Corporate Net-Zero Pathways: Science-Based Targets and Decarbonization Strategies Aligned with India's 2070 Climate Vision

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Abstract**:** With the growing threat of climate change and the growing pace of mitigation measures developed by nations, corporations are becoming increasingly important in the realization of national and international climate agendas. The decision to achieve net-zero greenhouse gas emissions by 2070 committed by India has triggered a rising trend of corporations now turning to the use of science-based targets (SBTs) to match business strategies with climate science. The paper discusses how corporate decarbonization can facilitate a long-term net-zero target of India, in particular through the adoption of science-based targets, operational changes, and value-chain involvement. Science-based targets are a plausible, quantifiable outline of the way to cut down emissions by tying corporate effort to the tracks in accordance with lowering the world warming to strongly less than 2degC, and hopefully not more than 1.5degC. The paper emphasizes that it is necessary to support the policy, report transparently, and collaborate with other sectors in order to make corporate climate action scalable. This is due to the fact that by aligning science-based targets with priorities in national development, corporations not only reduce climate risks but also increase competitiveness, resilience and long-term value creation. The results indicate that the corporate leadership on decarbonization is critical to close the gap between the current emissions trend in India and its net-zero target in 2070, which contributes to the role of the private sector as a major facilitator of sustainable and inclusive development.

Keywords: Corporate Decarbonization, Net-Zero Emissions (India 2070), Science-Based Targets (SBTs)

I. INTRODUCTION

Climate change can be considered one of the most crucial issues of the twenty-first century with extensive implications on ecosystems, economies, and societies. The temperature increase on Earth, extreme weather conditions, scarcity of resources, and the decrease in biodiversity are the factors that highlight the need to take concerted efforts towards mitigating greenhouse gas (GHG) emissions on a global scale. In their turn, governments, international organizations and the private sector have become more and more engaged in taking bold climate-related goals aimed at curbing global warming. The idea of net-zero emissions has become one of the key organizing concepts of climate mitigation strategies among such commitments.

India being among the fastest developing economies in the world and major emitter of greenhouse gasses is of critical concern in global climate outcome. India declared its target of the net-zero emission by 2070 at the

26 th Conference of the Parties (COP26). Although this goal is an indication of priorities in the national development process and equity the responsibility also greatly falls on all sectors of the economy especially the corporations to change the way energy is produced, consumed, and managed. The corporations contribute a significant percentage of emissions due to direct operations, consumption of electricity, and intricate global value chains. Corporate climate action, therefore, cannot be left out in the realization of the long-term climate goals of India.

Science-based targets (SBTs) have become an increasingly popular approach to credibly result in aligning the corporate actions in relation to reducing emissions with climate science over the past years. SBTs are based on scientifically-derived carbon budgets in contrast to conventional or voluntary targets and are consistent with limiting world temperature increase to well below 2degC and seeking to achieve limits of 1.5degC below pre-industrial temperate conditions. Through taking up science-based targets, corporations will be sending signals of taking quantifiable, transparent, and accountable decarbonization routes.

This paper under discusses the presence of expanding corporate involvement in the development of net-zero and decarbonization initiatives in support of the Indian 2070 climate target. It analyzes the conceptual basis of net-zero emissions, suitability of science-based goals, major decarbonization approaches of corporate operations and value chains, and obstacles and opportunities to business in India. The article asserts that a net-zero vision by India will only be accomplished through corporate leadership, which is backed by a strong policy framework and cross-sector cooperation.

II. Significance

Bridging the Mitigation Gap: The study addresses a critical national challenge by showing how proactive corporate leadership can bridge the gap between India's current emissions trajectory and its long-term 2070 net-zero national target.

Scientific Accountability over

Greenwashing: By focusing on Science-Based Targets (SBTs), the paper highlights a shift away from arbitrary, voluntary, or intensity-based goals toward scientifically verifiable carbon budgets. This framework minimizes greenwashing risks and enhances corporate transparency.

Strategic and Economic Value: The paper illustrates that corporate decarbonization is no longer just a regulatory compliance matter, but a strategic imperative. It outlines how aligning with climate science fosters long-term value creation, unlocks green finance, reduces climate risks, and enhances global competitiveness for Indian businesses.

Focus on Value Chains: It underscores the critical importance of addressing Scope 3 emissions, which represent the bulk of corporate footprints, thereby providing insights into decarbonizing complex supply chains involving small and medium enterprises (MSMEs).

III. Scope Of The Study

Geographical and Contextual Focus: The research is strictly contextualized within India's emerging low-carbon economy, aligning specifically with the nation's pledge made at COP26 to achieve net-zero greenhouse gas emissions by 2070.

Target Entities: The paper covers multinational subsidiaries, large Indian corporations, and export-driven companies, while also touching upon the financial and technological constraints faced by the Micro, Small, and Medium Enterprises (MSMEs) tied to their supply chains.

Operational Dimensions (Emissions Categorization): The scope encompasses all three tiers of emissions management:

- Scope 1: Direct operational fuel combustion.
- Scope 2: Indirect emissions from purchased electricity and heat.
- Scope 3: Complex value-chain, logistical, and product-use emissions.
- Strategic Domains: It details specific corporate strategies including energy efficiency, renewable energy transitions (solar/wind PPAs), technological innovations (green hydrogen, carbon capture), circular economy principles, and sustainable procurement.

IV. Aims And Objectives

Aims

To analyze how expanding corporate involvement, governed by Science-Based Targets (SBTs), can effectively facilitate and accelerate India's long-term national vision of achieving net-zero emissions by 2070.

Specific Objectives

- To examine the conceptual frameworks of net-zero emissions and the underlying scientific rationale of utilizing Science-Based Targets (SBTs) in business environments.
- To evaluate the primary decarbonization pathways available to Indian corporations, specifically analyzing energy efficiency, renewable energy procurement, and emergent low-carbon technologies.
- To assess the methods, challenges, and necessities of managing complex value chains and Scope 3 emissions within the Indian industrial landscape.
- To identify the core challenges and barriers inhibiting corporate decarbonization in India, including data gaps, financial constraints, and regulatory uncertainties.
- To highlight the policy mechanisms, cross-sector collaborations, and cultural changes required to make corporate climate action scalable and inclusive.

V. Hypothesis

Primary Hypothesis (H_1): Proactive corporate leadership and the adoption of Science-Based Targets (SBTs) significantly accelerate the closure of the gap between India's current greenhouse gas emissions trajectory and its national target of achieving net-zero emissions by 2070.

Secondary Hypothesis (H_2): Integrating Science-Based Targets (SBTs) into core corporate strategies reduces climate risks and greenwashing while enhancing long-term business resilience, competitiveness, and stakeholder trust.

Tertiary Hypothesis (H_3): Achieving comprehensive corporate decarbonization within the Indian industrial landscape depends heavily on implementing targeted enabling policies, cross-sector collaborations, and providing financial and technological support to value-chain partners (such as MSMEs).

VI. RESEARCH METHODOLOGY

The paper utilizes a qualitative, analytical, and conceptual methodology based on secondary data and thematic literature synthesis.

Conceptual Modeling and Framework Synthesis: The study builds a conceptual framework that maps global scientific standards (like the SBTi carbon budgets and global warming limits of 1.5°C to 2°C) directly onto India's national climate commitments (NDCs under the Paris Agreement).

Literature-Driven Analysis: The paper synthesizes existing academic research, environmental economics, and climate policy literature. This is evidenced by its integration of prominent studies regarding net-zero definitions (Fankhauser et al.), SBTi effectiveness (Giesekam et al.; Patchell), and India-specific energy transitions (Bhasin & Chatterjee; Kumar & Sharma).

Categorical Evaluation: The author(s) employ a structural analysis dividing corporate operations into distinct, standardized categories (Scope 1, 2, and 3 emissions) to evaluate real-world implementation strategies and corporate tracking frameworks.

Barrier and Co-benefit Assessment: The paper uses an inductive reasoning approach to weigh the current socio-economic challenges (capital intensity, data complexity in MSMEs) against the strategic co-benefits (market expansion, lower cost of green capital) to arrive at its final strategic recommendations for policymakers and corporate leaders.

Conceptual Framework: Net-Zero Emissions and Science-Based Targets

Understanding Net-Zero Emissions

Net-zero emissions are defined as a condition whereby there is a balance between the volume of greenhouse gases released to the atmosphere and the corresponding amount that is removed or offset in a certain duration of time. The net-zero means not the total cessation of emissions but profound cuts in all the sectors, and any residual emissions need to be offset with carbon removals through afforestation, soil carbon sequestration, or new technologies of carbon capture.

The net-zero concept has taken off because it makes climate action a subject that is consistent with scientific evaluation of the global carbon budget- the amount of carbon dioxide that can be emitted into the atmosphere without involving global warming to dangerous levels. In the case of corporations, net-zero objectives require long-term planning, capital investment, and systemic change as opposed to incremental improvements in efficiency.

Science-Based Targets: Definition and Rationale

Science-based targets offer an organized methodology to help organizations to establish emissions reduction targets that are aligned with climate science. Such targets enable global carbon budgets to be converted into sectoral and organizational journeys with consideration of such factors as baseline emissions, growth projections, and technological feasibility. SBTi has been instrumental in streamlining approaches and certifying business objectives.

The justifications of science-based targets are based on their believability and comparability. Compared to arbitrary or intensity-based objectives, SBTs serve to make sure that corporate action is aimed at mitigating the world. They make transparency also better, minimize the risks of greenwashing and increase the confidence of stakeholders. To investors, regulators and consumers, science-based targets amount to an indication of seriousness on the part of a company about climate risks.

Relevance to India's Climate Context

The emissions profile of India is influenced by the high-rate industrialization, urbanization, and the increasing energy demand. Although the per capita emissions are lower than the global average, the overall emissions are still on the increase. In this regard, science-based targets provide a system of striking a balance between development requirements and climate accountability. Using SBTs, the Indian corporations will be able to synchronize their growth strategies with national and international climate targets and improve resilience and competitiveness in the low-carbon global economy.

India's Net-Zero 2070 Goal: Implications for the Corporate Sector

National Climate Commitments and 1. Policy Landscape

The net-zero commitment of India by 2070 is based on the previous commitments towards climate action, such as Nationally Determined Contributions (NDCs) by the Paris Agreement. These are; cutting down on the intensity of emissions on GDP, growing the proportion of non-fossil fuel energy capacity, and strengthening the area of carbon sinks. Net-zero will be achieved through transformation in energy, industry, transport, buildings, and agriculture, which will be transformational change.

This change revolves around the corporate world. Business decisions are increasingly influenced by policies regarding renewable energy, energy efficiency, carbon markets and sustainable finance. Although the number of regulatory requirements is still low compared to other developed economies, the policy signals are starting to increase, and companies are moving towards decarbonization strategies actively.

Role of Corporations in India's Emissions Profile

Corporations are some of the largest contributors of emissions via several ways: direct fuel combustion (Scope 1), purchased electricity and heat (Scope 2), and indirect emissions in supply chains and product use (Scope 3). In most industries, the Scope 3 emissions represent most of the total emissions and this is why value-chain engagement is significant.

Meg Indian companies, multinational subsidiaries, and export-driven companies are becoming more exposed to foreign climatic expectations. The international investors, clients, and regulators require transparency, and reduction of emissions, which poses threats and opportunities to the Indian businesses.

Strategic Importance of Corporate Climate Action

Corporate climate action is not just a matter of compliance, it is a matter of innovation and market positioning, as well as long-term value creation. The first movers in the process of decarbonization can enjoy cost savings, availability of green finance, brand differentiation and less exposure to future carbon regulations. On the other hand, the latent action can lead to stranded assets, loss of reputation, and competitive edge.

Corporate Decarbonization Strategies:

Energy Efficiency and Operational Improvements

The primary and the most affordable step in corporate decarbonization is energy efficiency. Process optimization, waste heat recovery, new manufacturing technologies, and digital energy management systems are some of the measures that can play a significant role in reducing emissions and also reduce their cost of operation.

The forms of efficiency can give significant amounts of mitigation in the Indian context where most energy sectors still have fairly high intensity of energy. These gains depend on corporate investments in energy audits, performance benchmarking and employee engagement.

Renewable Energy Transition

Renewable energy is a foundation of corporate decarbonization through transitioning fossil fuels. Firms turn to on-site installations, power purchase agreements and renewable energy certificates more often to purchase renewable electricity. The growing renewable power supply of India, especially solar and wind energy, is a good place to implement corporate power.

Nevertheless, issues like grid reliability, storage capacity, and regulatory handicapping remain. To deal with these barriers, the corporations, utilities and policymakers have to work together and make the transition to energy smooth and equitable.

In steel, cement, chemicals, and aviation, which are difficult to decarbonize, deep decarbonization relies on technological innovation. Green hydrogen, industrial process electrification, alternative materials, and carbon capture and storage are emerging solutions. To scale these technologies, the corporate investment on research, pilot projects, and partnerships is of the essence.

Innovation can also focus on business models, like product-as-a-service, digital platforms and circular economy models that decouple growth and emissions.

Low-Carbon Technologies and Innovation

The reaction to the Scope 3 level of emissions is one of the most complicated areas of corporate decarbonization. The firms should communicate with suppliers, logistics companies and the customers in order to cut the emissions at the value chain. Some of the strategies are supplier codes of conduct, capacity-building programs, sustainable procurement policies, and working together with industry peers.

Supply Chain and Scope 3 Emissions Management

Capacity constraints are also another problem in India where the supply chains are usually characterized by small and medium workforces. Funding suppliers with money, technology transfer, sharing of data is very important to realize valuable cuts.

Science-Based Targets in Practice

Science based target setting includes the evaluation of the starting level of emissions, a relevant methodology to achieve the required reduction, the establishment of reduction pathways, and the formulation of governance instruments. It will need to be incorporated into corporate strategy, capital allocation and performance management to be effectively implemented.

Indian companies that have started using SBTs are making climate goals an integral part of executive rewards, risk management strategies, and investment choices. This incorporation makes it impossible to perceive reductions of emissions as peripheral programs but as business priorities.

Monitoring, Reporting, and Transparency

There is a need to have strong monitoring and reporting systems that can be used to track progress towards science-based targets. Third party verification promotes credibility, standardized reporting structures, comparability and accountability. The analytics of data and digital tools have become more significant in the management of complex emissions data . Transparency also promotes trust among the stakeholders, and learning in various sectors.

Corporate Leadership and Cultural Change

In addition to technical aspects, science-based targets need cultural change in organizations. The enablers of sustained climate action are the leadership commitment, employee engagement, and internal capacity-building. Whether through the creation of business models or the development of new products, companies that have a culture of sustainability are more likely to be innovative and adapt to a fast changing world.

Challenges and Barriers to Corporate Decarbonization in India

Although this momentum has increased, there are a number of challenges to corporate decarbonization in India.:

- Investment may be hampered by financial constraints especially because of capital intensive technologies.
- The lack of data and complications in the methods impedes proper accounting of emissions particularly in the Scope 3. The limitations on long-term planning are also complicated by regulatory uncertainty and infrastructure limitations.
- Also, the fact that climate action and developmental priorities are interventions is an issue of concern.
- A just transition can only be guaranteed to assist workers, communities, and small businesses to ensure social and political support of the decarbonization efforts.
- The obstacles are important but the transformation to net-zero also has major opportunities.
- Decarbonization would stimulate innovation, employment, and economic diversification.
- Renewable energy and clean technologies and sustainable infrastructure investments also lead to energy security and less pollution

Opportunities and Co-Benefits of Net-Zero Transition

In the case of corporations, adhering to the 2070 net-zero target of India can help them in being more resilient to climate risks, expanding access to international markets, and increasing the relationship with stakeholders. With the adoption of sustainability as the fundamental business practices, firms can generate the value of the long-term and involve themselves in the national and global climate targets.

The successful process of decarbonization of corporations needs favourable policy frameworks and cooperation platforms.

Corporate action can be hastened by clear long-term signals, the presence of carbon pricing mechanisms and green finance instruments, public-corporate partnerships. Associations, research bodies, and civil society groups equally have an important role to play in the sharing of knowledge and capacity-building.

Policy and Collaborative Enablers

International collaboration and global conformity are other ways on how corporate climate initiative can be effective, especially when it comes to export-seeking industries.

The attainment of net-zero emissions in 2070 is a characterizing challenge and opportunity to India. Corporations play a central role in this transition as their activities and emissions make major contributors to economic activity and emissions. Science-based targets present a plausible and practical outline on how to match the decarbonization work of corporations with climate science and national ambitions.

CONCLUSION

This article has shown that the idea of corporate net-zero directions is a blend of energy efficiency, the consumption of renewable energy, technological innovation, and involvement of the value-chain. Even though there are still impediments, with the help of enabling policies and partnerships, proactive corporate leadership can hasten the process towards a low-carbon and resilient future.

At the end of the day, the decarbonization of corporations is not just a reaction to the regulatory or market forces; it is a strategic need to grow sustainably. With the adoption of science-based targets and keeping pace with the 2070 climate vision of India, corporations will be able to play their part in the global climate mitigation process and enhance the long-term competitiveness and relevance of the corporation in society.

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