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Indian Carbon Market – An Overview

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Abstract

India's journey towards net zero by 2070 will need several policy initiatives including developing a domestic carbon market and a mechanism for emission trading. This paper gives an overview of the legislative changes undertaken by the Government in the last couple of years, as well as other draft guidelines on carbon pricing and capturing systems. There are several models available in the world, like those present in the USA or EU, and Indian policy draws heavily from the global experience. The paper also addresses several key questions that are raised in various forums and critically examines the arguments put forward in the public domain.

(Keywords: Carbon, Energy Conservation, Emission Trading)

Introduction

The Government of India has recently passed the Energy Conservation (Amendment) Bill, 2022, which envisages a provision to develop an Indian Carbon Market (ICM). After an initial voluntary carbon market phase, the ICM is expected to include a national emission trading system (ETS) for sectors and entities already part of the Perform, Achieve, and Trade (PAT) scheme, including power- and energy-intensive industry sectors. Obligated entities will be given a greenhouse gas (GHG) emission intensity target aligned with India's overall targets, and they can choose to abate and trade emissions allowances.

India is a large country, the world's seventh largest by area[20] and largest by population.[21] However, it also has the dubious distinction of being the third-largest greenhouse gas emitter[22] after China and the USA. The Indian government has committed to net zero by 2070 and updated the Nationally Determined Contribution (NDC) before the COP 27 summit in Egypt.

Recently, India updated its commitments to reduce emissions through a submission to the UNFCCC [1]The updates to India's Nationally Determine Contributions (NDCs) improve upon earlier commitments made in 2016 and were also approved by India's Cabinet [14]

The emissions reduction component of this update includes commitments to:

- Reduce the emissions intensity of its GDP by 45% in 2030 from 2005 levels, up from 33 — 35% from the original NDC.
- Achieve 50% cumulative electric power installer capacity from non-fossil fuel-based energy resources by 2030, up from 40% in the original NDC.

Carbon credit trading scheme in India

The Energy Conservation Bill is an amendment to the law originally passed in 2001. Through the amendment's addition of new clauses, parliament authorized the establishment of a domestic carbon credit trading scheme. Consistent with India's climate goals, the carbon credits will not initially be available for export[7],[17]. The bill's provisions will permit the generation of carbon credits by public and private sector entities in India with the aim of reducing emissions. The carbon credit certificates will be domestically tradeable between companies and individuals, subsequently setting up a compliance market [7],[18]

India's Lower House of Parliament passed the amendment to the Energy Conservation bill in August 2022[16]. The Upper House took it up in December 2022 and subsequently passed it into law, marking a significant step for the set-up of a carbon trading system in India.

Referred to in the bill as a carbon credit trading scheme, the bill effectively authorizes the central government to set up a national carbon credit trading system. A carbon credit, in this context, is effectively a permit to emit a pre-specified quantity of CO2 or other GHG emissions. Carbon credit certificates are earned by entities that are covered under the law by reducing emissions.

While details are still to be finalised, the certificates are tradeable. This permit can also be purchased by entities that emit more than a pre-determined threshold or sold by entities emitting less than the threshold under the rules of the trading scheme[15]. Registered entities will be able to trade credits between themselves, which will create a market for these certificates.

India's Power Ministry has begun the process of developing the carbon credit trading scheme by issuing a draft framework with a request for feedback from various stakeholders [3],[13] The scheme has been enacted with a focus on energy efficiency and CCUS is not formally included at the present time. However, the Ministry of

Power and the Ministry of Environment, Forestry and Climate Change have indicated that the government may have a willingness to include CCUS in the future. In a press release in February 2023, the ministry listed CCUS as a removal activity as part of its finalized list of activities under the Article 6.2 mechanism of the Paris Agreement, which will facilitate the mobilization of

international finance and the simultaneous transfer of emerging technologies through the trading of carbon credits[10]. The Ministry of Power's press release in May 2023, which announced the start of the policy development process for the Indian Carbon Market (ICM), states that methodologies for emissions reductions and removals

will fall under the ICM's mandate[14]

Additionally, India's budget for 2023 mentions green growth as a 'key feature'. The central government has also issued a green bond that will be used to finance green projects. The bond raised nearly US$1 billion in domestic capital markets. These are components of sustainable finance that have surfaced in India in this calendar year[11] While the financing for CCUS is currently not included, the report discussed in section 2.3 below mentions bonds as a financing mechanism that the government could use to raise funds for the proposed subsidies that may be needed for CCUS in India.

NITI Aayog's CCUS Report

In December 2022, a few months after the passage of the Energy Conservation Bill, India's government released a detailed report on CCUS titled Carbon Capture, Utilization and Storage (CCUS) – Policy Framework and its Deployment Mechanism in India [12]. The report was commissioned by NITI Aayog, a think tank affiliated with India's central government and was prepared by Dastur, a consulting organisation. The report is a comprehensive overview

of CCUS, sector-wide emissions, capture and utilisation technologies, potential for CO2 storage, and policy frameworks that would be applicable for India to make carbon capture and storage a viable decarbonisation solution. The report analyses policies in jurisdictions like Australia, Canada, the EU, the United States and Canada and makes recommendations for the Indian context.

For example, the applicability of a tax credit like 45Q in the US and an emissions trading scheme like the EU ETS are discussed. The report also discusses CCUS investments and financing mechanisms in detail with a recommendation to the central government to set up a Carbon Capture Finance Corporation (CCFC) that would provide tax and cash credits for CCUS projects in India.

The report proposes two mechanisms to fund the CCFC; the first is through a clean energy tax or levy imposed on coal, and the second is through government bonds and budgetary support for CCUS-related subsidies [12]. Three types of projects are discussed with the associated subsidies suggested in Indian Rupees (2022). The numbers below are approximate current equivalents in US dollars:

a. CO2 sequestration/storage at US$49/tonne until 2040 and US$36/tonne until 2050.

b. CO2 EOR at US$36/tonne until 2040 and US$29/tonne until 2050.

c. CO2 utilization at US$27/tonne until 2050.

It also mentions that CCUS technologies are essential to reduce emissions from India's hard-to-abate industries. These total emissions are estimated to grow to 2,400 Mtpa by 2050 and CCUS will have to increase to about 750 Mtpa to make a meaningful contribution to India's 2050 climate goals. To build this capacity and develop the domestic market, investments in the range of US$100-150 billion (2022 dollars) will be needed over the next 30 years[12],[19] .

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Carbon pricing and markets

Why is it important to price greenhouse gas (GHG) emissions? Several extreme weather events and shifts in climate—for example, extreme droughts, glacial shrinking, and deforestation—are directly linked with GHG emissions, which are found to be largely responsible for climate change. The loss and damage caused by extreme weather events are not factored into the cost of production. This leads to market failure and presents a necessity to price GHG emissions. All GHG emissions are referred to in terms of CO2 equivalent (CO2e) and pricing them is termed as 'carbon pricing'. A carbon price essentially increases the price of fossil fuels and products that use these fuels, making them more expensive relative to low-carbon alternatives.

There are different mechanisms for pricing carbon emissions. At the national and international level, carbon pricing is driven by factors such as the macroeconomic environment, geopolitics, UN-driven framework, and national policy-driven framework. At the entity level, in addition to the above-listed factors, the other determinants of carbon pricing are company-level marginal abatement cost curves (MACC) and emission mitigation strategy. Pricing mechanisms, apart from an emission trading system, that are adopted from the corporate level to the international level are explained below:

Internal carbon price (ICP): ICP is used by corporations that want to factor in carbon price in their strategic decisions and investments with or without any regulation (for carbon pricing). Companies employing ICP as a tool for designing their strategies are preparing themselves for future carbon prices and risks arising from them and taking relevant decisions today. A CEEW analysis reveals that, in 2021, ICP was employed by 31 companies in India and 1,077 companies worldwide[4]

ICP can be employed in the form of shadow pricing, implicit pricing, internal carbon tax or fee, and internal trading mechanisms [4]. In shadow pricing, a hypothetical price is assigned to a tonne of CO2e emissions, which then helps to assess future risks in the business. If an entity has resorted to emission mitigation measures (including buying offsets), the cost of abatement of per tonne CO2e is the implicit carbon price. Through an internal carbon tax, the entity taxes the emissions made by the business units and uses the revenue to invest in low-carbon technologies. Lastly, internal trading mechanisms work as an emission trading system wherein each business unit of an entity is provided with an emission target and units can trade among themselves to achieve the target cost-efficiently at an entity level.

Voluntary offset market: Voluntary offset market is the project-based offset market driven by private entities. In this market, an emission reduction/removal project is developed to generate offsets (tCO2e) that can then be bought by corporations to fulfil their voluntary targets.

UN-driven offset market1: In 1997, the Kyoto Protocol introduced three global market-based mechanisms, such as the Clean Development Mechanism (CDM) and Joint Implementation (JI). Article 6 of the Paris Agreement introduced similar market mechanisms, including Article 6.2, which allows for direct bilateral cooperation and trading of Internationally Transferred Mitigation Outcomes (ITMOs). Article 6.4 is a multilateral baseline-and-credit system like CDM and JI Track 2 but with more stringent methodologies for additionality and conservative baselines. Existing CDM projects can transition to Article 6.4 if they have an active crediting period, but rules and methodologies for Article 6.4 are yet to be designed. COP27 did not make significant decisions on Article 6.4; so it may take time to come into force. The UN market is part of the compliance market, which helps countries achieve their Nationally Determined Contributions (NDCs).

Carbon Border Adjustment Mechanism (CBAM): The mechanism of pricing carbon emissions varies across jurisdictions, resulting in different carbon prices. The jurisdictions with more stringent emission reduction targets will likely have lower emission intensities and may have higher carbon prices as compared to jurisdictions with lenient targets. This differential may prompt entities to move relevant operations to jurisdictions with more lenient/less restrictive GHG limitations. Over time, this differential can contribute to the loss of industrial capacity and jobs away from high-carbon price jurisdictions to those with lower carbon prices. This phenomenon is called carbon leakage.

As a measure to safeguard their industry against carbon leakage and loss of competitiveness, certain jurisdictions with more stringent rules are planning to implement CBAM. A CBAM is the additional tax that importers will have to pay at the border based on the emission intensity of their products. Jurisdictions like the EU and the UK are planning to implement CBAM as soon as 2026. Others, such as the United States, are also discussing how and whether to impose a CBAM, both as a tool to protect their economies from carbon leakage and/or serve other objectives.

Carbon tax: A carbon tax is a flat tax charged on GHG emissions. Jurisdictions using a carbon tax can decide the structure (e.g., flat, progressive, or industry-specific) and on the price they want to put on emissions (and/or products) based on their emission reduction targets and charge entities based on how much they emit.

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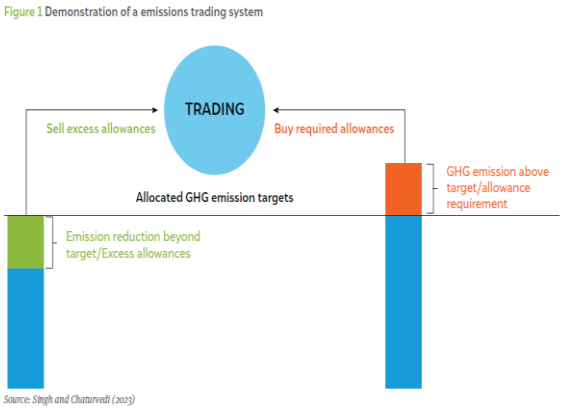
Introduction to emission trading systems

The emission trading system (ETS), also known as the 'cap and trade' mechanism, is a market-based approach for reducing GHG emissions. An ETS by design includes 'caps' or limits set on the total amount of certain greenhouse gases (for instance, carbon dioxide) that can be emitted by the entities covered under the system. Additionally, an important feature of the ETS mechanism is an emission allowance that entitles the holder to emit an agreed volume of greenhouse gases. Emission allowances must be obtained, either from the government or through trade with other entities. In other words, an entity falling short in meeting its compliance targets must either reduce emissions through in-house abatement measures or purchase allowances from the market (Fig I).

Fig I



On the other hand, if an entity reduces its emission beyond its compliance level, it can sell surplus allowances in the exchange market. Therefore, an ETS incentivises emission reduction in industries where it is cheapest to do so, thereby helping achieve a cost-effective reduction of GHG emissions. The carbon price signal from the market drives emission reduction and promotes investment in low-carbon technologies, contributing to the financial and operational decisions within entities. While trading brings flexibility to the system, entities are also allowed to bank their spare or surplus allowances to cover compliance targets in subsequent years. Also, allowing the use of offsets for meeting targets adds to the system's flexibility. However, only a set proportion (as specified by the regulatory authority) of compliance targets can be met through offsets.

Critical elements for ensuring an effective ETS design

The key pre-requisites for ensuring the effective functioning of an emission trading system are (a) transparent, robust, consistent and accurate monitoring, reporting, and verification (MRV) system along with strong enforcement, (b) an ambitious cap in line with Paris Agreement goals, (c) efficient data flow and management, for example, electronic reporting and registry, (d) a reliable and efficient market for trading allowances, and (e) long-term policy signals through markets for addressing future uncertainties.

ETS as a means of providing valuable climate finance

An emission trading system has the potential to generate revenue through auctioning of emission allowances, which can be used to finance climate mitigation and adaptation measures and other beneficial measures, including just energy transition and support for vulnerable communities. For instance, revenue generated in the European Union Emissions Trading System (EU ETS) has been used to fund different renewable energy projects, energy efficiency initiatives, hydrogen steelmaking, and carbon capture, utilisation, and storage (CCUS) projects. The amount of revenue can be substantial, depending on the carbon price and the auction share. For example, the EU ETS generated around $59 billion in 2020 and 2021 alone. Another interesting example is the California cap and trade programme, which includes a fund called California Climate Investments, financed through a portion of the revenue generated from the sale of emission allowances. This fund supports a range of measures, including clean energy programmes, transportation projects, and programmes to support vulnerable low-income communities. Fig II depicts more such examples. Fig II

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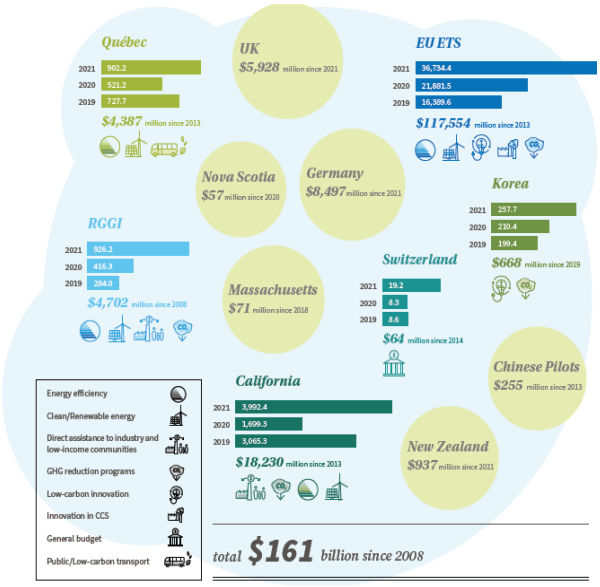
Figure 2 Generating valuable climate finance through auction revenue across jurisdictions



Source: ICAP (2022)

Auctioning is feasible for sectors that can pass-through carbon costs to product prices and are not at risk of carbon leakage. The power sector can be an important sector for auctioning, assuming there is a suitable cost pass-through mechanism to electricity prices. Industrial and residential stakeholders vulnerable to increased energy costs could be protected using a portion of the auction revenue.

Role of ETS in climate policy mix and protecting industrial competitiveness

ETS plays a central role in investment decisions around climate policy as it provides clear price signals, which can, in turn, help to drive investment in low-carbon technologies and encourage more efficient use of energy. Moreover, by putting a price on carbon, ETS can be used to drive reductions across the marginal abatement cost curves (MACC). For instance, if the price in the exchange market is higher than in-house mitigation, companies have an incentive to find ways to reduce their emissions more cost-effectively. For example, a company may invest in energy efficiency measures such as by switching to a lower-emission fuel.

Climate finance from ETS can support investment in emission reduction projects at the extreme ends of marginal abatement cost curves because, in some cases, emission reduction projects may require high upfront investment costs or involve complex technologies. Climate finance from ETS can help to bridge this financing gap.

Additionally, an ETS by design provides assurance of achieving GHG emission targets through a compliance cycle and sanctions. In this system, regulated entities therefore have a clear incentive to reduce their GHG emissions to comply with the cap set, which in turn ensures that overall emissions are reduced to the level needed to achieve the GHG emission targets.

Furthermore, the decision on free allocation under an ETS can be used to protect industrial competitiveness. For instance, a higher share of free allocation can be awarded to sectors at a high risk of carbon leakage. The Korean ETS uses carbon leakage criteria for determining sectors for free allocation and share of free allocation/auctioning in a similar way to the systems in the EU, California, and elsewhere. India could use this approach to protect the international competitiveness of its emission-intensive industries under the ICM-compliance market.

Key Questions

What would be the price of carbon in the ICM-compliance market?

Carbon prices are a function of two variables in an output-based ETS with emissions intensity targets2— the level of overall (cross-sectoral) emissions cap and the marginal cost of abatement across participating entities (designated consumers). These two variables would collectively determine the level of demand and supply of credits in the ICM-compliance market. The more stringent the overall emissions cap, the higher the carbon prices. The lower the cost of abatement across sectors and entities, the lower would be the carbon price.

The lower-cost abatement opportunities are harnessed first across sectors and get exhausted; therefore, the time path of carbon price is increasing in nature, reflecting that is it more expensive to mitigate the next unit of carbon compared to the last one.

Technology breakthroughs lead to lowering the cost of abatement and hence lead to a decrease in carbon prices.

If credits from the offset markets (ICM-voluntary market) are allowed in the ICM-Compliance market, this will imply an increase in the supply of credits and hence a downward pressure on the carbon price in the ICM-Compliance market and an upward pressure on the carbon price in the ICM-voluntary market.

If the ICM credits, be it from the offset market or the ICM-compliance market, are allowed to be imported into the EU ETS or any other international carbon market system, it would lead to a higher demand for ICM credits and, hence, an increase in their prices.

All the points mentioned relate to the long-term price trajectory of carbon, but the short-term dynamics and fluctuations around the trend are impacted by many other factors.

Should financial players be allowed in the market?

As the ICM market evolves, it is reasonable to expect that multiple types of players may participate in the market:

Liable entities: These are typically companies that are regulated under the ETS, often by virtue of their emissions type (i.e., a GHG such as CO2, CH4, SF6, N2O, etc.) and volume, that are obligated to measure, monitor, and verify their emissions. Such entities are also afforded the option to use their carbon portfolios to manage their emissions by either reducing emissions (via on-site abatements) and/or surrendering eligible allowances (secured from the government via allocations or through the secondary market) and/or buying offsets (secured from the market) in order to meet ETS-specified absolute or intensity-based goal(s).

Financial traders: Financial traders are sometimes called ‘speculators’ who manage positions with the intent of making profits, mitigating losses, and managing risks. Like a liable entity, a financial trader is a principal in an allowance or offset transaction. Unlike a liable entity, a financial trader does not have the responsibility to monitor or manage emissions nor to surrender allowances or offsets.

Market-makers: These entities provide market liquidity by posting bids and offers that can be hit and lifted (accepted) by counterparties. Such entities generally are principals in allowance and offset transactions.

Brokers: These players introduce and sometimes facilitate transactions between buyers and sellers. Unlike liable entities, financial players, and market-makers, brokers are agents for trade counterparties (e.g., buyers and sellers) and are generally not principals at risk for transactions. In such cases where brokers clear trades (i.e., provide escrow-like functions where they receive monies from a buyer, allowances/offsets from sellers, and subsequently deliver allowances/offset to buyers and purchase monies to sellers), they may take title to allowances/offsets for only so long as it is necessary to provide such clearing functions.

The roles, responsibilities, and privileges of each of these participants will generally be defined by specified ETS rules and/or the responsible regulatory entity and should be set in accord with considering the overall objectives of the ETS. For instance, California establishes holding limits, which serve to limit the number of allowances that participant players, liable entities, and financial players can hold. Policymakers can also impose restrictions that serve to limit market volatility, arbitrage opportunities, prices, and windfall gains that could otherwise be earned by participants. Moreover, given that the government is risk-averse, it may elect to come in and closely monitor the participation of financial players until such time as it decides that their broader engagement clearly contributes to the realization of underlying ETS goals.

As noted earlier, financial instruments can also play a significant role in the ICM. For instance, in particular, options (including puts and calls), futures contracts, and ‘carbon contracts for difference’ (CCFD) can be used to allow participants to secure the rights to allowances and offsets without having the need to secure title to such instruments on a spot basis. When appropriately included in carbon portfolios, such instruments can be used to hedge/manage risk, reduce volatility, moderate prices, and minimise calls on capital.

Should companies choose in-house mitigation or buy allowances from the carbon market?

Under the ETS, usually, there is a single emissions cap across sectors, while allocation of allowances or targets at the entity-level may be sector- or industry-specific. However, abatement costs are different across sectors as well as across entities within a sector. In the ICM-Compliance market as well, company-level abatement choices (including energy efficiency, fuel switching, and GHG emission reduction technology) would be based on their individual marginal abatement cost

curves. For instance, two entities in the same sector facing similar caps might have different MAC curves wherein one might find abatement more cost-effective than trading in the market and vice versa. An ICM-Compliance market system by default will incentivise best-suited strategy at the firm level through clear signals.

If an entity faces a higher cost of mitigation in-house as compared to the price of emission allowances, it could decide not to implement an emission mitigation strategy in-house and instead would be a buyer of carbon allowances. On the other hand, if mitigating in-house is cheaper than the carbon price, the entity would decide to mitigate in-house and can generate significant revenue by selling allowances. An entity's investment decision should ideally be based on the expected future carbon price that would apply to its investment, considering the time to implement the investment and its operating life, which is likely to be greater than the current market price. Entities have the option to delay implementing emission mitigation options in-house if they are very costly to do so and as emission reduction targets get tighter. Therefore, whether an entity decides to mitigate emissions sooner or later is a significant entity-level strategy that needs to be considered.

Should India implement an emission-intensity-based cap or an absolute emissions cap?

The ICM-compliance market is expected to be based on emission intensity-based targets soon. Emission reduction targets are set based on GHG emissions (tonne of CO2e per tonne of the product). The absolute cap on an entity in this case will therefore be

Prescribed emission intensity (tCO2e/t of product) * total production (in tonnes)

This number also is rendered in tonnes of CO2e like an absolute emission cap.

While the mature ETSs have absolute emissions caps, there are good reasons for the same pattern not being followed in the ICM-compliance market in its initial phase. The choice of absolute versus intensity-based cap has to depend on the context of a country. Emissions are heavily determined by the growth in GDP as shown in[5]. For a fast-growing developing economy like India, it is very challenging to set an absolute emissions cap due to uncertainties related to future economic growth forecasts. Once the GDP growth rate starts tapering with increasing per capita income, the ICM-Compliance market can start shifting towards an absolute emissions cap, with adequate flexibility potentially including market stability measures and adjustments in allocations in line with actual production. Even jurisdictions that employ an absolute emissions cap can provide flexibility in terms of variability in emissions induced by an increase or decrease in production volume. For example, in EU ETS, if an entity's production increases or decreases by 15 per cent of what was forecasted at the time of setting the emission cap, the allocation level can be adjusted.

What could be the role of offset markets in the cap-and-trade market debate?

As noted earlier, allowing liable entities to meet their compliance obligations by surrendering either offsets or allowances can provide increased flexibility and cost relief while also encouraging reductions from sources that are outside of the cap. To help achieve underlying ETS objectives, it is possible to narrowly prescribe the methodologies that can be used to create offsets, the geographic areas (both Indian and international) from which they can be secured, measures that must be used to minimise leakage, and the relative proportion that can be used to satisfy compliance obligations.

The Indian offset market will comprise the compliance offset market and the voluntary offset market. The compliance offset market will consist of an offset market under the government-led ICM (ICM-voluntary) and the UN-driven market under Article 6 of the Paris Agreement. The ICM-voluntary market, in alignment with the ICM-compliance market, will be used by policymakers to help India achieve its NDC. Under Article 6.2, two jurisdictions can come together under an agreement and bilaterally decide the nature of transactions between them with the aim of cost-efficient emission reduction. The Indian government recently published a list of 13 sectors that can generate credits and be transacted under Article 6.2. Similarly, offset trading can also happen under Article 6.4 and the rules for this trading are being finalised.

The voluntary offset market, on the other hand, is driven entirely by private players including project developers, accreditors, verifiers, and corporations seeking to meet their voluntary targets and local communities. The voluntary offset market should work independently of the compliance market.

The share of offsets (from the ICM-voluntary market or Article 6) that will be allowed for surrendering against compliance targets under the ICM will entirely be a policy choice. However, offsets are expected to play an important role in accelerating the pace towards net-zero targets at the country level. Therefore, the government's decision on the potential quota of offset usage in the ICM-compliance market will be crucial for market players.

Credits from the ICM-voluntary market will essentially increase the supply of credits in the ICM-compliance market. How big or small this supply is in an absolute sense and to what extent it will impact the dynamics of carbon price within the ICM-compliance market will be determined by the magnitude of offsets allowed in the ICM. A decision to import up to 5

per cent of ICM-voluntary market credits in the ICM-Compliance market would have a much lesser impact on carbon price within the ICM-Compliance market as compared to a higher value of 20 per cent.

Conclusion

India currently is on course to achieve its net zero target by 2070. However, the government has hastened the proof of reducing GHG emissions, and the current introduction of the carbon trading scheme will greatly facilitate the process. Some key questions remain, and thus, further consultations with stakeholders are required.

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