



## India's Carbon Market: A Green Leap Forward

*This editorial is based on "[Giving shape to India's carbon credit mechanism](#)" which was published in The Hindu on 12/11/2024. The article brings into picture the key role of carbon finance and credit frameworks at COP-29, focusing on India's efforts to develop its domestic carbon market. It highlights two major challenges: ensuring the integrity of carbon credits to avoid greenwashing and aligning with international standards, especially under Article 6 of the Paris Agreement.*

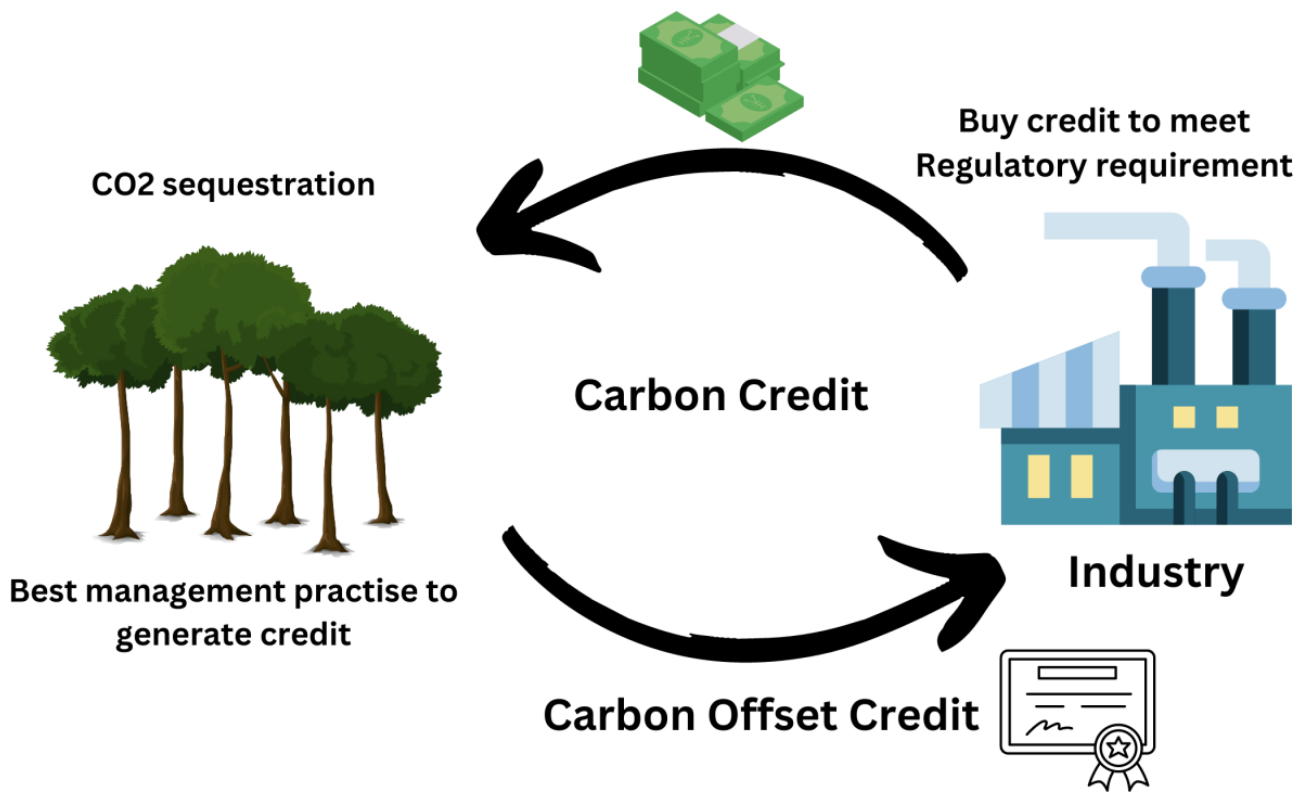
**For Prelims:** [COP-29](#), [Nationally Determined Contribution](#), [Carbon Market](#), [Paris Agreement](#), [Greenwashing](#), [Greenhouse gas](#), [International Solar Alliance](#), [EU-ETS](#), [Performance Achieve Trade \(PAT\) scheme](#), [Energy Conservation Amendment Act 2022](#), [Smart Cities Mission](#).

**For Mains:** Opportunities for India in Developing a Domestic Carbon Market, Major Issues Related to Development of Carbon Market in India.

As [COP-29](#) unfolds in **Baku, Azerbaijan**, **carbon finance and credit frameworks** have emerged as critical points of discussion between developed and developing nations. India, having updated its [Nationally Determined Contributions](#) in 2023, is poised to develop its domestic carbon market. However, global experiences highlight two crucial challenges: maintaining the integrity of carbon credits to **prevent greenwashing**, and ensuring alignment with international standards, particularly **Article 6 of the Paris Agreement**.

### What are Carbon Credits?

- **About:** Carbon credits are **tradable certificates representing a claim to avoided greenhouse gas (GHG) emissions** or enhanced removals from the atmosphere.
  - They allow entities to transfer these claims to buyers, who can "retire" them to meet climate targets.
- **Certification and Units:** Credits are certified by governments or independent bodies and typically **represent one metric ton of CO<sub>2</sub> avoided or removed**.
  - Carbon credits, rather than "**offsets**," are the preferred term for compliance and voluntary reporting.
  - To compare GHG effects, **emissions are standardized in CO<sub>2</sub>-equivalents (CO<sub>2</sub>e)** using **100-year Global Warming Potentials (GWPs)**.
- **Alternative Uses:** Carbon credits are also used without offsetting claims, contributing solely to climate mitigation.
  - This requires **high-quality credits that meet stringent criteria**.



## What are the Opportunities for India in Developing a Domestic Carbon Market?

- **Economic Value Creation & Market Size:** India is a significant exporter of carbon credits and has issued 278 million credits in the voluntary carbon markets between 2010 and 2022, accounting for **17% of the global supply**.
  - Beyond trading, the market creates opportunities for **carbon credit verification agencies, green finance institutions, and environmental consulting firms**, potentially creating **200,000+ new jobs**.
  - The **multiplier effect** could contribute significantly to **India's goal of becoming a \$5 trillion economy** while driving sustainable growth.
- **International Climate Leadership:** As the world's **third-largest emitter** yet leader in **renewable energy adoption**, India can leverage its carbon market to shape global climate finance architecture.
  - Recent leadership in initiatives like **International Solar Alliance** demonstrates India's capacity to lead climate action.
  - The carbon market could **strengthen India's position in climate negotiations**, particularly in **developing-country coalitions**, while creating opportunities for **South-South cooperation** and technology transfer.
- **Industrial Competitiveness & Innovation:** Carbon pricing could **drive industrial modernization and innovation across sectors**.
  - Industries can leverage carbon markets to fund efficiency improvements, similar to how **EU-ETS helped reduce industrial emissions by 41% since 2005**.
  - This presents opportunities for developing indigenous clean technologies, particularly in hard-to-abate sectors like cement and steel.
    - Recent success stories like **JSW Steel's carbon reduction initiatives** show potential for the Indian industry to lead in low-carbon solutions.
- **Digital Infrastructure & Technology Integration:** India's robust digital infrastructure presents unique opportunities for creating transparent, efficient carbon markets.
  - The success of **digital public goods like UPI and COWIN** provides a template for

- building sophisticated carbon trading platforms.
- Integration of **blockchain, IoT, and AI** could revolutionize carbon credit verification and trading, reducing costs and increasing transparency.
  - This could **position India as a leader in digital solutions for climate action.**
- **Green Investment Catalyst:** A well-designed carbon market could attract significant international green finance.
  - ESG investments now account for nearly **18% of foreign financing** in emerging markets (excluding China).
  - India's carbon market could provide a **structured avenue for channeling this capital into sustainable projects**, particularly in renewable energy, energy efficiency, and forest conservation. The market mechanism could also support India's green bonds and sustainable finance initiatives.
- **Rural Development & Agricultural Transformation:** Carbon markets present unique opportunities for rural India **through agricultural and forestry carbon credits**.
  - Recent pilot projects in states like Maharashtra show farmers earning additional income through carbon farming practices.
    - They are **making up to ₹65,000 per acre annually from forest harvest and carbon revenue**, compared to just ₹10,000 from paddy cultivation.
  - The structured market could **incentivize sustainable agriculture, agroforestry, and rural renewable energy projects**, potentially benefiting farmers while supporting food security and climate resilience.
- **Sector Transformation Opportunities:** Different sectors present unique opportunities: Energy sector can **accelerate renewable transition, manufacturing can fund efficiency** improvements, **real estate can drive green building adoption**, and **transport sector can accelerate electric mobility**.
  - Recent success of the **Performance Achieve Trade (PAT) scheme**, covering 13 energy-intensive sectors, demonstrates industry readiness for market mechanisms.
  - This sectoral approach could **create specialized carbon credit categories** and trading mechanisms.
- **Knowledge Economy Development:** Building a carbon market **creates opportunities for developing expertise in carbon accounting, verification, trading, and climate finance**.
  - This could position India as a **knowledge hub for emerging carbon markets** globally.
  - Recent initiatives like the Climate University Network (connecting 100+ universities) show potential for building specialized skills and research capacity.
  - The market could drive innovation in environmental education and professional development.
- **Urban Sustainability Integration:** Carbon markets could accelerate **sustainable urban development** through projects in waste management, urban forestry, and clean transport.
  - Cities like **Indore, which generates revenue from waste carbon credits**, demonstrate the potential.
  - The market mechanism could **support India's Smart Cities Mission, incentivizing low-carbon infrastructure** and creating new revenue streams for urban local bodies to fund climate initiatives.

## What are the Major Issues Related to Development of Carbon Market in India?

- **Market Design & Pricing Complexity:** India faces significant challenges in designing an efficient market structure that **balances environmental goals with economic realities**.
  - Setting **appropriate caps, allocating allowances, and ensuring market liquidity** while preventing price volatility requires complex policy decisions.
  - The diversity of **India's industrial landscape**, with varying technological capabilities and emission intensities, makes uniform pricing mechanisms particularly challenging.
  - This is **further complicated by the need to protect strategic sectors** while maintaining market effectiveness.
- **Measurement, Reporting & Verification Infrastructure:** **Current gaps in emissions data collection and verification systems** pose significant challenges.
  - The challenge is magnified by **India's diverse industrial base**, with **many small and medium enterprises lacking technical capacity** for accurate emissions monitoring. Establishing credible baseline emissions data across sectors remains a fundamental

challenge.

- **Regulatory Framework & Institutional Capacity:** Despite the [Energy Conservation Amendment Act 2022](#), significant regulatory gaps remain.
  - Recent implementation delays in the [Green Credit Programme](#) highlight institutional capacity constraints.
  - The need for coordination among multiple agencies ( [Bureau of Energy Efficiency](#), **Ministry of Environment, Forest and Climate Change**, **CERC**) creates operational complexities.
  - Current regulatory frameworks may need substantial enhancement to handle complex carbon market operations.
- **Industry Readiness & Compliance Costs:** Many Indian industries, particularly MSMEs generate around **110 million tonnes of CO2 equivalent annually**, face significant challenges in market participation.
  - The cost of compliance, including **monitoring equipment, verification processes, and trading infrastructure**, could be prohibitive for smaller players.
  - Technical capacity gaps in **carbon accounting and trading strategies** could disadvantage certain sectors and regions, potentially creating market distortions.
- **International Market Integration Issues:** Aligning domestic carbon markets with international standards while protecting national interests presents complex challenges.
  - **Article 6 negotiations at COP29** highlight **ongoing debates about corresponding adjustments and credit quality**.
  - India must navigate between maintaining sovereignty over its carbon assets and ensuring international market compatibility.
  - The **risk of carbon leakage through international trade** and competitiveness concerns requires careful policy design.
- **Double Counting & Additionality Concerns:** Ensuring credit integrity and preventing double counting remains a significant challenge.
  - Recent criticism of **forestry credits under voluntary schemes**, where up to **30% faced additionality questions**, highlights verification challenges.
  - The overlap between various schemes (**PAT, Renewable Energy Certificate, proposed carbon market**) creates risks of multiple counting.
  - Establishing **clear ownership rights and tracking mechanisms for carbon credits** across different programs requires sophisticated systems and protocols.
- **Regional & Sectoral Disparities:** Significant variations in industrial development and technical capacity across states create equity concerns.
  - States with **higher industrial concentration (Gujarat, Maharashtra and Rajasthan)** may dominate market dynamics.
  - The risk of market benefits concentrating in **developed regions** while imposing **disproportionate costs on less developed areas** requires careful consideration.
- **Technology & Infrastructure Gaps:** Current technological infrastructure may be inadequate for sophisticated carbon market operations.
  - Cybersecurity breaches in international carbon registries highlight technology risks.
    - In January 2011, hackers stole nearly **1.2 million credits from the Czech carbon registry** after issuing a bomb threat to its headquarters.
  - Developing secure, transparent trading platforms, reliable monitoring systems, and verification technologies requires significant investment.
  - The **digital divide across regions and industries** could create operational challenges and market access issues.
- **Market Manipulation & Speculation Risks:** Experience from other markets shows **vulnerability to price manipulation and excessive speculation**.
  - An investigation found that over **90% of rainforest carbon offsets by Verra**, widely used by companies like **Disney and Shell**, may be "**phantom credits**" with little real impact on emissions.
  - Furthermore, **greenwashing**—where companies claim carbon neutrality using questionable offsets—poses **a risk to market credibility and consumer trust**, further complicating the integrity of carbon markets.

**What Measures can India Adopt to Accelerate the Development of Carbon**

## Market?

- **Phased Implementation Strategy:** Adopt a tiered approach starting with **high-emission sectors (power, cement, steel)** where monitoring capabilities already exist under PAT scheme.
  - Gradually expand to **medium-emission sectors** while building capacity in smaller industries.
  - This approach, similar to **China's successful Emissions Trading System rollout**, allows market maturity while building institutional capacity.
- **Integrated Digital Infrastructure:** Develop a unified carbon registry platform integrating **blockchain technology for transparent tracking and trading**.
  - Mandate standardized **digital reporting formats and create APIs** for seamless data integration across different systems.
  - Implement **real-time monitoring and verification systems** using IoT sensors and automated data validation. This digital backbone would reduce transaction costs and enhance market transparency.
- **Capacity Building Ecosystem:** Establish a dedicated **Carbon Market Skill Development Program** targeting industry professionals, auditors, and regulators.
  - Create standardized certification programs for carbon market professionals and verification agencies. Build **industry-specific guidance** and tools for emissions calculation and reporting.
- **Dynamic Price Management System:** Implement a **price collar mechanism with floor and ceiling prices** to prevent extreme volatility while ensuring meaningful carbon pricing.
  - Create a **market stability reserve similar to EU-ETS** to manage supply-demand balance.
  - Develop **sector-specific allowance allocation methods** considering technological capabilities and international competitiveness.
- **Sectoral Integration Framework:** Create sector-specific emission intensity benchmarks and reduction pathways **aligned with India's NDCs**.
  - Develop mechanisms to link **existing schemes (PAT, REC)** with the carbon market to prevent double counting.
  - Establish **clear protocols for project-based credits from sectors not covered under cap-and-trade**.
  - Design specific provisions for hard-to-abate sectors including **alternative compliance mechanisms**. Create industry clusters for collective participation and knowledge sharing.
- **International Alignment:** Develop carbon market infrastructure aligned with **Article 6 requirements from the start**.
  - Create clear frameworks for international credit transfers and corresponding adjustments.
  - Establish **bilateral partnerships for market linking** and capacity building.
- **Regional Development Framework:** Create state-level carbon market cells for **localized support and monitoring**.
  - Develop regional carbon market development plans considering local industrial profiles.
  - Establish **mechanisms for revenue sharing with states** to incentivize participation.

## Conclusion:

**India's carbon market** holds immense potential for sustainable development. By addressing challenges like **market design, data integrity, and regulatory frameworks**, India can create a robust and efficient market. This will drive emissions reductions, attract green investments, and position India as a global leader in climate action.

### **Drishti Mains Question:**

*Discuss the role of carbon trading as a tool for climate mitigation. Analyse its potential with a focus on impact on developing countries.*

## **UPSC Civil Services Examination Previous Year Question:**

## **Prelims**

**Q.1 Which one of the following statements best the term 'Social Cost of Carbon'? (2020)**

**It is a measure, in monetary value, of the -**

- (a) long-term damage done by a tonne of CO<sub>2</sub> emissions in a given year.
- (b) requirement of fossil fuels for a country to provide goods and services to its citizens, based on the burning of those fuels.
- (c) efforts put in by a climate refugee to adapt to live in a new place.
- (d) contribution of an individual person to the carbon footprint on the planet Earth.

**Ans: (a)**

**Q2. Regarding "carbon credits", which one of the following statements is not correct? (2011)**

- (a) The carbon credit system was ratified in conjunction with the Kyoto Protocol
- (b) Carbon credits are awarded to countries or groups that have reduced greenhouse gases below their emission quota
- (c) The goal of the carbon credit system is to limit the increase of carbon dioxide emission
- (d) Carbon credits are traded at a price fixed from time to time by the United Nations Environment Programme.

**Ans: (d)**

**Q.3 Consider the following statements: (2023)**

**Statement-I:** Carbon markets are likely to be one of the most widespread tools in the fight against climate change.

**Statement-II:** Carbon markets transfer resources from the private sector to the State.

**Which one of the following is correct in respect of the above statements?**

- (a) Both Statement-I and Statement-II are correct and Statement-II is the correct explanation for Statement-I
- (b) Both Statement-I and Statement-II are correct and Statement-II is not the correct explanation for Statement-I
- (c) Statement-I is correct but Statement-II is incorrect
- (d) Statement-I is incorrect but Statement-II is correct

**Ans: (b)**

## **Mains**

Q. Should the pursuit of carbon credits and clean development mechanisms set up under UNFCCC be maintained even though there has been a massive slide in the value of a carbon credit? Discuss with respect to India's energy needs for economic growth. (2014)

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