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Carbon Markets

As a Tool for Climate Financing:

The India Story

BY: auctusESG - Carbon Markets Association of India - Invest India - National Institute of Public Finance and Policy

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Carbon Markets Association of India, 511, World Trade Centre, Connaught Place, New Delhi - 110001

auctusESG, 1008 Kohinoor Square N.C. Kelkar Marg, Dadar, Mumbai, Maharashtra 400028

National Institute of Public Finance & Policy, 18/2, Satsang Vihar Marg, Special, Qutab Institutional Area, New Delhi, Delhi 110067

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Souba Giridharan, Independent Consultant

Sanchayan Chakraborty, Aavishkaar Capital

Neha Khanna, Climate Policy Initiative

Arindom Datta, Independent Advisor/Ex-Rabobank

Santosh Singh, Intellecap

Pravin Jadhav, RBL Bank

Deepak Gupta, ReNew Power

Aamil Hemani, Green Exchange India

Authors

Gaurav Sishodia
Vice President, Invest India

Deepanshu Kaul Philip
Senior Manager, Invest India

Keshav Daga
Former Invest India

Namita Vikas
Founder and Managing Director, auctusESG

Smitha Hari
President (India), auctusESG

Suranjali Tandon
Associate Professor, National Institute of Public Finance and Policy and a visiting Senior Fellow at the London School of Economics

Aarti Bansal
Research Fellow, National Institute of Public Finance and Policy

Rohit Kumar
Secretary General, Carbon Markets Association of India (CMAI)

Shubhi Goel
Joint Secretary, Carbon Markets Association of India (CMAI)

Key Message

Namita Vikas
Founder & Managing Director
auctusESG

India is the world's third largest contributor to global greenhouse gas emissions and is increasingly vulnerable to frequent and intense extreme weather events with severe economic and social impacts. The Indian Government has demonstrated its commitment to prioritise climate change with ambitious targets as a part of its updated Nationally Determined Contributions (NDC) which includes reducing emission intensity by 45% by 2030 (from 2005 level).

The policy paper to develop a fully functional national carbon market (in phases) by the Bureau of Energy Efficiency (BEE), Ministry of Power that was published in March 2023, solidifies the Government's effort to harmonize various climate-related policies that facilitate the achievement of NDCs through market-based incentivization across multiple sectors. Further, with evolving stringent international carbon tax regulations such as the European Union's (EU) Carbon Border Adjustment Mechanism (CBAM), it becomes critical for India and its businesses to stay competitive, especially since it is a significant exporter to the EU. To respond to the challenges of the growing global regulatory environment, India needs to fast-track its long-term domestic and international strategies. Implementation of a carbon market is one such step in the right direction, which intends to establish a framework for a carbon trading system, thus enabling a domestic market for carbon credit trade.

India expects to build on its domestic experience of Perform, Achieve, and Trade (PAT) schemes and Renewable Energy Certificates (REC) to create such a carbon trading system with GHG-emission-denominated units that are fungible, tradeable, and aligned with global standards. Creating demand for carbon credits and ensuring that high-quality credits are generated is important for the effective functioning of the market. Establishing digital Measurement, Reporting, and Verification (MRV) systems for carbon credits could be a game changer that addresses the fundamental challenge of information asymmetry in trading. This will also help in attracting capital flows towards credible projects. Further, engaging with the private sector early on, can create awareness about the working of and providing clarity on the direction of carbon markets.

Such a development is expected to change the narrative for India and shape its market towards a low-carbon transition. A voluntary carbon market can spur private sector participation and investment in key transition and high-emission sectors. This is through deployment of clean energy mechanisms, e-transportation solutions, resource-efficient technologies and the adoption of sustainable agriculture practices. With key policy changes signaling a market for carbon credits, integration of informal and rural sectors within the framework, and incentivization for the financial sector to drive the change, India is well poised to speed up decarbonization and achieve long-term sustainable economic growth. This report thoroughly analyses global carbon market developments and critically evaluates challenges and opportunities in the evolving Indian policy landscape. It suggests actionable steps for government, industry, and financial entities towards establishing an effective carbon trading mechanism in India.

Key Message

Mr. Manish Dabkara

President, Carbon Markets Association of India (CMAI)

I am thrilled to share with you our profound commitment to environmental sustainability and the monumental strides we are taking towards a greener future. As we navigate the complexities of our modern world, it has become increasingly clear that safeguarding our planet is not just a responsibility—it is an imperative. In November 2021, at the Glasgow COP26 climate summit, India's Prime Minister Narendra Modi made a historic pledge: to achieve net-zero emissions by 2070. This declaration, although set for the future, resonates deeply with the urgent need for action in the present. It signifies our nation's unwavering dedication to combatting climate change and underscores the pivotal role that every individual and organization must play in this global effort.

Prime Minister Modi's vision extends beyond mere rhetoric—it is a call to action that demands tangible, measurable progress. By setting ambitious targets such as increasing India's non-fossil energy capacity to 500 GW by 2030 and meeting 50% of our energy requirements from renewable sources, we are charting a course towards a sustainable energy future. Furthermore, by pledging to reduce our total projected carbon emissions by one billion tonnes and slash the carbon intensity of our economy by more than 45% by 2030, we are demonstrating our commitment to meaningful change. At CMAI, we are proud to be part of this transformative journey. Through our unwavering dedication to sustainability, we are actively contributing to India's climate action agenda. Our focus on India's net-zero journey is not just a reflection of our values—it is a strategic imperative that drives our journey forward. `As India moves closer to realizing its climate goals, the establishment of a national emission trading system marks a significant milestone in our journey towards sustainability. This system, set to merge the existing energy efficiency trading and renewable energy trading mechanisms, will streamline carbon credit trading under a single entity, offering a unified platform for incentivizing emission reductions.

India's proactive stance towards climate action, exemplified by its strong commitment to achieving its Nationally Determined Contributions (NDCs) well ahead of schedule, is commendable. Prime Minister Narendra Modi's proposal of the "Panchamitra's" strategy at COP26 further underscores our nation's dedication to combating climate change. This comprehensive strategy, encompassing five key pillars, lays the foundation for a holistic approach to environmental stewardship. Moreover, the Green Credit Programme stands as a pivotal focus of the Government's environmental agenda. Aligned with the overarching vision of 'Lifestyle for Environment (LiFE)' and the comprehensive strategy of 'Panchamrit', as well as the ambitious goal of achieving net-zero carbon emissions by 2070, this initiative is poised to revolutionize the way we approach sustainability. Once fully developed and operational, it will serve as a cornerstone in advancing the nation's sustainable objectives and facilitating the transition towards cleaner, more sustainable energy practices.

Establishing a carbon market in India holds immense potential for catalyzing emission reductions and driving sustainable development. By providing economic incentives for businesses and industries to reduce their carbon footprint, a carbon market fosters innovation and promotes the adoption of cleaner technologies and practices. Moreover, the trading of carbon credits incentivizes emission reductions among entities, creating a virtuous cycle of environmental stewardship and economic prosperity. As we embark on this journey towards a low-carbon future, it is imperative that we harness the power of collaboration and innovation. By leveraging the opportunities presented by the establishment of a national emission trading system, we can accelerate our transition towards a greener, more sustainable economy. Together, let us seize this opportunity to build a brighter, more resilient future for generations to come.

Key Message

Nivruti Rai
Managing Director & CEO

INVEST INDIA

Climate change has ceased to be a distant concern, and is our reality, particularly evident in India, where more than three-quarters of districts, home to over 600 million people, grapple with the looming risks of extreme weather events. There has been a rising consciousness in this generation which factors in elements of carbon-free, green, recyclable, and zero-waste in its buying behavior. Visible in the investments and technology transfers India attracts- the rise of clean-tech start-ups, and a record jump of 31% (YoY) in investments, $1.1 Trillion in 2023, in carbon-free infrastructure assets bear testimony to this trend. BlackRock's new unit of Transition Capital to boost investments to a low-carbon economy, Macquarie's "Global Carbon" division focusing on carbon offsetting solutions, and OTPP's ambition of USD 50 billion in green investments by 2050 highlight this trend.

Recognizing this interplay of climate change and economic forces, the Indian government has boldly set ambitious targets and embarked on initiatives to combat climate change head-on. Despite India's relatively lower per capita emissions than developed nations, it stands as the world's third-largest emitter of greenhouse gases, with crucial sectors like electricity, transportation, and agriculture contributing 70% of emissions. With India's rapid economic growth projected to drive significant demand across various sectors, the imperative for accelerated decarbonization efforts cannot be overstated. A recent study by the Deloitte Economics Institute underscores the urgency for India to act decisively, highlighting potential economic losses of US$35 trillion over the next five decades if unchecked, alongside the prospect of gaining US$11 trillion through proactive climate action.

In Hon'ble Prime Minister Narendra Modi's COP-28 address, we heard the moral responsibility towards One Earth, One Family, One Future. In recent developments, the Ministry of Power has laid the groundwork for establishing a fully functional national carbon market, a pivotal step towards fulfilling India's Nationally Determined Contributions (NDC), preserving the environment, and positioning India as a leader in exporting decarbonization solutions. The burgeoning voluntary carbon market, expected to soar to $40 billion by 2030, presents promising opportunities for stakeholders to actualize their climate objectives and catalyze the transition towards a low-emission future. Leveraging India's successful experiences with initiatives like the Perform, Achieve, and Trade (PAT) schemes and Renewable Energy Certificates (REC), we stand well-equipped to spearhead the transition to a low-carbon economy. By harnessing digital solutions for Measurement, Reporting, and Verification (MRV) and actively involving the private sector, we can ensure the integrity and efficacy of our carbon trading system.

Moreover, the establishment of a carbon market holds immense potential to ignite innovation and investment in critical transition sectors such as clean energy, transportation, and agriculture. By incentivizing participation from both public and private stakeholders, we can unlock India's full potential for a sustainable future. This report stands as a timely and comprehensive exploration of the pivotal issues surrounding carbon markets and their ramifications for India's sustainable development. Crucially, it underscores the pivotal role of key stakeholders, including corporate entities and financial institutions, in driving the transition to a low-carbon economy. Offering actionable insights and recommendations, this report serves as a guiding beacon for policymakers, industry leaders, and investors alike, charting a course toward a more sustainable and resilient future for India.

Key Message

R. Kavita Rao

Director, National Institute of Public Finance and Policy

Global commitments for reduction in emissions of GHGs require significant work by both developed and developing countries. India has taken on ambitious targets for 2030 under its NDCs updated in 2022. The quantifiable changes include reduction in emission intensity of GDP by 45 percent when compared to the levels in 2005, expanding the contribution of renewable energy sources to 50 percent of installed capacity and creating additional carbon sink of 2.5 to 3 billion tonnes of CO2 through additional tree cover.

The instruments available to governments for signaling a change in the economic environment towards reduction in emissions include taxation instruments like carbon tax and regulatory instruments like cap and trade which impose a price on the use or emission of GHGs. The policy framework for introducing and refining the use of these instruments in India is evolving over time. This report presents a useful overview of the status of carbon markets in India.

Incorporating climate focus into other policies is another tool that governments are exploring. Afforestation policies and incentives to support investment in green technologies as well as in R&D to develop new solutions can help integrate concerns of climate change with economic development. For instance, India is incentivizing the eco-system for production and use of electric vehicles, production of high efficiency solar PV modules and battery storage systems – all of which use existing technologies to expand the landscape of manufacturing in India. For India to develop solutions suitable to its resources and its challenges, more investment in R&D too is called for. In years to come, one expects significant action on this front as well.

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1 | Introduction

The global community is accelerating its efforts to combat climate change through international agreements such as the Paris Agreement and the Conference of Parties (COP) meetings where stakeholders build consensus on decisions to address the climate crisis. Climate change is having a growing impact on India, with more than three-quarters of India's districts – home to over 600 million people - now considered to be at risk from extreme weather events. This threat is being taken seriously by the Indian government, which has set ambitious targets and is taking bold action to address it. However, India is still the world's third-largest emitter of greenhouse gases at 2.9 GtCO2e, even though its per capita emissions are much lower than those of developed countries i.e., 1.8 tons CO2e vs USA at 14.7 tons and China at 7.6 tons. 70% of the country's total greenhouse gas emissions are contributed by six sectors: electricity generation, transportation, aviation, steel production, cement production, and agriculture. India's economic growth is projected to lead to a significant increase in demand across several sectors, including power (double), steel (eightfold), cement (triple), automotive (triple), and food (double).[1]

A study conducted by the Deloitte Economics Institute emphasizes the urgency for India to take immediate action to avoid a potential loss of US$35 trillion in economic opportunities over the next five decades due to the unchecked effects of climate change. This report, titled "India's Turning Point: How Climate Action Can Shape Our Economic Prospects," also highlights the alternative scenario, wherein India has the potential to gain a significant economic value of US$11 trillion over the same period. This gain can be realized by curbing the global rise in temperatures and harnessing India's capacity to lead in "exporting decarbonization" to the rest of the world.[2]

Speeding up decarbonization has the potential to bring substantial benefits, not only to India but also to the global community. India can strategically use this shift towards a low-emission trajectory to reshape its economy, with a strong emphasis on fostering growth in advanced industrial sectors. This strategy can be effectively leveraged, taking advantage of the availability of cost-effective clean energy export markets, particularly as the region anticipates a rapid surge in energy demand in the coming years.

As nations and corporations strive to reduce their greenhouse gas (GHG) emissions, carbon finance and voluntary carbon markets have emerged as promising avenues for stakeholders to facilitate the realization of their climate goal and net zero pledges.

[1] McKinsey & Company. "Decarbonising India: Charting a Pathway for Sustainable Growth." McKinsey & Company, October 2022. https://www.mckinsey.com/~/media/mckinsey/business%20functions/sustainability/our%20insights/decarbonizing%20india%20charting%20a%20pathway%20for%20sustainable%20growth/Decarbonising-India-Charting-a-pathway-for-sustainable-growth-ES-Oct-2022.pdf

[2] Deloitte India. "Change How You See Tomorrow.," August 2018. https://www2.deloitte.com/in/en/pages/about-deloitte/articles/turning-point.html.

As a result, the voluntary carbon market continues to expand at a record pace – having quadrupled four times in value between 2020 and 2021 to reach $2 billion – and is expected to reach up to $40 billion by 2030.[3] Another estimate by major initiatives such as the US-led Energy Transition Accelerator and the African Carbon Markets Initiative aims to stimulate and leverage private voluntary demand for carbon credits in developing economies to augment revenues derived from these credits.[4] Instead of a global cap-and-trade scheme, there are however numerous emission trading markets both on national and regional levels. These carbon schemes can be distinguished into two types of carbon marketplaces – one voluntary (individuals and businesses buy credits) and the other regulated (cap-and-trade regulations). Following these developments, governments of developing countries have begun considering how best to leverage carbon markets for domestic developmental and climate goals. For example, Ghana and Jordan are among the countries that have established frameworks to facilitate the influx of capital for climate mitigation, in return for carbon credits.[5] As of June 2022, over 32 ETS and 36 carbon tax regimes exist across 46 national jurisdictions, including China's launch of the world's largest carbon market in 2021.[6]

Recognizing the need to act urgently on climate issues and following global trends, the Indian government released the draft blueprint of its National Carbon Market at the end of 2021 for stakeholder consultation. India finalized the framework for its Carbon Credit Trading Scheme (CCTS) for the Indian Carbon Market (ICM) via gazette notification on June 28, 2023; it predicted the launch of a functional national Emission Trading System (ETS) from 2026 onwards. This is also a significant step for India to meet its Nationally Determined Contributions (NDC) and net zero targets.

As the third largest greenhouse gas emitter after China and the United States, the development of an Indian ETS is paramount for safeguarding the environment and reaching national and global net-zero goals by 2070. India is a significant exporter of carbon credits into the decentralized voluntary market, with its credits worth between $200-300 billion per year and accounting for 17% of the global supply in 2022.[8] However, the ETS approach is fundamentally different with the core focus of generating carbon credits for both compliance and voluntary markets.

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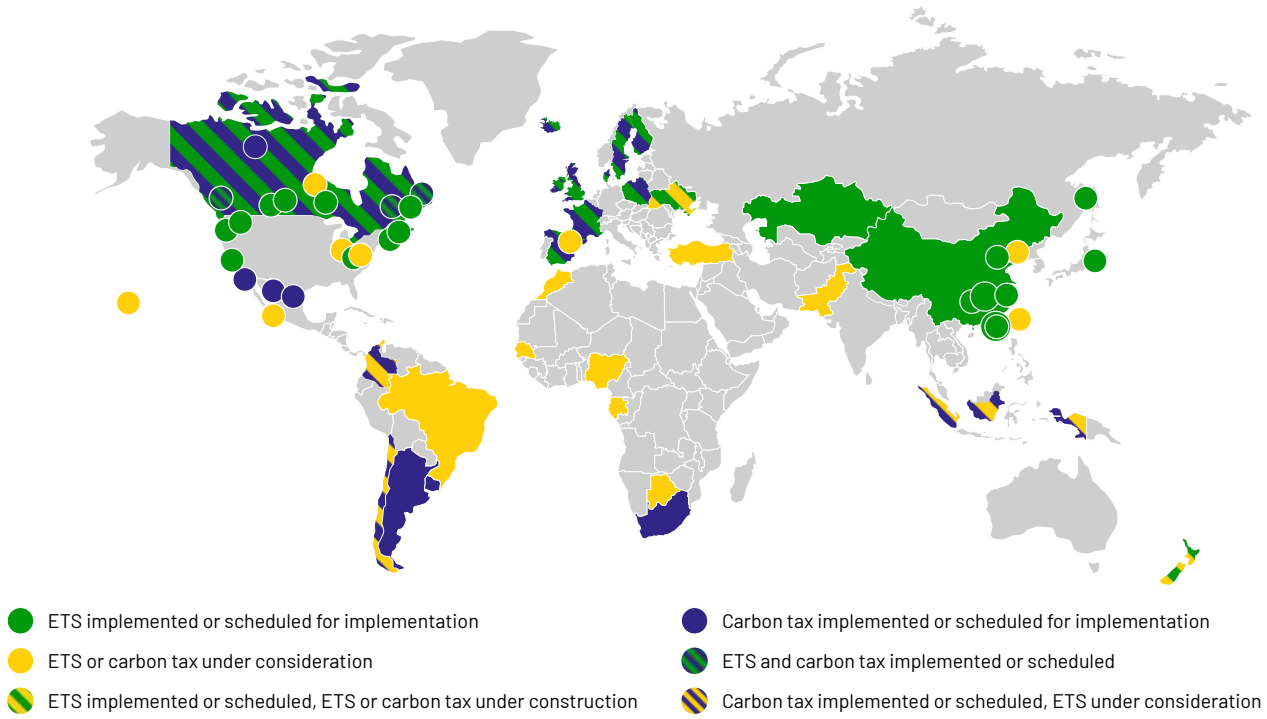
[3] Porsborg-Smith, Anders, Jesper Nielsen, Bayo Owolabi, and Carl Clayton. "The Voluntary Carbon Market Is Thriving." BCG Global, February 6, 2023. https://www.bcg.com/publications/2023/why-the-voluntary-carbon-market-is-thriving.

[4] Grantham Research Institute on Climate Change and the Environment. "Disentangling the Features of India's New National Carbon Market - Grantham Research Institute on Climate Change and the Environment," January 16, 2023. https://www.lse.ac.uk/granthaminstitute/news/disentangling-indias-new-national-carbon-market/.

[5] UNDP. "Carbon Justice For All: How Carbon Markets Can Advance Equitable Climate Action Globally," June, 2022. https://www.undp.org/africa/blog/carbon-justice-all-how-carbon-markets-can-advance-equitable-climate-action-globally.

[6] World Economic Forum. "Explainer: Which Countries Have Introduced a Carbon Tax?," July 11, 2022. https://www.weforum.org/agenda/2022/07/carbon-tax-emissions-countries/.

Figure 1: Summary map of regional, national and subnational carbon pricing initiatives



Source: World Bank[7]

Given this renewed domestic focus, there is a need for sustained and ongoing engagement and collaboration among civil society, the private sector, and the government regarding the operational and theoretical components of the ETS. This deeper and more comprehensive knowledge is crucial for stakeholders to look beyond their current carbon offset strategy and approach and ensure an effective and sustainable domestic ETS. The architecture of the national ETS is in alignment with the contextual realities of India while also incorporating developments and understandings from implemented ETS systems across the globe.

As such, this report critically examines the current state of and developments within global carbon markets and policies in addition to assessing the challenges and opportunities presented by the existing and developing policy landscape in India. Based on a holistic assessment, this reviews the developments surrounding the carbon trading mechanism and highlights the key considerations for different sets of actors including the government, corporations, and financial institutions.

[7] "Carbon Pricing Dashboard." World Bank. https://carbonpricingdashboard.worldbank.org/

[8] Singh, Ruchira, and Agamoni Ghosh. "India Works on Market Stabilization Fund: Details for Upcoming Carbon Market." S&P Global Commodity Insights, February 17, 2023. Edited by Jonathan Loades-Carter. https://www.spglobal.com/commodityinsights/en/market-insights/latest-news/energy-transition/021723-india-works-on-market-stabilization-fund-details-for-upcoming-carbon-market.

2 | The Carbon Market and Policy Landscape

The first international carbon market was established in 1997 under the United Nations Kyoto Protocol on Climate Change. The Kyoto Protocol established two project-based mechanisms - the Clean Development Mechanism (CDM) and the Joint Implementation (JI) mechanism - to enable countries to trade carbon credits and incentivize emissions reductions, to mitigate global GHG emissions. CDM permitted developed countries to purchase emissions reductions in the form of carbon credits, known as Certified Emissions Reductions (CERs), generated from emission reduction projects in developing countries.[9] JI, on the other hand, enabled developed countries to invest in emission reduction projects in other developed states with emission reduction targets under the Kyoto Protocol—creating carbon credits in the form of Emission Reduction Units (ERU). The JI was intended to foster a joint responsibility amongst developed nations for the implementation of collaborative and sustainable projects for long-term emission reductions[10].

Albeit its oversight mechanism—the International Transaction Log (ITL)— which was designed to provide transparency and ensure a fair and effective trading system, the trading scheme quickly fell into disorder and collapsed after widespread reports of abuse and corruption. A 2015 report analyzing forest offsets found that an estimated 80% of sustainable projects under the scheme were dubious, resulting in an emission increase of approximately 600 million metric tons[11].

Since its collapse, there has been a failure to draw a consensus on the most effective and efficient way to implement a global cap-and-trade scheme. While advancements were made at COP27 in relation to Article 6 of the Paris Agreement—which under Article 6.4 aims to create a global carbon market overseen by a United Nations' entity—and the first intergovernmental trades under Article 6.2 have been announced, many rules and regulations are still work in progress.[12] In addition, the impacts of national and supranational policies, particularly the European Union's Carbon Border Adjustment Mechanism (CBAM) addressing 'carbon leakage,' remain unclear and controversial on global, regional, and national scales.[13]

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[9] Carbon Market Watch. "The Clean Development Mechanism: Local Impacts of a Global System." October 2018. https://carbonmarketwatch.org/wp-content/uploads/2018/10/CMW-THE-CLEAN-DEVELOPMENT-MECHANISM-LOCAL-IMPACTS-OF-A-GLOBAL-SYSTEM-FINAL-SPREAD-WEB.pdf

[10] Carbon Credits, "The Ultimate Guide to Understanding Carbon Credits," Carbon Credits, March 23, 2023, https://carboncredits.com/the-ultimate-guide-to-understanding-carbon-credits/#1.

[11] Kollmuss, Anja, Lambert Schneider, and Vladyslav Zhezherin. "Has Joint Implementation Reduced GHG Emissions?: Lessons Learned for the Design of Carbon Market Mechanisms." Stockholm Environment Institute, 2015. http://www.jstor.org/stable/resrep02794.

[12] Grantham Research Institute on Climate Change and the Environment. "Disentangling the Features of India's New National Carbon Market - Grantham Research Institute on Climate Change and the Environment," January 16, 2023. https://www.lse.ac.uk/granthaminstitute/news/disentangling-indias-new-national-carbon-market/.

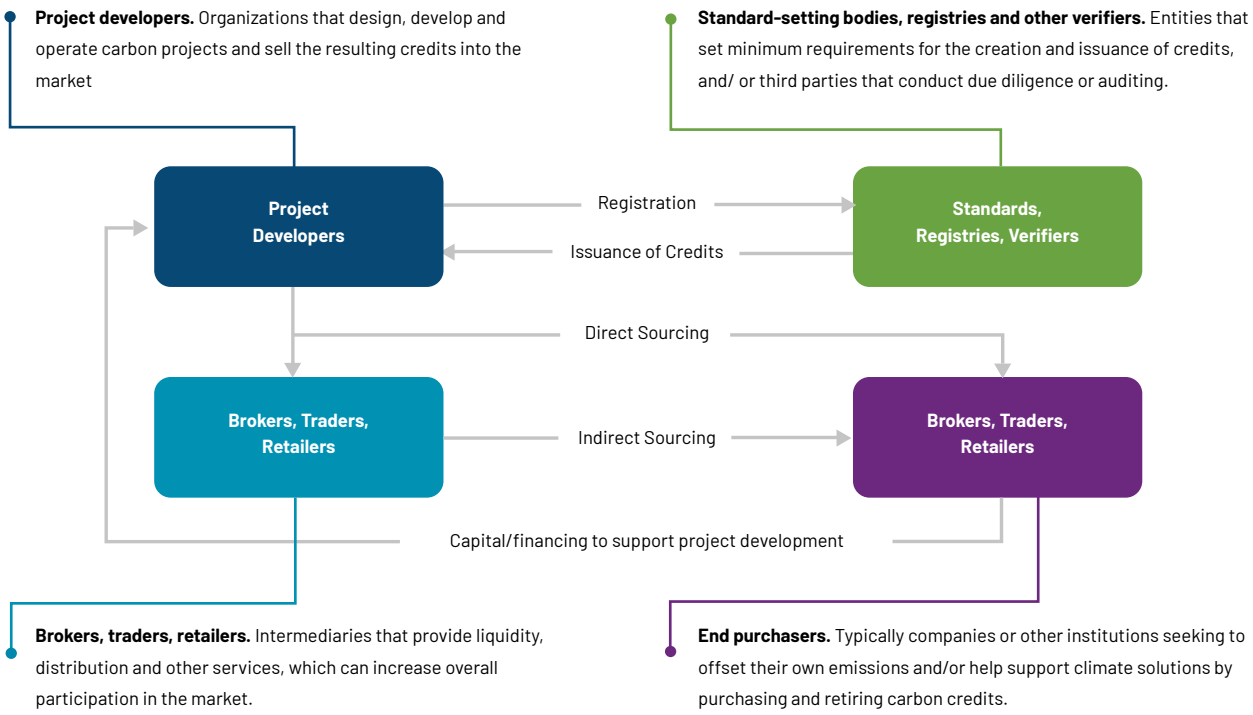
[13] "Carbon Border Adjustment Mechanism," Taxation and Customs Union, 2024, https://taxation-customs.ec.europa.eu/carbon-border-adjustment-mechanism_en.

While there is some overlap between the compliance and voluntary carbon markets, with some corporations participating in both, they have different objectives, revenue flows, and regulatory frameworks. Companies may use voluntary carbon offsets to meet corporate sustainability goals or reduce their carbon footprint. However, these voluntary actions do not necessarily contribute to national emissions reduction targets. In contrast, compliance carbon markets are established by governments, or regional governing bodies, to meet legally binding emissions reduction targets and are subject to rigorous monitoring and reporting requirements. The following sections provide an overview of current developments, policies, and global trends within these markets.

2.1 | The Voluntary Carbon Market (VCM)

The Voluntary Carbon Market (VCM) enables organisations or individuals to purchase carbon credits that have been issued by private, third-party offset credit schemes in order to voluntarily offset their own carbon footprints.[14] A schematic structure of market participants is provided below.[15]

Figure 2: Carbon market participants



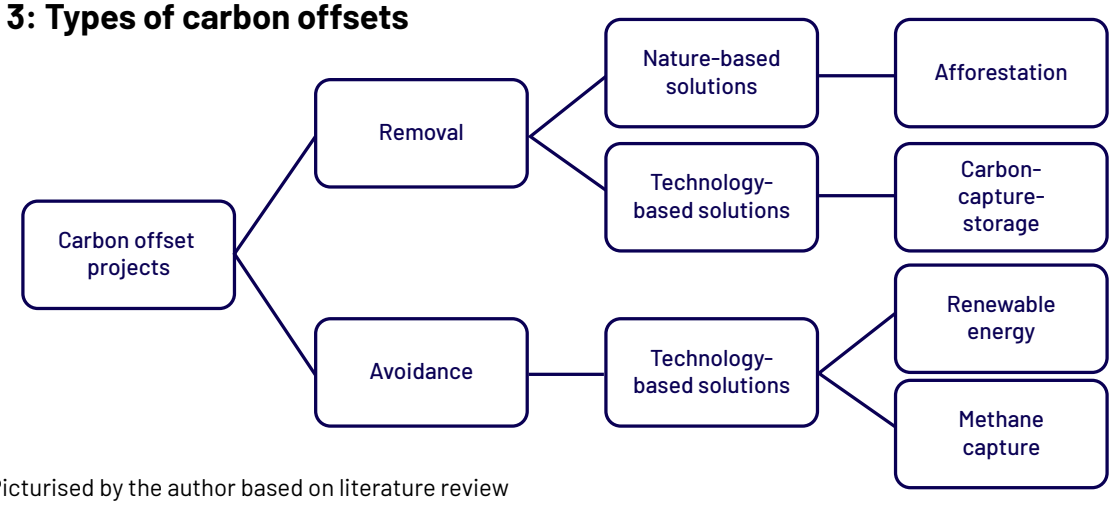
Source: Picturised by the author with information sourced from Agriculture and Horticulture Development Board (AHDB), UK

[14] Kreibich, Nicolas, and Lukas Hermwille. "Caught in Between: Credibility and Feasibility of the Voluntary Carbon Market Post-2020." Climate Policy 21, no. 7 (July 7, 2021): 939–57. https://doi.org/10.1080/14693062.2021.1948384.

[15] JP Morgan Chase & Co. "Carbon Market Principles." jpmorganchase.com, 2023. https://www.jpmorganchase.com/content/dam/jpmc/jpmorgan-chase-and-co/documents/carbon-market-principles.pdf

Companies can purchase two different types of offset credits – removal, and avoidance credits – usually equivalent to 1 tonne of CO_2. The former are attained from projects which lower existing emissions by removing CO_2 from the atmosphere, frequently in the form of either nature-based solutions or technology-based solutions. The latter are derived from projects preventing CO_2 from being emitted into the atmosphere. Before these credits may be bought and traded, third-party auditors such as Verra and Gold Standard validate the offset projects by verifying, collecting, and analysing data.[16]

Figure 3: Types of carbon offsets



Source: Picturised by the author based on literature review

The VCM's origins can be traced back to the 1990s which grew slowly in volume, types of credits, and participants in the 2000s.[17] In the aftermath of the 2008-2009 financial crisis, the VCM was stymied, with both market value and volume declining. However, 2018 and 2019 saw this trend's reversal. Between 2020 and 2021, the market saw a four-time increase, reaching a value of $2 billion. Despite the VCM value topping $2 billion by August 2022,[18] the market did not maintain the momentum of the prior year and grew slower than initially predicted. Analysts have attributed this impeded growth to a combination of geopolitical and macroeconomic factors – the Russo-Ukrainian conflict, energy crisis, and threat of a global recession – and the growing regulatory uncertainties surrounding both voluntary and compliance carbon markets.[19] Despite these challenges, the VCM is predicted to continue to grow and be valued between $10 to $40 billion by 2030.[20]

[16] Carbon Credits, "The Ultimate Guide to Understanding Carbon Credits," Carbon Credits, March 23, 2023, https://carboncredits.com/the-ultimate-guide-to-understanding-carbon-credits/#1.

[17] Sara Cottle, "So, What Is the Voluntary Carbon Market Exactly?," Climate Focus, July 14, 2022, https://climatefocus.com/so-what-voluntary-carbon-market-exactly/.

[18] Jade Plasencia, "Voluntary Carbon Market Value Tops US$2B," ClimateTrade, August 10, 2023, https://climatetrade.com/voluntary-carbon-market-value-tops-us2b/.

[19] "Voluntary Carbon Markets in 2023: A Bumpy Road Behind, Crossroads Ahead," Bain, February 13, 2023, https://www.bain.com/insights/voluntary-carbon-markets-in-2023-a-bumpy-road-behind-crossroads-ahead/.

[20] Anders Porsborg-Smith et al., "The Voluntary Carbon Market Is Thriving," BCG Global, February 6, 2023, https://www.bcg.com/publications/2023/why-the-voluntary-carbon-market-is-thriving.

Unlike in the early stages of the VCM during the late nineties and early 2000s, which saw public institutions as its major driving force, future demand is likely to be driven by private companies and organizations who increasingly have far-reaching carbon neutrality or net-zero commitments.[21] Indeed, despite the pandemic, 2020 saw corporate commitments double. By the end of the year, 1565 companies had set net-zero targets – representing 3.5 gigatons of annual GHG emission and $12.5 trillion in revenue.[22] According to estimates, the next decade will see a 20-fold increase in corporate spending on carbon credits to greater than $10 billion.[23]

Particularly in times of exhausted public budgets, the VCM is critical in driving investment in mitigation action and presents a unique opportunity for developing markets with otherwise limited access to foreign direct investment.[24] Indeed, the majority of voluntary carbon offset credits are supplied by developing markets, with such countries accounting for 43 of the top 50 suppliers of carbon credits. In 2019, India, the United States, China, Indonesia, Peru, and Kenya were the top carbon project locations for generating carbon offset credits to be traded in the VCM.[25]

2.2 | Compliance Markets: The EU's 'Emissions Trading System' Blueprint

Unlike the VCM which is regulated by market-based mechanisms, compliance markets are established and overseen by governments or supranational organizations to meet their emissions reduction targets. While varying in scope, cap-and-trade systems 'cap' the total amount of GHG emissions that may be released within a particular jurisdiction, allocate or auction off emissions allowances (or carbon credits) to regulated entities, and then enable these entities to trade their respective credits amongst themselves. Similarly, to the VCM, each credit typically equates to the equivalent of 1 tonne of CO_2, with the number of credits or the 'cap' decreasing over time in alliance with national or supranational targets.

[21] Nicolas Kreibich and Lukas Hermwille, "Caught in between: Credibility and Feasibility of the Voluntary Carbon Market Post-2020," Climate Policy 21, no. 7 (July 7, 2021): 939–57, https://doi.org/10.1080/14693062.2021.1948384.

[22] Charlotte Streck, "How Voluntary Carbon Markets Can Drive Climate Ambition," Journal of Energy & Natural Resources Law, February 12, 2021, 1–8, https://doi.org/10.1080/02646811.2021.1881275.

[23] "Is the 'Legacy' Carbon Credit Market a Climate Plus or Just Hype?," Yale E360, n.d., https://e360.yale.edu/features/is-the-legacy-carbon-credit-market-a-climate-plus-or-just-hype.

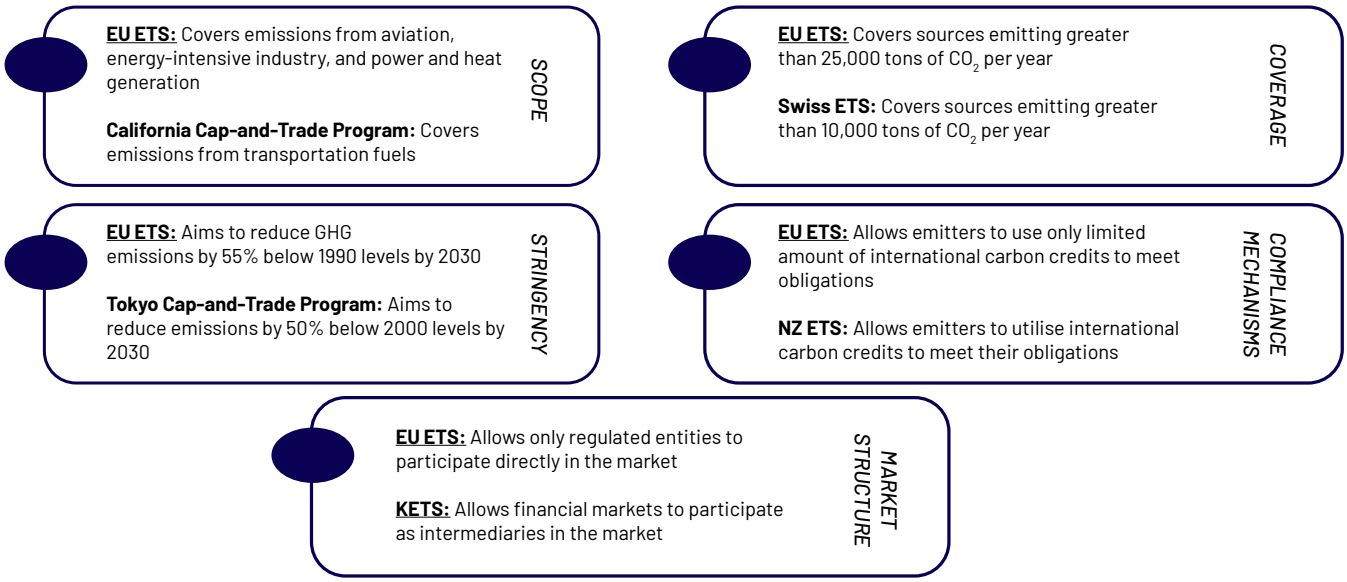
[24] Charlotte Streck, "How Voluntary Carbon Markets Can Drive Climate Ambition," Journal of Energy & Natural Resources Law, February 12, 2021, 1–8, https://doi.org/10.1080/02646811.2021.1881275.

[25] Charlotte Streck, "How Voluntary Carbon Markets Can Drive Climate Ambition," Journal of Energy & Natural Resources Law, February 12, 2021, 1–8, https://doi.org/10.1080/02646811.2021.1881275.

The first cap-and-trade scheme originated in the United States in 1990 as a response to acid rain. The scheme successfully regulated sulphur dioxide emissions and provided a model for the European Union's Emissions Trading System (EU ETS).[26] The initial climate change related international treaties such as the United Nations Framework Convention on Climate Change (UNFCCC) in 1992 and the subsequent 1997 Kyoto Protocol laid the foundation for formation of EU ETS. Launched in 2005, the first phase of EU ETS engrained the principles of Kyoto Protocol of an absolute quantitative emissions target and flexible mechanism to enable the potential exchange of emission units amongst countries.[27]

The EU ETS was, until the 2021 launch of China's cap-and-trade scheme, the largest carbon market with over 12,000 emission entities and 27 Member States of the EU covered.[28] It is organised into 4 trading phases, each lasting a few years, with distinguished shifts in emission caps, sectors involved within the scheme, how allowances are allocated, technology and innovation, and foreign trading.[29]

Figure 4: Global compliance market differences[30]



Source: Picturised by the author based on information sourced from EU ETS and other literature review

[26] "Cap-and-Trade," LII / Legal Information Institute, n.d., https://www.law.cornell.edu/wex/cap-and-trade#:~:text=The%20United%20States%20 created%20its,sulphur%20dioxide%20and%20 nitrogen%20 oxides.

[27] "The EU Emissions Trading System: An Introduction | Climate Policy Info Hub," n.d., https://climatepolicyinfohub.eu/eu-emissions-trading-system-introduction.html#:~:text=The%20main%20features%20of%20the,for%20which%20the%20cap%20applies).

[28] Kaile Zhou and Yiwen Li, "Carbon Finance and Carbon Market in China: Progress and Challenges," Journal of Cleaner Production 214 (March 1, 2019): 536–49, https://doi.org/10.1016/j.jclepro.2018.12.298.

[29] "Delivering the European Green Deal," European Commission, July 14, 2021, https://commission.europa.eu/strategy-and-policy/priorities-2019-2024/european-green-deal/delivering-european-green-deal_en#:~:text=With%20the%202030%20 Climate%20 Target,below%201990%20levels%20by%202030.

[30] "Korea Emissions Trading Scheme," International Carbon Action Partnership, December 5, 2022, https://icapcarbonaction.com/en/ets/korea-emissions-trading-scheme.

Although carbon taxes are additional policy instruments aimed at incentivizing emitters to reduce their emissions, this mechanism is distinct from and should not be conflated with the carbon market. Nonetheless, nations such as South Korea have implemented both carbon taxes on the products of heavy-emitting sectors, such as petroleum, and a cap-and-trade scheme, the Korea Emissions Trading Scheme (KETS).[31]

In its draft blueprint for the national carbon market, the Indian Bureau of Energy Efficiency announced that the proposed Indian ETS will also have a design that is similar to the EU ETS.[32] The EU ETS has been a model for many nations and/or cities in developing their own domestic cap-and-trade designs. To provide a few examples, the Swiss Emissions Trading System (Swiss ETS), KETS, New Zealand Emissions Trading Scheme (NZ ETS), California Cap-and-Trade Program, and Chinese cap-and-trade scheme are all modeled after the EU ETS. Despite their commonality, these systems maintain key differences in their scopes, stringency, compliance mechanisms, coverage, and market structure. Notably, China is the first nation to shift its focus from the reduction of absolute emissions to the intensity of emissions generation.[33] This disconnect and difference between markets establishes the intricate nature of the international carbon market landscape and the challenges involved in coordinating and integrating global efforts to tackle climate change.

Chapter 3 provides an in-depth assessment of the challenges faced by carbon markets on three fronts – globally, and within developing markets including India.

[31] KDI. "Carbon Taxation Policy in Korea" https://www.kdi.re.kr/eng/research/reportView?pub_no=17396#:~:text=In%20addition%20to%20the%20 carbon,in%20force%20in%20South%20 Korea.

[32] Government of India, Ministry of Power. "National Carbon Market: Draft Blueprint for Stakeholder Consultation".https://beeindia.gov.in/sites/default/files/publications/files/NCM%20Final.pdf

[33] Bianca Nogrady, "China Launches World's Largest Carbon Market: But Is It Ambitious Enough?," Nature, July 2021, https://doi.org/10.1038/d41586-021-01989-7.

3 | Challenges Faced by Carbon Markets

3.1 | Global Challenges: Article 6 and the Global Carbon Markets

3.1.1 Lack of Uniformity

The lack of harmonization and alignment between different markets is one of the predominant challenges confronting global carbon markets. As briefly evidenced in Chapter 2 and reflected by the International Carbon Action Partnership (ICAP)[34], the existing compliance schemes are generally independent, and a global trading market has not yet been established.[35] Given the different scopes and methodologies deployed in different markets, unifying these different schemes into a singular system is subject to distortions and inefficiencies that threaten to undermine its legitimacy in effecting real reductions in global emissions.

For example, as seen in Figure 3, countries and supranational organizations have different regulations around the integration of voluntary market credits within national compliance schemes. New Zealand allows emitters to integrate international carbon credits to meet their state-regulated obligations. The EU is phasing out the use of international credits generated under the CDM and JI mechanisms and promoting the use of domestic emission reduction projects and EU ETS allowances.[36] [37]

Article 6 of the Paris Agreement aims to address this challenge of uniformity by establishing a framework for voluntary cooperation amongst different government-regulated carbon markets and an international mechanism to facilitate greater oversight and harmonization. Article 6.2 enables countries to trade credits, or International Transferred Mitigation Outcomes (ITMOs) through multilateral or bilateral agreements to achieve their domestic Nationally Determined Contributions (NDCs). Countries such as Switzerland, Sweden, and Japan have already developed frameworks for purchasing this type of credit and counting it toward their NDCs.[38] Article 6.4 is expected to create a new global baseline-and-credit mechanism, similar to the CDM under the Kyoto Protocol, which can be traded between individuals, companies, or countries.[39]

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[34] International Carbon Action Partnership. "About Us," https://icapcarbonaction.com/en/about-us.

[35] " Emissions Trading Worldwide:International Carbon Action Partnership (ICAP) Status Report 2017," 2017.https://icapcarbonaction.com/system/files/document/icap_status_report_2017_web.pdf

[36] International Carbon Action Partnership "Use of International Credits," Climate Action, n.d., https://climate.ec.europa.eu/eu-action/eu-emissions-trading-system-eu-ets/use-international-credits_en.

[37] International Carbon Action Partnership. EU Emissions Trading System (EU ETS). https://icapcarbonaction.com/system/files/ets_pdfs/icap-etsmap-factsheet-43.pdf

[38] Lambert Schneider and Stephanie La Hoz Theuer, "Environmental Integrity of International Carbon Market Mechanisms under the Paris Agreement," Climate Policy 19, no. 3 (September 21, 2018): 386–400, https://doi.org/10.1080/14693062.2018.1521332.

[39] "Understanding Carbon Markets," CEEW, August 4, 2023, https://www.ceew.in/publications/indian-carbon-credit-markets-prospects-and-stakeholder-perspectives.

However, as evidenced by the failure to arrive at a consensus and make progress on carbon markets at COP27 and COP 28, the implementation of Article 6 continues to be a contentious issue.[40] A primary challenge in this regard is defining and accounting for emissions reductions. Different compliance markets hold different methodologies and rules for calculating emissions reductions. As a result, the reductions within one market that are properly accredited and recognized in another can be challenging.

3.1.2 Environmental Integrity Issues

Double counting: While Article 6 aims to ensure alignment between markets, there is a persisting risk that emissions reductions are double counted. Although Article 6.2 requires Parties[41] to robustly account for transferred ITMOs to ensure that reductions are not counted twice, the purchase of 'voluntary' credits by private corporations is not required to be accounted for through the Article 6 system.[42] This loophole enables private, unregulated schemes to allow double counting.

Additionality: Assuring additionality is a further challenge facing Article 6. The principle of additionality renders that the emissions reductions achieved through carbon markets should be additional to 'business-as-usual'. In other words, the credits should not have been generated from projects that would have otherwise occurred in the absence of the market.[43] This principle is vital for ensuring that carbon markets are resulting in actual emissions reductions. The determination of 'additionality' has been subjective and complex, with different markets having disparate assessments.

As it currently stands, under Article 6 countries will be able to continue using approximately 300 million CERs towards their NDCs until 2030 at a minimum.[44] However, CDM projects and the quality of 'legacy' CER credits have long been under scrutiny by academics and experts.

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[40] WRI India. "Deconstructing COP27 for India," December 2022. https://wri-india.org/blog/deconstructing-cop27-india

[41] Charles E. Di Leva and Scott Vaughan, "The Paris Agreement's New Article 6 Rules," International Institute for Sustainable Development, n.d., https://www.iisd.org/articles/paris-agreement-article-6-rules.

[42] Jonathan Crook, "COP27 FAQ: Article 6 of the Paris Agreement Explained," Carbon Market Watch, July 31, 2023, https://carbonmarketwatch.org/2022/11/02/cop27-faq-article-6-of-the-paris-agreement-explained/.

[43] Carbon Market Watch. "The Clean Development Mechanism: Local Impacts of a Global System," October 2018. https://carbonmarketwatch.org/wp-content/uploads/2018/10/CMW-THE-CLEAN-DEVELOPMENT-MECHANISM-LOCAL-IMPACTS-OF-A-GLOBAL-SYSTEM-FINAL-SPREAD-WEB.pdf

[44] Jonathan Crook, "COP27 FAQ: Article 6 of the Paris Agreement Explained," Carbon Market Watch, July 31, 2023, https://carbonmarketwatch.org/2022/11/02/cop27-faq-article-6-of-the-paris-agreement-explained/.

The University College London's Mark Maslin has noted that the market 'contains hundreds of millions of tons of poor-quality credits,'[45] with Trove Research's CEO Guy Turner stating that 60% of current credits on the market originate from projects with 'questionable additionality claims.'[46]

Indeed, a study published by the European Commission in 2016 found that 85% of CDM projects – accounting for 73% of the potential CER supply between 2013-2020 – hold a low likelihood of additionality.[47] It is estimated that the use of low-quality CDM credits within the EU ETS has resulted in an increase of emissions by 650 million tonnes of CO_2.

Accountability: Conversations to build consensus on the key operational elements of Article 6 were carried out but the finer details are still being ironed out. The need for transparency checks and balances and oversight mechanisms in place for national reporting requirements was emphasized. Accountability is critical to enhance public confidence in market-based approaches and the integrity of the reductions claimed.[48]

Grievance Redressal: Numerous case studies have evidenced the negative environmental and social impacts of CDM projects on local people and communities in the absence of grievance and safeguarding channels in the CDM.[49]

3.1.3 The Challenge of Political Will and Commitment

Given the complexity of carbon market systems and structures, there is a necessity for stringent oversight and robust governance structures. However, there remains a lack of clarity on how Article 6 will be structured and managed to ensure effective and fair governance and oversight. As outlined in 3.1.2, a lack of accountability and transparency threatens to undermine the credibility of the market and the achievement of climate goals.

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[45] "Is the 'Legacy' Carbon Credit Market a Climate Plus or Just Hype?," Yale E360, March, 2021., https://e360.yale.edu/features/is-the-legacy-carbon-credit-market-a-climate-plus-or-just-hype.

[46] "Is the 'Legacy' Carbon Credit Market a Climate Plus or Just Hype?," Yale E360, March 2021., https://e360.yale.edu/features/is-the-legacy-carbon-credit-market-a-climate-plus-or-just-hype.

[47] Europe Environment Agency. " EEA Report:Trends and projections in the EU ETS in 2016," 2016. https://www.eea.europa.eu/publications/trends-and-projections-EU-ETS-2016/file

[48] COP28 Diary (December 9): Baku to Host COP29; Africa Wants Robust GGA," n.d., https://www.downtoearth.org.in/news/climate-change/cop28-diary-december-9-baku-to-host-cop29-africa-wants-robust-gga-93292.

[49] Carbon Market Watch. "The Clean Development Mechanism: Local Impacts of a Global System," October 2018.https://carbonmarketwatch.org/wp-content/uploads/2018/10/CMW-THE-CLEAN-DEVELOPMENT-MECHANISM-LOCAL-IMPACTS-OF-A-GLOBAL-SYSTEM-FINAL-SPREAD-WEB.pdf

Carbon markets necessitate support and buy-in from relevant stakeholders and governments to be successful, leaving systems susceptible to being undermined by a lack of commitment or political opposition. In this regard, political will and commitment remain a core challenge, particularly in the current geopolitical scenario.

Thus, carbon markets face multiple significant challenges on the global front as discussed above. To address these concerns, significant collaboration and effort is required by governments, stakeholders, and the international community. While overcoming these obstacles would enable carbon markets to be a powerful mechanism in the fight against climate change and accelerate the transition to a more sustainable future, individual countries, markets, and regions face their own unique challenges that must also be addressed for their successful integration within a global schema.

3.2 | Challenges for Developing Markets

3.2.1 Supply Side: Lack of Infrastructure and Limited Institutional Capacity

One of the primary challenges which developing markets face in the context of carbon markets is the lack of infrastructure to support the implementation and operationalization of domestic carbon markets. Factors such as inadequate technical expertise, weak regulatory systems, limited financial resources, and foreign investment frequently present barriers to building both institutional and physical frameworks within these markets. Resultantly, necessary capacities such as collecting reliable emissions data, implementing regulatory frameworks for domestic trading, and developing the market infrastructure to enable the buying and selling of carbon credits remain underdeveloped. Primary research also confirmed that the required technology or the capabilities to be able to measure any kind of carbon units credibly do not exist yet.

Another critical barrier facing the growth of carbon markets within developing markets is that of limited institutional capacity, which can hinder the ability of regulatory bodies and government agencies to effectively administer and regulate domestic markets. Additional factors such as a lack of or weak technical expertise, inadequate enforcement mechanisms, and regulatory bodies undermine the confidence of investors thereby impeding market development.

However, developing markets continue to make progress at combating such challenges through initiatives and programs aimed at building the necessary infrastructure for carbon markets. An example is the World Bank's Partnership for Market Readiness (PMR) which provides financial and technical assistance to countries to pilot markets that can be integrated into international carbon markets.[50] For example, in early 2023, Vietnam decreed guidelines for the full-fledged establishment of carbon markets and carbon trading floor by 2028 after partaking in PMR from 2015-2020 and establishing a National Steering Committee in 2021.

[50] State and Trends of Carbon Pricing 2023, World Bank eBooks, 2023, https://doi.org/10.1596/39796

3.2.2 Demand Side: Price Volatility and Market Uncertainty

As is the case with any other financial market, carbon markets are prone to uncertainty and volatility, which can make them less attractive to investors. This is particularly true for developing markets in which compliance carbon markets remain relatively new and untested. The resulting lack of confidence in novel carbon markets can thereby exacerbate the existing challenges posed by both volatility and uncertainty.

Carbon prices can be unpredictable and fluctuate depending on a wide array of factors such as alterations of regulatory frameworks, changes in investor sentiment, and geopolitical developments. This type of volatility can make it difficult for governments and/or companies to invest in and plan carbon reduction projects, particularly if uncertainty about investment returns pervades. For example, in Indonesia, price volatility has been a significant challenge for the development of its carbon market.[51]

As discussed in Chapter 2, developing markets account for the majority of carbon credits entering the voluntary market. However, uncertainty around policy components of carbon markets has been partially responsible for the slower growth of the VCM and threatens the demand side of the market.

For one, there is still a long journey toward reaching a consensus on carbon credit quality and the integrity of demand. Governance bodies such as the Voluntary Carbon Markets Integrity Initiative (VCMI) and Integrity Council for Voluntary Carbon Market (ICVCM) are expected to put forth their long-awaited guidelines to ensure greater accountability on the supply and demand sides of the VCM. It is being debated whether the proposals threaten to stifle the market through their stringency or whether they are not strict enough for real change.

Another concern amongst buyers is that of shifting domestic policy frameworks. For instance, countries like Indonesia have announced plans to restrict the sale and export of credits to international markets.[52] COP27 saw increased clarity on national stances towards carbon trading under Article 6; however further negotiations continue post COP28. Particularly, with the commencement of CBAM in October 2023, developing markets have expressed concern that it could lead to potential "carbon clubs" where countries with harmonized climate action and policies may be favoured. Less developed and developing nations who are unable to meet its stringent requirements are threatened to be marginalised from global trade.[53] For example, Mozambique's GDP is predicted to drop by 1.5% only due to additional tariffs on aluminium exports.[54]

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[51] "Challenges and Opportunities for Carbon Trading in Indonesia," Challenges and Opportunities for Carbon Trading in Indonesia, n.d., https://www.icdx.co.id/news-detail/press-release/challenges-and-opportunities-for-carbon-trading-in-indonesia

[52] "Voluntary Carbon Markets in 2023: A Bumpy Road Behind, Crossroads Ahead," Bain, February 13, 2023, https://www.bain.com/insights/voluntary-carbon-markets-in-2023-a-bumpy-road-behind-crossroads-ahead/

[53] S&P Global. "EU Carbon Border Adjustment Mechanism to Raise $80B per Year by 2040," n.d. https://www.spglobal.com/esg/insights/featured/special-editorial/eu-carbon-border-adjustment-mechanism-to-raise-80b-per-year-by-2040

[54] "What You Should Know about Carbon-Reduction Incentive CBAM," World Economic Forum, December 20, 2022, https://www.weforum.org/agenda/2022/12/cbam-the-new-eu-decarbonization-incentive-and-what-you-need-to-know/

Finally, there continues to be uncertainty surrounding the eligibility of carbon credits because of public scrutiny surrounding greenwashing and lack of transparency. Given their primary role as suppliers within the existing carbon market landscape, developing markets are set to experience the brunt of credit ineligibility. Primary research findings confirm that creation of policy interventions and financial sector regulations is necessary to create solid demand for the credits generated for the VCM. In addition, given that strong demand for carbon credits is for the compliance market, there should be sufficient clarity and mechanisms for both the compliance and voluntary markets to co-exist and contribute to the achievement of NDCs.

As discussed, developing markets face significant challenges on both the synergistically acting supply and demand sides of the carbon market. The lack of infrastructure regulatory systems, and financial resources, hinders the development of vital capacities for carbon credits trading. In the context of ongoing uncertainty surrounding global challenges and national developments, developing markets may lose out on the vital foreign investment necessary to build their domestic infrastructure and institutional capacities. The subsequent chapter provides an in-depth study of India's carbon market landscape, providing an assessment of its domestic challenges and the impact of global market and policy developments.

4 | Impact of Global and Other Market Developments on India

Carbon emissions act as a global externality, emissions everywhere affect everyone, and owing to the large volume of trade across the world, carbon pricing mechanisms should be designed with international considerations. Eventually, several measures have been adopted such as the UN Framework Convention on Climate Change (UNFCCC) in 1992, the Kyoto Protocol in 1997, and the Paris Agreement in 2015 to mitigate carbon emissions. The historic Paris Agreement of 2015 aims to tackle climate change and reduce its negative impacts limiting global greenhouse gas emissions. India is among the 193 parties who signed the agreement and have submitted its Nationally Determined Contribution (NDC) commitments[55] comprising 8 goals with threefold quantitative targets. Updating its previously mentioned goals in August 2022[56] India now aims to reduce the emissions intensity of GDP by 45% by 2030 and achieve a 50% cumulative electric power installed capacity from non-fossil fuel-based energy resources. It also intends to create an additional carbon sink of 2.5 to 3 billion tonnes of CO_2 equivalent by 2050 through additional forest cover.

As per the International Energy Agency (IEA)[57] India's GDP has increased sixfold between 1990 and 2019 whereas final consumption of energy has only increased two and a half times which indicates a rapid improvement in energy intensity. According to India's second Biennial Update Report[58], 12% improvement in India's energy efficiency is attributed to the fact that GDP growth is faster than energy growth. However, a recent report by the Economic and Social Commission for Asia and the Pacific warns that as a part of developing Asia, India is at risk of incurring losses from climate change - as high as 35% of its gross domestic product by 2100.[59] The question that lies ahead is what strategy India should adopt to meet its targets.

4.1 | Indian Carbon Market Landscape

4.1.1 Perform, Achieve, and Trade (PAT) Scheme

Aimed at energy efficiency and cost-effectiveness, PAT introduced in 2008 under the National Mission for Enhanced Energy Efficiency (NMEEE) is a regulatory instrument to reduce Specific Energy Consumption (SEC) in 13 energy-intensive sectors as per the latest additions[60], with an associated market-based mechanism by creating certificates for excess energy saving which can be traded subsequently.

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[55] Press Information Bureau, October 2, 2015. Government of India.

[56] "India's Updated First Nationally Determined Contribution Under Paris Agreement (2021-2030)." United Nations Framework Convention on Climate Change, August 2022.

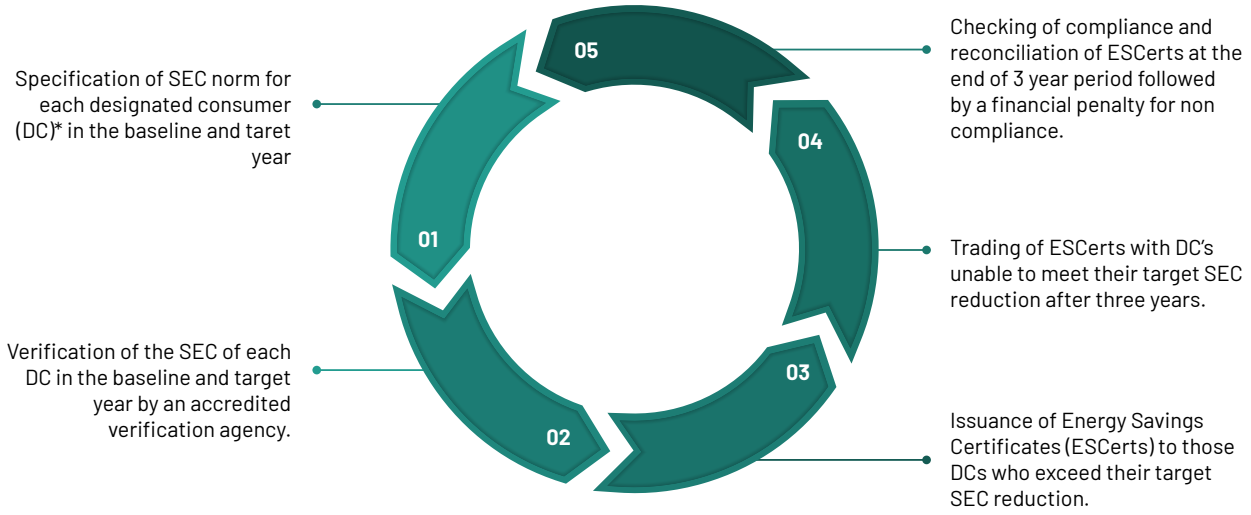
[57] Rep. India Energy Outlook 2021. World Energy Outlook Special Report, International Energy Agency., February 2021

[58] Ministry of Environment, Forest and Climate Change. "Second Biennial Update Report to the United Nations Framework Convention on Climate Change." United Nations Framework Convention on Climate Change, December 2018.(8)

[59] ET Bureau. "India May Lose 35% of GDP to Climate Change by 2100, Warns Unescap Report." The Economic Times, October 6, 2023.

[60] "Perform, Achieve and Trade (PAT)." BUREAU OF ENERGY EFFICIENCY, Government of India, Ministry of Power. Accessed September 25, 2023

Figure 5: Process of a PAT cycle



Source: Picturised by the author with information sourced from the Bureau of Energy Efficiency (BEE).

The PAT scheme is being implemented on a rolling cycle basis since its third cycle where new Designated Consumers (DCs)[61]/sectors are notified every year.[62] The first PAT cycle began in 2012 and till now has launched seven cycles out of which the first three cycles have been completed and the rest are under scrutiny. As reported Cycle - I covering 8 sectors resulted in energy savings of 8.67 Million Tonnes of Oil Equivalent (MTOE) which translates into avoiding about 31 million tonnes of CO_2 emissions. PAT Cycle - II covering 11 sectors resulted in energy savings to the extent of 14.08 MTOE i.e., 68 million tonnes of CO_2 emissions. From PAT Cycle - III covering 6 sectors, energy savings of 1.59 MTOE equivalent to a reduction of 5.59 million tonnes of CO_2 emissions have been realized. The Bureau of Energy Efficiency reported that after PAT Cycle - I, 110 DCs were entitled to purchase around 14.25 lakh ESCerts to meet their shortfall out of which 12.98 lakh EScerts were traded resulting in a business of about INR 100 crores.[63]

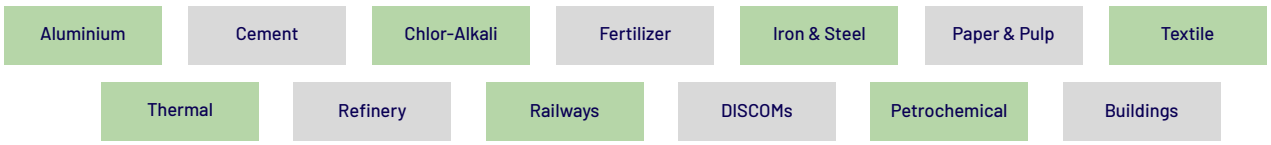
[61] Designated Consumers (DCs) are specific high energy intensive industries within certain key areas who are required to appoint an energy manager, file energy consumption returns every year and conduct mandatory energy audits regularly.

[62] "Perform, Achieve and Trade (PAT)." BUREAU OF ENERGY EFFICIENCY, Government of India, Ministry of Power. Accessed September 25, 2023.

[63] "Perform, Achieve and Trade (PAT)." BUREAU OF ENERGY EFFICIENCY, Government of India, Ministry of Power. Accessed September 25, 2023.

Some success stories from the PAT scheme emerge as the Indian Paper Manufacturers Association (IPMA) said in a statement that the paper industry has reduced its specific energy consumption by 20% in the last five years and it is expected that more than 100 paper mills will be added under the PAT scheme in the next one year[64]. The 52 DCs of Andhra Pradesh have so far saved 1.16 million tonnes of oil equivalent energy under the PAT scheme and the state has identified 130 more industrial units from cement, thermal power plants, textiles sectors and 98 units from pharma, automobile, ceramics, food and fisheries sectors which have potential to brought under PAT scheme.[65] The savings from the energy sector have reportedly exceeded 30% of their target in the first cycle at 8.67 million tonnes of oil equivalent, saving almost 1.25% of the primary energy consumption.[66] However, despite such accomplishments, the scheme still faces a lot of challenges.

Figure 6: Sectors covered under the PAT scheme



4.1.2 Domestic Challenges of the PAT Scheme

Limited participation: From the 110 DCs in the first PAT cycle who couldn't meet their targets, 96 bought the ESCerts creating a surplus in the market; a trend which is expected to keep up in subsequent cycles resulting in unstable ESCert prices. Thus, what appears to be a dependable plan in meeting the targets of the country is rather challenged with certain inefficiencies. The BEE in their report[67] listed out major barriers in the trading process starting with the participation limited to only designated consumers who buy ESCerts on obligation or an expected shortfall in the immediate next cycle. Another challenge in the PAT cycle is the limited time frame provided for trading such as 4 months for cycle - I which results in limited traded volume.

Incompatible standards: More and more corporates and businesses are pledging to reduce carbon emissions or go carbon neutral, such as Reliance Industries' announcement of being Net Carbon Zero by 2035 and India's largest software service exporter, Tata Consultancy Services committing to reduce greenhouse gas emissions by 2025.[68]

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[64] Press Trust of India. "More than 100 Paper Mills Likely to Come under PAT Scheme: IPMA Official." Business Standard. September 13, 2023.

[65] "52 Industries in Andhra Pradesh Get 6 Lakh Energy Saving Certificates." The Times of India. February 6, 2023.

[66] "Energy Savings Exceed 30% of Target under PAT Scheme: Power Minister." Zee Business, September 24, 2018.

[67] BUREAU OF ENERGY EFFICIENCY (BEE), National Carbon Market: Draft Blueprint for Stakeholder Consultation, Ministry of Power.

[68] "Major Indian Companies Committed to Going Carbon-Free." CNBCTV18, December 14, 2021.

However, the ESCerts in PAT are not denominated in terms of greenhouse gas (GHG) emissions but rather in energy efficiency (EE) terms which reduces their universal tradability. Not just in terms of trading, but also in terms of international standards of issuance and verification, the PAT scheme follows its own unique terms which pose a compatibility problem with international bodies like VERRA and Gold Standard.[69]

Lack of clear targets: Several critical analyses of the scheme have brought out the reasons why PAT cannot provide a one-stop solution to India's energy efficiency needs in international markets next to the European Union's EU ETS, China's national ETS or Korea's K-ETS. A report published in 2021 by the Centre for Science and Environment (CSE)[70] highlights the leniency in targets set for thermal power plants and yet further underperformance in meeting with these. It mentions that thermal power plants were given 3.07% and 2.6% energy reduction targets against their energy consumption in cycles I and II. Analysis of the Asian Development Bank (ADB) reports that the scheme is designed in a dynamic manner to tap into the energy efficiency potential of industrial units and introduces the trading mechanism in the country but possesses inherent challenges. A lack of clarity at the policy level could hinder future investments as it has been argued that the targets are set at an insufficiently stringent level for a lot of sectors, and hence could be easily achievable.[71]

Inefficient markets: Further evidence of inefficiency lies in the fact that only 40% of required ESCerts were purchased from Cycle II by its initial deadline of 27 June 2023 and 44% by the second deadline of 1 August 2023. This was further extended to 26 September 2023, thus delaying the financial penalties. These extensions occur on top of the already initial delay of issuing certificates by 20 months. Also, this trade is being done at the floor price set by the ministry showing lack of the market price discovery mechanism[72]. Thus, the extent of delay for the following five cycles which is also partly attributed to data submission by the DCs, is only far imaginable.

4.2 | Carbon Border Adjustment Mechanism (CBAM)

4.2.1 Overview of CBAM

After much contemplation, the proposal for the transitional implementation of a Carbon Border Adjustment Mechanism (CBAM) under the European Union's (EU) "Fit for 55" policy came into effect on the first of October 2023 with its taxation phase starting from January 2026.

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[69] BUREAU OF ENERGY EFFICIENCY (BEE), National Carbon Market: Draft Blueprint for Stakeholder Consultation

[70] Rep. Perform, Achieve and Trade (PAT) Scheme of Thermal Power Plants A Critical Analysis, Centre for Science and Environment, 2021.

[71] Sarangi, Gopal Krishna, and Farhad Taghizadeh Hesary. Working paper. Unleashing Market-Based Approaches to Drive Energy Efficiency Interventions in India: An Analysis of the Perform, Achieve, Trade (PAT) Scheme, August 2022.

[72] Chunekar, Aditya, and Apoorva Apte. "Not a PAT on the Back, Yet." Prayas Energy Group, 25 May, 2023.

In the wake of international efforts to mitigate climate change, the EU has been raising its climate consciousness ambitiously but believes that trading with other countries with less stringent carbon measures can undermine its efforts and progress. Hence, CBAM has been introduced to prevent carbon leakage[73] which occurs when industries transfer polluting production to other countries with less stringent climate policies or when EU products are replaced by more carbon intensive imports, excluding countries belonging to the European Economic Area (EEA) and Switzerland[74]. This implementation begins with a range of six most carbon intensive sectors namely cement, iron & steel, aluminium, fertiliser, hydrogen and electricity with further expansion of up to 56 items by 2026. Once the operations are fully functional, EU importers will have to buy CBAM certificates at a price established by weekly average auction of EU ETS allowances. Each year by 31 May, the importers must specify the quantity of imports and embedded emissions in those products thereby forfeiting certificates of equal amounts after verified deductions pertaining to an already paid carbon price at the time of production are done[75].

CBAM has been designed in a way so as to complement, interact with and improve EU's flagship ETS program to combat climate change. Though the CBAM certificates mirror ETS prices, CBAM will step up in this context by gradually phasing out the free allowances provided by the ETS to the CBAM-covered sectors from 2026 onwards.[26] The current phase can be viewed as a trial of the overall functioning of the planned system to therefore make decisions about including new products and indirect emissions in the form of their subsets as well as it gives enough time to understand the financial implications of the policy. During the transitional phase which ends on 31 December 2025, at the end of each quarter importers will have to report the total quantity of goods imported, total emissions embedded in their goods, total indirect emissions, and the carbon price, if any, due in the country of origin taking into account any rebate or compensation[77], as per the following set standards.

[73] European Commission, Taxation Customs, Carbon Border Adjustment Mechanism, 10 May 2023.

[74] Certain third countries who participate in the ETS or have an emission trading system linked to the European Union are excluded.

[75] European Commission, Taxation Customs, Carbon Border Adjustment Mechanism, 10 May 2023.

[76] "Questions and Answers: Carbon Border Adjustment Mechanism (CBAM)." European Commission, 14 July, 2023.

[77] "Questions and Answers: Carbon Border Adjustment Mechanism (CBAM)." European Commission, 14 July, 2023.

Table 1: Reporting standards under CBAM

Issue	CBAM goods					
	Cement	**Fertilisers**	**Iron/Steel**	**Aluminium**	**Hydrogen**	**Electricity**
Reporting metrics	(per) Tonne of good					(per) MWh
Greenhouse gases covered	Only CO_2	CO_2 (plus nitrous oxide for some fertiliser goods)	Only CO_2	CO_2 (plus perfluorocarbons (PFCs) for some aluminium goods)	Only CO_2	Only CO_2
Emission coverage during transitional period	Direct and indirect					Only direct
Emission coverage during definitive period	Direct and indirect		Only direct, subject to review			Only direct
Determination of direct embedded emissions	Based on actual emissions, unless they cannot be adequately determined					Based on default values, unless several cumulativee conditions are met
Determination of indirect embedded emissions	Based on default values, unless conditions are met (i.e. direct technical connection or power purchase agreement)					Not applicable

Source: "Questions and Answers: Carbon Border Adjustment Mechanism (CBAM)." European Commission.

4.2.2 Impact of CBAM on Global Trade including India

For as long as there has been discussion about CBAM, there has been contention that it is not compatible with the World Trade Organisation (WTO) rules. Though the EU asserts that CBAM has been carefully designed to keep the same carbon price on imported and domestic products ensuring WTO compatibility, there still lies a lot of disputes around the viability of the same on many levels. India and the EU have been significant trade partners with India exporting around 26% of its CBAM products to the EU when compared to the world[78]. India happens to be one of the top five importers of iron and steel for the EU reporting around US $5.51 billion worth of imports for the year 2022.[79] Some trading partners of the EU have flagged concerns regarding the policy acting as a trade barrier.

[78] Author's calculations. Data sourced from www.trademap.org

[79] Author's calculations. Data sourced from www.trademap.org

Back in 2021, the BASIC block i.e., Brazil, South Africa, India, and China issued a joint statement[80] calling CBAM discriminatory as such a border tax will ramp up prices of their goods in Europe and reduce demand. They added that it contradicts the UN's principle of Common but Differentiated Responsibilities and Respective Capabilities (CBDR-RC) which necessitates that richer countries have a responsibility of providing financial and technological assistance to developing and vulnerable countries, to fight climate change[81].

Within the first week of its implementation, CBAM received pushback not only from other countries but from its own members over concerns related to the treatment of Micro, Small, and Medium Enterprises (MSMEs) in Germany and Poland's intense coal dependency[82]. Both concerns stand true in the case of India as well, as the country has appealed for special treatment for MSME producers and has been analyzing alternatives to its coal-dependent power generation. However, with a growing number of economies such as the US and Japan showing interest in formulating policies like that of the EU, India needs to develop long-term domestic and international strategies to remain relevant and competitive in the world trade scenario. India now seems to be mulling over the creation of its carbon credit trading scheme to challenge taxes levied by the EU and collect proceeds itself to fund the country's climate targets.

4.3 | India Carbon Credit Trading Scheme 2023

Though appearing successful initially, schemes like PAT and Renewable Energy Certificates (REC) could not establish an internationally compatible trading system in India. In lieu of this, the Indian government announced on 28 June 2023 the formation of the Carbon Credit Trading Scheme (CCTS) 2023[83] clearly defining "carbon credit" as a value assigned to a reduction removal, or avoidance of greenhouse gas emissions achieved and is equal to one ton of carbon dioxide equivalent (tCO2e). The governance of this market and direct oversight of its functioning shall vest in the National Steering Committee for Indian Carbon Market to be constituted by the central government, the Bureau of Energy Efficiency shall be its administrator, the Grid Controller of India Limited its registry and the Central Electricity Regulatory Commission shall act as a regulator for the trading activities under the Indian Carbon Market.[84]

[80] "Emerging Economies Share 'grave concern' over EU Plans for a Carbon Border Tax." Climate Home News, April 9, 2021.

[81] "Article 3 (2)." United Nations Framework Convention on Climate Change, 1992.

[82] Mishra, Ravi Dutta. "Why the EU's Carbon Tax Is Facing Pushback." Mint, October 2, 2023.

[83] Part II-Section 3-Sub-section (ii) The Gazette of India No. 2702, 28 June, 2023.

[84] Part II-Section 3-Sub-section (ii) The Gazette of India No. 2702, 28 June, 2023.

The nitty gritties of an Indian Carbon Market are yet to be decided upon but it is highly probable to build on the existing PAT scheme by overcoming its challenges. As mentioned earlier, the major issue with ESCerts issued under PAT was their fungibility and tradability internationally but issuing certificates in GHG emissions under the new scheme could pave the way for India. Concurrently, there is a possibility of development of a voluntary mechanism in India which aims to provide incentives to climate actors to adopt low-cost options by attracting technology and finance towards sustainable projects generating carbon credits to encourage GHG reduction from the non-obligated sectors.[85] In December 2023, the ministry added a clause to the CCTS stating that non-obligated entities can register their projects for accounting greenhouse gases emission reduction or removal or avoidance for issuance of certificates.[86] Developing a foolproof carbon credit trading system for India amidst growing global developments and policies can be a daunting task and all eyes will now be on how the authorities pan it out.

[85] "Ministry of Power & Ministry of Environment, Forests & Climate Change to Develop Carbon Credit Trading Scheme for Decarbonisation." Press Information Bureau, May 11, 2023. Ministry of Power.

[86] Part II-Section 3-Sub-section (ii) The Gazette of India No. 5140, 19 December, 2023.

5 | Key Policy Development and Sectors

India has the potential to reconfigure its economy, prioritizing growth in advanced industrial sectors. This can be achieved by tapping into the expanding global clean energy export markets, which are projected to experience substantial growth as global energy demand escalates in the coming years. Concerted and climate-aligned efforts across multiple sectors is also necessary for India to achieve its climate goals. If policies are enacted to create the right demand signals within this decade, India can add low-carbon capacity in these sectors in the two decades thereafter. For example, in the steel sector, early imposition of a carbon price could lead to 200 Mt of steel capacity being built using low-carbon hydrogen instead of coal by 2050.[87]

This section shall delve into key policy developments and challenges facing the key sectors of Energy, Mobility and Agriculture.

5.1 | Policy developments

India faces the challenging task of finding a delicate balance between the imperative for sustained economic development, which naturally leads to increased energy demand, and the necessity to invest in and transition toward emerging low-emission technologies. As per India's NDC target and to facilitate the attainment of these targets, it was essential for India to explore the development of a domestic carbon market. This endeavour was undertaken by the Bureau of Energy Efficiency, and they developed a comprehensive strategy designed to provide the necessary support mechanisms for emerging mitigation opportunities while concurrently generating the momentum required to stimulate demand.

The establishment of a carbon market will contribute to the harmonization of various climate change mitigation policies. The World Bank's Partnership for Market Readiness (PMR) is a program for countries ready to design and implement a carbon pricing instrument, and this provides a platform to pilot. Developing readiness components that support the implementation of carbon pricing instruments for GHG mitigation and piloting carbon pricing instruments come together in the PMR's Country Work, which is embodied in the Market Readiness Proposal (MRP) for which the PMR provides grant financing. The World Bank under the PMR program (PMR) has also allocated grants for India. This funding is aimed at preparing and piloting the utilization of carbon pricing instruments to effectively reduce greenhouse gas (GHG) emissions. Other supporting policies enacted in the early 2010s have led to a surge in renewable energy capacity in India, and these policies will continue to enable even greater capacity expansion in the future.

[87] Rajat Gupta et al., "Decarbonising India: Charting a Pathway for Sustainable Growth," McKinsey & Company, October 27, 2022, https://www.mckinsey.com/capabilities/sustainability/our-insights/decarbonising-india-charting-a-pathway-for-sustainable-growth.

The cost of renewable energy and electrical vehicles (EVs) is declining, and some policies are starting to be put into place (e.g., Faster Adoption and Manufacturing of "Hybrid &" Electric Vehicles in India "FAME" for EVs, Production Linked Incentive Programs to Increase Manufacturing for Advanced Chemistry Cells for Energy Storage, Manufacturing Incentive Programs for Solar Panels). However, additional actions that can be scaled up significantly are required. For instance, the addition of renewable energy capacity needs to increase from 10 GW to 40–50 GW annually, a carbon price needs to be implemented to make green steel competitive, battery costs need to decrease by 80% by 2050, hydrogen costs need to decrease by 2/3 by 2035, a nationwide rollout of charging infrastructure needs to take place, farmers have to adopt new practices for rice cultivation, and targets for circularity have to be met and higher targets have to be set.

5.2 | Key carbon market sectors

Businesses can trade the offset credit points generated with other companies looking to reduce their carbon footprint. There are no geographical boundaries with whom companies can exchange or sell carbon credits, as climate change is a global concern. The carbon credit market provides a powerful tool in combating climate change, inspiring global commitment to environmental preservation.

To further understand the need of carbon markets in India, this report focuses on 3 key pillars i.e., **Energy, Mobility and Agriculture.**

5.2.1 Energy

In the context of India's energy sector, it is noteworthy that roughly 40% of the nation's greenhouse gas emissions stem from this sector, with coal playing a predominant role in the total fossil carbon dioxide emissions.

As a cornerstone priority for India's energy landscape, decarbonizing the sector necessitates the adoption of a multifaceted approach. This approach encompasses the substitution of fossil fuels with renewable alternatives, the enhancement of efficiency in legacy infrastructure to curtail fossil CO2 emissions, and the implementation of carbon sequestration techniques to address fugitive carbon emissions.

On the contrary India's favourable environment for renewable energy projects and policies like feed-in tariffs and renewable purchase obligations has fostered the growth of the carbon credit market. The country's implementation of the Carbon Credit Trading Scheme (CCTS) outlined by the Ministry of Power stands as a pivotal force shaping India's regulatory framework concerning carbon credits. Although to meet the sheer scale new policy interventions would be needed from time to time. Renewable energy does bring down carbon emissions however due to intermittency challenges, Round-The-Clock power through non-fossil fuel energy storage solutions such as Battery Storage and green hydrogen has become important to ensure grid stability and a full-fledged energy transition.

However, all these technologies are limited by the geographical location and their efficiencies. Countries in the tropics have an advantage in terms of high solar potential and onshore wind potential. They also have availability of labour that allows the development of energy projects at low capex. On the other hand, developed countries and the industries in the higher latitudes face challenges in sourcing renewable energy and are also under more stringent regulations to achieve carbon neutrality. A symbiotic relationship thus is natural, wherein the industries execute projects in the global south in exchange of carbon credits that may be traded in the voluntary carbon market. India's bilateral engagement with countries such as Japan, Singapore, and Korea can enable clean technologies of the companies in these countries and the local subsidies provided to them to find their way to India in carbon emission reduction projects. In exchange, the companies and the countries will be able to generate carbon certificates to trade and recover their investments and meet their net-zero commitments.

To cite some examples, Tata Power sold 87,351 Certified Emission Reductions (CERs) in FY 21, generating revenue of ₹1.44 crores.[88] Similarly, Adani Power's Mundra plant is the first coal-fired power project to receive carbon credits. Adani Power is expected to earn Rs 600 crore by trading these carbon credits during the first 10 years of its operations under the Clean Development Mechanism (CDM) of the United Nations Framework Convention on Climate Change (UNFCCC).[89]

5.2.2 Mobility

India's transportation sector ranks as the third-largest contributor to greenhouse gas (GHG) emissions, making up 14%[90] of the nation's energy-related CO2 emissions. These emissions have seen a dramatic increase, more than tripling since 1990, and are poised to surge even further given India's urban population is projected to double by 2050. The country's motor vehicle fleet is on an upward trajectory, with expectations that the number of vehicles on the road will nearly double, surpassing 200 million by 2030. As of the year 2020, the transportation sector's direct emissions, specifically those emitted directly from vehicles (excluding international aviation and international shipping), reached a total of 272 million tonnes of CO2 ($MtCO_2$)[91]. It is essential to highlight that within the transportation sector, the road segment, encompassing both passenger and freight transportation, exerts a dominant influence on emissions, constituting more than 92 percent of the overall emissions share.[92]

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[88] "Tata Power," n.d. https://www.tatapower.com/investor-relations/tata-power-2021/pdf/Manufactured%20Capital.

[89] Sakina Babwani, "Adani Power's Mundra Plant to Earn Rs 600 Crore in Carbon Credits," The Economic Times, September 10, 2012, https://economictimes.indiatimes.com/industry/energy/power/adani-powers-mundra-plant-to-earn-rs-600-crore-in-carbon-credits/articleshow/16334752.cms?from=mdr.

[90] Siddarth Sinha, "Decarbonising Transport: Redefining Mobility Policies in India", https://www.niti.gov.in/decarbonising-transport-redefining-mobility-policies-india#:~:text=The%20transport%20sector%20of%20India,are%20like%20to%20increase%20further.

[91] "India Transport Energy Outlook," CEEW, December 15, 2023, https://www.ceew.in/publications/india-transport-energy-use-carbon-emissions-and-decarbonisation#

[92] CEEW. "India Transport Energy Outlook," December 15, 2023. https://www.ceew.in/publications/india-transport-energy-use-carbon-emissions-and-decarbonisation.

Additionally, emissions originating from supply chains, categorised as Scope 3 emissions, constitute a substantial portion of total emissions in various sectors. Based on information gleaned from sustainability reports of specific companies and data from the CDP (formerly known as Carbon Disclosure Project), it is observed that within industries focused on business-to-consumer interactions, such as consumer staples and consumer discretionary categories, these emissions account for a significant portion, ranging from 93% to 99%. Among these supply-chain emissions, those linked to transportation present a noteworthy and widespread opportunity for tackling decarbonization.

Currently the carbon offsets in the transport sector are minimal. Most of the compliance and voluntary carbon offset pertains to low carbon energy projects. Although carbon offsets are not a new concept, businesses can enhance the effectiveness of their offset investments by aligning their offset portfolios strategically. This alignment should not only consider their ethical values but also reflect the actual climate impact they generate.

A prominent example is Tesla and how it has positioned itself as a leader in the electric vehicle market and the carbon credit market through its clean energy operations. It operates a solar panel installation business and sells energy storage systems, which generate carbon offset credits by reducing greenhouse gas emissions. These credits can be sold to other firms, such as automakers, that struggle to meet emissions standards set by regulatory bodies like the California Air Resources Board (CARB).[93]

Additionally, there are alternate methods such as a standardised book-and-claim framework[94]. This method represents a system that separates tangible green initiatives from virtual carbon credits. This system, made possible through digital tracking, operates on the principle that purchasers of green transportation services pay an additional fee (referred to as a green premium). In return, they receive credits that grant the owners of transportation assets the ability to assert lower Scope 1 emissions (direct emissions) or enable forwarders, shippers, and end consumers to declare reduced Scope 3 emissions (indirect emissions associated with the value chain) specifically related to the transportation of a particular shipment. Importantly, these credits must be supported by credible industry sources to ensure their validity and effectiveness.[95]

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[93] Jennifer L, "Tesla'S Record Carbon Credit Sales up 94% Year-Over-Year," Carbon Credits, October 19, 2023, https://carboncredits.com/teslas-record-carbon-credit-sales-up-94-year-over-year/#:~:text=Tesla%20has%20been%20earning%20revenues,that%20reduce%20planet%2Dwarming%20emissions.

[94] Ludwig Hausmann et al., "Driving Decarbonization: Accelerating Zero-emission Freight Transport," McKinsey & Company, July 28, 2022, https://www.mckinsey.com/industries/travel-logistics-and-infrastructure/our-insights/driving-decarbonization-accelerating-zero-emission-freight-transport.

[95] Ludwig Hausmann et al., "Driving Decarbonization: Accelerating Zero-emission Freight Transport," McKinsey & Company, July 28, 2022, https://www.mckinsey.com/industries/travel-logistics-and-infrastructure/our-insights/driving-decarbonization-accelerating-zero-emission-freight-transport.

5.2.3 Agriculture

Agriculture, which contributes to 18% of India's GDP and employs about 54% of its population, forms the bedrock of the Indian economy. However, it is a sector that is both extremely vulnerable to and one of the significant contributors of climate change. Nearly 50% of agricultural land is highly dependent on rainfall, which over the last two decades has become increasingly erratic. By the year 2100, major crops are expected to see their yield decrease by 10-20%. Annual emissions from agriculture come up to 400 million tCO2e, of which rice cultivation alone accounts for 17.5%. A green transition is not only important but necessary. More encouragingly, such a transition is possible. Various sustainable agriculture practices have been popular in India since the advent of farming. **A voluntary carbon market can be a stimulant to encourage farmers to adapt and sustain agricultural practices to effectively capture carbon.**

For instance, incentivisation of the restoration of soil organic carbon by providing a financial mechanism for farmers to adopt sustainable practices such as conservation tillage, agroforestry, cover cropping and nutrient management can be beneficial. Farmers can reap both direct and indirect benefits by participating in carbon markets through sequestering carbon in their lands.

The Ministry of Agriculture and Farmers Welfare conducted various studies on carbon projects covering agriculture land management, socio-agroforestry among other initiatives. One of the studies was done in the Beed district of Gujarat which is extremely drought prone and experiences long periods of drought nearly every decade. Deficient monsoon has exacerbated this problem and let it increase distress migration. These conditions have also reduced soil productivity and led to salt accumulation. The intervention was a suitable Verra-registered carbon project spread over a crediting period of over 15 to 20 years, which can help generate 675,280 Emission Reduction Certificates while also providing comprehensive watershed development and integrated carbon sequestration practices across the entire Beed region. While conducting this study it was learned that scale was important and for economic feasibility would only work on large land parcels of minimum 1000 hectares. Another project worth mentioning would be the ICAR research program on carbon farming which aims to train and develop a pool of talent suitable for the future. Another example is The National Innovations in Climate Resilient Agriculture Initiative (NICRA) has piloted carbon neutral village. Apart from these the Ministry upon recognising the need for an intervention for climate smart agriculture and as a push to the Carbon market in India have started developing a framework for voluntary carbon markets in Agriculture sector.

Strengthening Rural Livelihood Through Carbon Finance: Agroforestry Practices in Gorakhpur Forest Circle of Uttar Pradesh

The Afforestation, Reforestation and Revegetation (ARR) project is designed to include project activity such as tree plantations at multiple locations of Gorakhpur Forest Circle comprising Gorakhpur, Maharajganj, Deoria, and Kushinagar Forest Divisions in Uttar Pradesh, India. These forest divisions overlap with four administrative districts, i.e., Gorakhpur, Maharajganj, Deoria, and Kushinagar. The project has been designed with farmers practising agroforestry and tree planting on their private farmlands at multiple locations in Gorakhpur Forest Circle. The project has been developed at the Forest Circle level under the supervision of the Chief Conservator of Forests for simplified administration with the help of the State Forest Department.

The total estimated ERs for the crediting period of 30 years are 1,104,382 tCO2e and average annual ERs are 36,813 tCO2e. The value for the credits accrued is 603,224 VCUs.[96]

The Regeneration Meghalaya

Project is a grouped project under ARR category that can increase tree cover through planting a majority of indigenous trees that are suited to local conditions of the bioregion. The project is located in the Khasi, Ri Bhoi Jaintia and Garo Hills regions, in the Northeastern state of Meghalaya, India. This project will plant trees across up to 30,000 ha of land. The project aims to plant up to 40 - 64 million trees and plants and sequester up to 23 Million tonnes of CO2e in Meghalaya, aiming to reach a significant number of beneficiaries over a period of 35 years.[97]

How Apple reached carbon neutral for Apple Watch Ultra 2 paired with Alpine and Trail Loop and the role of carbon credits.

Apple has been at the forefront of sustainability and has been addressing its carbon emission by various methods such as transitioning to clean electricity for manufacturing, increasing non-air transportation among other avenues.

[96] Source: Verra Registry. VCS 4709

[97] Source : Verra Registry. VCS 4626

They have also deployed nature-based solutions, through programs like the Restore Fund, that result in high-quality carbon credits. These play an important role in addressing the climate crisis, as nature-based solutions contribute to the health of ecosystems and remove carbon from the atmosphere. Aligning with the scientific consensus that carbon credits should only be applied after aggressive efforts to reduce emissions and increase efficiency have been implemented.

Apple has partnered with the Applied Environmental Research Foundation (AERF) and the Conservation International to protect the mangrove ecosystem in the Raigad district of Maharashtra, India. The project is part of Apple's $200 million Restore Fund launched in 2021, which aims to support communities most affected by climate change. The project involves protecting 2,400 hectares of mangrove forests and restoring mangroves across a 50-hectare area where they have been lost. The grant also supports the purchase and distribution of portable bio-stoves that will help reduce indoor air pollution and improve the health of local communities.[98]

The carbon credit market presents a significant opportunity for Indian firms to generate additional revenue while contributing to the country's decarbonizing efforts. The popularity of the credits could be estimated by the fact that India alone has a market share of 17% globally with $35.94 million. Investing in achieving water neutrality, net zero waste, and building carbon reserves are equally essential avenues. Monetizing water credits, waste credits/EPR, along with carbon credits collectively becomes a powerful tool in combating climate change.

5.3 | Measures taken by key stakeholders

5.3.1 Corporate level actions

Despite the impact of climate change and potentially devastating consequences, the annual flows of climate finance investment in 2021 were a mere 20% or so of the estimated $4.3 trillion required by 2030[99]. The voluntary carbon market (VCM) is one of the few transition finance options for corporations that could accelerate action, scale up new technologies and connect private capital to high-potential projects in the limited time available.

[98] Apple, "Environment," Apple (India), n.d., https://www.apple.com/in/environment/.

[99] SAHAKYAN, Mr. Manuk , and Ms. Sophie EISENBERGER. "Background Information for the BUDG-CONT Joint Workshop on "The Role of the EU Budget in International Climate Finance." Policy Department for Budgetary Affairs. European Union: Policy Department for Budgetary Affairs, January 2023. https://www.europarl.europa.eu/cmsdata/263452/Briefing%20-%20Climate%20Finance.pdf.

The VCM market is expected to grow 15 times[100] to more than $50 billion by 2030[101], if companies begin investing more strategically today. A recent study by Ecosystem Marketplace indicates that to curb global temperature rise to no more than 1.5 degrees Celsius, the carbon offset market must expand by at least fifteen times its current size by 2030.[102]

At the corporate level, numerous voluntary actions are being taken to address climate change challenges. This section explores four key corporate-level actions: carbon measurement and reporting, adoption of low-carbon technologies and cleaner production processes, investment in low-carbon R&D, and the purchase of carbon credits to offset emissions.

I. Carbon Measurement and Reporting:

Corporate entities in India are increasingly recognizing the importance of measuring and reporting their carbon emissions. This practice not only enhances transparency but also helps in setting targets for emission reductions. Many companies in India have adopted international reporting standards like the Greenhouse Gas Protocol to measure and report their emissions accurately. Government regulations and market pressure have also played a role in driving this adoption.

Companies have started integrating carbon measurement into their sustainability reporting, which is crucial for demonstrating their commitment to sustainability and attracting socially responsible investors. For instance, companies like Tata Steel[103] and Mahindra & Mahindra[104] have established comprehensive carbon measurement and reporting systems, showcasing their leadership in this area.

[100] McKinsey & Company. "A Blueprint for Scaling Voluntary Carbon Markets to Meet the Climate Challenge." https://www.mckinsey.com/~/media/mckinsey/business%20functions/sustainability/our%20insights/a%20blueprint%20for%20scaling%20voluntary%20carbon%20markets%20to%20meet%20the%20climate%20challenge/a-blueprint-for-scaling-voluntary-carbon-markets-to-meet-the-climate-challenge.pdf

[101] Taskforce On Scaling Voluntary Carbon Markets, Final Report, January 2021, https://www.iif.com/Portals/1/Files/TSVCM_Report.pdf

[102] Ecosystem Marketplace. "Unpacking the New 'Blueprint' for Bigger (and Better?) Voluntary Carbon Markets - Ecosystem Marketplace," January 28, 2021. https://www.ecosystemmarketplace.com/articles/unpacking-the-voluntary-carbon-market-taskforce-blueprint/

[103] Tata Steel Annual Report 2022-2023," n.d. https://www.tatasteel.com/investors/integrated-report-2022-23/climate-change-report.html

[104] "MAHINDRA & MAHINDRA LTD- Sustainability Report 2021-22." India: MAHINDRA & MAHINDRA LTD, 2022. https://www.mahindra.com/sites/default/files/2023-01/Mahindra-Sustainability-Report-2021-22_0.pdf.

Tata Steel Carbon Measurement and Reporting

As a responsible corporation, Tata Steel has consistently prioritized environmental, social, and governance (ESG) factors in shaping its corporate strategy across all business activities. Recently, in the fiscal year 2022-23 have also committed to achieve net zero emissions across its global operations by 2045.

Tata Steel has been calculating and reporting emission intensity based on the guidelines provided by the World Steel Association (WSA). These were originally derived from the GHG Protocol methodology and are designed specifically for and have been widely adopted by the steel sector. The guidelines provide for site-wise emission reporting by steel companies based on common definitions and agreed boundaries. The data collection program enables individual steel plants to compare themselves against both average and best performance in the sector and identify the scope for improvement.

Tata Steel is ramping up its renewable energy capacity and procurement to substitute thermal power derived from fossil fuels. This move towards decarbonization has allowed the company to make savings in compliance expenses linked to emissions trading schemes, particularly in Europe. Furthermore, the adoption of a sustainable finance framework is expected to lead to cost reductions and improved access to financing for the company.

II. Adoption of Low-Carbon Technologies and Cleaner Production Processes:

The adoption of low-carbon technologies and cleaner production processes is another critical aspect of corporate-level actions in India. Many industries, such as automotive, energy, and manufacturing, are transitioning to cleaner and more energy-efficient technologies. One prominent example is the Indian IT sector, which has made significant strides in adopting green practices. Leading IT companies like Infosys[105] and Wipro[106] have invested in energy-efficient data centers, green buildings, and renewable energy sources to power their operations. These initiatives not only reduce emissions but also result in cost savings in the long run.

[105] Confederation of Indian Industry, Indian Green Building Council, Lawrence Berkeley National Laboratory, and Infosys. "INNOVATION IN ENERGY EFFICIENCY: INFOSYS-BANGALORE DATA CENTER," January 2021. https://igbc.in/assets/html_pdfs/Infosys%20case%20study%20092020_Final_CII-28Jan2021.pdf.

[106] Moneycontrol. "Wipro, Pure Storage Join Hands for Sustainable Data Centre Technology," July 24, 2023. https://www.moneycontrol.com/news/business/wipro-pure-storage-join-hands-for-sustainable-data-centre-technology-11018761.html.

An example in a hard-to-abate sector is Jindal Vijaynagar Steel, which has declared that by the next 10 years, it will be able to sell $225 million worth of saved carbon through the carbon credits generated by the carbon market mechanism. This is estimated to be made possible because - the steel plant uses the Corex furnace technology which prevents 15 million tonnes of carbon from being discharged into the atmosphere.[107]

III. Investment in Low-Carbon R&D:

To stay competitive and address climate challenges, Indian corporations are investing in low-carbon research and development (R&D). This includes developing innovative solutions for reducing emissions and improving energy efficiency. Public-private partnerships and government incentives have encouraged companies to invest in R&D in areas such as renewable energy, electric vehicles, and waste management.

Startups like ReNew Power are focusing on renewable energy solutions; it stands as among the most significant Independent Power Producers (IPPs) in India and worldwide within the renewable energy sector. Their extensive portfolio includes over 120 operational large-scale wind, solar, and hydro-energy projects spanning 9 states in India. Additionally, the company serves commercial and industrial clients throughout the country. These initiatives not only support India's transition to a low-carbon economy but also create new opportunities for sustainable economic growth.

The development of low carbon technologies in India such as Green Hydrogen and Carbon Capture Utilisation and Storage (CCUS) requires R&D for which think tanks such as NITI Aayog, and TERI have been investing and working aggressively to develop robust roadmaps and methodologies for the carbon market mechanism. Such technologies have huge potential to generate carbon credit in the long run, help in the sequestration of emissions, and also help in achieving the Net Zero goal. For example, the carbon credit benefit from green hydrogen is estimated to be USD 10-40/t CO_2. This is because- the substitution of conventional grey hydrogen production to green hydrogen may reduce approximately 10 kg CO_2/ kg H_2.[108]

IV. Purchase of Carbon Credits to Offset Emissions:

To offset their emissions and meet carbon neutrality targets, many companies are purchasing carbon credits from carbon offset projects. For example, Shell has invested in nature-based solutions to reduce GHG emissions and generate carbon credits.

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[107] Sivasankari, S., and T. Vel Rajan. "CARBON TRADING –A FINANCIAL INCENTIVE TO POLLUTE LESS." International Journal of Advanced Research 4, no. 2 (February 2016). https://www.journalijar.com/uploads/388_IJAR-8787.pdf.

[108] Raj, Kowtham, Pranav Lakhina, and Clay Stranger. "Harnessing Green Hydrogen." India: Niti Aayog and RMI , June 2022. https://www.niti.gov.in/sites/default/files/2022-06/Harnessing_Green_Hydrogen_V21_DIGITAL_29062022.pd

It has signed a joint venture with EKI Energy Services Ltd (EKI) for which a company is incorporated in the name, Amrut Nature Solutions Pvt Limited to work towards conservation, restoration, and enhancement of natural ecosystems such as agriculture, forests, wetlands, grasslands, and blue carbon to reduce greenhouse gas emissions.[109] These projects, such as afforestation, renewable energy installations, and methane capture from landfills, reduce or remove greenhouse gas emissions from the atmosphere.

Companies can buy these credits to compensate for their own emissions, thereby contributing to global emissions reductions.

Corporate-level actions in India play a vital role in the country's efforts to combat climate change and transition to a low-carbon economy. Through carbon measurement and reporting, adoption of low-carbon technologies, investment in low-carbon R&D, and the purchase of carbon credits, Indian corporations are making significant strides towards reducing their carbon footprint and contributing to global sustainability goals. As government regulations and market pressures continue to evolve, it is expected that these corporate actions will further accelerate, making India a key player in the global fight against climate change.

5.3.2 Financial Institutions level actions

Financial institutions in India are increasingly recognizing the significance of non-financial reporting by large corporates. The role of ESG-compliance in addressing climate change and promoting a low-carbon economy has led to dynamism in green instruments and the markets that trade them. This section explores three key financial institution-level actions and their repercussions within the framework of India's carbon market:

I. Development of Innovative Financing Products for Low-Carbon Economy Transition:

The banking sector has a crucial role to play in mobilizing finances towards climate change goals. Many banks have started to establish dedicated climate finance units that provide loans and financial support to businesses and projects focused on reducing carbon emissions and promoting sustainability.

For example, Yes Bank took significant steps for sustainable finance more than a decade back, by integrating ESG considerations to finance and promote sustainable economic activities and projects.

[109] ET Energyworld. "EKI Energy Services, Shell Float JV for Nature Based Solutions ." March 25, 2022. https://energy.economictimes.indiatimes.com/news/renewable/eki-energy-services-shell-float-jv-for-nature-based-solutions/90430558.

The bank has mobilized finance to sustainable sectors such as renewable energy and electric mobility and deepened the reach and access of formal financial services amongst unbanked, hard-to-reach, and vulnerable communities[110].

Financial institutions in India are taking proactive steps to develop innovative financing products aimed at facilitating the transition to a low-carbon economy. These products encompass a range of offerings designed to support environmentally sustainable projects and initiatives. For instance:

- **Green Bonds:** Several Indian financial institutions have issued green bonds to raise funds specifically for projects with environmental benefits, such as renewable energy, energy-efficient infrastructure, and sustainable agriculture. The Finance and Corporate Affairs Minister, Ms. Nirmala Sitharaman, revealed the Indian government's intention on February 1st, 2022, to introduce sovereign green bonds aimed at raising funds for green infrastructure. Subsequently, on January 25, 2023, India launched the initial installment of its inaugural sovereign green bond, amounting to INR 80 billion (equivalent to $980 million). Following this, on February 9, 2023, the Government of India declared the issuance of an additional INR 80 billion ($968 million) in sovereign green bonds. These funds would be directed into public sector initiatives that actively contribute to lowering the economy's carbon intensity.[111]

- **Sustainability-Linked Loans (SLL):** These financial products offer incentives to borrowers to achieve predefined sustainability targets, such as reducing emissions intensity or increasing energy efficiency. The interest rates on such loans are pegged to achieving the targets, and move downwards or upwards, based on achieving targets or not respectively. For example, DCM Shriram, which has a presence in sugar, fertilizer, and chemical businesses, has raised an SLL of Rs 200 crore from HSBC India to fund its capex plan in Gujarat.[112]

II. Lending to Companies Working Towards Carbon Emissions Reduction:

With increasing regulatory and investor mandates towards environmental and social priorities, both debt and equity capital by financial institutions have started getting re-oriented towards such avenues. For example, banks have started institutionalizing Environmental and Social Management Systems (ESMS) and ESG considerations in their lending practices.

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[110] Yes Bank. "Sustainable Finance." Accessed January 9, 2024. https://www.yesbank.in/about-us/sustainability-at-yes-bank/sustainable-finance

[111] Dill, Farah Imrana Hussain Helena, and Farah Imrana Hussain Helena Dill. "India Incorporates Green Bonds into Its Climate Finance Strategy." World Bank Blogs, October 2, 2023. https://blogs.worldbank.org/climatechange/india-incorporates-green-bonds-its-climate-finance-strategy.

[112] Pti. "DCM Shriram Raises Rs 200 Crore from HSBC India as Sustainability-Linked Loan." Zee Business, September 28, 2023. https://www.zeebiz.com/companies/news-dcm-shriram-raises-rs-200-crore-from-hsbc-india-as-sustainability-linked-loan-256700

Similarly, on the equity side, there are venture capital firms and financial institutions that are actively investing in startups and innovative companies that develop clean technologies and solutions aimed at reducing carbon emissions. While there is still a long way to go for Indian companies on the back of data and capacity challenges, there are visible green shoots, given the regulatory signals.

III. Development of Carbon Offset Products:

Financial institutions in India are playing a pivotal role in the development of carbon offset products, which enable businesses to offset their emissions by investing in carbon reduction projects. These products include:

- **Carbon Credit Trading Platforms:** Some financial institutions have launched online platforms that facilitate the trading of carbon credits, making it easier for businesses to access and purchase offsets.

- **Carbon Offsetting Portfolios:** Wealth management divisions of financial institutions have introduced portfolios that include investments in carbon offset projects as part of a diversified investment strategy.

- **Carbon Offset Funds:** Financial institutions/ corporates have established funds that invest specifically in projects that generate carbon credits, such as community-based initiatives, nature-based solutions, afforestation, renewable energy, methane capture initiatives, etc.

Carbon Credit Trading Platforms- Indian Energy Exchange (IEX)

The Renewable Energy Certificates (REC), a market-based instrument, was introduced to promote Renewable Energy (RE) and facilitate compliance with Renewable purchase obligations (RPO) under PAT scheme. For the exchange of the RECs a carbon credit trading platform was formed in India named as the Indian Energy Exchange (IEX). IEX serves as the leading energy market in India, offering a countrywide automated trading system for the physical supply of electricity, Renewable Energy (RE), and RE certificates.

The total Renewable Energy Certificates (RECs) traded were 59,65,430, equivalent to 5.9 Billion Units (BUs) of electricity for the financial year 2023. The ESCerts market at the exchange accomplished a cumulative trade of 1,76,479 ESCerts which is equivalent to 176 Million Units (MUs) during the fiscal year.[113]

[113] https://www.iexindia.com/pdf/Annual%20Report%20FY%202022-23.pdf

The IEX has been an instrument of change in the power sector, leading through product innovations. Such commitments of adopting new technologies, entering new markets, and launching new and futuristic products that will accelerate India's march toward energy security and sustainability would be helpful through the development of carbon market.

The REC helps corporates to mitigate their scope 2 emissions, hence this platform will not only help in trading certificates but also will help in buying credits for the offset management and carbon neutral goal of the corporates. Similarly, IEX has incorporated a wholly owned subsidiary company "International Carbon Exchange Private Limited" ("ICX") to explore business opportunities in the voluntary carbon market.

Financial institutions in India are stepping up their efforts in the carbon market to address climate change and support the transition to a low-carbon economy. Through the development of innovative financing products, investments in emission reduction-focused companies, and the creation of carbon offset products, these institutions are not only aligning with global sustainability goals but also driving change within the financial sector.

5.4 | Policy Frontiers and Considerations

Like the dollar functioning as an international reserve currency, carbon dioxide is the benchmark gas against which other gases such as methane, nitrous oxide, sulphur hexafluoride, nitrogen trifluoride, hydrofluorocarbon, and chlorofluorocarbon are compared in what is termed as carbon dioxide (CO2) equivalent[114]. The carbon market works as a unifying force. This may seem ironic, considering the sluggish pace of the annual COPs of the UNFCCC, and the long-drawn debates between the Global South and the developed countries. However, carbon along with the other organic elements in a way binds all sectors.

Growing awareness around global warming has led to an emphasis on climate-related regulations by governments and ESG compliance by giant corporations. The highly publicized announcements of ambitious carbon neutral targets, and a commitment to climate consciousness, across nations and sectors are possible because carbon and its derivatives allow the quantification, measurement, and comparison of the global warming potential in a 100-year time horizon of various activities- natural or anthropological.[115]

[114] Calculate the carbon dioxide equivalent quantity of an F gas. Gov.uk. https://www.gov.uk/guidance/calculate-the-carbon-dioxide-equivalent-quantity-of-an-f-gas#:~:text=The%20account%20in%20tonnes%20of,of%20HFC%20404A%20is%203%2C922. December 30, 2014

[115] Understanding Global Warming Potentials. U.S. Environmental Protection Agency. https://www.epa.gov/ghgemissions/understanding-global-warming-potentials.

Much like the global monetary system which pegs an economic value to activities in terms of costs, profits, and losses, the greenhouse gases collectively measure the environmental effects of the same activities. The carbon market allows the integration of these two concepts and promotes pathways that reduce the emission of these greenhouse gases.

The prime climate goal targeted by India is to reduce the emissions intensity of its GDP by 45 percent by 2030, from the 2005 level, and achieve about 50 percent cumulative electric power installed capacity from non-fossil fuel-based energy resources by 2030[116]. These GHG reduction national targets are supported by quantifiable goals such as the 500 GW of non-fossil fuels-based electricity sources and broader missions such as the Lifestyle for Environment (LiFE) Mission[117]. Therefore, for a robust carbon market, integration and parity is needed across activities, sectors, and gases.

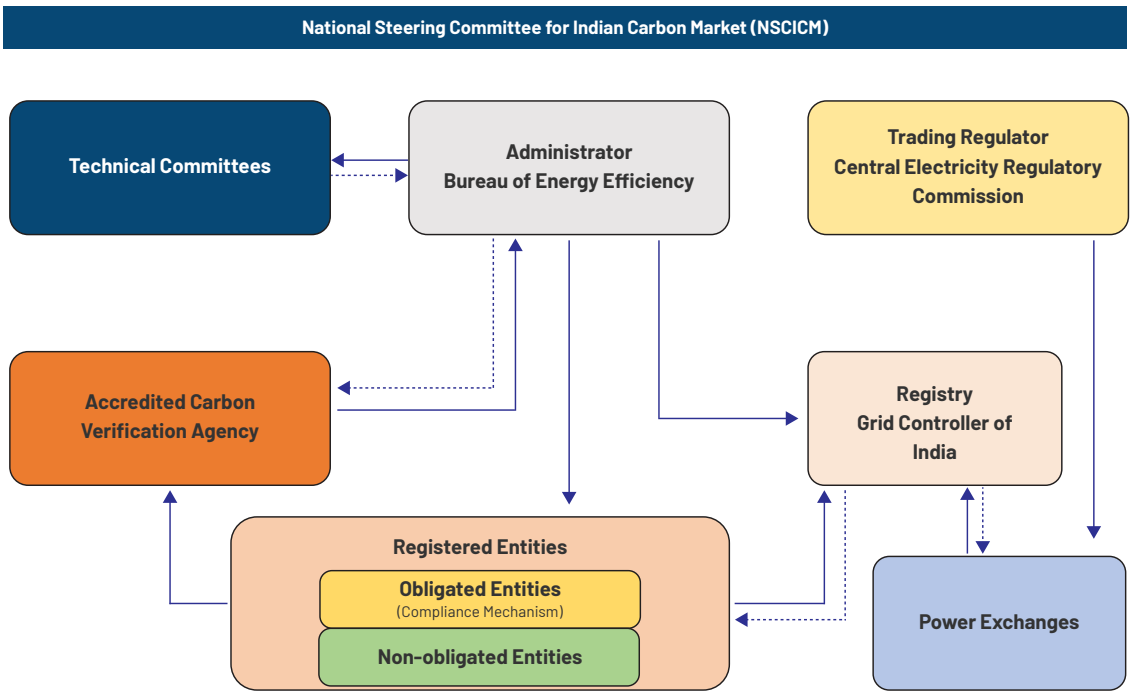
5.4.1 Indian Carbon Market – Framework and Operationalization

Post the Glasgow Summit of COP-26, India has taken several steps towards having an institutional mechanism for carbon trading. It began with the constitution of the National Designated Authority for the Implementation of the Paris Agreement (NDAIAPA) under Article 6 on 30th May 2022. Unlike other countries, where a carbon market was tested at a pilot scale, India had the advantage of having more than a decade of experience in trading similar certificates through energy exchanges. With the Central Electricity Regulatory Commission (CERC) as a regulator and a transparent mechanism for trading, India decided to leverage this experience and build on it for the proposed national carbon market. Similarly, the experience of the Bureau of Energy Efficiency with the market-based mechanism of the Perform-Achieve-Trade (PAT) scheme was important in understanding the necessary safeguards for a national carbon market and the industries to be placed under mandates. A key learning was that for a robust carbon market, there is a need for a strong law supporting it and adding credibility. This was the guiding force behind the amendment to the Energy Conservation Act 2001 passed in December 2022. This was followed by the notification of the 13 sectors considered for the trading of carbon credits under the Article 6.2 mechanism, and finally the release of the Carbon Credit Trading Scheme (CCTS) 2023 in June. Along with this, India is also in talks with countries such as Japan, Singapore, and South Korea for a Joint Crediting Mechanism to trade Internationally Transferred Mitigation Outcomes (ITMOs). The next step indicated by the government is the development of institutional mechanisms and processes for Article 6 (6.2,6.4 and 6.8).

[116] India's Stand at COP-26." Press Information Bureau, Government of India https://pib.gov.in/PressReleasePage.aspx?PRID=1795071. 3 Feb. 2023

[117] Ministry of Environment, Forest and Climate Change. "Mission LIFE." https://missionlife-moefcc.nic.in/

Figure 7: Institutional Framework for the Indian Carbon Market



Source: Bureau of Energy Efficiency (BEE)

Under Article 6.2, countries have entered into bilateral agreements. More than sixty bilateral agreements have been inked between 39 host countries and 6 buyer countries- Australia, Japan, Singapore, South Korea, Sweden, and Switzerland. With a large share of pilot projects supported by Japan, there is tremendous activity toward projects that have huge carbon certification potential. A regional analysis shows that the maximum bilateral agreements are with host countries in Asia. However, most of these are in small developing countries and island nations. India therefore has a big advantage in terms of market maturity and scale for the deployment of carbon-zero technologies[118].

Article 6.4 allows for the creation of an international registry and national level registry. For a high-potential country like India, a dedicated registry thus becomes important to issue, register, and trade carbon certificates[119].

[118] Bureau of Energy Efficiency presentation on Carbon Markets

[119] United Nations Framework Convention on Climate Change. 'Article 6: Mechanism.' UNFCCC,https://unfccc.int/process-and-meetings/the-paris-agreement/article-64-mechanism

There is an understanding among policymakers to begin the integration of all disparate sectors. This will be achieved through the fungibility of existing forms of instruments traded on energy markets- ESCerts and Renewable Energy Certificates' transition to the carbon market. Moreover, demand generation by designation of Obligated Entities such as refineries, DISCOMS, and large steel industries mandated to include renewable energy and green hydrogen for their energy needs should have greater enforceability and alignment with eligible activities. Currently, the only signal one can see is from the list of 13 activities. It must be noted that other activities excluded from this list may also have carbon credits generated that may be traded in the voluntary market or internationally through B2B mechanisms.

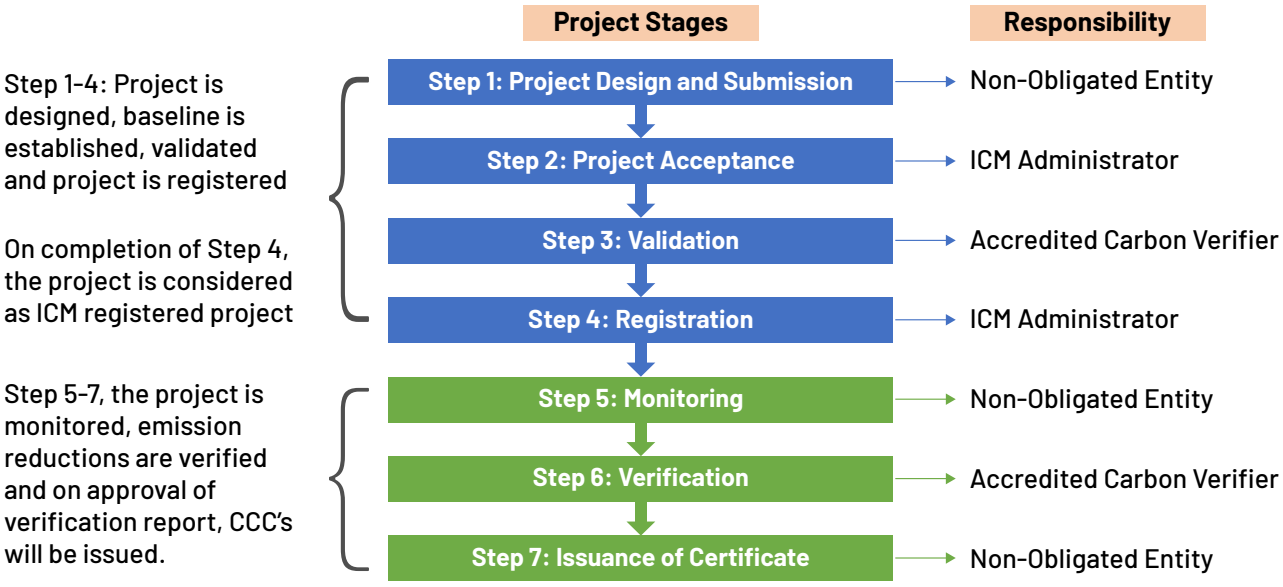
The 13 activities are not permanent but will be revised every 3 years to ensure that the benefits of the carbon market are used to promote the flow of investments in critical sectors that are capital intensive, highly emitting, and require futuristic technologies. Thus, India looks at this as an opportunity to also build global value chains backed by strong research development . Examples in this regard are the emerging areas in renewable energy. With India having the 4th largest renewable energy installed capacity, the focus is now beyond vanilla solar and wind energy plants to green hydrogen, offshore wind, and battery energy storage systems[121]. These emerging sectors require large-scale capex to make them competitive globally. Apart from the production-linked incentives, the Ministry of New & Renewable Energy looks at the carbon credit mechanism as a tool to bridge the cost. One may also compare it to a market-based "Viability Gap Funding" of sorts that bridges costs. For instance, the objective of the government towards green hydrogen is not only to maximize the production of green hydrogen but also to lower the cost.

Similarly, the carbon market will be used to support the development of new technologies such as solar thermal power and oceanic energy systems in India.

[120] Activities finalised to be considered for trading of carbon credits under Article 6.2 mechanism to facilitate transfer of emerging technologies and mobilise international finance in India. Press Information Bureau of India. https://pib.gov.in/PressReleaseIframePage.aspx?PRID=1900216. Accessed: February 17, 2023

[121] Ministry of Environment, Forest and Climate Change. "Mission LIFE." https://missionlife-moefcc.nic.in/

Figure 8: General project cycle for offset



Source: Bureau of Energy Efficiency (BEE)

The challenge will be to define the baseline and methodology. Every project will be registered and have its baseline. For instance, in the case of green hydrogen, the maximum projected emissions of carbon dioxide should be 2kg per kg of hydrogen while the baseline is estimated to be 12 kg of carbon dioxide based on grey hydrogen production. Thus, the certificate would recognize the difference of 10 kg as an emission reduction.[122]

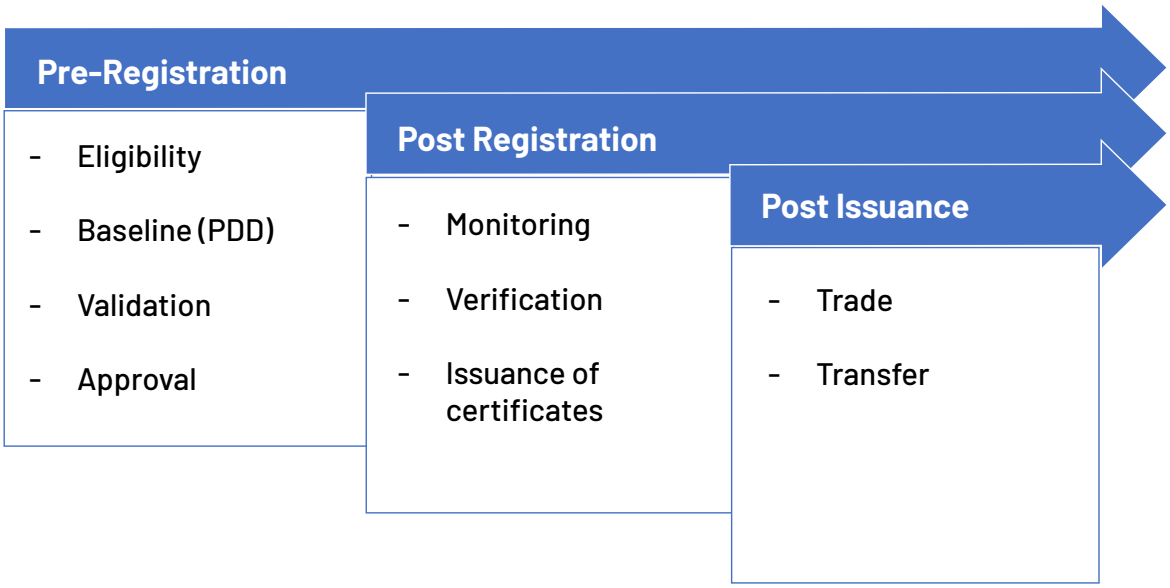
This evaluation will be done for various methodologies and sectors. For international markets, the international baselines must be looked at. As per UNFCCC, India would have to collect details for 5 years with a combination of the International Energy Agency to establish the baseline. BEE has done this exercise through the collection of data from 9 refineries. This exercise must be done on an annual basis for other sectors such as well- green ammonia, fertilizer industry, steel plants, and so on. Even within green hydrogen, there are different mechanisms such as hydrogen as storage, and biomass-based pathways.[123]

Timelines for the credits are under discussion at UNFCCC. Policymakers must be cautious in ensuring a scientific rationale for timelines for each credit as it may impact the flow of investments and climate action efforts towards a particular sector and technology. All this while, ensuring the quality of the certificate remains the paramount consideration.

[122] Carbon Emission Thresholds for Green Hydrogen Production." Mercom India. https://www.mercomindia.com/carbon-emission-thresholds-for-green-hydrogen-production

[123] Bureau of Energy Efficiency presentation on Carbon Markets

Figure 9: Process for issuance of credits



Source: Bureau of Energy Efficiency (BEE)

A key business decision that markets players will have to factor in is the stage at which they choose to get the carbon credits issued. Clarity is needed on whether one can access the credits at an intermediate stage or during end-use only. For instance, the carbon credit rate for green hydrogen versus after its conversion to any derivative. This would also have an impact on contracts between producer and offtake of the commodity and their locations. There may be other dynamics at play related to the timelines of the project activities. What is clear is that in no circumstance would double counting be allowed.

Under the present framework, the validity of ITMOs is only till 2030. While it is understood that after the global stocktaking the carbon markets will continue, there is fear in what shape the global regulations take post the 2030 mark.

6 | Indian Carbon Market – Implications and Way Forward

Carbon markets and climate policies have implications for both the corporate and financial sectors and influence their business, strategy, and operations. This section presents the implications of the carbon market mechanisms on these sectors and how they can drive the decarbonization journey.

Fungibility and traceability of instruments: Fungibility of ESCerts, Renewable Energy Certificates (RECs), and Emission Reduction Units with the integration of energy exchanges is necessary since a lot of decarbonization strategies for high emitting sectors will be based on energy transition. It is expected that while these instruments will be made convertible under the larger ambit of carbon certificates, it will only be for the new projects once the Indian domestic carbon market is operational. With the recently announced Green Credits Program to promote voluntary environmental actions, it is to be seen how the two certificates co-exist.

Green Credit Program (GCP)

The Green Credit Program (GCP), introduced on October 13, 2023, stands as an innovative market-oriented mechanism crafted to encourage voluntary environmental initiatives across diverse sectors. Various stakeholders, including individuals, communities, private sector industries, and companies, are incentivized to participate. The GCP's governance structure is reinforced by an inter-ministerial Steering Committee, and the Indian Council of Forestry Research and Education (ICFRE) assumes the role of GCP Administrator, overseeing program implementation, management, monitoring, and operation.

In its initial phase, the GCP concentrates on two primary activities: water conservation and afforestation. Draft methodologies outlining the criteria for awarding Green Credits have been formulated and will soon undergo stakeholder consultation. These methodologies establish benchmarks for each activity/process, ensuring environmental impact and fungibility across sectors. A user-friendly digital platform is in development to streamline project registration, verification, and Green Credit issuance. ICFRE, in collaboration with experts, is creating the Green Credit Registry and trading platform, facilitating project registration and subsequent buying and selling of Green Credits.

Individuals and entities seeking Green Credits must register their activities with the central government. The Administrator will verify the activity, engaging a designated agency with self-verification available for small projects. Following verification, the Administrator will issue a tradable Green Credit certificate accessible on the Green Credit platform[124].

Export of carbon credits: Indian projects that receive certificates are at liberty to sell their credits to their foreign partners. Registration can happen at an international registry or through the national authority. While the overarching aim is to provide this parallel process to expedite reporting processes between India and the international registry, it must not lead to redundancy. A clarification would be needed on whether the mechanism of reporting to the Indian registry is for simple permission from the Indian authorities or for a detailed mandatory process of making corresponding adjustments.

Internationally acceptable carbon standards and methodologies: In order to make the carbon credits globally tradeable and saleable it is important to establish carbon standards that are aligned with international methodologies and core carbon principles.[125] This enhances the credibility of the carbon credits and opens opportunities in the carbon markets. Carbon registries such as Gold Standard and Verra are reputed globally, however, each have their own methodologies. EU ETS, for example, as mentioned earlier, has provided a series of documents and templates for accredited verifiers and certifiers in order to enable them to discharge their functions responsibility. Primary research findings suggest that India should adopt and contextualise best-in-class practices given the heterogeneity and complexity of Indian markets, geography, weather patterns and climate vulnerabilities, and avoid directly replicating any existing systems in developed markets such as the EU.

Holistic carbon market system

A significant portion of demand for carbon credits is expected to stem from large industry players in hard-to-abate sectors for compliance purposes and to meet their net zero commitments or investor demand. Therefore, as confirmed by the primary respondents, it is critical for policy stakeholders to clearly lay down the rules, regulations and market mechanisms that allow both voluntary and compliance carbon markets to co-exist and complement each other. For example, in China, upto 5% of an obligated entity's compliance requirements can be met through China's voluntary credit scheme China Certified Emission Reductions (CCER).[126] With greater clarity and explicit regulations, the market will function efficiently and can neatly tie into the achievement of the NDCs. How India's domestic carbon market interplays with international carbon markets and its alignment with ITMOs and Article 6 of the Paris Agreement needs to be defined as the international landscape evolves.

Digital measurement, reporting and verification (MRV) systems

A critical question to be addressed is ensuring the quality of certificates within the MRV process. It is important to assess the lifecycle of a project in reducing carbon emissions, especially in nature-based solutions sectors. The quality of credits will ultimately be determined by the agencies selected for accreditation. This comes at a time when carbon credit verifiers have been under criticism for approving poor-quality offsets.

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[124] Press Information Bureau. "Notification issued for Green Credit Program (GCP)," October 13, 2023. Government of India, Ministry of Information & Broadcasting https://pib.gov.in/PressReleaseIframePage.aspx?PRID =1967476

[125] "The Core Carbon Principles, The Integrity Council for the Voluntary Carbon Market", The Integrity Council for the Voluntary Carbon Market.

[126] Liu Lican, " China's carbon credit system to restart this year ", China Dialogue, 8 June 2023.

Establishing digital MRV systems for carbon credits could be a game changer that addresses the fundamental problem of trading and financial markets since its existence – information asymmetry. This can also attract capital flows towards credible projects given that India and China are expected to become two of the largest carbon markets in the world, as highlighted by the primary respondents.

Engage with stakeholders for policy formulation

Consult with financial regulators and legal experts early on: Policy stakeholders are mainly focused on the real sectors in formulating policies and providing incentives and subsidies. For example, while there is a demand to include green lending and sustainable finance in the Priority Sector Lending (PSL) category, the primary respondents expressed concern about whether the Reserve Bank of India will be able to do much in terms of directed lending given that the PSL bucket is already overloaded to ensure the feasibility of any policy recommendation. However, to enable capital flows, the financial markets regulators and industry bodies such as the Indian Banking Association need to be involved at a very early stage. Legal representation is also critical to ensure that the schemes can be implemented in a legally compliant manner. This is important to ensure the growth of the carbon markets in a sustainable manner. Furthermore, such engagement will also pave the way for financial innovations to match the green capital requirements.

Engagement with the private sector

Engaging with the private sector on policies, mechanisms, and the core objectives of the carbon market is crucial, as it gives clarity on the direction of the carbon market and provides a better understanding of the economics of the relevant sectors and the level of involvement.

Sector targets

Aggressive sectoral targets on carbon emission reduction and policies demanding more aggressive and stringent targets on emission reductions will enable the creation of demand for carbon credits, as emphasized by primary research, and will also encourage technical advancement and innovation and climate-responsible solutions. It will also improve the quality of carbon certificates and prevent an oversupply situation like the one in the PAT scheme.

Clarity on informal sectors and NDC

The agriculture and rural sectors have overlapped with the informal economy and are a huge contributor to GHG emissions. It is important to recognize that these sectors have a role in reducing carbon, avoiding carbon, removing carbon, and ultimately achieving the NDCs. For example, primary respondents confirmed that by transitioning into efficient and alternate rural cooking solutions, a reduction of as much as 50% of emissions is possible. Interventions in the agricultural sector, for example, in the form of intercropping of trees alongside cash crops may be explored. These kinds of nature-based solutions could cost only about $25 to $30 per ton of carbon removal as assessed by primary respondents. The creation of financial incentive schemes to finance such cost-efficient projects can help drive the supply of carbon credits.

Carbon revenues and financial sector

The financial sector needs to step in with real-time incentives in the form of reduced cost of capital to corporations. Primary research findings acknowledged the need for creating such structures.

It was also confirmed by primary respondents that no such proven practice currently exists in the financial sector globally which is a challenge for the growth of the carbon markets.

Green procurement guidelines for government

Primary respondents opined that one of the faster ways to embed or incorporate lower carbon emission products or more energy-efficient products is to establish green procurement practices and guidelines for the government with clear definitions of best-in-class 'green standards'. This will also spur demand for such products in the country leading to both sustainable products and financial innovation. As witnessed in the Mode-2 announcement of the National Green Hydrogen Mission, procurement of Green Ammonia and Green Hydrogen along with the carbon-emission-based definition by the Solar Energy Commission of India will enable demand aggregation. Since these activities are also among the ones announced for domestic carbon markets it will raise the confidence of the private sector to venture into newer areas for carbon-reduction projects.

The Indian carbon market is still a work in progress, although the building blocks for different carbon market mechanisms have started taking shape at various levels. However, more clarity is expected for the markets to function efficiently. Strengthening existing tools and mechanisms, engaging with various stakeholders early in the journey, understanding sectoral nuances, building effective partnerships, and focusing on implementation and action can truly help carbon markets move the country towards its carbon commitments.

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