Advances in Consumer Research
ISSN (Print): 0098-9258
ISSN(Online): 3079-1766

Vol. 2, Issue 3 (2025) https://acr-journal.com/

Carbon Market in India Problems & Prospects

Prantik Ray[1]

[1]XLRI, Jamshedpur

Cite this paper as: Prantik Ray, (2025) Carbon Market in India Problems & Prospects. *Advances in Consumer Research*, 2 (3), 823-831.

KEYWORDS
N/A
.

ABSTRACT
Climate change mitigation has become a global issue, and countries have adopted carbon markets as one of the mitigation measures for tackling climate change. India has also developed its own domestic carbon market in the form of the Indian carbon market. This paper examines the assessment of the Indian carbon market and draws lessons from the international carbon markets in the USA, Europe and China. The paper explores the opportunities and challenges for integrating the Indian carbon market with international carbon markets. The paper examines the policy and regulatory framework, the market, infrastructure, and preparedness regarding the different stakeholders and their active participation in the carbon market. The document highlights some key requirements for a stable carbon market in terms of a stable regulatory environment, market trading mechanisms, monitoring and verification requirements, liquidity concerns and the alignment of the Indian carbon market with international trading platforms. The findings of the paper provide a positive perspective for policy makers in developing a domestic carbon market in line with India's decarbonization targets

1. INTRODUCTION OF STUDY AND RESEARCH METHODOLOGY

1.1 Background

Extreme weather events, water scarcity, wildfires, and high temperatures are just a few of the ways that climate change is manifesting itself on a global scale. The last ten years have been the warmest on record, according to NASA. According to Carrington, Greenland has lost a trillion tonnes of ice since 1985 due to glacier retreat alone, and it is losing thirty tonnes per hour. According to WEF, countries like China, Bangladesh, and India are in danger of their coastal cities being submerged due to the approximately 21 cm rise in the global sea level since.

In light of the global dangers of climate change, nations have concurred with carrying out their joint responsibilities as outlined in the Paris Agreement. The Paris Agreement aims to keep the rise in the global average temperature to substantially below 2°C above pre-industrial levels, and to aim for a cap on the temperature increase of 1.5°C above pre-industrial levels (UNFCCC, 2015). A plethora of initiatives have been launched under the Paris Agreement by countries, including establishing nation-specific decarbonization policies, promoting technological innovation, and implementing a market system for carbon trading. Among these, carbon trading emerges as a crucial policy tool. As a signatory to the Paris Agreement, India has also made its pledges in line with the Nationally Determined Contributions (NDCs), in accordance with Article 3 of the Paris Agreement.

1.2 Importance of Carbon Markets

The effects of climate change have become increasingly evident on a global scale, manifesting through extreme weather patterns, water shortages, wildfires, and soaring temperatures, among other consequences. According to NASA, the last decade has recorded the highest temperatures in history (NASA, 2024). Greenland is losing approximately 30 million tonnes of ice per hour, with a total loss of one trillion tonnes due to glacier retreat since 1985. Since 1880, global sea levels have risen by about 21 cm, putting coastal cities in countries like China, Bangladesh, and India at risk of submersion (World Economic Forum, 2024).

To combat these global climate threats, nations have committed to collective action under the Paris Agreement. This international accord aims to keep the rise in global temperatures well below 2°C above pre-industrial levels while striving to limit it to 1.5°C (UNFCCC, 2015). Various initiatives have been implemented under this agreement, including aligning national decarbonization policies, fostering technological innovation, and establishing carbon trading markets. Among these measures,

carbon trading emerges as a pivotal policy tool. As a signatory to the Paris Agreement, India has also pledged its commitments through its Nationally Determined Contributions (NDCs), in accordance with Article 3 of the agreement.

1.3 Carbon Markets in India

Carbon markets have emerged as a highly promising tool for nations striving to achieve their decarbonization objectives. The trading of carbon credits provides economic incentives for reducing greenhouse gas (GHG) emissions. India has also implemented various policy initiatives through a structured framework to integrate market mechanisms that facilitate the adoption of clean energy technologies. Notable initiatives include the Renewable Energy Certificate (REC) trading scheme and the Perform, Achieve, and Trade (PAT) scheme. Carbon credit trading presents a significant opportunity to enhance energy efficiency and promote renewable energy technologies, aligning with India's climate commitments under the Paris Agreement.

Although India's carbon market is still in its early stages and evolving rapidly, its initial framework has been heavily influenced by the European Union's Emission Trading Scheme (EU-ETS), which follows the cap-and-trade principle. To ensure balanced economic growth alongside environmental sustainability, India must integrate global best practices while developing an indigenous approach suited to its unique economic and environmental landscape.

As the world's third-largest emitter, contributing over 7% of global GHG emissions, India plays a crucial role in reducing emissions. The country has committed to lowering the emission intensity of its GDP by 33–35% from 2005 levels by 2030 and ensuring that 40% of its cumulative electricity generation comes from non-fossil fuel sources by the same year. Additionally, India has set a net-zero target for 2070 (Government of India, 2015). Various short-term, medium-term, and long-term initiatives have been introduced to meet these goals, including the government's announcement to achieve 500 GW of renewable energy capacity by 2030 (GoI, MNRE, 2021). Learning from European nations and China, India is actively developing its carbon market to provide economic incentives for projects that contribute to GHG reductions, following a market-based mechanism similar to the EU- ETS.

1.4 Research Objectives and Scope

India has been the second-largest contributor to the UNFCCC's Clean Development Mechanism (CDM)

projects, which have significantly contributed to global efforts in reducing greenhouse gas (GHG)

emissions (UNFCCC, 2020). Over the past two decades, existing carbon markets have provided valuable insights into market design, regulatory frameworks, and implementation strategies. However, a research gap remains in understanding how these international experiences can be adapted to a developing nation like India and how its carbon market can align with global carbon trading systems.

This paper aims to bridge that gap by offering a comprehensive analysis of the challenges and opportunities that India's carbon market is expected to encounter as it continues to evolve. The study focuses on three key objectives:

- Analyzing the current structure and progress of India's carbon market, assessing the existing policy framework, and evaluating its alignment with global best practices.
- Examining the regulatory infrastructure and market-based challenges that could impact
- the effective implementation of India's carbon trading system.
- Providing actionable insights for policymakers to improve the design and execution of India's carbon market, ensuring a balanced approach between economic development and climate commitments.

2. EVOLUTION OF CARBON MARKETS

2.1 Genesis of Carbon Markets

The origins of the carbon market trace back to 1997 when the United Nations Framework Convention on Climate Change (UNFCCC) introduced the Kyoto Protocol ("The Carbon Market," n.d.). Implemented in 2005, the Kyoto Protocol categorized countries into two groups: Annex 1 nations, which had binding emission reduction targets, and Non-Annex nations, which were not subject to emission cap requirements. This system operated under the Clean Development Mechanism (CDM) (United Nations Climate Change, 2024). Under this framework, India and China emerged as the leading suppliers of carbon credits (Gupta, 2016).

2.2 Emergence of Regional Carbon Markets

Following the adoption of the Kyoto Protocol, the European Union established the European Union Emission Trading Scheme (EU-ETS) in 2005, enabling carbon trading among EU member states under a cap-and-trade system (Climate Action, 2024). In 2013, the United States introduced its own

domestic carbon market, known as the California Cap-and-Trade System ("Cap-and-Trade Program," n.d.). Over time, several other nations, including China, developed their own domestic carbon markets. The Clean Development Mechanism (CDM) played a crucial role in enabling global carbon credit trading, as compliance with the EU-ETS was permitted through the purchase of carbon credits from the CDM market.

2.3 Shift to Voluntary Carbon Markets

In 2012, the European Union phased out the use of CDM credits for compliance under the EU-ETS, marking the decline of carbon credit trading through the CDM mechanism (Kainou, 2022). This shift led to the rise of voluntary carbon markets, with former CDM participants transitioning to voluntary trading platforms. Although the Voluntary Carbon Standard (VCS) was introduced in 2007, voluntary carbon credit trading became more prominent after 2012, gradually replacing the CDM as the primary global carbon market mechanism. In 2016, the airline industry launched the Carbon Offsetting and The Carbon Offsetting and Reduction Scheme for International Aviation (CORSIA) was introduced in 2016 as part of the airline industry's efforts to achieve carbon neutrality. Today, several countries, including South Korea, China, Canada, and New Zealand, have established their own domestic carbon markets.

The evolution of carbon markets demonstrates a dynamic and adaptive approach to the development of carbon trading mechanisms. Insights gained from the Clean Development Mechanism (CDM) and the Voluntary Carbon Standard (VCS) have been instrumental in shaping country-specific market frameworks. The shift toward voluntary carbon markets and the introduction of mechanisms like CORSIA highlight the ongoing transformation of global carbon markets, integrating both international and domestic systems in alignment with regional and global trading regulations. As India's carbon market is still in its early stages, leveraging lessons from international experiences will be crucial in designing a strong and effective carbon trading framework that supports India's net-zero target by 2070.

2.4 Emergence of Indian Carbon Markets

2.5 National Action Plan on Climate Change (NAPCC)

In 2008, the Government of India launched the National Action Plan on Climate Change (NAPCC), comprising eight key missions, including the National Solar Mission and the National Mission for Enhanced Energy Efficiency. These initiatives were designed to help India progress toward its net-

zero targets through various strategic programs. This plan laid the foundation for the Indian carbon market.

As part of the National Solar Mission, distribution companies (DISCOMs) were assigned Renewable Energy Purchase Obligations (RPOs), and the Renewable Energy Certificate (REC) trading system was introduced to provide an additional revenue stream for renewable energy producers. Additionally, under the National Mission for Enhanced Energy Efficiency (NMEEE), the Government of India introduced the Perform, Achieve, and Trade (PAT) scheme, which facilitated the trading of Energy Savings Certificates (ESCerts). This domestic trading mechanism aimed to improve industrial energy efficiency through market-based incentives.

2.6 Launch of the Indian National Carbon Market

Building on the success of the Perform, Achieve, and Trade (PAT) and Renewable Energy Certificate (REC) schemes, the Government of India took a significant step toward establishing a national carbon market in December 2022. In its initial phase, the Indian carbon market is focusing on four key sectors—iron and steel, cement, petrochemicals, and paper and pulp—to facilitate carbon credit trading. Trading activities are expected to commence by April 2025 (Chaganti Singh, 2023). By 2030, the market is projected to cover approximately 15% of the country's greenhouse gas (GHG) emissions, with additional sectors gradually being included under stricter regulatory frameworks.

The Bureau of Energy Efficiency (BEE) has been designated as the primary regulatory authority responsible for overseeing the governance and implementation of the carbon market mechanism (Bloomberg, 2023). A National Steering Committee, comprising representatives from various ministries, has also been formed to provide strategic direction. The Central Electricity Regulatory Commission (CERC) has been appointed as the market administrator, responsible for monitoring transactions, ensuring transparency, and preventing market manipulation (Writer, 2023). Monitoring and verification processes will be handled by State Designated Agencies (SDAs), ensuring accurate reporting and maintaining data integrity.

The trading platform for carbon credits will be hosted on the Indian Energy Exchange (IEX) and the Power Exchange of India Ltd (PXIL), both of which already support trading in Energy Saving Certificates (ESCerts) and Renewable Energy Certificates (RECs). Furthermore, the Indian government is considering integrating the national carbon market with international markets under Article 6 of the Paris Agreement. This linkage would enhance market liquidity and foster global

cooperation in carbon credit trading.

Image 1: Evolution of Global and Indian Carbon Markets

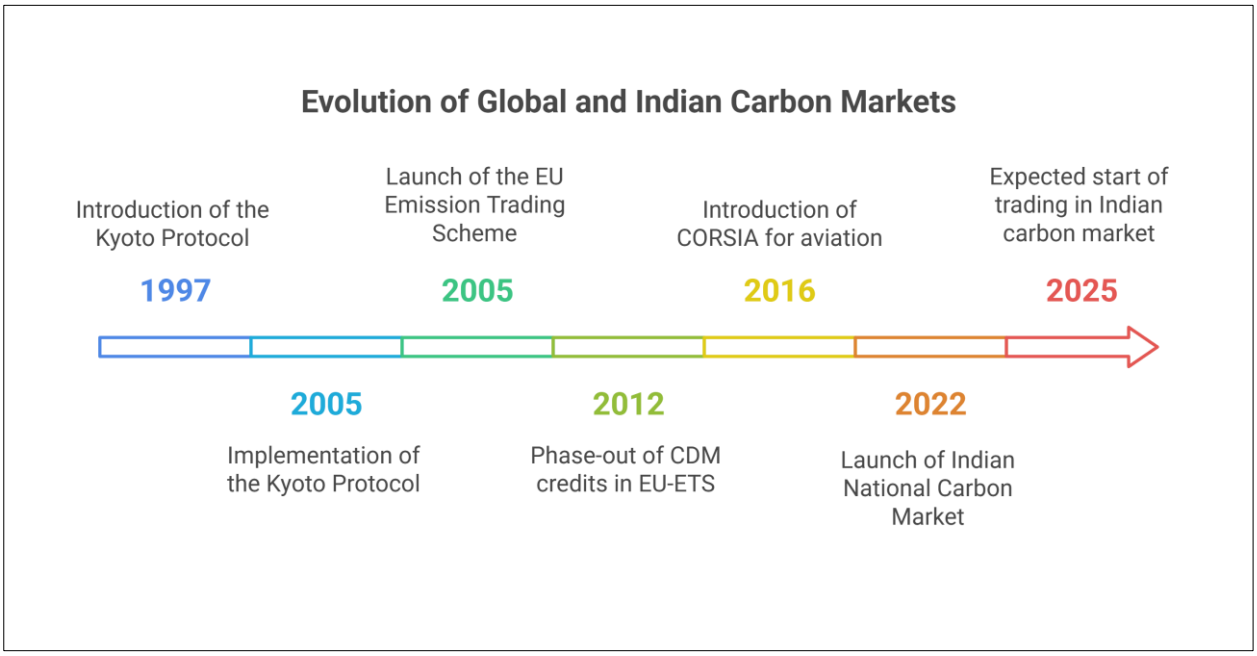

Table 1: Structure of Indian Carbon Market

Component	Role
Regulator	Bureau of Energy Efficiency (BEE): Acts as the primary regulatory authority responsible for the overall governance and implementation of carbon market mechanisms in India. The BEE ensures that all market participants comply with national climate policies and regulations.
Oversight Body	National Steering Committee: Comprising representatives from various ministries, this committee provides strategic oversight, ensuring that the carbon market aligns with India's national policy objectives and international climate commitments.
Market Administrator	Central Electricity Regulatory Commission (CERC): Administers the carbon credit trading scheme, monitors market transactions, ensures transparency, and prevents market manipulation. CERC also oversees the cap-and-trade mechanism and carbon offsets.

Market Participants	Industries in Specific Sectors: Initially, companies in the iron and steel, cement, petrochemicals, and paper and pulp sectors are obligated to participate in the carbon credit trading scheme, starting by April 2025. These industries must meet specific carbon reduction targets or purchase carbon credits.
Monitoring and Verification	State Designated Agencies (SDAs): These agencies are responsible for monitoring and verifying compliance with carbon market rules. They ensure accurate reporting, data integrity, and adherence to energy efficiency and carbon reduction targets.
Trading Platform	Indian Energy Exchange (IEX) and Power Exchange India Limited (PXIL): These platforms will facilitate the trading of carbon credits, alongside existing markets for Energy Savings Certificates (ESCerts) and Renewable Energy Certificates (RECs).
Compliance Mechanism	Penalties and Incentives: Companies that fail to meet their carbon reduction obligations will face penalties, while those that exceed their targets may benefit from financial incentives. This mechanism ensures adherence to carbon market regulations.
Linkages with Other Markets	International Market Integration: The Government of India is exploring the possibility of linking the Indian carbon market with international markets under Article 6 of the Paris Agreement. This would enhance market liquidity and foster global cooperation in carbon credit trading.
Carbon Pricing Mechanism	Cap-and-Trade and Carbon Offsets: India employs a cap-and-trade mechanism alongside carbon offsets to regulate and reduce greenhouse gas emissions. Companies in obligated sectors must either reduce their emissions or purchase carbon credits to comply with the set limits.
Legal Framework	Energy Conservation Act (Amended) and Environmental Protection Act: These acts provide the legal foundation for the operation and enforcement of the Indian carbon market. The legal framework ensures that the carbon market is aligned with national and international climate goals.

3. CHALLENGES FOR CARBON MARKETS

Carbon markets serve as a crucial tool for mitigating climate change; however, their design and implementation face multiple challenges. If left unaddressed, these challenges can hinder their effectiveness. This analysis highlights key obstacles and potential solutions, particularly in the Indian context. The challenges include regulatory and policy uncertainties,

infrastructure and capacity limitations, market liquidity and participation barriers, global market integration, stakeholder acceptance, carbon pricing instability, and governance issues. Addressing these concerns is vital for the success of carbon markets.

3.1 Regulatory uncertainty

Like stock markets, carbon markets are dynamic and influenced by regulatory changes, which can significantly impact pricing, market behavior, and stability. For instance, during the initial phase of the EU ETS, power producers received free allowances to prevent electricity price hikes. However, many utilities transferred the cost to consumers, resulting in "windfall profits" and financial risks. Indian regulators face challenges enforcing emission reduction targets on financially stressed distribution companies (Discoms). Policy uncertainty and vague guidelines reduce the market's attractiveness, creating compliance challenges for companies. Moreover, businesses may prefer low- cost carbon credits over high-cost options like forestry credits, limiting the effectiveness of diverse clean energy solutions. Regulatory bodies must ensure **balanced market mechanisms** to encourage **varied technological investments** while maintaining stability. If carbon credit trading remains at floor prices, financial viability may decline, reducing high-quality credit supply.

Measuring CO_2 reduction equivalence across projects presents another challenge. CDM projects have highlighted risks such as biodiversity loss from monoculture forestry and groundwater depletion from fast-growing tree plantations. Biofuel and forestry projects may also displace local food production. Uneven distribution of projects risks limiting benefits to certain regions, as seen in CDM projects concentrated in India, China, and Brazil. Furthermore, carbon credit projects have been criticized for failing to deliver local community benefits. The market has also faced manipulation, such as firms producing HFC-23 solely to claim carbon credits. If offsets are too cheap, they may enable continued fossil fuel reliance, undermining climate goals (Carton & Andersson, 2017).

3.2 Market Infrastructure and Capacity

A robust carbon market requires transparency, credibility, and a strong infrastructure. Effective **Monitoring, Reporting, and Verification (MRV)** systems are critical to preventing fraud and ensuring credit validity (Belenky, 2024). However, developing these systems demands significant investment and technical expertise, which can be challenging for developing nations. India's MRV system must coordinate across multiple sectors, requiring substantial resources (Invest India, Carbon Markets Association of India, ESG, & National Institute of Public Finance & Policy, 2024). Technical failures have also impacted market operations, such as the PXIL glitch in 2021, which disrupted EScert trading. California's carbon market experienced similar setbacks during its early stages.

Consistency in carbon accounting standards is crucial. Variations in emissions reduction methodologies can create disputes over credit validity, affecting market confidence. Furthermore, efficient carbon trading requires advanced platforms capable of handling complex transactions. Poor infrastructure can lead to inefficiencies, increasing costs and reducing participation. The EU ETS faced price collapses due to an oversupply of allowances, demonstrating the risks of poor market design. Emerging technologies such as **blockchain** can enhance transparency and prevent double counting in carbon trading. Blockchain-based systems provide secure, tamper-proof records, reducing fraud risks.

3.3 Market Liquidity and Participation

For any carbon market to be effective, **it must maintain high liquidity and broad participation**. Ensuring sufficient buyers and sellers is critical for price stability and market efficiency, especially in the early stages of market development. This is so because the limited participation can result in low market liquidity, leading to instability in the carbon prices. The instability in carbon pricing will have a detrimental impact on the carbon market as it will not only deter potential participants but also create a vicious cycle of low participation and high volatility in the market, making it highly ineffective. Without a broad base of participants, the market may fail to reflect the true cost of carbon, undermining its ability to drive emission reduction decisions by businesses.

Companies may find purchasing allowances cheaper than investing in emission-reducing technologies, stalling progress towards environmental targets. The market participation can also be impacted by the diverse kinds of projects being pursued and their environmental impacts due to the

regional differences. Thus, these regional and project specific challenges require a tailored approach to ensure sustainable and equitable carbon market operations.

3.4 Linkage with Global Markets

Aligning domestic carbon markets with international standards is crucial for enhancing their credibility and effectiveness. However, this process requires overcoming regulatory, economic, and technical challenges. To attract investment, carbon markets must **adopt standardized accounting for emission reductions and ensure seamless integration with global markets**. Discrepancies in methodologies can create disputes, reducing market attractiveness for investors. Harmonization requires addressing variations in emissions trading system design, including targets (fixed or intensity-based), accounting

methods (direct or indirect), compliance periods, banking rules, and sector coverage. Political differences further complicate efforts to synchronize carbon markets. Effective diplomacy and international cooperation are necessary to align policies and standards.

For instance, Indian exporters in carbon-intensive industries like steel and cement may face higher costs due to Carbon Border Adjustment Mechanisms (CBAMs), affecting their competitiveness (ICWA). Additionally, compliance costs must remain competitive, as excessive costs can reduce market attractiveness and influence carbon pricing. Striking the right balance in carbon pricing is crucial—it must be high enough to drive emissions reductions but not so high that it causes economic disruptions.

A major challenge in linking carbon markets is **carbon leakage**, where industries in nations with **strict carbon pricing face competitive disadvantages** compared to those in regions with weaker regulations. While border tax adjustments can mitigate this issue, they introduce complexities related to international trade laws and administration.

Although successful international carbon market linkages exist, they remain limited. For example, the **EU ETS is well integrated with the Swiss Emission Trading Scheme**, requiring both markets to align rules on cap setting, sector coverage, and verification systems. Similarly, **California's cap- and-trade program is effectively linked with Québec's carbon market**. However, achieving global standardization remains difficult. The **Clean Development Mechanism (CDM) faced credibility issues due to inconsistent validation** and verification processes across different countries. A UN report found that **80% of CDM projects were concentrated in just five countries**, raising concerns about the unequal distribution of benefits.

The European Union's introduction of CBAM further underscores the need for domestic markets to align with international carbon trading systems. Currently, Indian companies complying with EU carbon offset requirements have no choice but to purchase credits from the EU ETS (Jaspal & Miller, 2024). India must explore integrating its carbon market with global trading systems such as ETS to ensure flexibility and competitiveness.

By linking with international carbon markets, India can expand its carbon credit pool, enhance liquidity, and help companies meet global compliance standards. Strengthening these connections will ensure a more efficient and globally competitive carbon market.

3.5 Public and Stakeholder Acceptance

Public trust and stakeholder engagement are essential for carbon market success. Historical financial scandals, such as the 2008 crisis, have diminished trust in banks, affecting carbon market credibility. Transparency initiatives, like JP Morgan's sustainability reporting, help address these concerns. China's regional pilot ETS programs improved public acceptance before national implementation. India must foster transparent industry dialogues and expand stakeholder consultation efforts.

3.6 Price Volatility

Price volatility remains a major challenge in carbon markets as it directly impacts market stability and the effectiveness of emission reduction efforts. Regulatory changes can cause significant fluctuations, leading to uncertainty. For instance, tightening **emissions caps** reduces the supply of allowances, causing prices to surge as companies compete for limited credits. Conversely, loosening caps can flood the market, driving prices down. Similarly, modifications in **allowance allocation methods**, such as shifting from free allocation to auctions, can also impact pricing. Such changes often create instability, as market participants react to the evolving regulatory landscape.

Economic cycles also influence carbon pricing, including growth, recession, or financial crises. During periods of economic expansion, increased industrial activity leads to higher emissions, raising demand for carbon credits and driving up prices. However, industrial activity declines during economic downturns, resulting in lower emissions and reduced demand for credits, causing prices to fall. For example, during the 2008 financial crisis, the price of EU ETS allowances plummeted from

€25 per tonne to €9 per tonne due to declining industrial demand. This demonstrated the

vulnerability of carbon markets to broader economic fluctuations (International Swaps and Derivatives Association, 2021).

To **mitigate price volatility**, carbon markets utilize financial instruments such as **futures, options, and swaps**. Additionally, companies can secure long-term **contracts with renewable energy** and forestry projects, ensuring a steady supply of carbon credits at a fixed price, enhancing market stability and investment predictability.

Carbon markets have introduced **floor and ceiling prices** to further address price fluctuations, ensuring a greater price stability, reducing uncertainty, and encouraging long-term investments in low-carbon technologies. In India, floor prices and forbearance prices were established for Renewable Energy Certificates (RECs) to minimize volatility (CERC, 2017). This mechanism guarantees that REC sellers receive a minimum return on their renewable energy investments. Similarly, the Bureau of Energy Efficiency (BEE) has managed price volatility in the Energy Saving Certificates (ESCerts) market by

extending trading windows multiple times, allowing buyers additional time to meet compliance requirements. This measure has helped prevent sudden price crashes caused by excess supply.

3.7 Governance and Regulation

For carbon markets to function effectively, they require **strong governance and regulatory oversight**. Oversight is particularly crucial in preventing **fraud within cap-and-trade systems**. A notable example of such fraud occurred in the Czech Republic, where hackers stole **1.2 million carbon credits** from the Czech Carbon Registry. Without proper oversight, market participants may engage in **rent-seeking behavior**, exploiting the system for financial gain without achieving real emission reductions, thereby undermining the market's core purpose.

A **weak regulatory framework** can also lead to **market manipulation**, where participants deliberately **influence carbon credit prices** for profit, causing instability [(Adcock & Crowe, 2022); (National Academies of Science, Engineering, and Medicine, 2024)]. For instance, India's **Renewable Energy Certificate (REC) scheme** faced enforcement issues, as **distribution companies (Discoms) failed to meet their Renewable Purchase Obligations (RPOs)**, leading to an oversupply of RECs and market distortions (Powell, Sati, & Kumar Tomar, 2024). This lack of enforcement also discouraged banks and financial institutions from considering RECs as a reliable revenue source, affecting the viability of **renewable energy projects**.

The success of any carbon market relies on **consistent demand for carbon credits**. The collapse of the **Clean Development Mechanism (CDM) market** was a direct result of the **EU ETS withdrawing its compliance requirement**, leading to carbon credit prices falling below **one dollar per credit** (Australian-Japan Research Centre, n.d.). As a result, the market largely shifted towards **voluntary carbon trading**.

A similar oversupply issue may arise in India's carbon market. The trading of **Energy Saving Certificates (ESCerts) under the PAT scheme** has frequently occurred at floor prices due to low demand. The Discoms and fertilizer sectors did not meet their compliance targets, causing an oversupply—57 lakh ESCerts were issued in PAT Cycle II, while the demand was only 36 lakh (Prayas Energy, n.d.). Enforcing compliance among designated consumers will be a major challenge for Indian regulators. Without proper enforcement of the supply-demand balance, the Indian carbon market may struggle with similar inefficiencies, reducing its effectiveness in driving emissions reductions.

4. CONCLUSION

India's carbon market is evolving within the framework of its net-zero target under the Paris Agreement. Achieving carbon neutrality by 2070 presents significant challenges for developing nations like India. Globally, carbon markets have been recognized as an effective mechanism for addressing climate goals, and India is actively exploring their implementation to foster innovation and investment in clean technologies. Lessons from established carbon markets such as the **EU-ETS, California's cap-and-trade system, and China's ETS** offer valuable insights for Indian policymakers in designing a **robust carbon trading framework**.

For a carbon market to be successful, it requires **a stable policy environment, strong market infrastructure, adequate liquidity, and broad participation from both buyers and sellers**. However, challenges such as **price volatility and the risk of market manipulation** have posed difficulties in global carbon markets. To ensure the integrity and effectiveness of India's carbon market, **strong governance and regulatory oversight** will be essential in driving meaningful emission reductions and long-term sustainability.

REFERENCES

[1] NASA. (2024, January 12-NASA. https://www.nasa.gov/news-release/nasa-analysis- confirms-2023-as-warmestyear-on-record/.

[2] Sea level rise: Everything you need to know. (2024, July 11). World Economic Forum. https://www.weforum.org/agenda/2024/07/rising-sea-levels-global threat/.

[3] The Parties to this Agreement. (n.d.). Paris Agreement. https://unfccc.int/files/meetings/paris_nov_2015/application/pdf/paris_agreement_english pdf.

[4] Carbon Market | BUREAU OF ENERGY EFFICIENCY, Government of India, Ministry of Power. (n.d.). https://beeindia.gov.in/en/programmes/carbon-market

[5] Renewable Purchase Obligation (RPO) and energy storage obligation trajectory till 2029-2030- regarding. (2022, July 22). Ministry of Power, Government of India. https://powermin.gov.in/sites/default/files/Renewable_Purchase_Obligation_and_Energy _Storage_Obligation_Trajectory_till_2029_30.pdf.

[6] Gupta, A. (2016). Climate change and Kyoto Protocol. In Elsevier eBooks (pp. 3-23). https://doi.org/10.1016/b978-0-12-803615-0.00001-7.

[7] Kainou, K. (2022, March 16): Collapse of the Clean Development Mechanism scheme under the Kyoto Protocol and its spillover: Consequences of 'carbon panic' | CEPR

[8] Chaganti Singh, S. (2023, September 26). India to set emission reduction mandates for 4 sectors, to start carbon trading from 2025 -Sources. Reuters. https://www.reuters.com/sustainability/climate-energy/india-set-emissionreduction mandates-4-sectors-start-carbon-trading-2025-2023-09-26/.

[9] Writer, S. (2023, June 30). Steering committee to be formed for carbon market. Mint. https://www.livemint.com/news/india/steering-committee-to-be-formedfor-carbon-market-11688154325471.html

[10] Carton, W., & Andersson, E. (2017). Where forest carbon meets its maker: forestry-based offsetting as the subsumption of nature. Society & Natural Resources, 30(7): https://www.tandfonline.com/doi/full/10.1080/08941920.2017.1284291

[11] Belenky, L. (2024, March 16). Carbon markets: Why digitization will be key to success. World Bank Blogs. https://blogs.worldbank.org/en/climatechange/carbonmarkets-why- digitization-will-be-key-success.

[12] Jaspal, M., & Miller, D. (2024). "Can we make the CBAM work for India?" Observer Research Foundation: Expert Speak, Raisina Debates. Retrieved from https://www.orfonline.org/expert- speak/can-we-make-the-cbam-work-for-india/.

[13] Adcock, M., & Crowe, T. (2022, May 31). Regulating carbon markets. KPMG. https://kpmg.com/xx/en/home/insights/2022/05/regulating-carbonmarkets.html.

[14] Vashishtha, S., & Vashishtha, D. S. The Evolution of the Indian Carbon Market: Challenges, Opportunities, and Policy Frameworks. Opportunities, and Policy Frameworks.

❖❖❖❖❖