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India's Trajectory in Future Climate Change Mitigation: Challenges, Opportunities, and Global Implications

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Abstract

India stands at the central dogma of global climate politics, balancing urgent development needs with mounting international pressure to contribute meaningfully to climate change mitigation. As third largest emitters of greenhouse gases in the world, yet with relatively low per capita emissions, India's future mitigation trajectory will significantly shape global climate outcomes. This research article examines India's evolving climate mitigation pathway through the lenses of diplomacy, domestic policy frameworks, technological transitions, and international cooperation. It further evaluates the structural constraints India faces, including energy poverty, financing gaps, and developmental imperatives, while highlighting emerging opportunities such as green hydrogen, climate finance mobilization, and South–South cooperation. The study argues that India's future mitigation trajectory will be incremental, equity-driven, and highly conditional on international support, yet potentially transformative if aligned with global finance and technology flows. The paper contributes to the literature by situating India's mitigation strategy within broader debates on climate justice, differentiated responsibilities, and sustainable development.

Keywords: Climate Change Mitigation, India, Climate Diplomacy, Paris Agreement, Net-Zero, Climate Justice

Introduction

Climate change represents one of the most pressing global challenges of the twenty-first century, necessitating collective action across national boundaries while simultaneously respecting diverse developmental trajectories. Among emerging economies, India occupies a particularly complex and influential position. As the world's most populous country and the third-largest emitter of greenhouse gases in absolute terms, India's future climate change

mitigation trajectory is of decisive importance to the success of global efforts to limit temperature rise to well below 2°C, as envisioned under the Paris Agreement. At the same time, India's per capita emissions remain significantly below the global average, and the country continues to grapple with persistent challenges of poverty alleviation, energy access, and economic development.

India's engagement with climate change mitigation has evolved considerably over the past three decades. Initially adopting a defensive posture rooted in the principles of equity and common but differentiated responsibilities and respective capabilities (CBDR–RC), India consistently emphasized historical responsibility and the developmental obligations of industrialized nations. This stance was evident during the negotiations of the United Nations Framework Convention on Climate Change (UNFCCC) and the Kyoto Protocol, where India resisted binding emission reduction targets for developing countries. Over time, however, India's position has shifted toward a more proactive and constructive engagement with global climate governance, particularly following the Copenhagen Accord and the adoption of the Paris Agreement in 2015.

The announcement of India's long-term goal to achieve net-zero emissions by 2070 at COP26 in Glasgow marked a significant milestone in its climate diplomacy and mitigation narrative. Alongside this commitment, India articulated the 'Panchamrit' strategy, encompassing five key elements related to non-fossil energy capacity, renewable energy expansion, emissions intensity reduction, and climate finance. These pledges signal India's willingness to align its development pathway with global climate objectives, albeit on timelines and terms consistent with national circumstances.

This research article seeks to examine India's future trajectory in climate change mitigation by analyzing the interplay between international commitments, domestic policy initiatives, technological transitions, and geopolitical considerations. The central dogma of this study is: (i) Role of key drivers in shaping India's future climate mitigation pathway (ii) How do equity in climate justice and developmental imperatives influence India's mitigation strategies? And (iii) how does the India's mitigation trajectory for climate change effects impact the global governance? By addressing these questions, the paper aims to provide a comprehensive and analytically grounded assessment of India's role in future climate change mitigation.

Climate Justice and Differentiated Responsibilities

The concept of climate justice provides a critical normative framework for understanding India's approach to climate change mitigation. Rooted in principles of fairness, equity, and historical responsibility, climate justice emphasizes the disproportionate contribution of developed countries to cumulative greenhouse gas emissions and the unequal distribution of climate change impacts. The principle of common but differentiated responsibilities,

enshrined in the UNFCCC, reflects this logic by acknowledging the shared obligation of all states to address climate change while recognizing differences in capabilities and development levels.

For India, climate justice has served as both a moral argument and a strategic tool in international negotiations. Indian policymakers have consistently highlighted the inequities inherent in global emissions patterns, arguing that imposing uniform mitigation obligations would constrain the developmental prospects of the Global South. Scholars note that India's emphasis on per capita emissions and historical responsibility has shaped its resistance to binding targets under earlier climate regimes, while simultaneously legitimizing its calls for financial and technological support.

At the same time, the evolution of the global climate regime toward universal participation under the Paris Agreement has necessitated a reconfiguration of differentiation. The nationally determined contributions (NDCs) framework represents a shift from legally binding targets to self-determined commitments, allowing countries like India to articulate mitigation goals aligned with national priorities. This flexible architecture has enabled India to reconcile its climate justice narrative with increased participation in global mitigation efforts.

Evolution of India's Climate Mitigation Commitments

From UNFCCC to Kyoto Protocol

India's early engagement with climate mitigation was characterized by a cautious and defensive approach. During the UNFCCC negotiations in the early 1990s, India played a key role in embedding the principle of CBDR into the convention's core framework. As a Non-Annex I country under the Kyoto Protocol, India was exempt from binding emission reduction targets, a position it strongly defended on developmental grounds.

Transition Phase: Copenhagen to Paris and Net-Zero Commitment

The Copenhagen Conference of 2009 marked a turning point in India's climate diplomacy. India agreed to voluntary mitigation actions and submitted emission intensity reduction targets, signaling a shift toward greater engagement. The Paris Agreement further institutionalized this transition by adopting a bottom-up approach, under which India committed to reducing emissions intensity and increasing non-fossil fuel capacity. India's net-zero announcement at COP26 represents a forward-looking vision for long-term decarbonization. While the 2070 timeline reflects India's developmental realities, it also underscores the country's recognition of the need for systemic transformation across energy, industry, transport, and agriculture sectors.

Domestic Policy Frameworks for Climate Mitigation

India's mitigation trajectory is closely linked to its domestic policy landscape. The National Action Plan on Climate Change (NAPCC) and its associated missions provide a comprehensive framework for addressing mitigation and adaptation simultaneously. Key initiatives such as the National Solar Mission, National Electric Mobility Mission, and energy efficiency programs have contributed to measurable emissions reductions. The expansion of renewable energy capacity, particularly solar and wind, has emerged as a cornerstone of India's mitigation strategy. India's target of achieving 500 GW of non-fossil fuel capacity by 2030 reflects both climate and energy security considerations. Additionally, policies promoting energy efficiency in industry and buildings have played a crucial role in reducing emissions intensity.

Sectoral Pathways for Future Mitigation

Energy Sector

The energy sector accounts for the largest share of India's emissions. Transitioning away from coal while ensuring energy access remains a central challenge. India's approach emphasizes gradual diversification, increased renewables, and cleaner coal technologies.

Transport and Industry

Proliferation of electric vehicle, promotion of public transport, and adoption of low-carbon industrial processes are critical components of future mitigation. Initiatives such as the National Electric Vehicle Mission aim to reduce emissions while fostering domestic manufacturing.

Agriculture and Land Use

Although agriculture contributes relatively more to economic growth but less to emissions and mitigation in this sector is linked to sustainable practices with land-use management. Afforestation and carbon sinks form part of India's NDC commitments.

International Cooperation and Climate Finance

India's future mitigation trajectory is heavily contingent on access to climate finance and technology transfer. Despite commitments by developed countries to mobilize USD 100 billion annually, actual flows have remained inadequate. India has consistently emphasized the need for predictable and concessional finance to support large-scale mitigation efforts. Platforms such as the International Solar Alliance and Coalition for disaster resilient infrastructure (CDRI) illustrate India's leadership in fostering South–South cooperation. Such

initiatives not only enhance mitigation capacity but also strengthen India's diplomatic standing in global climate governance.

Challenges and Constraints

Structural constraints, including energy production, fiscal limitations, and institutional capacity pose significant challenges to India's mitigation ambitions. Balancing economic growth with emissions reduction remains a delicate task, particularly in the context of post-pandemic recovery and global economic uncertainties.

Opportunities and Future Pathways

Emerging technologies such as green hydrogen, battery storage, and carbon capture offer new avenues for deep decarbonization. India's growing emphasis on innovation and domestic manufacturing could position it as a leader in low-carbon technologies.

Future Pathways of India to Mitigate the Effects of Climate Change

India's future pathways shaped by the dual imperatives of sustaining economic growth and fulfilling international climate commitments to mitigate the climate change effects. As a rapidly developing economy with persistent challenges of energy access, urbanization, and poverty alleviation, India's mitigation strategy is expected to follow a gradual, equity-based, and technology-driven trajectory. Rather than abrupt decarbonization, India's approach emphasizes structural transformation across key sectors while safeguarding developmental priorities.

Energy Transition and Decarbonization

The energy sector is expected to continue as the central pillar of India's climate change mitigation strategy. Future approaches will prioritize a faster shift away from fossil fuel–based electricity generation toward renewable and other low-carbon energy sources. India's pledge to reach 500 GW of non-fossil fuel power capacity by 2030 reflects a substantial realignment toward solar, wind, hydroelectric, and nuclear energy. Expanding renewable capacity is anticipated to lower emissions intensity, strengthen energy security, and lessen reliance on imported fossil fuels. Simultaneously, India is likely to adopt a gradual and managed reduction in coal usage rather than an immediate phase-out. This transition will involve the deployment of cleaner coal technologies, efficiency improvements in thermal power plants, and a progressive diversification of the overall energy mix. Over the longer term, green hydrogen is projected to assume a pivotal role in decarbonizing sectors that are difficult to electrify, including steel, cement, and heavy transportation.

Low-Carbon Industrial Transformation

Industrial decarbonization constitutes a critical component of India's future mitigation pathway. Energy-intensive industries will increasingly adopt energy-efficient technologies, alternative fuels, and circular economy practices. Government initiatives promoting cleaner production, resource efficiency, and waste reduction are expected to lower industrial emissions without undermining competitiveness. The expansion of domestic manufacturing under initiatives such as "Make in India" also presents an opportunity to integrate low-carbon technologies at an early stage. Carbon markets, performance-linked incentives, and regulatory standards may further encourage industries to transition toward sustainable production models.

Sustainable Transport and Urban Development

India's rapidly growing urban population presents both a challenge and an opportunity for climate mitigation. Future pathways emphasize the electrification of transport, expansion of public transport systems, and adoption of sustainable urban planning. Electric vehicles, supported by renewable electricity, are expected to significantly reduce emissions from the transport sector while improving air quality in urban centers. Smart cities, energy-efficient buildings, and climate-resilient infrastructure will play an increasingly important role in reducing emissions and enhancing adaptive capacity. Urban mitigation strategies will also contribute to social co-benefits, including improved public health and reduced congestion.

Nature-Based Solutions and Carbon Sinks

Enhancing natural carbon sinks will remain a vital element of India's mitigation strategy. Afforestation, reforestation, and sustainable land-use practices are expected to contribute significantly toward achieving India's carbon sink targets under its nationally determined contributions. Integrating climate-smart agriculture, soil carbon sequestration, and biodiversity conservation will further strengthen ecosystem resilience while supporting rural livelihoods. Nature-based solutions also offer cost-effective pathways for mitigating climate impacts, particularly in vulnerable regions facing land degradation and climate variability.

Climate Finance, Technology, and Global Cooperation

India's future mitigation trajectory is closely linked to the availability of climate finance and advanced technologies. International cooperation will be essential for scaling up renewable energy, green hydrogen, and carbon capture technologies. India is expected to continue advocating for enhanced financial flows, technology transfer, and capacity building from developed countries in line with the principles of equity and common but differentiated responsibilities. Initiatives such as the International Solar Alliance and India's engagement in South–South cooperation demonstrate its potential to shape collaborative mitigation pathways beyond traditional North–South frameworks. Effective climate mitigation in the

future will depend on integrating climate objectives into broader economic and development planning. Strengthening institutional coordination, improving data and monitoring systems, and aligning national and sub-national policies will be critical for translating commitments into measurable outcomes.

Implications for Global Climate Governance

India's mitigation trajectory has broader implications for the legitimacy and effectiveness of the global climate regime. By advocating equity-based pathways while incrementally enhancing ambition, India contributes to a more resilient, inclusive and realistic model of global climate cooperation.

Conclusion

India's future trajectory in climate change mitigation will be shaped by a complex interplay of domestic development priorities, international obligations, and evolving global norms. While India faces significant constraints, its commitment to equity, coupled with strategic policy initiatives and international cooperation, provides a viable pathway toward sustainable decarbonization. The success of India's mitigation efforts will depend not only on national actions but also on the willingness of the international community to deliver on promises of finance, technology, and capacity building. As such, India's experience offers important lessons for reconciling development and climate action in an increasingly multipolar world.

Furthermore, India's climate commitments are heavily conditional on international support, reflecting both practical constraints and normative assertions of climate justice. While this conditionality is consistent with the equity principles embedded in the UNFCCC and Paris Agreement, it also exposes India to uncertainties arising from inadequate climate finance flows and slow progress on technology transfer. The gap between promised and delivered climate finance from developed countries continues to undermine trust within the climate regime, complicating implementation efforts in developing economies like India. Geopolitical dynamics further complicate India's climate engagement. Strategic competition among major powers, shifting global supply chains, and emerging debates over carbon border adjustment mechanisms pose new challenges for India's trade and industrial policies. Measures such as carbon tariffs risk penalising developing countries for emissions embedded in export-oriented manufacturing, potentially constraining India's growth prospects. Navigating these emerging regimes will require India to integrate climate considerations more deeply into its trade diplomacy and industrial strategy.

Despite these challenges, the analysis underscores that India possesses substantial opportunities to position itself as a leading actor in global climate governance. Its demographic scale, technological innovation capacity, and experience in balancing development with environmental constraints equip it with unique comparative advantages.

Initiatives such as large-scale solar deployment, green hydrogen missions, and regional energy integration demonstrate India's potential to contribute meaningfully to global mitigation efforts while advancing domestic development goals. Moreover, India's leadership role within the Global South provides it with normative and diplomatic leverage. By articulating climate action through the lenses of equity, development, and justice, India can shape global narratives and influence rule-making processes in ways that reflect the realities of developing economies. This role is particularly critical at a time when climate impacts disproportionately affect vulnerable populations and when adaptation finance remains severely inadequate.

References

1. Mathur, Ajay. "India's Energy Transition and Climate Change Commitments." Energy Policy, vol. 38, no. 11, Nov. 2010, pp. 7389–96.
2. Kanwal, S. (2023). India's climate diplomacy and mitigation pathways. Climate Policy, 23(3), 345–360.
3. Konoorayar, V. (2021). Climate justice and India's negotiating strategy. Global Environmental Politics, 21(2), 67–85.
4. Mishra, S., & Verma, P. (2024). India's net-zero strategy and policy challenges. Energy Policy, 178, 113567.
5. Negi, S., & Gießen, L. (2018). Coalition politics in climate negotiations. World Development, 103, 1–12.
6. Subramanian, A., et al. (2023). Renewable energy transition in India. Renewable and Sustainable Energy Reviews, 172, 113020.
7. Zhang, Y., Li, X., & Kumar, A. (2023). Differentiation in post-Paris climate governance. Climate Policy, 23(4), 512–528.
8. Ahluwalia, M.S., & Patel, U. (2022). Managing climate change: A strategy for India (CSEP Working Paper 31). Centre for Social and Economic Progress. Retrieved from https://csep. org/working-paper/managing-climate-change-astrategy-for-india.
9. Gupta, Joyeeta. The climate change convention and developing countries: From conflict to consensus?. Vol. 8. Springer Science & Business Media, 2013.
10. Molitor, Michael R. "The United Nations climate change agreements." The global environment. Routledge, 2023. 210-235.
11. Bhardwaj, Manuj. "The role and relationship of climate justice and common but differentiated responsibilities & respective capabilities (CBDR-RC) principle in the international climate change legal framework." United Nations University & Maastricht University (2018).
12. Modi, Renu, and Meera Venkatachalam. "India, Africa and Global Climate Diplomacy." India–Africa Partnerships for Food Security and Capacity Building: South–South Cooperation. Cham: Springer International Publishing, 2021. 47-70.
13. Centre for Research on Energy and Clean Air. Record Renewables Capacity in FY24-25 Signals India's Path Beyond Coal. CREA, May 2025, energyandcleanair.org/publications/record-renewables-capacity-fy25-india/.