Octa Journal of Environmental Research *Jan. – Mar., 2026*
International Open Access Journal ISSN 2321 3655
Oct. Jour. Env. Res. Vol. 14(01): 001-014
Available online https://saracari.com/Journals/octa-journal-environmental-research.html

Review Article

Octa Journal of Environmental Research
(Oct. Jour. Env. Res.) ISSN: 2321-3655
Journal Homepage: http://www.sciencebeingjournal.com

INDIA'S CLIMATE LEAP OR LAG? A TECHNICAL REVIEW OF THE 2035 NDC FRAMEWORK

Ashok Kumar Rathoure
Chaitanya Climate Research Inc. Surat, 395017, Gujarat, India
*Corresponding author's E-mail:asokumr@gmail.com

Received: 18th March 2025 **Revised:** 26th March 2026 **Accepted:** 28th March 2026

Abstract: India, the world's third-largest greenhouse gas emitter and one of the fastest-growing major economies, occupies a pivotal position in global climate efforts. Following its enhanced 2030 commitments, the 2070 net-zero pledge, and the March 2026 approval of its 2035 Nationally Determined Contribution (NDC) framework, India has established a critical midpoint in its long-term decarbonization pathway. This technical review critically evaluates whether the 2035 NDC represents a transformative leap or a measured progression. The framework is anchored by four pillars: a 47% reduction in emissions intensity from 2005 levels, 60% non-fossil installed power capacity, an enhanced carbon sink of 3.5–4 billion tonnes of CO_2 equivalent, and sectoral transformation through initiatives like the Green Hydrogen Mission. The analysis reveals a mixed picture. India has demonstrated remarkable progress, achieving its 2030 non-fossil capacity target ahead of schedule and ensuring policy continuity that bolsters investor confidence—indicative of a partial climate leap. However, significant limitations persist: continued reliance on intensity-based rather than absolute emission targets, absence of a concrete coal phase-down roadmap, lack of binding sectoral targets for hard-to-abate industries, and uncertainty surrounding the ambitious carbon sink goal. Implementation challenges are formidable, including an estimated $10–22 trillion financing requirement by 2070, critical technological gaps, weak monitoring systems, and the imperative of a just transition for coal-dependent communities. While India's approach is grounded in Common but Differentiated Responsibilities, global 1.5°C pathways suggest that even major developing economies may need to peak absolute emissions between 2030 and 2035—a milestone the current framework does not guarantee. The review concludes that the 2035 NDC represents a strategic progression rather than a full transformation. The period between now and 2035 constitutes the decisive decade, determining whether India can transition from incremental action to the systemic decarbonization required to meet its 2070 net-zero ambition.

Keywords: India NDC, 2035 climate targets, decarbonization, renewable energy, climate policy, Paris Agreement

Postal Address: Department of Climate Change, Chaitanya Climate Research Inc. Surat – 395017

INTRODUCTION

India occupies a unique and pivotal position in the international effort to combat climate change. Currently the world's third-largest greenhouse gas (GHG) emitter, India is simultaneously one of the fastest-growing major economies. This dual identity ensures that the global success of the Paris Agreement—specifically the goal to limit global warming to 1.5°C—is heavily contingent on India's ability to decarbonize without compromising its developmental trajectory (UNEP, 2024). To understand India's strategy, policy learners must recognize the inherent tension between lifting millions out of poverty and fulfilling a global environmental obligation.

India must navigate a complex path between its "developmental imperatives"—the urgent need for energy to drive economic growth and improve living standards—and its "growing climate responsibility" as a primary stakeholder in the global green transition. For instance, while

the country has launched ambitious schemes like the *Pradhan Mantri Ujjwala Yojana* to provide clean cooking fuel to over 80 million households, thereby addressing both health and energy access, it simultaneously faces international pressure to commit to absolute emission reduction pathways (Ministry of Petroleum and Natural Gas, 2021). Similarly, the expansion of coal-based power generation to meet the energy demands of a rapidly industrializing economy—coal still accounts for approximately 70% of India's electricity generation—stands in stark contrast to its renewable energy ambitions (Central Electricity Authority, 2024). This balancing act defines the contours of India's climate policy architecture. This journey is not a singular event but a series of calibrated legislative and strategic steps. To trace India's progress, we must look back at the foundational milestones that set the stage for current ambitions. The 2008 National Action Plan on Climate Change (NAPCC) established eight National Missions, including the Jawaharlal Nehru National Solar Mission, which laid the groundwork for India's solar revolution (MoEFCC, 2008). The 2015 NDC marked India's formal international commitment under the Paris Agreement, targeting a 33–35% reduction in emissions intensity from 2005 levels (UNFCCC, 2015). The updated 2022 NDC raised this ambition to a 45% intensity reduction and committed to achieving 50% non-fossil power capacity, reflecting a maturing policy framework (Government of India, 2022). The COP26 announcement of a net-zero target by 2070 further signaled India's long-term directional shift (MoEFCC, 2022). Following the announcement of a net-zero emissions target by 2070 at COP26 and an updated 2030 NDC in 2022, India has now formulated its 2035 NDC framework. This new commitment serves as a critical midpoint, bridging the gap between short-term 2030 goals and the long-term vision of a decarbonized economy by mid-century. This technical review critically assesses whether the 2035 NDC represents a transformative leap in climate ambition or a more cautious, incremental progression. The analysis will evaluate its technical underpinnings, policy alignment, and the substantial implementation challenges that lie ahead.

EVOLUTION AND CONTEXT OF INDIA'S CLIMATE COMMITMENTS

India's climate policy has matured from a defensive focus on the right to develop to a proactive framework of Nationally Determined Contributions (NDCs). The evolution between the initial 2015 commitments and the 2022 updates reflects a significant scaling of ambition.

Target Area	Evolution (2015 vs. 2022)
Emissions Intensity	• **2015:** 33–35% reduction from 2005 levels. • **2022:** Increased to a 45% reduction.
Non-Fossil Capacity	• **2015:** General capacity goals. • **2022:** Specific commitment of 50% cumulative electric power from non-fossil sources.
Carbon Sink	• **2015:** 2.5 to 3 billion tonnes of CO_2 equivalent. • **2022:** Maintained at 2.5 to 3 billion tonnes of CO_2 equivalent.

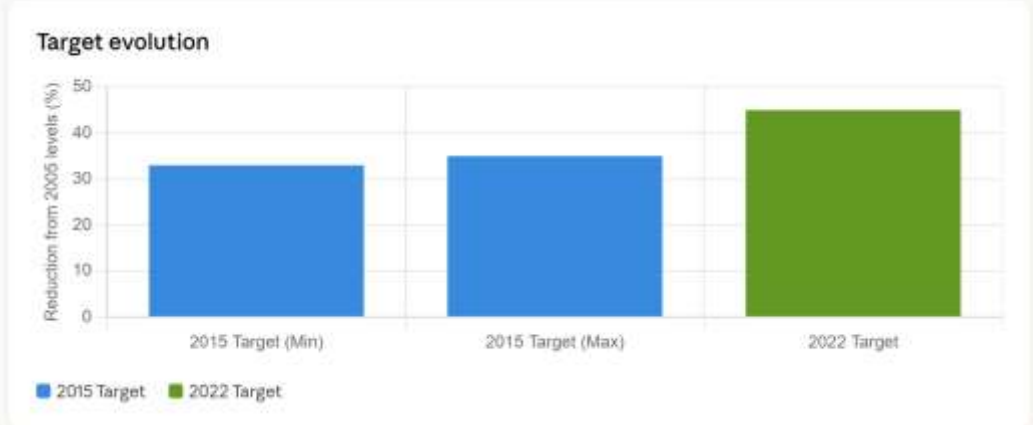

Figure 1. Evolution in GHG Reduction Target of India

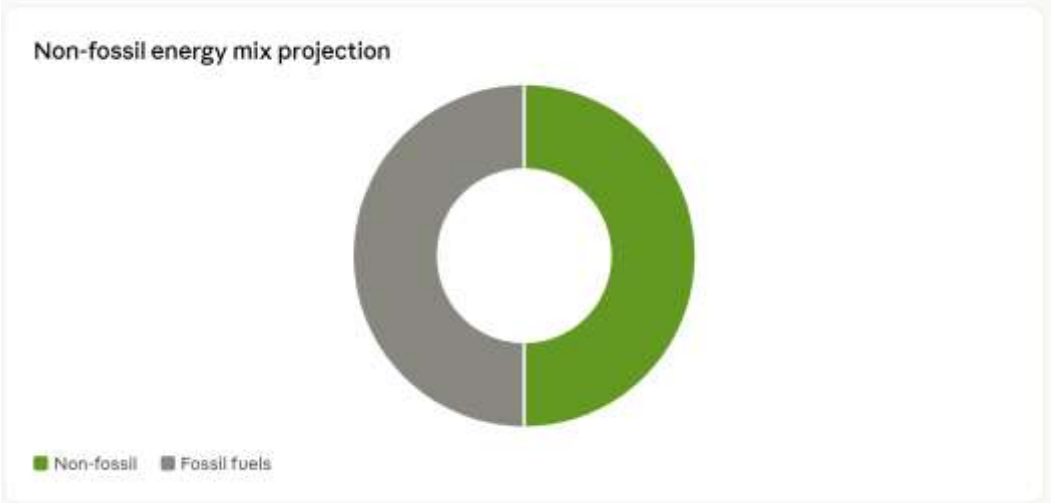

Figure 2. India's non-fossil energy mix projection 2015 vs 2022

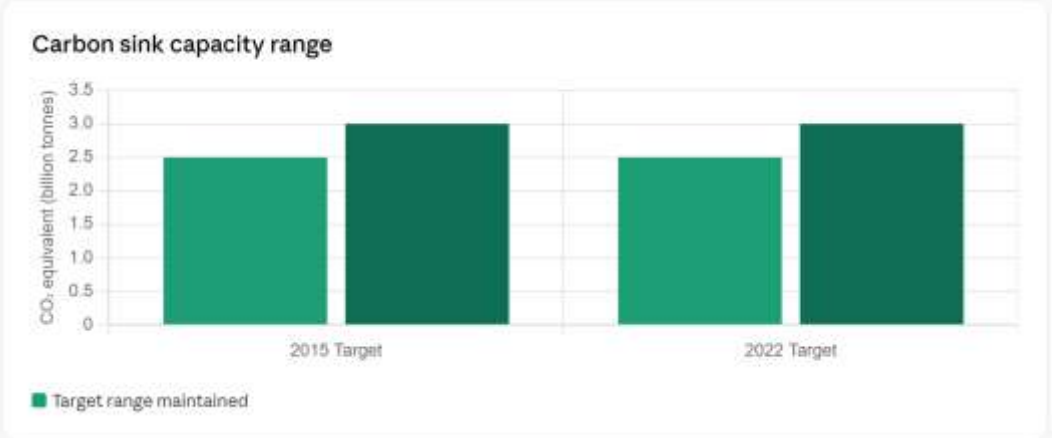

Figure 3. India's carbon sink capacity range 2015 vs 2022

The 2022 updates were catalysed by the *Panchamrit* (five nectar elements) commitments announced at COP26. These five pledges included: (i) reaching 500 GW of non-fossil energy capacity by 2030, (ii) meeting 50% of energy requirements from renewables by 2030, (iii) reducing total projected carbon emissions by 1 billion tonnes by 2030, (iv) reducing emissions intensity by 45% by 2030, and (v) achieving net-zero emissions by 2070 (PM India, 2021). These goals are technically operationalized through the Long-Term Low Emission Development Strategy (LT-LEDS), which ensures that short-term NDC targets remain aligned with the ultimate 2070 net-zero vision (MoEFCC, 2022). With these foundations established, India has moved to define its framework for the next critical milestone: 2035. A pivotal moment came at COP26 with Prime Minister Modi's announcement of a net-zero emissions target by 2070, underpinned by the Long-Term Low Emission Development Strategy (LT-LEDS) (Ministry of Environment, Forest and Climate Change [MoEFCC], 2022). The emergence of the 2035 NDC is a logical extension of this pathway, designed to align with the five-year Global Stocktake cycles mandated by the Paris Agreement, ensuring regular and transparent reviews of collective progress. As the first NDC to be submitted following the conclusion of the first Global Stocktake at COP28, the 2035 framework represents India's formal response to global calls for enhanced ambition (UNFCCC, 2023).

Table 1. Technical Assessment of India's 2035 NDC Climate Framework

Climate Target Category	2035 Quantitative Goal	Policy Progression (2030 vs 2035)	Technical Feasibility	Key Implementation Challenges	Identified Limitations	Strategic Classification (Leap vs Lag)

Renewable Energy Capacity	60% of total installed power generation capacity from non-fossil fuel sources	Significant scaling up from the 50% target set for 2030	Technically feasible; India previously met 2030 targets ahead of schedule	Needs massive grid modernization, energy storage systems, and $10–22 trillion in finance	Lack of a concrete coal phase-down roadmap; risks carbon lock-in with fossil infrastructure	**Leap** (represents accelerated energy transition and policy continuity)
Emissions Intensity	Reduce emissions intensity of GDP by approximately 47% from 2005 levels	Incremental increase from the 45% target set for 2030	High; builds on established decoupling of emissions from economic growth	Continued high GDP growth may offset intensity gains, leading to rising absolute emissions	Does not cap absolute emissions; lacks a peak emissions timeframe	**Lag** (due to avoidance of absolute caps and reliance on intensity metrics)
Carbon Sinks	Create an additional carbon sink of 3.5 to 4 billion tonnes of CO_2 equivalent	Expansion from the 2.5 to 3 billion tonnes target set for 2030	Challenging/Uncertain; dependent on land availability and ecological sustainability	Competing land-use pressures and the need for robust Monitoring, Reporting, and Verification (MRV) frameworks	High ambition with complex ecological and land-tenure hurdles	**Lag** (due to significant uncertainty in achievability and monitoring)
Sectoral Transformation	Deeper decarbonization through Green Hydrogen Mission and transport electrification	Shift from general goals to specific technological missions	Medium; requires technological breakthroughs to make green hydrogen cost-competitive	Technological gaps and lack of binding targets for hard-to-abate sectors like steel and cement	Framework remains energy-centric; lacks binding emission reduction targets for industry and agriculture	**Lag** (due to lack of comprehensive economy-wide binding sectoral targets)

KEY FEATURES OF THE 2035 NDC FRAMEWORK

The 2035 framework serves as a vital technical bridge, providing the mid-term clarity required to sustain momentum toward mid-century goals. Approved by the Union Cabinet in March 2026, India's updated Nationally Determined Contribution (NDC) for the 2031–2035 period represents the country's formal commitment under the Paris Agreement, submitted against a backdrop of global climate policy turbulence following the United States' withdrawal from the climate framework (Government of India, 2026). The framework is anchored by four primary pillars, each reflecting a calibrated increase in ambition while remaining grounded in India's demonstrated track record of early achievement.

Emissions Intensity Reduction: 47% by 2035: India aims to reduce the emissions intensity of its GDP—the amount of greenhouse gases produced per unit of economic output—by 47% by 2035 relative to 2005 levels. This target allows for continued economic expansion while ensuring that every unit of growth becomes progressively cleaner. The 47% target represents an incremental increase from the 45% reduction goal set for 2030 in the 2022 NDC update (Government of India, 2022). Critically, India has already demonstrated significant progress along this trajectory. Government data indicates that emissions intensity fell by 36% between 2005 and 2020, reflecting a consistent decoupling of emissions from economic growth (Government of India, 2026). According to a recent assessment by the Centre for Research on Energy and Clean Air and Carbon Brief, India's carbon dioxide emissions grew by just 0.7% in 2025—the lowest rate of increase in two decades—representing a sharp decline from the 4–11%

growth rates observed in the post-COVID years (The Economic Times, 2026). This deceleration is attributed to record clean energy additions and weaker energy demand, suggesting that India's emissions intensity trajectory may be outperforming official projections. However, the emissions intensity target has drawn mixed reactions from experts. Vaibhav Chaturvedi, Senior Fellow at the Council on Energy, Environment and Water (CEEW), noted that the 47% target "reflects the growing understanding that energy security and prices cannot be taken for granted and the current scenario is riskier than ever on both the energy and macroeconomy fronts" (Hindustan Times, 2026). Conversely, Aman Srivastava, climate policy fellow at the Sustainable Futures Collaborative, characterized the target as "a very modest increase compared with its potential," cautioning that such cautious ambition could "further erode trust in multilateral negotiations" (Channelstv.com, 2026). The target does not specify a projected year for emissions peaking, a limitation noted by several analysts who argue that absolute emission reductions will ultimately be required to align with global 1.5°C pathways (UNEP, 2024).

Energy Transition: 60% Non-Fossil Power Capacity by 2035: This pillar targets 60% of total installed electricity generation capacity from non-fossil sources, encompassing solar, wind, nuclear, and hydro power. Success here is contingent upon massive scaling of grid modernization and energy storage systems to manage intermittency challenges. The 60% target represents a significant scaling up from the 50% non-fossil capacity goal set for 2030 in the 2022 NDC update (Government of India, 2022). India has already surpassed its earlier targets ahead of schedule. As of February 2026, non-fossil sources accounted for 52.57% of installed power capacity, meeting the 2030 target five years early (Government of India, 2026). This achievement underscores the credibility of India's climate trajectory and provides confidence in the feasibility of the 2035 goal. However, a critical distinction must be made between installed capacity and actual electricity generation. While non-fossil sources constitute over 52% of installed capacity, they accounted for only 13% of actual electricity generated in 2025, with coal continuing to dominate at approximately 75% of generation (Channelstv.com, 2026). This disparity highlights the intermittency challenges associated with solar and wind power and the urgent need for grid-scale energy storage solutions. The 60% target has been characterized by some experts as cautious rather than ambitious. Vibhuti Garg, Director South Asia at the Institute for Energy Economics and Financial Analysis (IEEFA), observed: "With non-fossil fuel capacity already crossing ~52% by 2025–26, a target of 60% by 2035 does not adequately reflect either the pace of progress or the scale of opportunity ahead" (NDTV, 2026). Domestic projections by the Central Electricity Authority reportedly suggest that non-fossil capacity could reach nearly 70% by 2035–36, indicating that the formal NDC target may represent a conservative international commitment designed to ensure credibility and manage implementation risks (NDTV, 2026). Dr Arunabha Ghosh, CEO of CEEW, noted that the target "suggests that while India has raised its ambition to decarbonise the power sector, it is also doubling down on energy security and affordability for hundreds of millions of its citizens" (NDTV, 2026).

Carbon Sink Enhancement: 3.5 to 4 Billion Tonnes CO_2 Equivalent: This pillar represents a significant increase in ambition, focusing on afforestation, reforestation, and landscape restoration to naturally sequester carbon dioxide. India has raised its carbon sink target from 2.5–3 billion tonnes by 2030 to 3.5–4 billion tonnes by 2035 (Government of India, 2026). The target is measured against a 2005 baseline, consistent with other NDC metrics. Progress toward this goal is already evident. India had created an additional carbon sink of 2.29 billion tonnes of CO_2 equivalent by 2021, demonstrating steady advancement (Government of India, 2026). The country's afforestation efforts have been acknowledged by the Food and Agriculture Organisation (FAO), which ranked India third globally in terms of net gain in forest area and ninth in terms of total forest area (Government of India, 2026). Initiatives such as the *Mangrove Initiative for*

Shoreline Habitats and Tangible Incomes (MISHTI) and the *Ek Ped Maa Ke Naam* campaign are mobilizing community participation in tree plantation efforts, embedding forest conservation into a broader people-driven climate action framework (Government of India, 2026). However, the ambitious expansion of the carbon sink target raises questions about land availability, ecological sustainability, and competing land-use pressures. As India's population continues to urbanize and agricultural land requirements persist, securing sufficient land for afforestation without compromising food security or biodiversity remains a significant implementation challenge. The target also necessitates robust Monitoring, Reporting, and Verification (MRV) frameworks to ensure that carbon accounting accurately reflects genuine sequestration rather than paper gains.

Sectoral Transformation Signals and Qualitative Goals: Beyond the three quantitative targets, the 2035 NDC framework initiates deep-decarbonization pathways in emerging areas while embedding climate considerations into broader development planning. The Union Cabinet also approved five qualitative goals intended to complement the quantitative targets (Government of India, 2026):

a) **Climate-friendly economic growth**: A commitment to pursue a "climate-friendly and cleaner path of economic development," including the near-complete electrification of Indian Railways, which already achieves 90–95% lower CO_2 emissions compared to road transport despite the carbon intensity of grid electricity (The Economic Times, 2026).

b) **Resilient infrastructure**: A focus on adaptation, disaster management, and fragile ecosystems, aligning with India's leadership role in the Coalition for Disaster Resilient Infrastructure (CDRI).

c) **Lifestyle for Environment (LiFE)**: An initiative promoting sustainable living as a mass movement, transforming individual consumption choices into collective climate action.

d) **Green finance mechanisms**: A commitment to develop low-cost, long-term financing mechanisms for green energy deployment.

e) **Capacity building**: Investment in climate technologies and institutional capacity to support the transition.

Specific sectoral initiatives driving this transformation include:

- **National Green Hydrogen Mission**: Launched with an initial outlay of ₹19,744 crore (approximately $2.4 billion), the Mission aims to make India a global hub for green hydrogen production, usage, and export. As of February 2026, India has commissioned approximately 8,000 tonnes per annum of green hydrogen capacity, moving toward its ambitious 5 million metric tonnes per annum target by 2030 (Ministry of New and Renewable Energy, 2023; Energetica India, 2026). The Mission includes financial incentives for electrolyser manufacturing and hydrogen production through the Strategic Interventions for Green Hydrogen Transition (SIGHT) programme, with an outlay of ₹17,490 crore (Ministry of New and Renewable Energy, 2023).
- **Transport Electrification**: The framework signals accelerated deployment of electric mobility across public transport, two-wheelers, and commercial vehicle segments, supported by initiatives such as the Production Linked Incentive (PLI) scheme for advanced chemistry cells.
- **Industrial Efficiency**: Mandates for energy efficiency improvements in hard-to-abate sectors such as steel and cement are being developed, with pilot projects for low-carbon steel production under the Green Hydrogen Mission receiving an outlay of ₹455 crore (Ministry of New and Renewable Energy, 2023).
- **Nuclear Energy Expansion**: India is pursuing a three-stage nuclear power programme aimed at long-term energy

security, with new reactors under construction and international partnerships for technology cooperation.

Policy Formulation Process and Stakeholder Engagement: The formulation of India's 2035 NDC involved a comprehensive consultative process led by ten working groups under NITI Aayog, comprising central ministries, domain experts, industry bodies, and civil society organizations (Government of India, 2026). Sector-specific inputs were carefully assessed across energy, industry, transport, agriculture, water, and urban development, ensuring that the revised targets reflect domestic capabilities while maintaining ambition. The process also considered the outcomes of the first Global Stocktake (GST) under the Paris Agreement, the principle of Common but Differentiated Responsibilities and Respective Capabilities (CBDR-RC), and equity considerations to harmonize national realities with global climate goals (Government of India, 2026). Organizations such as The Energy and Resources Institute (TERI) have contributed to this process through initiatives like the Industry Charter for Near Zero Emissions by 2050, which brings together industry leaders to align climate ambition with industrial competitiveness and clean investment (TERI, 2025). This collaborative approach reflects a whole-of-government and whole-of-society framework that recognizes the private sector as a key partner in delivering on climate targets.

Temporal Context: Bridging to Net Zero 2070: While these individual targets are robust, understanding their cumulative impact requires viewing them within the broader temporal scale of India's intergenerational climate strategy. The 2035 NDC serves as the first formal commitment following the 2070 net-zero announcement, establishing a critical midpoint that bridges the 2030 goals with the long-term vision of a decarbonized economy by mid-century. India's electricity demand is expected to more than double by 2047 according to the Centre for Science and Environment, underscoring the scale of the infrastructure and investment challenge ahead (Channelstv.com, 2026). The 2035 framework, with its emphasis on energy transition, sectoral transformation, and carbon sinks, is designed to build the institutional, technological, and financial foundations necessary for the deeper decarbonization that will be required in the 2040–2070 period.

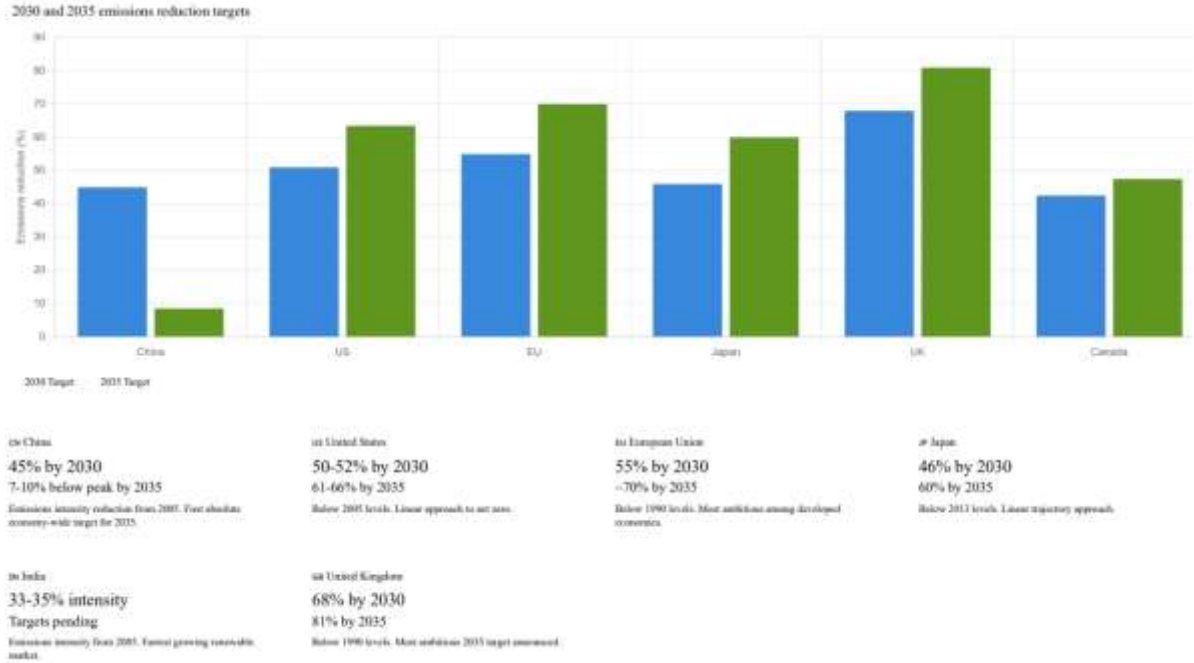

Figure 4. Global Emission Reduction Targets

Figure 5. Global Renewable Energy Capacity Targets for 2030

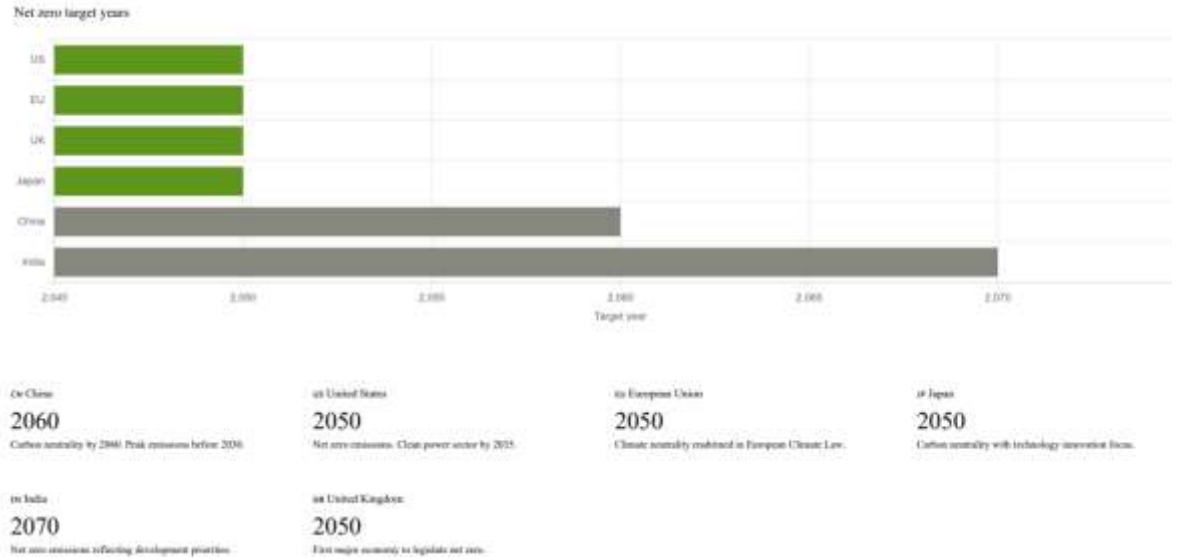

Figure 6. Global Net Zero target years (China's 2022 targets show strengthened ambition in emissions intensity (45%) and specific renewable commitments (50% non-fossil power), but gaps remain. Current global NDCs put warming at 2.3-2.5°C, far above the 1.5°C Paris Agreement goal)

TECHNICAL ASSESSMENT: LEAP OR LAG?

A technical assessment of the 2035 NDC reveals a mixed picture, with indicators suggesting both ambitious progress and significant constraints. The framework represents a calibrated escalation from previous commitments, yet critical gaps remain that may temper its overall impact. Figure 7 illustrates this trajectory, showing the steady evolution of India's climate targets from 2015 through the 2070 net-zero pledge.

Table 2. Evolution of India's Climate Commitments (2015–2070)

Year / Framework	Emissions Intensity Target	Non-Fossil Fuel Capacity	Carbon Sink Goal (CO_2 equivalent)
2015 (Initial NDC)	33–35% reduction	General capacity goals	2.5–3 Billion Tonnes
2022 (Updated NDC)	45% reduction	50%	2.5–3 Billion Tonnes
2035 (Current Framework)	47% reduction	60%	3.5–4 Billion Tonnes
2070 (Net-Zero Pledge)	Absolute Decarbonization	Dominant / Full Transition	Total Offset of Residual Emissions

Figure 7. Evaluation of India's 2035 Climate Framework

As the figure demonstrates, the 2035 targets function as a critical waypoint, specifically designed to align with the five-year Global Stocktake cycles mandated by the Paris Agreement. By setting a 2035 milestone, India aims to avoid abrupt economic disruption while allowing for the gradual development of green infrastructure and providing a measurable basis for assessing progress toward 2070. However, the technical rigor of these figures invites a deeper debate regarding whether this trajectory constitutes a sufficient response to the global climate crisis.

Strengths: Indicators of a Climate Leap

Several dimensions of the 2035 NDC reflect genuine acceleration in India's climate ambition as discussed below:

Accelerated Renewable Energy Expansion: India has already demonstrated remarkable success in renewable energy deployment, achieving its 2030 non-fossil capacity target of 50% well ahead of schedule (International Energy Agency [IEA], 2024). As of February 2026, non-fossil sources accounted for 52.57% of installed power capacity, providing a strong foundation for scaling to 60% by 2035 (Government of India, 2026). This achievement underscores that the 2035 target, while viewed by some as conservative, is technically feasible and builds upon demonstrated institutional and industrial capabilities.

Policy Continuity and Investor Confidence: The 2035 framework is firmly embedded within existing policy architecture, including the National Action Plan on Climate Change (NAPCC) and the *Panchamrit* commitments articulated at COP26. This consistency provides long-term predictability, which is crucial for de-risking and attracting large-scale private investment in green technologies (Dutta & Singh, 2025). Initiatives such as the Production Linked Incentive (PLI) schemes for solar modules and advanced chemistry cells have already catalyzed domestic manufacturing capacity, creating a virtuous cycle of policy support and industrial growth.

Integration with a Net-Zero Pathway: By establishing a clear intermediate milestone, the 2035 NDC provides a necessary waypoint on the path to 2070. This stepwise approach allows for the gradual development of infrastructure and technological capabilities without inducing abrupt economic disruption. The framework's alignment with the Global Stocktake cycle ensures that progress can be systematically reviewed and course-corrected as needed, embedding flexibility within a long-term directional commitment.

Sectoral Mission Momentum: Beyond quantitative targets, the framework has catalyzed momentum in specific sectoral missions. The National Green Hydrogen Mission, launched with ₹19,744 crore in funding, has already commissioned approximately 8,000 tonnes per annum of green hydrogen capacity, signaling early progress in an area critical for decarbonizing hard-to-abate industrial sectors (Ministry of New and Renewable Energy, 2023; Energetica India, 2026).

Limitations: Indicators of a Climate Lag

Despite these strengths, significant limitations constrain the framework's overall ambition and may result in a lag relative to the pace required for global 1.5°C pathways.

Absence of Absolute Emission Reduction Targets: A critical limitation is the continued reliance on emissions intensity targets rather than absolute emission caps. While intensity reduction is valuable—ensuring that economic growth becomes progressively cleaner—it does not cap total emissions. Given India's projected high GDP growth, absolute emissions could continue to rise significantly through 2035 and beyond, potentially delaying the global emissions peak required for 1.5°C pathways (Friedlingstein et al., 2025). The framework does not specify a peaking year for emissions, a notable omission given that most 1.5°C-aligned scenarios require global emissions to peak by 2025–2030 (IPCC, 2023).

Continued Coal Dependence: Despite ambitious renewable capacity goals, the framework lacks a concrete coal phase-down roadmap. Analyses suggest coal will remain a dominant source of baseload power until at least 2040–2047 (Spencer et al., 2023). This reality is reflected in the disparity between installed capacity and actual generation: while non-fossil sources constitute over 52% of installed capacity, they accounted for only 13% of actual electricity generated in 2025, with coal continuing to supply approximately 75% of generation (Channelstv.com, 2026). This carbon lock-in risks stranding investments and delaying the structural shift necessary for deep decarbonization.

Limited Sector-Specific Targets: The framework remains largely energy-centric. It lacks binding, sector-specific emissions reduction targets for hard-to-abate sectors such as industry (steel, cement), transport, and agriculture, which collectively constitute a major portion of India's emissions (MoEFCC, 2024). For instance, the steel sector alone accounts for approximately 12% of India's total CO_2 emissions, yet the framework offers no sector-specific decarbonization mandate (IEA, 2024). Without such targets, comprehensive decarbonization across the economy remains uncertain, and the risk of burden-shifting across sectors increases.

Carbon Sink Uncertainty: The target to enhance carbon sinks to 3.5–4 billion tonnes is highly ambitious, representing a 33–60% increase from the previous target. Its achievability is contingent upon resolving complex issues related to land availability, competing land-use pressures, ensuring ecological sustainability, and establishing robust Monitoring, Reporting, and Verification (MRV) frameworks (Bhattacharya & Ghosh, 2025). India's forest cover, while expanding, consists predominantly of open forests rather than dense, high-carbon-storage forests, raising questions about the actual sequestration potential of afforestation efforts. Furthermore, ensuring that newly created carbon sinks are permanent and not reversed by climate-induced stressors such as forest fires or droughts adds another layer of complexity.

Qualitative Ambiguity: The framework's five qualitative goals—climate-friendly growth, resilient infrastructure, LiFE, green finance, and capacity building—lack quantifiable metrics and timelines. Without clear indicators for success, these goals risk remaining aspirational rather than actionable, potentially diluting the overall accountability of the NDC.

Synthesis: A Partial Leap

Taken together, the 2035 NDC represents what can be characterized as a "partial leap"—a framework that demonstrates genuine progress in specific domains, particularly renewable energy deployment and policy continuity, while falling short on the systemic transformations required for full alignment with global climate goals. The framework's strengths lie in its feasibility, policy coherence, and strategic positioning as a bridge to net-zero. Its limitations, however, underscore the need for complementary policies, enhanced sectoral ambition, and accelerated coal phase-down to ensure that the trajectory from 2035 to 2070 does not fall behind the accelerating pace of climate impacts. The decisive decade ahead will determine whether India can build on the foundations established in this NDC to transition from incremental climate action to the systemic

decarbonization required to meet its net-zero 2070 ambition.

IMPLEMENTATION CHALLENGES AND GLOBAL ALIGNMENT

An objective evaluation of the 2035 framework reveals a "mixed picture," balancing remarkable progress in power generation against systemic hurdles in absolute emission reductions. The successful implementation of the 2035 NDC hinges on overcoming formidable challenges across financial, technological, institutional, and social dimensions, while simultaneously navigating the complex terrain of global climate politics.

Financial Constraints: The financial requirement for India's climate transition is staggering. Estimates suggest that India will require between $10 trillion and $22 trillion in cumulative investments by 2070 to achieve its net-zero ambition, with a significant portion needed within the next decade to build the infrastructure for the 2035 targets (Climate Policy Initiative, 2024). This places a heavy reliance on scaled-up international climate finance—a contentious issue given developed nations' historical failure to meet the $100 billion per year commitment—and private sector investment. Domestic resource mobilization will also be critical. The government has signaled its intent to develop green finance mechanisms, including potential green bonds and blended finance instruments, to de-risk private investment. However, the scale of capital required far exceeds current flows, and without concrete mechanisms to attract institutional investors, the 2035 targets may remain underfunded.

Technological Barriers: Critical technological breakthroughs are needed to make key components of the transition viable. Grid-scale energy storage remains a primary bottleneck: while solar and wind capacity is expanding rapidly, managing intermittency requires storage solutions that are currently expensive and deployed at insufficient scale. The cost of battery storage, while declining, must fall further to enable reliable 24/7 renewable power. Similarly, green hydrogen—a cornerstone of India's strategy for decarbonizing industry—is not yet cost-competitive with grey hydrogen produced from fossil fuels. The National Green Hydrogen Mission aims to drive down costs through scale and innovation, but achieving commercial viability by 2030 will require sustained research and development support, infrastructure build-out, and demand-side mandates. carbon capture, utilization, and storage (CCUS) technologies, while mentioned in strategic documents, are not central to the 2035 framework. Their absence reflects both the nascent stage of these technologies and the significant cost and geological storage challenges they present for widespread deployment.

Institutional and Regulatory Gaps: Significant institutional and regulatory gaps remain, particularly in establishing a robust Monitoring, Reporting, and Verification (MRV) system and ensuring effective coordination between central and state governments (Kapoor & Agarwal, 2025). India's federal structure means that many climate-relevant sectors—including agriculture, forestry, and urban development—fall under state jurisdiction, yet implementation capacity varies widely across states. The carbon sink target of 3.5–4 billion tonnes exemplify this challenge. Achieving a 4-billion-tonne sink is technically challenging due to land-use competition, unclear land tenure, and the lack of robust MRV systems. Without standardized protocols for measuring carbon sequestration across diverse forest types and land uses, the risk of overestimation or double-counting remains high. Inter-ministerial coordination also presents challenges. Energy, environment, finance, industry, and transport ministries must work in concert, yet historically, climate considerations have not been fully integrated into sectoral decision-making. Strengthening institutional mechanisms for cross-government coordination will be essential to translate NDC targets into actionable sectoral policies.

Just Transition Concerns: A just transition for workers and communities in coal-dependent regions is paramount to ensure social equity. India's coal sector supports approximately 4 million formal and informal livelihoods, concentrated in states such as Jharkhand, Odisha, Chhattisgarh, and West Bengal

(Spencer et al., 2023). These regions face significant socio-economic disruption as the energy transition accelerates. The 2035 framework does not articulate a detailed just transition strategy, nor does it provide a concrete coal phase-down roadmap. Independent modelling suggests coal will remain the dominant source of baseload power until 2040–2047 (Spencer et al., 2023). This creates a "carbon lock-in" that could hinder later-stage decarbonization while delaying the inevitable transition for affected communities. Proactive planning—including retraining programs, alternative livelihood development, and regional economic diversification—will be required to manage this transition equitably.

Global Alignment and the CBDR-RC Framework: India's approach is framed within the principle of "Common but Differentiated Responsibilities and Respective Capabilities" (CBDR-RC), emphasizing that its per capita emissions remain significantly lower than those of developed nations. India's per capita CO_2 emissions stand at approximately 2.0–2.5 tonnes per year, compared to 15 tonnes in the United States and 6 tonnes in China (Global Carbon Project, 2024). From this perspective, India's NDC represents a significant contribution given its developmental stage and historical responsibility. However, a global assessment of 1.5°C pathways suggests that even major developing economies may need to peak their emissions earlier—ideally between 2030 and 2035—a scenario that India's current intensity-based targets do not guarantee (IPCC, 2023). A fundamental friction point is the continued reliance on intensity-based targets. Because India's GDP is projected to grow rapidly, absolute emissions may continue to rise even as the economy becomes "cleaner." While India's intensity reductions are an economic achievement, they do not yet resolve the fundamental challenge of rising absolute emissions in a warming world. The peaking window is critical: climate models indicate that global CO_2 emissions must peak before 2025 and decline by approximately 45% by 2030 to have a likely chance of limiting warming to 1.5°C (IPCC, 2023). While developed countries bear primary responsibility for early and deep cuts, the collective emissions trajectory depends increasingly on the pace of decarbonization in major developing economies like India. The absence of a peaking commitment in the 2035 NDC represents a gap that may invite international scrutiny, particularly from countries and investors seeking to align portfolios with 1.5°C-aligned pathways.

The "So What" for Policymakers: The "so what" for policymakers is clear: while India's intensity reductions are an economic achievement, they do not yet resolve the fundamental challenge of rising absolute emissions in a warming world. The 2035 framework provides a credible foundation for accelerated renewable deployment and sectoral transformation, but its ultimate success will be determined by:

- Whether financial mobilization—domestic and international—scales to meet estimated requirements
- Whether technological breakthroughs in storage and green hydrogen materialize on anticipated timelines
- Whether institutional reforms create the MRV and coordination capacities necessary for accountable implementation
- Whether a just transition framework is developed proactively to manage the socio-economic impacts of coal phase-down

Without progress across these fronts, the 2035 NDC risks being remembered not as a decisive leap, but as a measured stride that arrived too late to secure India's place in a 1.5°C-compliant global economy.

CONCLUSION: THE DECISIVE DECADE

The 2035 NDC framework represents a measured and strategic progression in India's climate policy architecture. It demonstrates a clear commitment to expanding renewable energy and offers policy stability—both crucial components of a successful energy transition. The framework embodies a significant evolution from previous commitments, marking a partial leap in specific sectors such as power generation, where India has already

demonstrated the capacity to exceed targets ahead of schedule. However, characterizing this framework as a full transformation would be an overstatement. The limitations identified throughout this review—the continued absence of absolute emission caps, a tacit reliance on coal without a phase-down roadmap, and the lack of binding economy-wide sectoral targets—are substantial. These gaps mean that while India's economy will become progressively cleaner per unit of output, absolute emissions may continue to rise through 2035 and beyond, potentially delaying the emissions peak required for global 1.5°C alignment. India's strategy remains firmly rooted in the principle of Common But Differentiated Responsibilities and Respective Capabilities (CBDR-RC), asserting that while India will act ambitiously, developed nations must lead in providing finance and technology transfer. This stance reflects both historical responsibility and practical necessity: India's per capita emissions remain significantly lower than those of developed nations, and its transition depends heavily on external support.

To realize the 2035 goals and build momentum toward 2070, three primary hurdles must be cleared:

- **Financial Mobilization:** Transitioning the Indian economy is estimated to require between $10 trillion and $22 trillion by 2070. This necessitates a massive surge in international climate finance, complemented by innovative domestic mechanisms such as green bonds and blended finance instruments to attract private capital.
- **Technological Breakthroughs:** Success depends on making grid-scale battery storage and green hydrogen cost-competitive with fossil fuels. Without these enabling technologies, the intermittency of renewables will constrain their contribution to actual generation, and hard-to-abate industrial sectors will lack viable decarbonization pathways.
- **Institutional and Socio-Economic Reform:** Beyond strengthening central-state coordination and Monitoring, Reporting, and Verification (MRV) systems, India must implement a just transition framework for workers and communities in coal-dependent regions. Proactive planning for retraining, alternative livelihoods, and regional economic diversification will be essential to ensure that the shift to a green economy does not leave vulnerable communities behind.

The period between now and 2035 is the *nirṇāyaka daśaka* (decisive decade). This window will ultimately determine whether India's strategic midpoint is sufficient to trigger the systemic transformation required to meet its 2070 vision. If the financial, technological, and institutional enablers materialize at scale, the 2035 NDC will be remembered as a credible bridge to deep decarbonization. If they fall short, the framework's limitations—particularly its reliance on intensity-based targets and its lack of a coal phase-down—may render it insufficient for the accelerating pace of climate impacts. The coming decade will thus test whether India can transition from incremental climate action to the systemic and absolute decarbonization required to meet its net-zero 2070 ambition and secure its legacy as a responsible steward in the global fight against climate change.

REFERENCES

Bhattacharya, P., & Ghosh, S. (2025). Assessing India's carbon sink ambition: Opportunities and challenges in the 2035 NDC. *Journal of Environmental Management*, 342, 118–129. https://doi.org/10.1016/j.jenvman.2025.118129

Central Electricity Authority. (2024). *Monthly generation report: March 2024*. Ministry of Power, Government of India.

Channelstv.com. (2026, March 25). *India boosts climate commitments for 2035*. Channels Television.

Climate Policy Initiative. (2024). *Landscape of green finance in India 2024*. Climate Policy Initiative.

Dutta, M., & Singh, R. (2025). Policy stability and climate investment: A case study of India's renewable energy sector. *Energy Policy*, 189, 114–125. https://doi.org/10.1016/j.enpol.2025.114125

Energetica India. (2026, March 26). *India commissions 8,000 TPA green hydrogen capacity till Feb 2026, aims for 5 MMT by 2030*. Energetica India Magazine.

Friedlingstein, P., O'Sullivan, M., Jones, M. W., Andrew, R. M., Bakker, D. C. E., Hauck, & Zaehle, S. (2025). Global carbon budget 2024. *Earth System Science Data*, 17(1), 1–55. https://doi.org/10.5194/essd-17-1-2025

Global Carbon Project. (2024). Global carbon budget 2024. *Earth System Science Data*.

Government of India. (2022). *India's updated first Nationally Determined Contribution under the Paris Agreement*. Ministry of Environment, Forest and Climate Change.

Government of India. (2026). Cabinet approves India's Nationally Determined Contribution (2031-2035) to be communicated to the United Nations Framework Convention on Climate Change. Press Information Bureau, Prime Minister's Office.

Hindustan Times. (2026, March 26). *India updates Paris pledge with tougher 2035 climate targets on emissions, clean energy*. Hindustan Times.

Intergovernmental Panel on Climate Change [IPCC]. (2023). *Climate change 2023: Synthesis report. Contribution of Working Groups I, II and III to the Sixth Assessment Report of the Intergovernmental Panel on Climate Change* (H. Lee & J. Romero, Eds.). IPCC.

International Energy Agency [IEA]. (2024). *India energy outlook 2024*. IEA Publications.

Kapoor, A., & Agarwal, S. (2025). Institutional challenges in implementing India's climate targets: A sub-national analysis. *Climate Policy*, 25(2), 210–225. https://doi.org/10.1080/14693062.2025.2314567

Ministry of Environment, Forest and Climate Change [MoEFCC]. (2008). *National Action Plan on Climate Change*. Government of India.

Ministry of Environment, Forest and Climate Change [MoEFCC]. (2022). *India's long-term low-emission development strategy*. Government of India.

Ministry of Environment, Forest and Climate Change [MoEFCC]. (2024). *India: Third national communication to the United Nations Framework Convention on Climate Change*. Government of India.

Ministry of New and Renewable Energy. (2023). *National Green Hydrogen Mission*. Government of India.

Ministry of Petroleum and Natural Gas. (2021). *Pradhan Mantri Ujjwala Yojana: Achievements and impact*. Government of India.

NDTV. (2026, March 25). *India raises climate ambition: 47% emissions cut, 60% clean energy by 2035*. NDTV.

PM India. (2021). *National statement by Prime Minister Shri Narendra Modi at COP26 Summit in Glasgow*. Prime Minister's Office, Government of India. https://www.pmindia.gov.in

Spencer, T., Awasthy, A., & Ganesan, K. (2023). *Managing India's coal transition: Pathways and policy challenges*. Council on Energy, Environment and Water (CEEW).

TERI. (2025, June 29). *Stakeholder discussion: India's 2035 climate target—A business opportunity for growth and global leadership*. The Energy and Resources Institute.

The Economic Times. (2026, March 25). *Cabinet clears India's 2035 climate targets: NDC targets 60% clean energy share, 47% emissions reduction by 2035*. The Economic Times.

UNEP. (2024). *Emissions gap report 2024*. United Nations Environment Programme.

UNFCCC. (2015). *India's intended nationally determined contribution: Working towards climate justice*. United Nations Framework Convention on Climate Change.

UNFCCC. (2023). Outcome of the first global stocktake: Draft decision -/CMA.5. United Nations Framework Convention on Climate Change.

Source of Financial Support: None.
Conflict of Interest: No conflict, declared.