

Assessing the Role of Climate Policy in Achieving Sustainable Development Goals in India

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Abstract- Climate change has emerged as one of the most critical challenges affecting economic growth, environmental sustainability, and social well-being across the world. India has implemented a number of climate policies to address these issues while seeking sustainable development because it is extremely exposed to climate-related threats such as extreme weather events, rising temperatures, and resource scarcity. This study looks at how climate policy affects India's efforts to meet the Sustainable Development Goals (SDGs). The National Action Plan on Climate Change (NAPCC), the promotion of renewable energy, energy efficiency measures, afforestation programs, and climate-resilient agriculture practices are among the primary policy efforts that are the subject of this study. The study looks into how these policies promote economic growth, social inclusion, poverty alleviation, energy security, and environmental preservation. It also draws attention to the difficulties encountered in putting policies into practice, including budgetary limitations, gaps in technology, institutional flaws, and regional differences. The results indicate that India's progress toward a number of SDGs, especially those pertaining to climate action, clean energy, sustainable cities, and responsible consumption, has been greatly aided by climate policy. However, attaining long-term sustainability requires improved public involvement, greater investment in green technologies, and improved governmental coordination. The study comes to the conclusion that successful climate policies are essential to promoting inclusive and resilient development and strengthening India's commitment to the Sustainable Development Goals.

Keywords- Climate Policy, Sustainable Development Goals (SDGs), Climate Change, Environmental Sustainability, Renewable Energy, Climate Action, Green Growth, India.)

I. Introduction

Climate change is one of the most significant global challenges of the twenty-first century, posing serious threats to economic development, environmental sustainability, and social well-being. Both affluent and developing nations have been negatively impacted by rising temperatures, shifting rainfall patterns, harsh weather, biodiversity loss, and environmental degradation. India's vast population, reliance on agriculture, and varied ecological circumstances make it especially susceptible to the effects of climate change. The nation is dedicated to accomplishing the Sustainable Development Goals (SDGs), which were approved by the UN in 2015 and are intended to advance social inclusion, economic progress, and environmental preservation. The National Action Plan on Climate Change (NAPCC), renewable energy programs, energy-efficiency measures, afforestation plans, and sustainable farming practices are just a few of the policies and initiatives the Indian government has undertaken in recognition of the significance of climate action. These regulations are intended to lower

greenhouse gas emissions, improve climate resilience, and promote sustainable development in a number of industries. In addition to tackling environmental issues, climate policy is essential for reducing poverty, ensuring energy security, creating jobs, and enhancing quality of life. Thus, evaluating how well climate policies accomplish sustainable development objectives is crucial to guaranteeing long-term environmental sustainability and equitable economic growth. The importance of climate policy in advancing and accomplishing the Sustainable Development Goals in India is examined in this paper.

Overview

In order to solve the environmental, economic, and social issues brought on by climate change, climate policy has emerged as a crucial tool. To lower greenhouse gas emissions, support renewable energy, improve energy efficiency, and fortify climate resilience, India has put in place a number of climate-related laws and projects. By promoting social welfare, economic growth, poverty reduction, and environmental sustainability, these actions greatly aid in the accomplishment of the Sustainable Development Goals (SDGs). Notwithstanding significant advancements, problems like budgetary restrictions, technology limits, and implementation gaps still exist. Therefore, in order to ensure inclusive and sustainable development while tackling climate-related threats in India, effective climate policies are essential.

II. Review of Literature

Stern (2007) in the *Stern Review on the Economics of Climate Change* emphasized that climate change poses significant risks to global economic growth and sustainable development. The study argued that early policy interventions and investments in climate mitigation are more cost-effective than addressing future climate-related damages.

IPCC (2014) highlighted that climate change adversely affects natural resources, livelihoods, and economic development. The report stressed the importance of adaptation and mitigation policies for achieving sustainable development and reducing environmental vulnerabilities across nations.

United Nations (2015), through the Sustainable Development Goals (SDGs), recognized climate action as a critical component of sustainable development. The report emphasized the integration of environmental sustainability, social inclusion, and economic growth through effective climate policies.

Dubash et al. (2018) examined India's climate policy framework and found that initiatives such as the National Action Plan on Climate Change (NAPCC) have contributed to renewable energy expansion and climate resilience. However, challenges related to implementation and policy coordination continue to affect outcomes.

Bhattacharya and Mitra (2020) analyzed India's renewable energy policies and observed that investments in solar and wind energy have supported sustainable development by reducing carbon emissions, enhancing energy security, and creating employment opportunities.

NITI Aayog (2023) reported that India's climate policies have positively influenced progress toward several Sustainable Development Goals, particularly clean energy, sustainable cities, and climate action. The report emphasized the need for stronger institutional mechanisms and green investments to accelerate sustainable development.

Research Gap

Previous research has looked at sustainable development, climate policies, and climate change independently at the national and international levels. Nevertheless, little study has thoroughly evaluated how climate policy contributes to India's attainment of the Sustainable Development Goals (SDGs) by incorporating social, economic, and environmental factors. Evaluating the success of recent climate initiatives is also necessary, as is identifying legislative measures that can support India's advancement toward equitable and sustainable development. By analyzing how climate policies contribute to the attainment of SDGs in India, this study aims to close this gap.

III. Statement of the Problem

In India, climate change has emerged as a significant obstacle to social progress, environmental sustainability, and economic growth. Agriculture, livelihoods, health, and natural resources are increasingly impacted by rising temperatures, erratic rainfall, extreme weather, water scarcity, and environmental degradation. The Indian government has implemented a number of climate policies and initiatives with an emphasis on renewable energy, energy efficiency, emission reduction, afforestation, and climate adaptation in order to address these issues. The accomplishment of the Sustainable Development Goals (SDGs), in particular climate action, clean energy, sustainable communities, and responsible consumerism, is intimately linked to these projects. However, India still faces obstacles with regard to efficient execution, funding, technology constraints, institutional coordination, and regional inequities despite significant legislative initiatives. Therefore, a methodical evaluation of how much climate policies help achieve sustainable development goals is necessary. With a focus on policy efficacy, implementation difficulties, and prospects for sustainable and equitable development, the current study investigates the role of climate policy in accomplishing the Sustainable Development Goals in India.

Objectives

- To assess the role of climate policies in achieving the Sustainable Development Goals (SDGs) in India.
- To identify the major challenges and constraints in the implementation of climate policies in India.
- To examine the opportunities for strengthening climate policy and promoting green and inclusive economic growth in India.

IV. Methodology

The study adopts a descriptive and analytical research design to examine the major climate policies and initiatives implemented by the Government of India and to assess the opportunities for strengthening climate policy and promoting green and inclusive economic growth. The study is based entirely on secondary data collected from reliable and authentic sources, including Government of India publications, the Ministry of

Environment, Forest and Climate Change (MoEFCC), Ministry of New and Renewable Energy (MNRE), NITI Aayog, Ministry of Power, Bureau of Energy Efficiency (BEE), Central Electricity Authority (CEA), Economic Survey, SDG India Index and other relevant official reports and publications. The period of the study covers 2010–11 to 2025–26, enabling the researcher to examine the long-term development and changing trends in India's climate-related policies and indicators. Selected indicators include renewable energy capacity, solar capacity, wind capacity, energy efficiency, green finance, clean energy development and other relevant climate-related measures. Compound Annual Growth Rate (CAGR) is applied to measure the average annual growth of selected indicators during the study period. Trend Analysis is used to examine the direction and pattern of changes over time by estimating the trend coefficient. The findings are presented through appropriate tables and interpretations to identify growth performance, emerging opportunities and the overall direction of India's climate-policy development.

V. Result and Discussion

Table1: Year-wise Progress of Renewable Energy as an Indicator of Climate Policy and Sustainable Development in India, 2010–11 to 2025–26

S. No.	Year	Renewable Energy Capacity Added (MW)	Solar Capacity Added (MW)	Wind Capacity Added (MW)
1	2010–11	3,157.31	26.59	2,350.00
2	2011–12	4,942.90	905.60	3,197.00
3	2012–13	3,163.17	754.14	1,698.80
4	2013–14	1,468.00*	395.00*	881.00*
5	2014–15	4,100.50	1,171.62	2,311.77
6	2015–16	7,141.30	3,130.36	3,423.05
7	2016–17	11,466.81	5,658.63	5,502.37
8	2017–18	12,093.24	9,563.69	1,865.23
9	2018–19	8,760.56	6,750.97	1,480.97
10	2019–20	8,843.31	6,510.06	2,117.79
11	2020–21	7,548.11	5,628.80	1,503.30
12	2021–22	14,081.97	12,760.50	1,110.53
13	2022–23	15,274.43	12,783.80	2,275.55
14	2023–24	18,484.68	15,033.24	3,253.38
15	2024–25	28,723.65	23,832.87	4,151.31

The table presents the year-wise addition of renewable energy capacity in India, with specific emphasis on solar and wind energy during the period 2010–11 to 2024–25. The data reveal an overall increasing trend in renewable energy development, although considerable year-to-year fluctuations are observed. Total renewable energy capacity addition increased from 3,157.31 MW in 2010–11 to 28,723.65 MW in 2024–25, indicating a substantial expansion of renewable energy investment and deployment. Solar energy recorded the most remarkable growth, increasing from only 26.59 MW in 2010–11 to 23,832.87 MW in 2024–25. The rapid expansion of solar capacity became particularly evident after 2015–16 and reached 23,832.87 MW in 2024–25, reflecting India's increasing emphasis on clean and sustainable energy. Wind energy also

contributed significantly, rising from 2,350.00 MW in 2010–11 to 4,151.31 MW in 2024–25, although its growth was comparatively moderate and fluctuated across the years. Renewable energy additions declined during certain periods, particularly 2013–14 and 2020–21, but subsequently recovered strongly. The highest total renewable energy addition was recorded in 2024–25, while solar capacity also achieved its highest annual addition during the same year. Overall, the table indicates a significant structural shift towards renewable energy, particularly solar power, supporting India's climate-action objectives, energy transition, and sustainable development goals.

Statistical Tools Used

1. Trend Analysis

The following linear trend model can be applied:

$$Y = a + bX$$

Y represents renewable-energy capacity and **X** represents the year.

You can estimate separate trends for:

Total Renewable Energy , Solar Energy , Wind Energy

2. Compound Annual Growth Rate (CAGR)

CAGR can be calculated for the complete period:

$$\text{CAGR} = [(\text{Ending Value} / \text{Beginning Value})^{(1/n)} - 1] \times 100$$

where **n** = number of years.

Table for Statistical Results

After calculating the trend and CAGR, you can add a separate summary table:

Table: Statistical Results of Renewable Energy Capacity in India, 2010–11 to 2024–25

S. No.	Indicator	Beginning Value (2010–11)	Ending Value (2024–25)	CAGR (%)	Trend Coefficient (b)	Trend
1	Renewable Energy Capacity	3,157.31 MW	28,723.65 MW	17.08	1,365.24	Increasing
2	Solar Capacity	26.59 MW	23,832.87 MW	62.51	1,365.15	Increasing
3	Wind Capacity	2,350.00 MW	4,151.31 MW	4.15	27.47	Increasing

The table indicates that renewable energy capacity in India recorded a significant increasing trend during 2010–11 to 2024–25. Total renewable energy capacity increased from 3,157.31 MW to 28,723.65 MW, registering a CAGR of 17.08% and a positive trend coefficient of 1,365.24. Solar capacity showed the most remarkable growth, rising from 26.59 MW to 23,832.87 MW, with a very high CAGR of 62.51% and a positive trend coefficient of 1,365.15. Wind capacity increased from 2,350 MW to 4,151.31 MW, recording a CAGR of 4.15%. Overall, the results confirm India's strong expansion in renewable energy, particularly solar power.

Table 2.: Year-wise Major Climate Policies and Initiatives of the Government of India, 2010–11 to 2025–26

S. No.	Year	Major Climate Policy / Initiative	Major Focus / Objective
1	2010–11	National Solar Mission (NSM)	Promotion of solar energy and reduction of dependence on fossil fuels
2	2011–12	National Mission for Enhanced Energy Efficiency (NMEEE)	Improving energy efficiency and reducing energy consumption
3	2012–13	National Water Mission (NWM)	Water conservation, efficient water use and climate resilience
4	2013–14	National Mission for Sustainable Agriculture (NMSA)	Climate-resilient and sustainable agricultural development
5	2014–15	National Mission for a Green India (GIM)	Increasing forest and tree cover and enhancing carbon sequestration
6	2015–16	UJALA Scheme	Promotion of energy-efficient LED lighting and reduction in electricity consumption
7	2016–17	FAME India Scheme	Promotion of electric and hybrid vehicles and reduction of transport emissions
8	2017–18	State Action Plans on Climate Change (SAPCC)	Strengthening state-level climate adaptation and mitigation
9	2018–19	National Clean Air Programme (NCAP)	Reduction of air pollution and improvement of air quality
10	2019–20	India Cooling Action Plan (ICAP)	Sustainable cooling, energy efficiency and reduction of refrigerant emissions
11	2020–21	Nationally Determined Contributions (NDC) implementation	Strengthening India's mitigation and adaptation commitments
12	2021–22	National Mission on Climate Change and Human Health	Addressing climate-related health risks and strengthening health resilience
13	2022–23	India's Long-Term Low-Emission Development Strategy (LT-LEDS)	Long-term low-carbon and climate-resilient development

14	2023–24	National Green Hydrogen Mission	Development of green hydrogen and decarbonisation of major sectors
15	2024–25	PM-Surya Ghar: Muft Bijli Yojana	Promotion of rooftop solar and clean household electricity
16	2025–26	NAPCC 2.0 / strengthened climate action framework	Strengthening climate resilience, mitigation and sustainable development

Table 3: Major Opportunities for Strengthening Climate Policy and Promoting Green and Inclusive Economic Growth in India

S. No.	Opportunity Area	Major Opportunity	Expected Contribution to Green & Inclusive Growth
1	Renewable Energy	Expansion of solar, wind and other renewable energy sources	Reduces fossil-fuel dependence and promotes low-carbon growth
2	Green Technology	Adoption of clean and energy-efficient technologies	Reduces emissions and improves productivity
3	Green Finance	Expansion of green bonds, climate finance and sustainable investment	Mobilises finance for climate-friendly development
4	Green Employment	Development of employment and skill opportunities in green sectors	Generates jobs and improves livelihoods
5	Sustainable Agriculture	Promotion of climate-smart agriculture and efficient irrigation	Strengthens rural income and climate resilience
6	Green MSMEs	Financial and technological support for sustainable MSME production	Improves resource efficiency and creates employment
7	Clean Transport	Promotion of electric vehicles and public transportation	Reduces emissions and fossil-fuel consumption
8	Circular Economy	Recycling, resource recovery and waste-to-energy activities	Reduces waste and creates economic value
9	Climate-Resilient Infrastructure	Investment in climate-resilient infrastructure	Reduces climate-related economic losses
10	Inclusive Climate Policy	Greater participation of rural communities, women, MSMEs and vulnerable groups	Promotes equitable and inclusive green development

Table 4: Major International Climate Policies, Programmes and Initiatives Related to Sustainable Development

S. No.	Policy / Programme / Initiative	Year	Major Focus
International Level			
1	United Nations Framework Convention on Climate Change (UNFCCC)	1992	International climate cooperation
2	Kyoto Protocol	1997	Greenhouse-gas emission reduction
3	Green Climate Fund (GCF)	2010	Climate finance
4	Sustainable Development Goals (SDGs)	2015	Sustainable and inclusive development
5	Paris Agreement	2015	Climate-change mitigation and adaptation
6	Global Methane Pledge	2021	Methane emission reduction
7	UN Decade on Ecosystem Restoration	2021–2030	Ecosystem restoration
8	Kunming–Montreal Global Biodiversity Framework	2022	Biodiversity and ecosystem conservation
National Level (India)			
1	National Action Plan on Climate Change (NAPCC)	2008	Overall climate action
2	National Solar Mission	2010	Solar energy development
3	National Mission for Enhanced Energy Efficiency	2010	Energy efficiency
4	National Mission on Sustainable Habitat	2010	Sustainable urban development
5	National Water Mission	2011	Water conservation
6	National Mission for Green India	2011	Forest and carbon sink
7	National Mission for Sustainable Agriculture	2014	Climate-resilient agriculture
8	FAME India Scheme	2015	Electric mobility
9	National Clean Air Programme	2019	Air pollution reduction
10	PM-KUSUM	2019	Solar energy in agriculture
11	Mission LiFE	2022	Sustainable lifestyles
12	National Green Hydrogen Mission	2023	Green hydrogen development
13	Green Credit Programme	2023	Environmental sustainability
14	PM Surya Ghar: Muft Bijli Yojana	2024	Rooftop solar energy
Tamil Nadu Level			
1	Tamil Nadu Climate Change Mission (TNCCM)	2021	Climate mitigation and adaptation
2	Green Tamil Nadu Mission (GTM)	2021	Forest and tree-cover expansion

3	Tamil Nadu Wetlands Mission	2021	Wetland conservation
4	Meendum Manjappai Campaign	2021	Reduction of single-use plastics
5	Tamil Nadu Green Climate Company (TNGCC)	2022	Coordinated climate action
6	Tamil Nadu Green Climate Fund	2022	Climate finance
7	Chief Minister's Green Fellowship Programme	2022	Climate capacity building
8	Climate Resilient Village Programme	2023	Local climate adaptation
9	Green Schools Programme	2023	Environmental education
10	TN-SHORE	2024	Coastal ecosystem restoration and resilience

Major Findings

- Overall renewable energy increased substantially: Renewable energy capacity addition increased from 3,157.31 MW in 2010–11 to 28,723.65 MW in 2024–25.
- Solar energy showed the strongest expansion: Solar capacity increased dramatically from 26.59 MW to 23,832.87 MW during the study period.
- Wind energy showed moderate growth: Wind capacity increased from 2,350.00 MW to 4,151.31 MW, but its annual additions fluctuated considerably.
- 2016–17 onwards was an important expansion period: Renewable energy additions increased significantly, reflecting accelerated investment in renewable-energy infrastructure.
- Temporary decline during 2020–21: Total renewable energy additions declined to 7,548.11 MW, coinciding with the disruption associated with the COVID-19 period.
- Strong recovery after 2020–21: Renewable energy additions increased to 14,081.97 MW in 2021–22 and continued rising thereafter.
- Highest performance in 2024–25: Total renewable energy addition reached 28,723.65 MW, the highest value in the table.
- Solar became the dominant contributor: By 2024–25, solar capacity addition (23,832.87 MW) was substantially higher than wind capacity addition (4,151.31 MW).

Suggestions

- Strengthen the integration of climate policies with national development programmes.
- Accelerate investment in renewable energy, particularly solar and wind power.
- Improve coordination among central, state and local governments for effective policy implementation.
- Increase the availability of green finance and climate-related investments.
- Promote green technologies and energy-efficient production systems.
- Expand skill-development programmes to generate green employment opportunities.
- Promote climate-smart and sustainable agricultural practices.
- Provide greater financial and technological support to green MSMEs.
- Strengthen climate-resilient infrastructure and sustainable urban development.

- Enhance the participation of women, rural communities and vulnerable groups in climate action.
- Improve monitoring and evaluation of climate policies using measurable SDG indicators.
- Promote public awareness of sustainable consumption, energy conservation and environmental protection.

VI. Conclusion

The study concludes that climate policies play an important role in promoting sustainable development and achieving the Sustainable Development Goals (SDGs) in India. During the study period, India made significant progress in renewable energy, energy efficiency, clean transportation, green finance and other climate-related initiatives. The expansion of solar and wind energy demonstrates the country's increasing transition towards a low-carbon economy. However, challenges such as inadequate finance, technological constraints, institutional weaknesses, implementation gaps and limited public awareness continue to affect effective climate-policy outcomes. At the same time, substantial opportunities exist through renewable energy expansion, green technology, green employment, sustainable agriculture, green finance and climate-resilient infrastructure. Strengthening policy coordination, financial support, technological innovation and inclusive participation can help India achieve climate objectives while generating employment and improving livelihoods. Therefore, integrating climate action with inclusive and sustainable economic growth is essential for achieving long-term environmental and developmental goals in India.

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