

Group 5

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Analyzing the Impact of Renewable Energy Investments on Economic Growth and Emission Reduction Across Indian States

Background & Context

India has positioned itself as one of the fastest-growing renewable energy markets globally, driven by its commitment to achieve Net Zero emissions by 2070 ([IEA, 2023](#)).

As of mid-2025, renewable and other non-fossil sources account for nearly 49% of India's installed power capacity, up from just 31% in 2015 ([Power Technology, 2025](#)).

Through flagship initiatives such as the National Solar Mission, Green Hydrogen Mission, and the Production-Linked Incentive (PLI) Scheme for solar manufacturing, India aims to reach 500 GW of non-fossil capacity by 2030 ([Enerdata, 2025](#); [PIB, 2025](#)).

However, despite the surge in renewable energy deployment, it remains unclear whether these investments translate into measurable economic and environmental outcomes at the state level.

While macroeconomic data indicates that clean energy infrastructure generates employment and supports industrialization, there is limited state-wise empirical evidence connecting renewable energy capacity growth to Gross State Domestic Product (GSDP) or CO₂ emission intensity.

This gap between investment and measurable outcomes presents a critical managerial and policy challenge: governments and investors must determine whether renewable investments are producing proportionate economic returns and emission reductions.

Hence, this study will quantitatively analyze whether renewable energy capacity growth across Indian states correlates with economic performance (GSDP growth) and environmental performance (emission intensity) over the past decade to identify which states are achieving “green growth” and what differentiates them from others.

Sources:

https://www.business-standard.com/industry/news/nearly-half-of-india-s-power-generation-capacity-non-fossil-125062200249_1.html

<https://mercomindia.com/renewable-energy-capacity-in-indias-power-mix-reaches-48-3-in-q2-2025>

<https://static.pib.gov.in/WriteReadData/specifcdocs/documents/2025/jun/doc2025622575501.pdf>

<https://www.power-technology.com/news/indias-renewable-energy-capacity-soars-decade/>

<https://www.enerdata.net/publications/daily-energy-news/india-reached-220-gw-new-renewable-energy-capacity-2024-2025.html>

<https://www.investindia.gov.in/sector/renewable-energy>

Problem Statement

Despite massive renewable energy investments, there is limited empirical evidence on whether these initiatives yield tangible economic growth and environmental benefits at the state level. Policymakers, investors, and sustainability leaders need data-backed insights to determine which states’ renewable strategies are delivering optimal results — and why others are lagging behind.

This study seeks to address the problem by analyzing the relationship between renewable energy capacity expansion and key economic and environmental indicators using publicly available datasets.

Objective

To examine and quantify the impact of renewable energy capacity growth on:

1. Economic performance — measured by state-level GDP growth, and
2. Environmental performance — measured by CO₂ emissions intensity (CO₂ per unit of GDP).

The goal is to identify whether renewable energy expansion contributes to a “green growth” pattern across Indian states and to derive managerial insights for better policy and investment decisions.

Data Source

- Primary Dataset: [India Renewable Energy Dataset \(Kaggle\)](#)
 - Contains state-wise installed renewable energy capacity (solar, wind, hydro, biomass) over multiple years.
 - Supporting Datasets:
 - https://cea.nic.in/cdm-co2-baseline-database/?lang=en&utm_source=chatgpt.com
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Variables:

Type	Variable	Description	Measurement
Dependent Variable 1	GDP Growth Rate	State-wise annual economic growth (%)	Continuous
Dependent Variable 2	CO ₂ Emission Intensity	Total CO ₂ emissions per unit of GSDP	Continuous

Independent Variable	Renewable Energy Capacity Growth	Year-over-year % increase in installed renewable capacity (MW)	Continuous
Control Variables (Optional)	Population, Industrial Output, Urbanization Rate	To control for state-level economic diversity	Continuous