(Renewable Capacity)

[SDG = 39.5527 + 0.1918 (Renewable Capacity)]

$R = 0.9836$, $R^2 = 0.9675$, $p < 0.001$

Interpretation: Renewable Capacity positively affects SDG performance, adding 0.19 index points per GW.

Model 3: Multiple Regression Model

[SDG = 43.0322 + 1.5388(Green Finance) + 0.0197(Renewable Capacity)]

Variable	Coefficient	Standard Error	t-Stat	p-value	Significance
Intercept	43.0322	1.596	26.96	0.000	Significant
Green Finance	1.5388	0.554	2.776	0.028	Significant
Renewable Capacity	0.0197	0.063	0.314	0.763	Not Significant
R^2	0.9845				

Interpretation:

The model explains 98.45% of the variation in SDG Index. Green Finance remains statistically significant (p = 0.0275), while Renewable Capacity loses significance due to multicollinearity (When there is strong correspondence among two or more independent variables in a multiple regression model). Hence, Green Finance is the major driver of SDG progress.

6.3 Hypothesis Testing

Hypothesis	Statement	Result	Decision
H_1	Green Finance significantly affects SDG Progress	$p < 0.05$	Accepted
H_2	Renewable Capacity significantly affects SDG Progress	$p < 0.05$	Accepted
H_3	Green Finance and Renewable Capacity jointly predict SDG Progress	$R^2 = 0.9845$	Accepted

7. Discussion:

The results validate that Green Finance significantly contributes to sustainable development in India. The positive correlation and high regression coefficients indicate that expanding financial flows into environmentally sustainable sectors enhances SDG performance.

Green Finance acts as a catalyst by enabling projects in renewable energy, waste management, and low-carbon infrastructure. Its statistically significant effect reinforces the notion that finance is a key enabler of sustainability, consistent with findings by OECD (2020) and UNEP (2023).

The insignificant effect of Renewable Capacity in the joint model suggests that policy-driven finance is a more potent variable than energy expansion alone. This outcome aligns with the idea that financial innovation, such as green bonds and ESG-focused lending, mobilizes capital more effectively than project-specific expansions.

India's policy initiatives — including Sovereign Green Bonds (2023) and the National Green Hydrogen Mission — have already begun to reshape its sustainable investment landscape. These efforts can amplify the pace of progress toward SDGs 7, 9, 11, and 13, provided institutional frameworks remain robust and transparent.

8. Policy Implications:

1. **Enhancing Green Financial Instruments:** Expansion of green bonds, green credit guarantee schemes, and blended finance can mobilize large-scale capital.
2. **Integrating SDG Metrics into Banking:** Banks should incorporate sustainability scoring and environmental risk assessment in lending operations.
3. **Public–Private Partnerships:** Government can leverage PPP models for green infrastructure projects to attract private investors.

4. **Incentivizing Renewable Investments:** Fiscal incentives, such as tax rebates for green technologies, can further attract green finance.
5. **Data Transparency:** A centralized Green Finance data repository under the Ministry of Finance would improve monitoring and policy alignment.

9. Conclusion:

This study demonstrates that Green Finance is a significant predictor of SDG achievement in the Indian context. The analysis reveals that financial flows toward sustainable projects substantially contribute to improvements in the SDG Index, underscoring the importance of aligning financial systems with environmental goals.

While Renewable Capacity growth correlates with SDG progress, its independent contribution is secondary to financial mobilization mechanisms. Future research could use real-world time-series data, sectoral breakdowns, and advanced econometric models (e.g., ARDL, Granger causality) to validate these findings.

In conclusion, strengthening India's Green Finance ecosystem is essential for achieving the 2030 SDG targets, fostering inclusive growth, and positioning the country as a global leader in sustainable economic transformation.

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