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Carbon Credit Trading in India: A Market-Based Solution for Sustainable Development

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Abstract

With around 7% of the world's CO_2 emissions, India is one of the top four carbon polluters in the world. Balancing development with environmental stewardship has become a national issue due to the country's expanding industrial base and fast urbanisation. India pledged in 2015 to achieve net-zero emissions by 2070 and reduce its emissions intensity by 45% by 2030 compared to 2005 levels as part of the Paris Agreement. Rather than a voluntary agreement, achieving these targets will need extensive decarbonisation programs across sectors. By either cutting their own emissions or funding reductions elsewhere, a carbon market offers businesses an affordable means of addressing climate change. It fosters innovation across industries by putting a price on carbon and transforming emissions into a tradable cost and reward system. One such strategy to make decarbonisation economical is India's recently introduced Carbon Credit Trading Scheme (CCTS). This paper analyse the evolution journey of the Country's carbon market and also its operational mechanism.

Keywords: Climate Change, CO_2 Emissions, PAT Scheme, Carbon Market, Compliance mechanism.

Introduction

Climate Change is a serious threat faced by the humanity. The world community is growing increasingly concerned about the negative effects of climate change, which disproportionately affect the most vulnerable and impoverished. Any human civilization's ability to survive depends on its environment. But unfortunately its survival is in jeopardy because climate change calamities are inevitable. The primary cause of climate change is anthropogenic CO2 emissions, which are released into the environment through the burning of fossil fuels, energy-related emissions, deforestation, and forest degradation. In response to this global concern, a number of

worldwide initiatives have been launched to promote collective action to reduce the emissions. The United Nations Framework Convention on Climate Change (UNFCCC) 1992 created the groundwork for global collaboration, followed by the Kyoto Protocol 1995, which established mandatory emission reduction targets for industrialised countries and established institutions such as the Clean Development Mechanism (CDM). The Paris Agreement in 2015 established a shared framework for all governments to tackle climate mitigation via Nationally Determined Contributions (NDCs) and long-term decarbonisation policies. These international frameworks have urged governments to use market-based mechanisms, particularly carbon pricing, trading, and crediting systems, as key policy tools for achieving cost-effective emission reductions. Approximately 170 countries have submitted their NDC under the Paris Agreement. India is a positive contributor to the global initiatives for mitigation of Climate Change. It has also submitted its NDC under the Paris agreement. Under that, India has committed to be a Net-Zero country by 2070.

Carbon Markets

Carbon Markets are important tool for the countries to meet their NDC targets. Article 6 of the Paris Agreement provides for the use of International carbon markets by countries to fulfill their NDC's. The Paris Agreement permits countries to cooperate collaboratively to meet the carbon reduction targets outlined in their NDCs. This means that, under Article 6, a nation (or countries) will be entitled to transfer carbon credits obtained through GHG emission reductions to assist one or more countries in meeting climate targets. (World Bank, 2022)

Carbon Credit - One carbon credit allows one to emit 1,000 kilogrammes of carbon dioxide (or its equivalent). Carbon credits are exchanged using Certified Emission Reductions (CER) as the currency. CERs are certificates of declaration, similar to stocks. For example, an industrial facility that uses solar power instead of coal and avoids 50 tonnes of CO_2 annually can claim 50 CERs. (Agarwal & Sharma, 2021). Carbon trading involves buying and selling allowances (authorized emission limits) that allow the quota holder to release the equivalent of one tonne of carbon dioxide. As An outcome, if a company or a country produces fewer emissions than its quota, it has the option to sell its surplus on the carbon trading market. Conversely, if it exceeds the designated limits, it must either obtain additional quota or diminish its output (Jain, J. K., Jain, H., & Agarwal, M., 2023)

India and Carbon Trading Mechanism

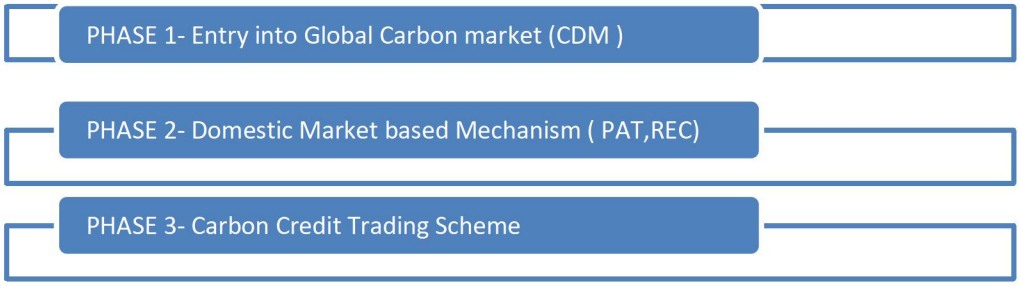
India is the Third largest Emitter of Greenhouse Gases after USA and China (Koshy,2025). It has committed to reduce the emission intensity of its GDP by 45% by 2025 at levels of 2025 (Press Information Bureau, 2022). India has been working to reduce carbon emissions across different sectors to achieve its various development goals, such as alleviating poverty and ensuring that its people have access to affordable and dependable energy. India became a part of the Clean Development Mechanism, a component of the Kyoto Protocol's 'flexibility mechanisms' that enables industrialized nations to carry out climate mitigation initiatives in developing nations, allowing them to gain certified emission reduction units that can be traded and utilized to fulfill their emission reduction goals. In 2011, India emerged as the world's second-largest supplier of Certified Emission Reduction Units, following China (Sadat, 2024). Taking inspiration from China and European nations, India is prepared to offer financial incentives to projects that are lowering GHG emissions through market mechanism design in accordance with EU – Emission Trading Scheme (Vashishtha, 2025). Carbon Credit Trading Scheme is the most ambitious attempt of India to create an Integrated carbon market. In order to decarbonise the Indian economy, the government intends to create the Indian Carbon Market (ICM), a national framework that will price greenhouse gas (GHG) emissions through the exchange of carbon credit certificates. The Carbon Credit Trading Scheme is being developed for this purpose by the Ministry of Power's Bureau of Energy Efficiency and the Ministry of Environment, Forests, and Climate Change (Ministry of Power & Ministry of Environment, Forests and Climate Change, 2023).This paper attempts to analyze the functioning of Indian Carbon Market.

Objectives

1. To examine the evolution of India's Carbon Credit Trading Scheme..
2. To evaluate the operational mechanism of carbon credit generation, verification, and trading under the scheme.

Discussions

1. *Evolution of India's Carbon Credit Trading Scheme*- It could be divided into 3 phases.



- ***Phase1- Entry into Global Carbon Market (2000-2012***)- The Kyoto Protocol established the CDM, which was the biggest carbon market instrument in the world. It was created to make capital, technology, and capacity accessible to developing nations. constructing for their long-term growth while simultaneously enabling developed nations (the EU and, to a lesser extent, Japan and Korea) to economically satisfy their emission

  reduction commitments by funding mitigation initiatives in developing nations, and/or acquiring CDM carbon credits (also known as Certified Emission Reductions, or CERs) (Centre for Energy Regulation, 2022, p.3). India became one of the major players in the CDM, producing the second-highest number of CERs. The CDM was implemented in India by the National CDM Authority (NCDMA) under MoEFCC. Among the 7,847 projects that the CDM Executive Board has recorded,1,686 projects come from India, and 255 million, or 12.6% of all CERs given, go to Indian projects (Paul, n.d., p.139). Approximately 85–90% of Indian CERs came from private sector-developed programs in the fields of forestry, industrial gases, fuel switching, renewable energy, energy efficiency, and municipal solid waste. In particular, CDM encouraged the early implementation of large-scale renewable energy technologies like biomass, solar, wind, and modest hydropower. When the EU unilaterally opted to prioritise CERs from Least Developed Countries (LDC) for the 2013–2020 term, the CDM market collapsed in 2012.

- ***Phase 2- Domestic Market Based Mechanism (2012-2022) -*** After the decline of CDM markets, India started exploring domestic markets In order to promote energy efficiency, emissions reductions, and low-carbon transitions within its own borders. The introduction of

the Perform, Achieve and Trade (PAT) program under the National Mission for Enhanced Energy Efficiency (NMEEE) in 2012 was the most important development during this time.

PAT Scheme- The Bureau of Energy Efficiency defines PAT as a *"regulatory instrument to reduce specific energy consumption in energy-intensive industries, with an associated market based-mechanism to enhance the cost effectiveness through certification of excess energy saving which can be traded"* (Sadat, 2024) The main goal of the PAT mechanism was to accelerate the adoption of low-carbon and energy-efficient technology in order to lower the energy intensity of big energy-using entities. The main idea of the program is that, depending on their relative energy intensity performance in their industry, certain designated consumers (DCs) are given mandated energy intensity targets over a predetermined period of time. The DC is given Energy Saving Certificates (ESCerts) equivalent to the savings compared to the target for the actual production if it uses less energy per unit of production than the predetermined target. These certificates can be exchanged on a specialised platform. The DC is instructed to buy ESCerts on the exchange to make up for any energy consumption that exceeds the target (Centre for Energy Regulation, 2022, p.4-5). India's PAT program was successful in reducing energy intensity overall by utilising market forces. The fact that total energy intensity decreased even while it increased for some entities indicates that the market mechanism was effective since such businesses were able to purchase energy efficiency certificates rather than make expensive internal adjustments (Singh & Chaturvedi, 2025) .

Renewable Energy Certificate (REC) Scheme- REC is intended to encourage the production of renewable energy (RE) in the nation to make power greener grid. The process effectively encourages the huge scale RE deployment and makes interstate RE power exchange. It permits compliance with the Required Renewable Purchase Obligations (RPOs) It offers a possible source of funding for encouraging RE (TERI, 2018, p.3). The REC program intended to efficiently deploy RE on a broad scale while enabling the inter-state trade of RECs, so offering an extra source of funding for investments in RE.

While PAT concentrates on the most energy-intensive businesses, REC concentrates on the power sector, which is the primary source of GHG emissions. Both Market Based Mechanisms have a significant potential for reducing GHG emissions and are essential for assisting India in meeting its mitigation targets.

- ***Phase 3- Transition to the Carbon Credit Trading Scheme:*** India is one of the major middle-income and growing nations implementing carbon pricing along with Brazil and Turkey. With the implementation of the Carbon Credit Trading Scheme (CCTS) in July 2024, India is transitioning to a rate-based Emissions Trading System (ETS). It was introduced via the mandate of The Energy Conservation (Amendment) Act, 2022. In 2025, the market-based energy efficiency program Perform, Achieve, and Trade will gradually give way to these new initiatives (PIB, 2025). The new avatar The Carbon Credit Trading Scheme will expand the scope of energy transformation initiatives to include India's potential energy sectors. In accordance with climate goals, GHG emissions intensity targets for these industries will be created and matched to India's emissions trajectory. The performance in relation to these sectoral trajectories will determine how carbon credits are traded. Additionally, it is anticipated that a voluntary method to promote GHG reduction from non-obligated sectors will be developed concurrently. By pricing greenhouse gas (GHG) emissions through the trading of carbon credit certificates, the government intends to create the Indian Carbon Market (ICM), a national framework with the goal of decarbonising the Indian economy. Shri Abhay Bakre stated that *"The ICM will enable the creation of a competitive market that can provide incentives to climate actors to adopt low-cost options by attracting technology and finance towards sustainable projects that generate carbon credits. It can be a vehicle for mobilizing a significant portion of investments required by Indian economy to transition toward low-carbon pathways"* (PIB, 2023). Companies will eventually become part of Indian Carbon Market by joining the Carbon Credit Trading Scheme.

2. *Operational Mechanism of Carbon Credit Trading Scheme-* The Indian Carbon Market Framework currently consists of two main mechanisms:
   - The Compliance mechanism- which attempts to address emissions from the country's energy use and industrial sectors, and
   - The Offset mechanism- which provides a comprehensive approach to decarbonising the economy by incentivising voluntary actions from entities (not covered under compliance) for GHG reduction (Jain,2025)

   As an instance of carbon credit trading in India, ABC Ltd., a steel manufacturing company, uses greener energy sources or energy-efficient technologies to reduce annual carbon dioxide emissions. It consequently produces an excess of 5,000 carbon credits. These credits have

market value and can be sold to XYZ Ltd., a different business that needs more credits to stay in compliance with regulations since it has exceeded its emission cap. An approved third-party agency verifies ABC Ltd.'s lower emissions prior to the purchase to make sure they satisfy all eligibility requirements.

How the Mechanism for Compliance Operates

Step 1: ICM Portal Registration: The project developer starts by enrolling on the BEE-managed Indian Carbon Market (ICM) portal.

Step 2: Create the PDD (Project Design Document).

A comprehensive proposal is created that describes how the project would prevent or minimise greenhouse gas emissions. This covers technique, estimated impact, baseline data, and monitoring strategies.

Step 3: Accredited Carbon Verification Agency (ACVA) validation

An impartial ACVA reviews the PDD to see whether the suggested emission reductions are measurable, supported by science, and qualified for CCTS.

Step 4: Official project registration: Following validation, BEE formally registers the initiative under the Carbon Credit Trading Scheme.

Step 5: Monitoring: Following project implementation, the developer must keep an eye on operations and gather information to track real greenhouse gas reductions over a predetermined time frame.

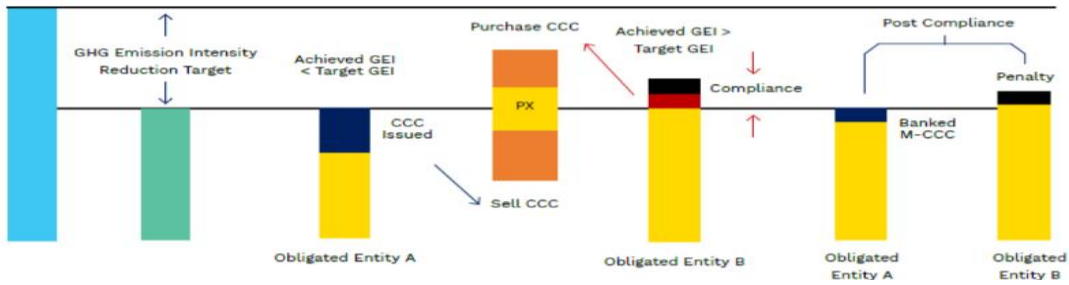
Step 6: Verification: The monitoring data is sent to the ACVA for confirmation of the real reduction in CO2 (or its equivalent).

Step 7: Carbon Credit Issuance: BEE provides the project developer with Carbon Credit Certificates (CCCs) based on confirmed emission reductions.

Step 8: Trading Carbon Credits: The carbon trading platform allows the project developer to post the credits for sale. These can be purchased by obligated entities that need to meet their emission reduction targets.

Step 9: Banking of Carbon Credits: If the issued credits aren't sold right away, they can be banked (stored) for later usage or sale within the time limit specified by the market regulations. (Jain,2025)

Figure 1: Working of Compliance Mechanism



Source- Detailed Procedure for Compliance Mechanism under the Indian Carbon Market, Version 1.0 – July 2024, Bureau of Energy Efficiency

Conclusion

India's Carbon Credit Trading Scheme (CCTS) represents a significant transition from dispersed market-based programs to a single, nationally integrated carbon market that can guide the nation toward its long-term climate objectives. India has gradually strengthened its institutional, regulatory, and market capacity for large-scale decarbonization, starting with active participation in the Clean Development Mechanism, moving through domestic mechanisms like PAT and REC, and now moving into a comprehensive emissions trading framework. By setting clear sectoral trajectories, pricing carbon, and raising funds for low-carbon technology, the government hopes to balance economic growth with climate responsibility. This is reflected in the implementation of the CCTS under the Energy Conservation (Amendment) Act, 2022.Ensuring environmental integrity, transparency, and credibility of carbon credits is the goal of the CCTS's operational design, which is based on strong procedures for registration, validation, monitoring, verification, and trading. The method enables cost-effective compliance through trade and promotes firms to adopt cleaner processes by connecting compliance requirements with market incentives. At the same time, the proposed voluntary offset method encourages innovation and climate-positive activity throughout the economy by expanding involvement beyond required industries. The CCTS has the potential to become the cornerstone of India's climate policy architecture as it works to lower the carbon intensity of its GDP and reach net-zero by 2070. However, robust institutional coordination, trustworthy data systems, investor confidence, and ongoing policy improvement in accordance with international best practices will be necessary for its success.If carried out successfully, the program can improve energy security,

draw in green investments, hasten India's shift to a low-carbon development route, and establish the Indian Carbon Market as a major participant in international carbon finance.

References

1. Agarwal, Lokesh, & Sharma , R. (2021). A Study on Carbon Credit Trading: An Overview. *EIJO – Journal of Humanities, Social Affair, Management and Innovative Research, 6*(3), 13–18.
2. Bureau of Energy Efficiency. (2024, July). *Detailed Procedure for Compliance Mechanism under CCTS*. Bureau of Energy Efficiency. https://beeindia.gov.in/sites/default/files/Detailed%20Procedure%20for%20Compliance%20Procedure%20under%20CCTS.pdf
3. Centre for Energy Regulation. (2022, October). *Policy Paper on Indian Carbon Market*. Indian Institute of Technology Kanpur. https://cer.iitk.ac.in/odf_assets/upload_files/blog/Draft_Carbon_Market_Policy_DocumentFor_Stakeholder_Consultation.pdf
4. *Climate explainer: Article 6*. (2022). World Bank. https://www.worldbank.org/en/news/feature/2022/05/17/what-you-need-to-know-about-article-6-of-the-paris-agreement
5. Jain, Dhriti. (2025, May 2). *India's new carbon market: Ccts rules, compliance & impact*. https://www.thesustainabilitycloud.com/blog/carbon-credit-trading-scheme-ccts/
6. Jain, J. K., Jain, H., & Agrawal, M. (2023). Prospects and challenges of carbon credit Trading in India. *International Journal of Advanced Research in Commerce, Management &Social Science (IJARCMSS)* , *6*(1), 83–94.
7. Koshy, J. (2025, November 13). India's carbon emission rise slower in 2025, says report. *The Hindu*. https://www.thehindu.com/sci-tech/energy-and-environment/indias-2025-carbon-emissions-rise-lower-than-last-year-says-report/article70275808.ece
8. *Ministry of power & ministry of environment, forests & climate change to develop carbon credit trading scheme for decarbonisation*. (2023). https://www.pib.gov.in/www.pib.gov.in/Pressreleaseshare.aspx?PRID=1923458
9. Paul, A. (n.d.). Carbon Credit and Carbon Trading in India: An Overview. *BS Journal*, *31–32*. https://www.caluniv.ac.in/dj/BS-Journal/vol-31-32/Carbon.pdf

10. Press Information Bureau. (2022). *India stands committed to reduce Emissions Intensity of its GDP by 45 percent by 2030, from 2005 level*. Ministry of Environment, Forest and Climate Change. https://www.pib.gov.in/www.pib.gov.in/Pressreleaseshare.aspx?PRID=1885731
11. Sadat, A. (2024, August 28). Establishing a carbon market. *The Hindu*. https://www.thehindu.com/opinion/op-ed/establishing-a-carbon-market/article68577126.ece
12. Singh, T., Mangotra, Karan , & Agarwal, S. (2018, July). *Linking Carbon Markets: A case study of India's PAT and Rec schemes*. The Energy and Resources Institute.
13. Singh, V. C. & D. (2025, July 13). Assessing India's carbon credit trading scheme targets. *The Hindu*. https://www.thehindu.com/opinion/op-ed/assessing-indias-carbon-credit-trading-scheme-targets/article69808116.ece
14. Vashishtha, S., & Vashishtha, Dr. S. (2025). *The Evolution of the Indian Carbon Market: Challenges, Opportunities, and Policy Frameworks*. https://doi.org/http://dx.doi.org/10.2139/ssrn.5082032