DISCUSSION
PAPER

INDIA GHG PROGRAM
Promoting profitable, sustainable and competitive businesses.

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CARBON MARKETS IN INDIA

EXPLORING PROSPECTS & DESIGN CONSIDERATIONS

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About India GHG Program

The India GHG Program led by WRI India, Confederation of India Industry (CII) and The Energy and Resources Institute (TERI) is an industry-led voluntary framework to measure and manage greenhouse gas emissions. The programme builds comprehensive measurement and management strategies to reduce emissions and drive more profitable, competitive and sustainable businesses and organizations in India. More program details could be accessed at www.indiaghgp.org

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Executive Summary

Even with the Paris Agreement, there exists a significant gap in the current reduction commitments and the efforts and investments required to achieve the target of limiting global temperature increase at 1.5 to 2 degrees Celsius. The dynamic ratchet mechanism of the Paris Agreement provides a platform to raise ambition progressively and thus meet this target. However, considering the lock-in period for the most energy intensive economic activities such as power generation, production and manufacturing and built infrastructure, there is a great urgency to act now. In this scenario, putting a price on the right to emit is a key economic instrument to facilitate necessary shifts in decision making, to incentivize low carbon technologies and investments and to encourage innovation, thus putting the world on a low carbon pathway.

As the salience of carbon pricing becomes evident, we are witnessing an increased adoption of carbon pricing instruments such as emissions trading schemes and carbon taxes. While there is a pressing need to ramp up the pace, it is important to ensure pricing instruments deliver reductions while maintaining environmental integrity, compensating for losses in competitiveness and productivity and minimizing leakages. Carbon taxes are relatively straightforward, in that they price emissions at a fixed rate. In spite of this simplicity, political willingness and the inability to predict and track consequent reductions have made carbon taxes less popular, especially in developing countries like India, where political narratives still look at climate change and development as competing priorities. Further, taxes are also vulnerable to challenges of leakages and loss of global competitiveness for export-oriented sectors. In this scenario, carbon markets, in the form of emission trading schemes or cap and trade systems, are emerging as relatively viable instruments to create a marketplace for emission reductions, thus achieving predictable reductions while allowing space for managing stakeholder interests and expectations.

At least four new carbon market initiatives[1] have emerged since 2016 and carbon markets are under consideration in almost eight more jurisdictions[2]. As of early 2018, 21 carbon market initiatives are in place representing 15% of the global emissions (ICAP 2018). In keeping with these global trends, India is actively considering a cap and trade scheme to accelerate progress towards its Nationally Determined Contribution (NDC) commitments. To this effect, India now an implementing participant to the World Bank's Partnership for Market Readiness (PMR), which supports countries to assess, prepare, and implement carbon pricing instruments in order to scale up greenhouse gas mitigation (PMR 2018). Within its proposal, India seeks to strengthen and broaden its existing market mechanisms of PAT and REC, while developing and implementing a carbon market pilot by 2020.

[1] British Columbia (Canada), Australia, Fujian (China), Ontario (Canada), Washington state (US)
[2] Considering Mexico, China, Brazil, Massachusetts (US), Colombia, Chile, Nova Scotia and India

About this Report

As India joins the global momentum on carbon pricing, there is a clear need to explore the avenues for implementing a domestic carbon market in India. This research paper is an exploratory study to answer some of the essential questions such as – what role a carbon market can play in helping India achieve its NDC targets and raise ambition over time, what are the key lessons that existing global carbon markets and India's own market mechanisms hold for a future mechanism, and what are the key considerations for a carbon market in India. This research aims to serve as a first step in defining the modalities of a locally relevant market-based carbon reduction mechanism to help India achieve the current NDC targets as well increase climate ambition over time. Based on an objective study of global carbon markets and understanding of the Indian economic and policy landscape, this paper investigates the case for a carbon market in India, the outlook on a potential Indian Market identifying the enablers, challenges and key considerations. This research paper also lays out the important design decisions to be made, the essential stakeholders and actors to be involved and the basic framework required for the operationalization of an effective carbon market in India.

The Case for a Carbon Market in India

Even with low per capita emissions of 2.4 tCO2 in 2014, India is highly vulnerable to the impacts of climate change. With India's development priorities and the need to create jobs, mitigate poverty, improve public health, and ensure energy security, there is expected a sharp increase in absolute emissions in the business as usual scenario over the next decade. This coupled with India's vulnerability creates a strong case for India to develop a low carbon pathway for its growth and economic development. In this scenario, a potential carbon market can play a key role in incentivizing low carbon technologies and practices while providing flexibility and cost efficiency. Based on the desk research, we find that a potential carbon market can help facilitate **cost-efficiency** by encouraging reductions from sectors with low marginal costs, enhance **political feasibility** for climate change mitigation through development of a market tailored to accommodate multiple priorities and through active engagement with various stakeholder groups, **build on existing experience with market mechanisms** and integrate them to bring out greater efficiencies while providing **long-term incentives to move towards low carbon economic activities.** This would help lower India's climate vulnerability and public health costs.

Such a carbon market would help **create synergies** across different policy measures for climate change mitigation, by creating a common marketplace for emissions trading through development of a meta-registry in India, and thus help India **enhance its ambition**, in line with the Paris Agreement. and reductions. Further, designing a domestic carbon market that aligns with global best practices on MRV and environmental integrity can enable India to **link its domestic market** with other reputed and robust global carbon markets, thus giving regulated Indian entities greater flexibility to

reduce their emissions, giving them access to cost-effective credits to satisfy their emission reduction obligations, as well as provide greater liquidity to reductions from India. Furthermore, developing a carbon market that allows credits to be purchased from emission reduction activities undertaken by the **Micro, Small, Medium Enterprises (MSME) sector** would not only **incentivize** the sector to improve their energy and resource use but also, in the long-term build capacity on reduction options and MRV best practices and pave the way for low carbon growth in the sector.

Implementation of a carbon market in India also has the potential to **boost finance and low carbon technology inflows by increasing the demand for low cost reduction opportunities**. A carbon market can also help **accelerate India's progress on Sustainable Development Goals (SDGs)** especially on Climate Action (Goal 13), Affordable and Clean Energy (Goal 7), Responsible Consumption and Production (Goal 12) and Sustainable Development (Goal 9). Moreover, with its positive spillovers, a carbon market can also enhance performance on Sustained Inclusive and Sustainable Economic Growth (Goal 8) through improvements in resource efficiency, Industry Innovation and Infrastructure (Goal 9) through reduction in carbon footprint of per unit value added, and Good Health and Wellbeing (Goal 3) through reduction in mortality due to household and ambient air pollution.

Finally, a carbon market in India would demonstrate India's commitment to climate change mitigation and thus has the potential to **elevate India's role** on the global climate platform. This would mean a greater influence in negotiating international agreements that alleviate challenges such as climate finance mobilization and technology transfer, faced by developing countries. The overall feasibility of a carbon market would however depend on the relative costs and benefits from the program. Some of the challenges that would have to be considered and addressed include

- **loss of competitiveness and possible carbon leakage** due to increases in production and manufacturing costs for regulated entities
- **inequities** that often unfairly impact smaller or disadvantaged firms
- **high implementation and administrative costs** given the current level of capacity and climate action maturity prevalent in India
- **high costs related to development of robust monitoring, reporting, verification and trading mechanism** to ensure environmental integrity, in the absence of a meta registry or mandatory GHG reporting at present
- ensuring that there is no **double counting of emission reductions**
- **ensuring compliance and market security**

Building Blocks for Carbon Market Development

I. Defining the Objectives:

As a first step towards the development of a carbon market, it is recommended that targets and goals be clearly defined at the outset, and communicated in measurable, quantifiable terms – including long-term level of reductions that the carbon market aims to achieve, compared to the business as usual scenario, by when, and the rate of reductions or reductions pathway.

II. Developing the Institutional Framework:

Development of an institutional framework allocates legal, regulatory and administrative responsibilities while considering core competencies of the institutions involved, minimizing transactional costs and ensuring adequate oversight and operational ease. The proposed institutional framework allocates these responsibilities across Regulatory, Administrative and Legal Authorities. The key responsibilities envisaged are as follows:

a. *Regulatory Authority* – Governance, oversight and development of the policy, guidance and standards of implementation for the carbon market through due legislative and representative processes, empanelment of accreditors for verification, and regular and inclusive stakeholder engagement
b. *Administrative Authority* – Oversee core implementation of the carbon market by coordinating across stakeholders, managing the technical platform, providing implementation support and ensuring the standards and guidelines are followed, building capacity and ensuring monitoring, reporting and verification processes as defined are followed by the various regulated entities.
c. *Legal Authority* – Issue directives, enforce regulation and ensure compliance by enforcement of penalties and carrying out legal proceedings in cases of conflicts and grievances, hold the various stakeholders including the regulatory and administrative bodies accountable and adherent to the democratically legislated policies.

III. Defining Market Principles:

While the design of a carbon market would be developed based on the goals and the policy parameters, it is also important to define key operating principles such as climate change mitigation, environmental credibility, least cost reductions, local relevance, stability, accountability, transparency, cost effectiveness, and administrative ease in order to ensure a fair and effective carbon market.

- With the primary objective of the carbon market being **Climate Change Mitigation**, the ability of a program to affect lowering of greenhouse gases covered forms an essential criterion to assess the success of the program.
- **Environmental Credibility** would depend on the ability of a market to create real, measurable and verifiable emission reductions, while minimizing leakages to other regions or gases.
- Further, the carbon market must ensure that the design does not compromise **Administrative Ease and Cost effectiveness**, which hampers the sustainability and efficiency of a market.
- An effective carbon market would encourage **Least Cost Reductions** by providing flexibility on when, where and how emission reductions take place.
- Clear long-term goals and reduction pathway would enhance **Predictability** of the carbon market thus allowing regulated entities to plan future emission reduction investments effectively.
- Strong Monitoring, Reporting and Verification (MRV) Framework and Compliance features along with a compatible registry design ensure the **accountability and transparency** of the system.
- For a market to be sustainable, it must also allow for mechanisms that offer **Stability** from external economic shocks.
- Finally, for a carbon market to function effectively and help meet the program objectives, the precise features of each system must be tailored to the jurisdiction (**Local Relevance**), while also making provisions for **International Compatibility**.

These principles also serve as key parameters against which the success of a carbon market may be assessed.

IV. Designing the Market:

Designing a carbon market for India would involve at the outset a limit or a Cap on the selected greenhouse emissions in one or more sectors (Scope) of the economy, and issuing of tradable allowances (**Allocation**) to the regulated entities, companies or facilities depending on the **Point of Regulation**, not exceeding the level of the cap. Allowances can be allocated for free—based on a combination of historical emissions, output, and/or performance standards—or auctioned. Each allowance typically corresponds to one unit of emissions (1 tCO2e). At the end of the compliance period, the regulated entities would be required to surrender one allowance for every tonne of emissions for which they are accountable. Participants who hold more allowances than they have emitted during the period can sell them, or bank them for future use; entities that have exceeded the cap and require additional

allowances may buy them on the market or pay the penalty for underachieving the target. The trade or exchange of allowances between those with surplus and insufficient allowances, generates a price on allowances (**Carbon Price**). Finally, carbon markets also involve setting up a robust monitoring, reporting and verification framework (**MRV Framework**) to ensure accurate and genuine accounting of allowances along with enforcing mechanisms such as penalties and naming and shaming to ensure **Compliance** and discourage defaults. Optionally, markets also include **Price Stability Mechanisms** such as price ceilings and floors as well as **Flexibility Mechanisms** such as offsets, banking and borrowing choice to regulated entities for reducing emissions at the least cost possible.

V. Stakeholder Engagement:

Effective stakeholder engagement would begin with a comprehensive **Stakeholder Engagement Plan** covering workshops, roundtables, and ongoing communication and dialogue with various stakeholders including industry (regulated as well as nonregulated), experts, auditors, registry operators, accreditation agencies, academics, civil society as well as relevant government ministries. These engagement avenues would help seek inputs on the target, reduction pathway, institutional framework, design and supplementary policy support required, discuss and debate operational guidelines and requirements, as well as technology options available and develop consensus on the best available options for the market. Additionally, it is also important to ensure structured engagement with stakeholders is carried out during the implementation phase and at regular intervals to seek feedback on operational challenges faced by stakeholders and address issues through design improvements in subsequent phases. Finally, it is also strongly recommended to document stakeholder engagement proceedings and make it accessible to the larger public to build in transparency and accountability in the process.

VI. Building Capacity:

Lack of adequate capacity across participants as well as the larger set of stakeholders can substantially undermine even the best designed carbon market. A robust capacity development plan is thus required to train entities involved for implementation and operational aspects such as monitoring, reporting and verification, as well as to trade allowances and participate effectively in auctions, if conducted. A pilot carbon market program preceding the final implementation is also a crucial step in building the initial operational capacity across participants and ironing out issues based on their feedback, thus preparing the industry for the carbon market through hands-on experience. Further, additional capacity building efforts and handholding would be required to ensure participants are duly prepared to take reduction efforts and comply with market requirements.

VII. Learning by Doing:

To ensure long term sustainability and relevance of a carbon market, the market must improve on the existing design and evolve over time with economic and technological developments. An independent, objective review of the carbon market at periodic intervals is essential to take stock of its progress against the set targets and objectives, to identify challenges and inefficiencies and seek feedback. Such a review may also reveal measures to reduce costs.

Key Design Considerations

Based on the understanding of the Indian context, as well as domestic and global experience on market mechanisms, some of the key design considerations for a carbon market in India include -

1. *Importance of Stakeholder Engagement* – The involvement of and engagement with stakeholders who would be directly and indirectly affected by the program is increasingly seen as a vital step to implementing a program that is accepted and supported by the relevant parties. These may include industry (regulated as well as nonregulated), especially the MSME sector with higher resource constraints and lower capacity level, high emissions sectors as well as export-oriented sectors to ensure their challenges are given due consideration in the development process. Other stakeholders include experts, auditors, registry operators, accreditation agencies, academics, civil society as well as relevant government ministries. Adequate engagement with stakeholders provides an opportunity for policymakers to seek feedback from regulated entities on experience in markets as well as on design parameters planned for the program under consideration. The process also generates buy-in from critical stakeholders early in the process and also helps develop capacity on the modalities and procedures of the market.
2. *Cap Setting* – One of the key determinants of the market price of carbon is the level of ambition or the emissions cap for the market. When the level of ambition is low, or not at par with the level of economic activity, targets are often overachieved thus increasing the supply of reductions and lowering the trading price of carbon, and undermining the credibility of the market and trust in the long-term sustainability of the market.
3. *Piloting and Phasing in* – Implementing a carbon market requires extensive preparatory phase to collect and analyze data, develop the necessary legal and institutional framework, and develop the modalities required for the market implementation. Carbon market pilots or simulations allow all parties to test policies, systems, and institutions; build capacity; and demonstrate effectiveness. An alternative or addition is to gradually phase-in some design features of the market to allow for learning-by-doing, easing the burden on institutions and sectors and progressively make the program more comprehensive, ambitious and stringent

4. *Periodic Review and improvement* – A periodic review at the end of a compliance period acts as a method to analyze and evaluate the effectiveness based on real data and thus improvise over time. A successful review must be conducted by an independent agency to allow for non-partisan and fair evaluation of the programs successes and shortcomings, thus also ensuring transparency and accountability.
5. *Providing Flexibility* – The use of price floors, ceilings, and other price stabilizing policies have proven to be key design elements to increase programmatic stability and confidence in the program by accommodating for exogenous shocks. Further, mechanisms to borrow from future compliance periods or bank allowances for future compliance periods help smooth uneven periods and large variations in demand and supply of allowances.
6. *Providing Predictability* – Long-term (10-15 year) emission reductions pathway with interim goals provides businesses with the predictability on their future obligations and hence allows them to comply and facilitate least cost reductions within their operations.
7. *Building Stability* – In order to ensure reduction activities have inherent minimum monetary value, a floor price of allowances is determined for some markets. This ensures that at minimum, reduction efforts of companies would have a predetermined value and trading can only happen at prices at or above the floor price. In order to protect the market from such temporal shocks, a ceiling price is often implemented. A market reserve acts similar to a price collar (floor and ceiling), where the regulator adds or removes allowances into or from the market in when market prices spike or dip beyond a predetermined threshold.
8. *Avoiding Leakage and Double Counting* – Differential costs of compliance and loss of competitiveness affecting certain sectors may cause them to move operations outside the regulated region, thus simply shifting emissions elsewhere or in other words causing carbon leakage. This can be duly addressed by incorporating special provisions such as tax reliefs, higher thresholds, free allocation of allowances, compensatory distribution of auction revenues or provision of subsidies linked to compliance, in order to avoid leakage. Such provisions could be specifically targeted to vulnerable and leakage prone sectors. Similarly, clearly defined MRV and robust accounting would be critical to ensuring no double counting and thus the environmental credibility of the carbon market.
9. *Ensuring Compliance* – In order to have a sustainable balance between supply and demand along with trust in the market and value of allowances, it would be important that the Indian carbon market define penalties high enough to drive compliance, and ensure the enforcement of such penalties in cases of default. Additionally, a carbon market in India can implement such interim targets to ensure compliance at the end of the compliance cycle.
10. *MRV and robust registry* – While a robust MRV would add to the operational and transactional costs for a carbon market in India, especially considering a relatively lower percentage of entities currently measuring and reporting their emissions and the level of capacities, it is critical to the environmental credibility and the final value of emission allowances, to have a

strong MRV protocol. Additionally, it would be important to ensure the registry offers transparency, security and flexibility to facilitate enlisting and transfer of allowances across entities. Investing in a technologically robust registry that meets international standards is also important towards a potential linkage with global or regional carbon markets in the future

11. *Policy Package/Enabling Policies* – A carbon market policy in India should be built as part of an overall enabling policy package. Such a policy package would support regulated entities by compensating for losses in competitiveness and incentivizes low carbon technologies. Furthermore, such a policy package should also include institutional measures to ensure greater transparency and accountability from the carbon market, as well as help build awareness and capacity on climate change mitigation.

Way Forward

A carbon market in India can not only complement the existing emission reduction frameworks but can also help meet other policy objectives such as improvement in energy security, reduction in health costs and climate vulnerability as well as sustainable economic development. While this paper serves as a first step towards exploring the implementation avenues for a carbon market in India, greater research is required to develop policy recommendations and design features for the implementation of a carbon market in India

Introduction

In December 2015, at the 21st Conference of the Parties (COP 21) to the United Nations Framework Convention on Climate Change (UNFCCC), world leaders reached an agreement to keep the global average temperature increase to well below 2 degrees, while pursuing efforts to hold the increase to 1.5 degrees (UNFCCC 2018). The Paris agreement, currently representing 88 percent of the global emissions (WRI 2018), came into effect in November 2016. Through their Nationally Determined Contributions (NDCs), the Agreement encouraged countries to make individual, voluntary nationally determined commitments to contribute to the global goal. The countries also committed to accelerate and intensify actions and investments needed for a sustainable low carbon future.

Meeting these NDC commitments will require significant shifts in investment decisions and accelerated adoption of low carbon technologies. Consequently, there is an urgent need to identify and implement initiatives that bring about these shifts and create an environment that facilitates least cost reductions and encourages technological innovation. These priorities must be balanced with domestic growth priorities and local circumstances, in an economically and socially equitable manner.

Carbon Pricing and Paris Agreement

Carbon pricing instruments, which put a price on the right to emit greenhouse gases, are increasingly emerging as key enablers for this transition. While 81 Nationally Determined Contributions include carbon pricing instruments (World Bank 2017b), the Paris Agreement also reflects the increasing role of carbon pricing in meeting global climate goals. As noted in paragraph 137 of the decision text, the Paris Agreement recognizes the effectiveness of carbon pricing policy instruments in incentivizing emission reductions (UNFCCC 2015). The text especially recognizes the role of voluntary cooperation among Parties involving the use of internationally transferred mitigation outcomes (ITMOs) to demonstrate target achievement and allow for higher ambition in their mitigation and adaptation actions (UNFCCC 2015). Article 6 of the Paris Agreement further defines a mechanism that aims to "contribute(s) to the mitigation of greenhouse gas emissions and support sustainable development," by incentivizing and facilitating mitigation actions by public and private parties to "deliver an overall mitigation in global emissions,", where a share of proceeds from this mechanism will be used to assist developing countries in adapting to the impacts of climate change (UNFCCC 2015b). While the exact nature of ITMOs has not yet been defined, they aim to provide a basis for facilitating cross-border cooperation through international, national and subnational carbon pricing initiatives.

Global Trends

In line with the overall outlook on carbon pricing, the take up of pricing instruments globally has been rising. According to the 2017 edition of the State and Trends of Carbon Pricing by the World

Bank, 42 national and 25 subnational (including cities, states and subnational regions), are using some form of carbon pricing in their efforts to reduce emissions (World Bank 2017b). Overall, carbon pricing instruments now cover about 8 gigatons of carbon dioxide equivalent (GtCO2e) or about 15 percent of global emissions, with prices ranging from less than US $1 per ton of CO_2e to US $140 per ton of CO_2e (World Bank 2017b). It is also critical to note that, of these, eight new initiatives have emerged since 2016, and at least two more are expected to be implemented in 2018, thus demonstrating the global momentum on carbon pricing.

An increasing number of these jurisdictions are approaching carbon pricing through implementation of emission trading schemes or carbon markets. Carbon markets, by definition, create a marketplace for greenhouse gas emissions, limit the total emissions and encourage least cost mitigation. As of September 2017, carbon markets covered about 10 percent of global GHG emissions and two-thirds of the carbon pricing initiatives (World Bank 2017b). With four new carbon markets since 2016 and eight more expected to be launched in the near future, carbon markets across developing and developed economies alike are poised to play a significant role in facilitating voluntary cooperation mentioned within the Paris Agreement. The creation of carbon markets and their linkage can create a platform for the transfer of mitigation outcomes from jurisdictions, where reductions are at lower cost and thus also facilitate transfer of financing for reduction activities. Accordingly, emerging markets are increasingly adopting carbon markets over a carbon tax.

Indian Context

Even with low per capita emissions of 2.4 tCO2e in 2014 (WRI 2018), compared to the global average of about 6.3 tCO2e (WRI 2018b), India is the fourth largest GHG emitter globally (WRI 2018b). It is one of the largest emerging economies, and given the country's growth agenda and the imperative for infrastructure development, industrialization, and poverty reduction, India's per capita emission intensity as well as absolute emissions are set to increase in a business as usual scenario. However, India has committed to climate action and is Party to the United Nations Framework Convention on Climate Change (UNFCCC) along with landmark agreements such as the Kyoto Protocol, as well as the Paris Agreement (UNFCCC 2018b). In its NDC, India has committed to reducing the emissions intensity of its gross domestic product (GDP) by 33-35% by 2030 as compared to 2005 levels, achieving 40 percent cumulative electric power installed capacity from non-fossil fuel-based energy resources by 2030 and creating an additional carbon sink of 2.5 to 3 billion tons of CO2 equivalent through additional forest and tree cover by 2030 (Government of India 2015).

With an aim to prioritize policies that yield greater decarbonization without compromising the developmental imperatives of the country, India has implemented a variety of measures. These include a tax on coal consumption, feed-in-tariffs, and market-based instruments such as Renewable Energy Certificate (REC) to meet respective Renewable Purchase Obligations and plant level energy efficiency improvements through the Perform-Achieve-Trade (PAT) scheme. India's action plan also states complementary measures such as awareness building, energy efficiency labelling of appliances, and targeted research and development (R&D) (Government of India 2015).

Additional to these measures and in response to India's Market Readiness Proposal (MRP), the World Bank's Partnership for Market Readiness (PMR)[3] announced an $8 million grant in March 2017, for India to prepare for and pilot the use of carbon pricing instruments to help reduce to greenhouse gas (GHG) emissions (PMR 2017). Within its draft MRP, India has sought the grant to:

- assess the barriers for effective implementation of existing schemes like PAT and REC
- increase their market liquidity, improve their design and enhance preparedness for scaling-up these schemes
- develop and pilot a new Market Based Mechanism (MBM) by 2020
- develop and pilot a meta-registry to synthesize the existing market mechanisms

Thus, along with its existing efforts, it is evident that India is poised to scale up market-based emission reduction instruments in the coming years.

Need for this study

Considering India's emission reduction goals and reduction measures, along with the Paris Agreement and the provisions for market mechanisms and ITMOs thereof, there is a clear need to explore and analyze the avenues for implementing a domestic carbon market in India. This study, thus, seeks to answer key questions around the potential of a carbon market in India, such as:

- Is there a case for a carbon market in India
- How can India develop a stable carbon market that has potential for international linking
- What are the lessons for India from carbon markets implemented globally
- How have previous market mechanisms fared in India
- What are the global carbon market trends and outlook
- What is the outlook of the Indian industry on carbon market prospects and design
- What prospective role can a carbon market play in India
- What opportunities and challenges would a carbon market in India be faced with
- What are the key design considerations for a carbon market in India

This research paper is an exploratory study to answer these essential questions and aims to serve as a first step in identifying the considerations and modalities of a locally relevant market based carbon reduction mechanism to help India achieve the current NDC targets as well increase climate ambition over time. By studying global carbon markets while keeping in mind the Indian context, this research would help highlight the potential enablers and challenges for a carbon market. This research paper would also lay out the important design decisions to be made, the essential stakeholders and actors to be involved and the basic framework for the operationalization of a carbon market in India.

[3] The PMR is a World Bank Group-led multi-donor fund to support countries in preparing and implementing climate change mitigation policies, including carbon pricing instruments and as a platform to share lessons and work together (PMR 2017)

Approach

In order to answer the questions laid out, the research uses a combination of primary and secondary research to investigate the rationale for policy makers to consider a carbon market in India and the implementation avenues, prospects and design considerations for a potential carbon market in the current Indian context.

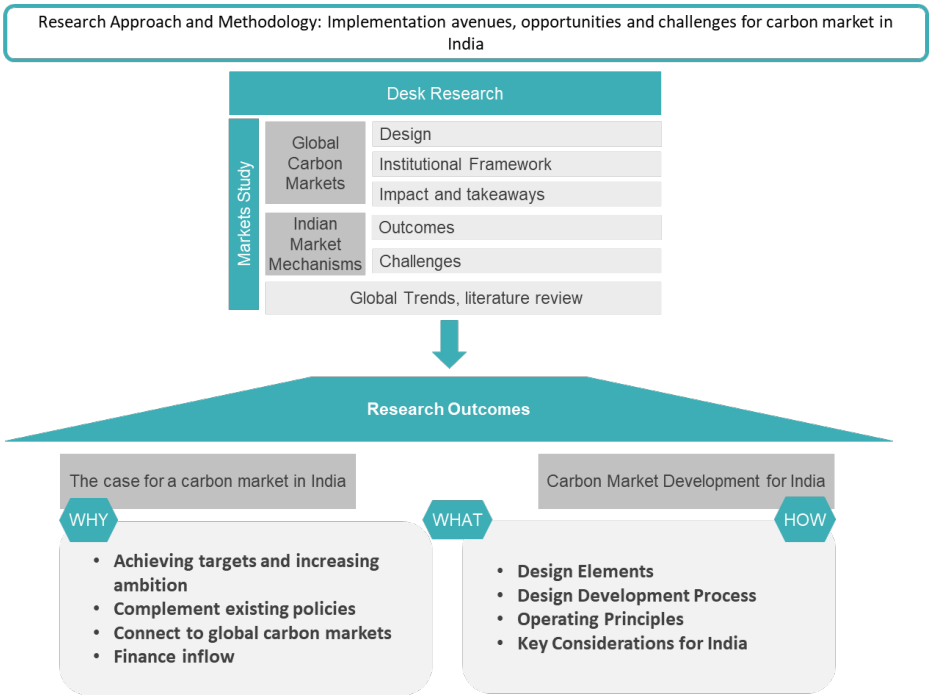

Figure 1Research Approach and Outcomes

This paper begins with an investigating the rationale and prospects for a carbon market in India – does a carbon market offer additional advantages over other policies, what is the Indian context and what are the priorities, whether a carbon market would offer significant efficiencies or flexibilities considering India's domestic priorities and climate vulnerability, the overall role a carbon market can play or opportunities it can offer to synthesize India's existing efforts and finally the barriers and costs of implementing a carbon market in India. Next, we look at existing market mechanisms in India, their current status, successes and challenges as well as global carbon markets and trends to derive key learnings for a potential carbon market implementation in India. As a first step towards development of a potential carbon market, we prepare a preliminary institutional framework and the key steps involved in the development of an effective carbon market in India, the market principles and the design decisions to be made. Finally, the paper outlines the key design considerations for a carbon market in India drawing from the global and domestic experiences.

Prospects for a Carbon Market in India

Why Carbon Market

As we aim to move towards a low-carbon future and achieve the goal of holding the increase in the global average temperature to well below 2 degrees above pre-industrial levels, there is a clear need of initiatives that bring about a shift in investment patterns and behaviors and incentivize innovation in technology and financing. Policies will be needed that achieve this change in ways that reflect local circumstances and create new economic opportunities as well as manage competitiveness and compensate for inequities. For many jurisdictions, GHG carbon pricing is emerging as a key driver of this transformation. By aligning profits with low-emissions investment and innovation, carbon pricing can channel private capital in low carbon technology and products, drive innovation and mobilize greater uptake and knowledge of mitigation options.

Putting a price on carbon emissions makes emitting costlier, thus making clean energy cheaper and more profitable, allows energy efficiency to earn a greater return and makes low-carbon products more competitive. A growing number of firms and investors are advocating carbon pricing policies from government, and applying an internal carbon price to guide investment in advance of government policy to that effect (CPLC 2018). Carbon pricing, as part of a comprehensive policy package including capacity building, a robust regulatory framework and the alignment of right incentives, can harness markets to lead a low carbon growth pathway.

Two kinds of carbon pricing policy instruments exist to drive emission reductions: carbon markets (or emissions trading) and carbon taxes. The core principle of these economic instruments lies in internalizing the cost of carbon externalities as they:

- Use the 'Polluter Pays' principle – Put a cost on emitting greenhouse gases, thus penalizing emitters
- Create Least Cost Reductions – By allowing the market to determine where emission reductions occur, and how, carbon pricing instruments ensure that emission reductions occur at the least cost
- Create Dynamic Efficiency – Encourage progressive mitigation action by emitters to reduce their costs thus stimulating innovation in technology
- Generate a Double Dividend – Generate revenues that may be utilized to invest in climate action, support competitiveness, incentivize low carbon technologies, or reduce cost inequities.

While the effects of carbon taxes and market programs are identical in theory, some practical differences exist between the two policy instruments. In terms of implementation, a carbon tax is

simpler than a cap-and-trade program. A tax does not require the government to allocate or conduct auctions for emissions allowances, or monitor the trading of allowances, and regulated entities do not need to participate in auctions or secondary markets for allowance trading. Further, regulated entities might prefer a tax approach due to the predictability of the carbon costs, which makes business planning easier.

However, with a carbon tax the government sets the price and allows the market to determine the quantity of emissions, whereas with emissions trading the government sets the quantity of emissions and allows the market to determine the price. That is, in case of an carbon tax, while the price on emissions is known, there exists considerable uncertainty on the actual emissions reduced. In contrast, an emissions trading mechanism allows for certainty in emission reductions achieved, making it an attractive policy instrument to governments. Also, hybrid systems, which combine elements of both approaches i.e. which define a price floor and ceiling reduce price volatility, thus providing more certainty to regulated entities. In addition, allowance allocation methodologies adopted can materially help manage the distributional and leakage effects of emissions trading to support vulnerable sectors. Furthermore, carbon markets are ideally suited for GHGs, which are pervasive and where the timing and point of emissions does not significantly affect the primary environmental impact of concern, climate change. Overall, the flexibility provided by carbon market design allows for the market to be tailored to local circumstances, thus also making politically more feasible than taxes. Finally, domestic or subnational carbon markets can be linked to international or regional emission trading schemes or offset mechanisms, thus facilitating international cooperation, achieving least cost reductions, encouraging greater reductions and creating financial inflows where needed.

Indian Context

With a population of 1.3 billion (World Bank 2018) and an annual GDP growth of 7% in FY 2017 (World Bank 2018), India is the one of the fastest growing economies of the world, and is projected (Fensom 2017) to continue this pace of growth until 2030. The key factors contributing to this pace and projection are its young demography (and hence, low dependency ratio, healthy savings and investment rates, and increasing integration into the global economy (CIA World FactBook 2018). However, India's growth pathway also requires creating 10 million to 12 million jobs for the young population every year (Dubash 2015), lifting 180 million people out of poverty, providing basic healthcare, sanitation and drinking water to 480 million, and providing access to electricity for 300 million Indians who lack these basic services, while building the new infrastructure which is required to meet these needs.

In 2030, India is projected to remain the second most populous country and the third largest – economy of the world (PWC 2017). This projection corresponds at least a doubling of per capita energy consumption and of per capita emissions to 2.67 metric tons (MOEFCC 2009). This increase in India's emissions intensity coupled with the inevitable increase in its absolute emissions would contribute significantly to global emissions and climate change. Moreover, with 60% of the

population vulnerable to climate change impacts, a high carbon growth pathway stands to threaten food security, economic growth, health and make poverty reduction more difficult.

Recognizing these realities in the light of its growth priorities and global responsibility, India has taken several constructive steps in mitigating its emissions. In 2008, India launched the National Action Plan on Climate Change (NAPCC) with eight ambitious missions that cover a wide range of sectors including energy, industries, construction, water, agriculture, and ecosystems. The NAPCC provides a long-term policy package to tackle both mitigation of climate change as well as reducing climate change vulnerability through adaptation initiatives. At the Copenhagen Accord, in 2009, India pledged to reduce its emissions intensity of its GDP by 20-25% by 2020 compared to 2005 level (Government of India 2015). Further, in its Nationally Determined Contributions at Paris, India has committed to reducing the emissions intensity of its GDP by 33-35% by 2030 (compared to 2005 levels), and increasing the share of non-fossil fuel based energy to 40%, while creating an additional carbon sink of 2.5 to 3 billion tons of CO2 equivalent through additional forest and tree cover by 2030.

However, given the magnitude of India's climate vulnerability and the dynamic ratchet mechanism under the Paris Agreement to increase ambition on an ongoing basis, it is inevitable that India will have to scale up its reduction targets. However, in order to meet these targets, it would be essential for India to consider reduction mechanisms that efficiently supplement the existing reduction initiatives, support its growth and development ambitions and leverage global finance and cooperation opportunities. Given the economic efficiencies it creates, the global trends and India's domestic priorities, a carbon market supported by complementary policies could play a significant role in helping India raise and achieve a higher climate ambition.

The Case for a Carbon Market in India

Considering India's overall objectives as well as climate vulnerability, a carbon market could play a key role in setting the country on a path of low carbon investments, green jobs, improved air quality and reduced climate vulnerability, while accommodating for local economic realities.

1. **Cost efficiency** – Carbon markets facilitate predictable, least-cost reductions by encouraging emission reduction where marginal abatement costs are competitive compared to market price of allowances. Similarly, they provide flexibility to regulated players with high marginal costs of abatement to purchase lower cost allowances, thus reducing overall emissions at the lowest cost. This would specifically cater to India's priorities where it is essential to ensure least cost reductions from sectors where marginal costs are lower while allowing for aggregate reductions in line with India's climate ambitions and need to mitigate climate risks.
2. **Politically feasible** – Globally, taxes are highly political in nature. With a large population still lacking basic infrastructure in India, a carbon tax would be less politically feasible than a carbon market, which can be tailored to accommodate multiple priorities and stakeholder interests. Finally, while the operational costs such as data gathering for allowance allocation, conducting of auctions or distributing allowances, and oversight of market, are higher in case

of a carbon markets, they facilitate a more ongoing engagement with industry and other stakeholders, thus reducing political resistance and improvising the design and ambition as the market matures.

3. **Build on existing experience and infrastructure** – With domestic market mechanisms such as PAT and REC already in place over the last three to five years, there is considerable infrastructure as well as capacity developed via trading exchange platforms, reporting of energy efficiencies, verification agencies as well as overall awareness and capacity. A future carbon market in India can build on this existing experience to develop a carbon market that can synthesize the different schemes and improve overall market liquidity and balance demand and supply of ESCerts and RECs, thus also ensuring better outcomes from existing mechanisms.
4. **Long term incentives to move towards low carbon economic activities** – With the development of a market for carbon, India can create long-term market signals and pathway for the industry, thus providing clarity and predictability for businesses to invest in and develop low carbon technologies and setting India on the path of sustainable development. This would also encourage an overall transition by leapfrogging the high carbon growth with clean infrastructure and resource efficiency
5. **Lower climate vulnerability** – As India looks towards reducing overall emissions, a carbon market, as one of the key policies could reduce climate related risks, thus lowering future physical and ecological climate costs.
6. **Lower air pollution health costs** - A carbon market would encourage to reduce GHGs by adoption of improved operations, cleaner technologies and more resource efficiency. This would also have positive spillovers in terms of air quality improvement and hence reduced public health costs associated with poor air quality.

Carbon Market Opportunities

Apart from emission reductions, carbon markets could also create global opportunities and have positive spillovers on other areas such as accelerating progress on SDGs

1. Create synergies across different market mechanisms

A domestic carbon market can supplement existing domestic decarbonization policies like Clean Energy Cess, Perform Achieve Trade (PAT) and Renewable Energy Certificate (REC). This can be done by designing a domestic carbon market that regulates emission sources that are not already covered under any of these schemes. India is already considering this supplementarity, as evident from India's Market Readiness Proposal (PMR 2017) where it aims to cover sectors such as waste and MSMEs, as they are not already covered under the scope of the existing policies.

A domestic carbon market can play a bigger role than simply supplementing existing efforts by bringing together existing mechanisms and creating a common marketplace for emissions trading. Over the past five years, India has, to a large extent, built the basic infrastructure for data collection, verification, registry, exchange & trading platforms, to serve the PAT and REC schemes. These efforts can be consolidated to develop a meta-registry that can act as a master platform for hosting the emissions database as well as to facilitate interlinking and trading across these schemes, along with sectors that would-be part of a pure carbon market. Such a domestic carbon market and registry can

create efficiencies in the market by creating a wider marketplace that balances the demand and supply of ESCerts, RECs and Emissions Certificates.

2. Accelerate climate ambition

A carbon market in India will not only supplement efforts to help India achieve its targets but also support higher ambition and reductions. With Paris agreement's dynamic ratchet mechanism, countries are expected to raise ambition beyond their 2015 commitments, every five years. As a signatory to the Paris Agreement, India will be expected to raise its existing commitment of 33-35% reduction in the emission intensity of its GDP by 2030. While the current policies on accelerating renewable energy installations, energy efficiency market and standards and coal cess, may help India achieve its existing commitments (CPR 2015), a carbon market that complements these policies would help bridge the gap, if any, and provide a mechanism to progressively increase emission reductions from India's industry sector.

3. Connect to global finance flows and low-cost reductions

India can leverage the platform provided by the PMR with a long-term vision of a globally interlinked carbon market. The Paris Agreement explicitly mentions international cooperation through ITMOs. India can prepare for such international cooperation through interlinking to enhance its market liquidity and complement its domestic reduction measures. Designing a domestic carbon market that aligns with global best practices on MRV and environmental integrity can enable India to link its domestic market with other reputed and robust global carbon markets like the EU ETS, CARB, Korea Emission Trading Scheme etc. This would give regulated Indian entities greater flexibility to reduce their emissions, give them access to cost-effective credits to satisfy their emission reduction obligations, as well as provide greater liquidity to reduction certificates from India, thus encouraging greater reductions at a global level.

Implementation of a carbon market in India also has the potential to boost finance and low carbon technology inflows. As more and more companies under regulation demand cost-efficient mitigation to demonstrate compliance, investment will be focused on low carbon technologies, thus attracting global technology to enter Indian market. Further, an interlinked carbon market would facilitate global finance through purchase of mitigation outcomes from India. The Clean Development Mechanism under the Kyoto Protocol mobilized INR 1.3 trillion of clean investment in India (NCDMA 2015) during the first commitment period and financed 13% of total emission reductions under the Protocol, issued to Indian projects. Thus, creating a globally linked carbon market can ensure surplus emission reductions would also attract the viability gap finance to encourage low cost reductions.

4. Create a Double Dividend

While the design on allowance allocation in an Indian carbon market is unclear, considering the realities of industry preparedness and capacity, it may be expected that India will implement a free allocation to begin with. However, as carbon markets mature, they move towards an auctioning method of allocation. The funds collected during auctions while covering the costs of the market and can further be utilized to compensate for loss of competitiveness, finance low carbon technologies and projects, as well as boost public spending on low carbon infrastructure. This medium to long term opportunity would also prepare India to raise its ambition and demonstrate compliance thereof.

Additionally, funds collected from auction of emission allowances will boost public spending coffers on climate change mitigation, energy efficiency subsidies and development of renewable energy

technologies. This will provide a financial incentive to the companies and to the government while leading to climate change mitigation.

5. Accelerate progress on SDGs

Carbon markets can also play an important role in accelerating India's progress on Sustainable Development Goals (SDGs). With deployment of cleaner technologies to keep emissions under a cap which is below business as usual, a carbon market would directly advance the SDG goals on Climate Action (Goal 13) and Affordable and Clean Energy (Goal 7). Additionally, a pricing instrument such as carbon markets provide economic incentives for businesses to improve their practices towards sustainable production and resource use, thus having a positive impact on the Responsible Consumption and Production (Goal 12) and Sustainable Development (Goal 9). Finally, sustainable business and infrastructure incentivized by a clean market would also have positive spillover effects on Sustained Inclusive and Sustainable Economic Growth (Goal 8) through improvements in resource efficiency, Industry Innovation and Infrastructure (Goal 9) through reduction in carbon footprint of per unit value added, and Good Health and Wellbeing (Goal 3) through reduction in mortality due to household and ambient air pollution. A mapping on the relative impact on each of the relevant goals is illustrated below.

Table 1: Mapping of Relative Impact on SDG Goals Progress

Sustainable Development Goal	Potential for accelerating progress on the goal
Goal 1 – No Poverty	Very Low
Goal 2 – Zero Hunger	Very Low
Goal 3 – Good Health and Wellbeing	Low
Goal 4 – Quality Education	Very Low
Goal 5 – Gender Equality	Very Low
Goal 6 – Clean Water and Sanitation	Very Low
Goal 7 – Affordable and Clean Energy	High
Goal 8 – Decent Work and Economic Growth	Medium
Goal 9 – Industry, Innovation and Infrastructure	Medium
Goal 10 – Reduced Inequalities	Very Low
Goal 11 – Sustainable Cities and Communities	Medium
Goal 12 – Responsible Consumption and Production	High

Goal 13 – Climate Action	High
Goal 14 – Life Below Water	Very Low
Goal 15 – Life on land	Very Low
Goal 16 – Peace, Justice and Strong Institutions	Very Low
Goal 17 – Partnerships for the Goals	Very Low

6. Leverage International Opportunities

There is increasing emphasis on international link-ability of such local or regional programs. The Paris Agreement recognizes the possibility of voluntary cooperation among Parties that involves the use of internationally transferred mitigation outcomes (ITMOs) to allow for higher ambition in their mitigation and adaptation actions. While the exact nature of ITMOs has not yet been defined, they aim to provide a basis for facilitating international recognition of cross-border applications of subnational, national, regional and international carbon pricing initiatives. Accordingly, regional carbon markets are increasingly linked internationally. Linking markets reduces aggregate compliance cost, increase market liquidity and also promote price stability, by acting as shock absorbers for local variations. Further, linking carbon markets also enable targets to be met in spite of local technological limitations in the short term. Moreover, they provide **greater certainty** to entities implementing reduction initiatives in selling their allowances by opening up to other markets.

International cooperation on mitigation has the potential to facilitate reductions where they would occur at a lower cost, while increasing the global market size for reductions, thus providing greater liquidity to carbon markets. Further, this would also mean greater flow of finances as well as knowledge sharing and coordination. This is particularly salient for a country like India where a majority of the infrastructure is yet to be built. Implementing a market in India that is designed to link with international markets in the future would provide India with opportunities to attract finance to make low carbon infrastructure economically feasible and help bring in technologies that India would need to put India on a sustainable development pathway. This would also expand the opportunities for leveraging low cost reduction opportunities globally for sectors where the price of reduction is relatively high or infeasible in India. Finally, India has the opportunity to mobilize climate finance to catalyze development of a domestic carbon market that is by design able to attain tangible reduction outcomes.

7. Developing Synergies with other Emission Reduction Policies

While a carbon market is an effective policy for encouraging emission reductions, it is not the only one. Carbon markets are often implemented as part of a policy package or in addition to existing policies and mechanisms. Carbon markets may be complemented by some of the existing policies or may be distorted by or distort effective results from other emission reduction policies such as energy efficiency regulations or markets, renewable energy policies or an existing carbon tax. In order to

optimize the overall emission reductions, policies must complement each other and accelerate reductions faster than they would achieve by themselves. Further, regulated entities are often exposed to more than one emission policy. Thus, policies need to be designed to reduce inefficiencies and reduce the costs of compliance, especially in cases where multiple policies affect the same group of regulated entities. These policies should help entities plan their reductions while mutually reinforcing the incentives to reduce emissions, thus achieving greater decarbonization in the long term. Finally, multiple policies and market mechanisms within jurisdictions could be interlinked to allow for liquidity and create efficiencies, while taking due care to avoid double counting of reduction claims.

A carbon market in India has potential to interlink the existing market mechanisms to provide liquidity and flexibility in the market. Further, potential linkage coupled with an ability to convert RECs and ESCerts to allowances would also create a common emission reduction denominator and help track emission reductions in the country. Finally, interlinking would further allow for greater synergies in policy target setting, implementation and tracking, thus enabling greater ambition on national reduction goals.

8. Encouraging SME climate action

With more than 36.1 million entities, the SME sector in India accounts for around 6 percent of the country's GDP, 33 percent of the manufacturing output, forty five percent of the overall exports and employs 120 million people (CII 2018; MSME 2015) . However, regulating this diverse and highly fragmented sector would involve very high transactional and administrative costs. Additionally, with average employment of 2 per firm, any low carbon policy directly regulating the sector can potentially be counterproductive due to capacity, resource and credit constraints the sector faces. However, a carbon market that allows credits to be purchased from emission reduction activities undertaken by the SME sector would not only incentivize the sector to improve their energy and resource use but also, in the long-term build capacity and pave the way for low carbon growth in the sector.

9. Demonstrate Climate leadership and global responsibility

With an expected rise in per capita income, India's absolute emissions are expected to grow rapidly with its economic progress. As India's share in the global emissions increases, there would be greater responsibility on India to accelerate its emission reduction efforts. This, coupled with India's high vulnerability to climate change impacts, means that India would have to raise its ambition with in coming years. India's existing policies while sufficient in the current scenario, still leave a considerable gap in meeting higher targets. Accordingly, India would have to ramp up its domestic policies. A carbon market in this case would play a key role in supplementing India's existing actions to prepare for and meet the inevitable higher reduction targets in the future. At the same time, a carbon market in India has the potential to elevate India's role in the global climate narrative. This would mean a greater influence in negotiating international agreements that alleviate challenges such as climate finance mobilization and technology transfer, faced by developing countries. Thus, from a global perspective a carbon market in India would allow India to take on greater responsibility and lead climate change action, in line with its overall economic progress and influence.

Challenges and concerns

While recognizing the case for a carbon market in India, it is also vital to consider the costs and barriers to such a policy. The overall feasibility of a carbon market would then depend on a careful analysis of the relative costs and benefits from the program, thus ensuring overall benefits to the society. Below, we elaborate some of the key challenges based on India's current economic realities as well as its past experience with market mechanisms:

1. **Loss of competitiveness and carbon leakage** – One of the key concerns in implementing an emission reduction policy such as a carbon market is the added cost and hence the losses in competitiveness for the industry sector. This also could mean firms might no longer find it profitable to do business in the regulated region or sector. This is particularly relevant to vulnerable sectors with high marginal costs of reduction, competitive disadvantages, export oriented sectors and newer and niche sectors. Also, this could also lead to leakage of emissions to a region where emissions are not regulated.
2. **Inequities** – While the marginal costs of emission reduction might be same for two entities, resource constraints may unfairly impact smaller sized firms. Additionally, resource constraints could also limit the capacity or skills required to meet compliance targets by disproportionately impacting profitability and business sustainability.
3. **Implementation costs** – Compared to a tax, a carbon market entails higher costs associated with market oversight, administration, monitoring and ensuring compliance and maintaining the registry and trading infrastructure and security. Costs related to data collection, quality and coordination across stakeholders are especially higher in India with the lack of existing mandatory reporting requirement or platform and the sheer number of entities. In spite of the predictability of emission reductions and the flexibility offered, the costs of implementation could make a potential market unviable. Accordingly, a thorough cost benefit analysis would eventually make the case for a carbon market.
4. **Double counting** – one of the key challenges that would threaten the environmental integrity of emission reductions in a potential carbon market is the risk of double counting. Double counting is essentially the use of an emission reduction unit used more than once, either to demonstrate compliance or sell units to a buyer. While GHG accounting rules defined in the market would be key to ensure accurate and reliable reduction book-keeping, it would also be critical to ensure the implementation of the rules through adequate capacity building and provision of checks and balances to identify violations.
5. **Ensuring compliance** – Caps in emissions, facilitated by a carbon market, are only effective if they ensure compliance across regulated entities. A weak compliance could threaten market stability by lowering the value of emission reductions and further discouraging entities to take concrete steps to reduce emissions below the limit. Ensuring compliance would not only need strong institutional support for effective penalties and sanctions in cases of non-compliance but also infrastructure needed to monitor compliance and implement these penalties as well as a conducive policy environment that reduces the transactional costs of compliance
6. **Market Security and Fraud** - Ensuring security of allowances, especially from cyber-attacks, breaches and online fraud is a key concern for a carbon market. Going beyond market design, it is essential to have adequate security measures and a robust technical platform to ensure data security. Also, as with financial markets, a carbon market is vulnerable to manipulation,

fraud, collusion by players and insider trading. This is a significant challenge as markets grow bigger and get connected internationally. Market security and integrity would largely determine the value and integrity of reductions achieved.

While all of these concerns are material and critical to the effectiveness and success of a carbon market, it is also important to consider the relevance and significance of these challenges as well as the cost associated with overcoming or mitigating them prior to setting up a carbon market. These costs need to be weighed against the overall tangible as well as intangible future benefits and opportunities in order to ensure a sustainable carbon market. Finally, many of the challenges stated above can be addressed or mitigated through tailored design of the program. In the subsequent sections, we discuss in detail the Indian experience with market mechanisms as well conduct a review of global carbon markets and trends to identify learnings for a potential Indian market that takes into consideration the aforementioned challenges and identify design and implementation measures to mitigate some of these.

Learning from Experiences

The California Acid Rain Program, was the one the earliest market mechanisms that put the theory of environmental economics into action back in 1990 (EPA 2018) The success of the program encouraged the global carbon mitigation narrative, culminating into the Kyoto Protocol in year 1997 (UNFCCC 2018c). Since then, market mechanisms are currently being implemented in 21 jurisdictions, as of early 2018 (ICAP 2018) As this number continues to grow with newer schemes being implemented each year, many past and existing schemes hold important lessons for newer markets. While the relative success or failure of a carbon market may be attributed to specific local or global factors, they can provide critical insight into designing a carbon market that can accommodate local circumstances while absorbing global shocks. Thus, looking at existing carbon markets through the Indian lens is an important step in developing the design for a carbon market that would work for India.

Clean Development Mechanism (CDM) under the Kyoto Protocol, introduced the concept of carbon markets and carbon credits in India, despite the fact that India was amongst the non-Annex I countries and therefore did not have a mandatory reduction target. Clean projects in India helped mobilize investments over 1.3 Trillion INR (NCDMA 2016) in the absence of a business case for such technologies at the time, thus making them feasible with CDM revenues. Over the first phase of the Kyoto Protocol, clean development projects reduced emissions equivalent to almost 170 million tonnes of CO_2e (NCDMA 2016). This initial push was further complemented by the Government's market schemes such as the Renewable Energy Certificates (REC) and Perform, Achieve and Trade (PAT). While both these schemes have had their set of challenges, they have also played a key role in developing the capacity and infrastructure for a potential carbon market in India.

In this section, we study existing carbon markets and map learnings from these international experiences to the Indian scenario, thus identifying the key considerations for an Indian carbon market. This analysis is made stronger by critically looking at India's experience with market mechanisms and identifying the enablers and challenges in their respective successes and failures. Finally, we draw insights from the global trends in carbon markets to prepare India.

India's experience with Market mechanisms

The Perform, Achieve and Trade (PAT) scheme:

The Perform Achieve Trade (PAT) is a market-based energy efficiency trading scheme for energy-intensive industries to reduce the specific energy consumption. The scheme was introduced in 2008 under the National Mission on Enhanced Energy Efficiency (NMEEE) of the National Action Plan on Climate Change (NAPCC). Initially, in phase I, the scheme covered 8 energy intensive industries - Aluminium, Iron & Steel, Cement, Power, Pulp & Paper, Textile, Chlor-Alkali, and Fertilizer and it was expected to save 6 to 7 million TOE (tons of oil equivalent) of energy. Later on, in phase II, Railways, Refineries, and Electricity Distribution Companies (DISCOMs) sectors got included. Currently, the scheme covers 621 designated consumers in total.

The scheme involves the trading of an energy efficiency certificate called EsCerts within the participated designated consumers or industries. The Central Government issues the certificate to industries meeting the assigned target. Industries having ESCerts are allowed to trade for those designated consumers who fail to achieve their targets. This flexibility helps to meet the compliance requirements. In the PAT cycle I (2014 - 2015), every sector achieved an energy saving much more than the targeted value except thermal power sector. Cycle I overachieved by 30% in comparison to the assigned targets and the amount of emission reduction was about 31 million tonnes of CO2 emission. Pulp and Paper sector outstood the saving of 143% higher than the targeted saving. In every sector, various best practices and energy efficient technologies were upgraded. However, an oversupply of EScerts led to a low clearing price, indicating the need for higher ambition. Nevertheless, considering building the infrastructure and capacity was a significant challenge in the first two phases, the scheme can progressively set caps that lead to price levels in line with cost of reductions.

The key enablers for the successful implementation of the PAT Scheme was the engagement process followed throughout the first phase of the program providing stakeholders clarity on expectations and processes leading to overcompliance. The scheme can be made further effective by use of minimum floor prices and higher reduction targets to ensure market stability. Additionally, long term predictability on targets help investors plan reduction initiatives. Liquidity in the market can be created through interlinking with other initiatives to help complying entities achieve value for their excess reductions.

Table 2 PAT Highlights

The Perform, Achieve and Trade (PAT) scheme	
PAT Cycle I (2012-13 to 2014-15)	**Outcome**
Coverage: 8 sectors covering 478 designated consumers Aluminium, Iron & Steel, Cement, Power, Pulp & Paper, Textile, Chlor-Alkali, and Fertilizer	Saved of about 8.67 mtoe against assigned target of 6.68 mtoe from the assessed 427 DCs Emission reduction: 31 million tonnes of CO2
PAT Cycle II (2016-17 to 2018-19)	**Targeted Outcome**
Coverage: 11 sectors covering 621 designated consumers Aluminium, Iron & Steel, Cement, Power, Pulp & Paper, Textile, Chlor-Alkali, and Fertilizer, Refinery, Railways and Electricity DISCOMS	Saving of about 8.869 mtoe at the end of 2nd PAT Cycle (by 2018-19)

Renewable Energy Certificates (REC):

In 2010, the Electricity Act & National Action Plan on Climate Change (NAPCC) launched Renewable Energy Certificate as a market-based mechanism to ensure the implementation of Renewable

Purchase Obligation that promotes renewable energy capacity in the electricity supply. The policy involves mandatory renewable energy targets for states, and to meet such targets a mechanism for the sale and purchase of renewable energy between generators and purchasers thus balancing the demand and supply of compliance certificates in the form of RECs. It facilitates interstate renewable energy transaction as some states in India have less potential to generate renewable energy. The implementation framework of REC revolves around the State Electricity Regulatory Commission (SERC) and the Central Electricity Regulatory Commission (CERC).

This scheme has supported the initial take up of renewable energy installation in the country however, the effectiveness of the mechanism to facilitate renewable energy installation or reduce emissions is uncertain. Particularly, the lack of enforcement of RPOs or a lack of stringent penalty structure for noncompliance has also resulted in state electricity retailers (DISCOMs) not complying with their RPO targets, leading to persistently low levels of demand for RECs. Most critical challenges in the scheme have been to ensure compliance by the already financially burdened Distribution Companies. Furthermore, lack of strict penalties has kept the prices low in spite of a lower supply of RECs.

International experience[4]

EU Emissions Trading System (EU ETS) [5]

Since its inception, EU ETS has been the biggest operational carbon market. Over time, it has been reformed to reduce inefficiencies and cope with challenges faced in previous phases. As a multi-state integrated carbon trading mechanism (28+3 states), the flexibilities and processes built into its design as well as the overall stakeholder coordination holds critical lessons for an Indian carbon market, considering demographic and economic diversity of regulated entities as well as the balancing of policy priorities amongst different public institutions.

EU+3 (Norway, Liechtenstein and Norway) countries account for a fifth of global GDP and emit 11% of global energy related CO2 emissions. The EU ETS directive was adopted in 2003 and came into force in 2005 to help Europe meet its Kyoto Protocol targets. Thus, it became the first and largest installation-level cap and trade program for greenhouse gas mitigation in the world. The EU ETS follows an experiential learning approach wherein key achievements and drawbacks are studied during and towards the end of each phase and subsequent improvisations are then made for the future phases. Thus far, the scheme is planned for four phases (Phase 1: 2005-2007, Phase 2: 2008-

[4] A table which provides a comparison between the key features of each of these schemes is presented in Appendix A

[5] All figures and facts quoted are sourced from (European Commission 2018 https://ec.europa.eu/clima/policies/ets_en)

2012, Phase 3: 2013-2020, Phase 4: 2021-2030) and is currently is its third phase. It covers 45% of the EU's GHG emissions and aims to reduce emissions 21% below 1990 levels by 2020 and 43% below 1990 levels by 2030. The EU ETS remained the main driver of the international carbon market with 84% of the total global carbon market share in 2010 and trading worth €56 billion in 2012.

Progress thus far: The EU ETS is a sector-specific and facility-level program and covers carbon dioxide (CO_2), Nitrous Oxide (N_2O) and Perfluoro Carbon (PFC) emissions from over 11,500 installations across different sectors in 31 countries. Over the last two phases, the lessons learnt from the experience have been incorporated in the design for subsequent phases, along with improvisations based on increased maturity of participants. Allocation of emission allowances was done mostly for free depending on the number of allowances specified in the National Allocation Plan (NAP) of each member state during Phase 1 and Phase 2 of the program. However, from Phase 3, auctioning became the default method for entire allowance allocation. Also, from Phase 3, the scheme has a single EU-wide cap, with a separate cap for aviation related emissions. This cap decreases each year by a linear reduction factor of 1.74% (without an end date) of the average total quantity of allowances issued annually in 2008-2012, providing investors predictability of emission reductions they need to make and certainty about the return on investment in emission reductions.

Since 2009, a surplus of emission allowances has built up in the EU ETS due to the recent global economic crisis and import of international credits leading to an oversupply of allowances supressing the carbon price and discouraging companies to reduce emissions. The European Commission is addressing this through short- and long-term measures which are back loading and market stability reserve (MSR) respectively. 'Back loading' is withholding the number of allowances to be auctioned to rebalance supply and demand in short term thus balancing the prices. The EU Commission has postponed the auctioning of 900 million allowances until 2019-2020. MSR functions by adjusting the number allowances being auctioned on a long-term basis to improve resilience of the system to major shocks. The 900 million allowances being backloaded will be transferred to the MSR. Flexibility provisions such as use of offsets, free allowance for new entrants, unlimited banking of allowances in Phase II and III, and possibility of early borrowing from future quota, allow the regulated entities to implement least cost measures and plan future investment for emission reductions. Offset usage was limited to 50% of required aggregated abatement relative of 2005 for the period 2008-2020. EU ETS credits could be linked with those from CDM, JI projects etc.

One of the noteworthy features of the EU ETS scheme is the Monitoring, Reporting and Verification (MRV) system, aimed towards robust, transparent and consistent monitoring, reporting and verification of emissions. All emitters develop and submit a monitoring plan detailing their emissions, which are subsequently approved based on predefined criteria. Annually, emitters submit an emissions report. On verification, operators are required to surrender the equivalent number of allowances by 30 April of the current year. Capped firms also report emissions annually and have them independently verified, failing which they lose the right to sell allowances in the carbon market. In case a regulated entity fails to surrender enough units, it pays a penalty which increases with the EU consumer price index (€100/tCO2e in Phase III). Penalised companies also have their names shared in public and may also face additional national fines.

As per the EU Environmental Agency, CO2e emissions declined by approximately 19% between 2005 and 2013 with 2-5% of emission reduction in Phase I. In 2014, the verified GHG emissions from

stationary installations amounted to 1,812 million tCO2e, a 4.5% decrease from 2013 level. Although emission reduction from EU ETS is not a large share but the research points that the EU carbon price has been useful in promoting cost-effective emission abatements leading to a reduction of 1,048 million tCO2 between 2008 and 2012 through CDM and JI mechanisms projects credits. Lower credit prices have enabled installations to save their compliance costs between €4 billion and €20 billion over 2008-12.

Institutional framework: The key regulatory law which formulates the EU ETS policy is the directive 2003/87/EC Of the European Parliament And Of The Council establishing a scheme for greenhouse gas emission allowance trading within the Community. This is supplemented by policies on verification, sanctions, and market abuse. The key institutions involved in the development, running and implementation of the EU ETS are the European Commission, European council and the EU parliament. Among these, the council sets the strategic direction for wider EU goals including climate change. The European Commission maintains communication with the member states and assists in the implementation of the criteria listed in Annex III to Directive 2003/87/EC establishing a scheme for greenhouse gas emission allowance trading within the EU. Along with the national allocation plan (NAP), it covers all aspects of information related to the national targets and covered installation specifications such as number of the greenhouse gas emissions, permit unique (EPER) identifier of the installation, annual data per installation, including emission factors etc. This information is confirmed by the member states through their legislative representation in the European Parliament.

Takeaways for India: One of the most attractive aspects of a carbon market is the level of flexibility it allows to accommodate local diversities and competing priorities. As seen in the case of the EU ETS, the design of the carbon market was shaped by a collaborative political bargaining process amongst the EU states, providing space for differentiated circumstances while offering actors with a long-term certainty on reductions. Over time, as different states and actors developed capacity, the market has moved progressively towards efficiency by implementing auctioning and a single EU-wide target. Considering the diversity of its industry sectors as well as competing mandates amongst key stakeholders in India, it can design a carbon market that provides such long-term certainty while accommodating for flexibility in the short term and improving efficiency over time. Another key aspect of the EU ETS is the presence of one central authority, European Commission in its case, which drafts the framework and structure of various aspects of the carbon market including the allowance allocation, price stability measures and the MRV mechanism and ensures fair and transparent implementation of all these design parameters to ensure smooth functioning of the market. With multiple actors involved in the Indian legislative processes as well as climate action, it would be integral to ensure a single regulating authority for the carbon market that coordinates amongst the different actors, in order to ensure transparency, efficiency and accountability.

Considering India's price sensitivity, industrial growth priorities market, and availability of technology and resources, allocation of allowances can be free, as seen in the case of the EU ETS, while preparing regulated entities for a auction based allocation at a known time in the future. Funds generated from these auctions are particularly important for the Indian market to finance or subsidise the development and implementation of clean technologies to set India on a low carbon pathway. This is especially important for investments in the relatively poorer provinces which lack

the infrastructure. Also, auction based allowance allocation is a pragmatic method of allocating credits while lowering the probability of political gaming.

The Regional Greenhouse Gas Initiative (RGGI) [6]

RGGI was the first cooperative effort to establish a mandatory multistate market-based program in the United States to reduce greenhouse gas emissions. It covers nine states of Connecticut, Delaware, Maine, Maryland, Massachusetts, New Hampshire, New York, Rhode Island, and Vermont and aims to cap and reduce CO_2 emissions from power sector (fossil fuel fired electric power plants > 25 MW) by 45% by 2020 relative to 2005 emissions. Beginning in 2009, the program follows a three-year compliance period, and is now in its third phase (2015-2017). After review of the first phase of the program, in 2014, RGGI capped emissions at 82.5 $MtCO_2$. The cap then declines 2.5 percent each year from 2015 to 2020. As of 2017, the program covered 165 fossil fuel plants with state specific caps which are distributed through quarterly auctions. Proceeds from the allowance auctions are invested in consumer benefit programs to improve energy efficiency and accelerate the deployment of renewable energy technologies for lower emissions.

For each allowance auction, there exists a reserve price under which no allowance can be sold. Currently, the 2017 auction reserve price is $2.15 per CO2 allowance. Each year, the minimum reserve price increases by 2.5%. The RGGI states have also established a Cost Containment Reserve (CCR) of CO_2 allowances to create a fixed additional supply of CO2 allowances that are only available for sale if the allowance prices exceed certain price levels –$6 in 2015, $8 in 2016, and $10 in 2017, rising by 2.5 percent each year thereafter. This allowance reserve is replenished at the start of each calendar year. The CCR was 5 million CO2 allowances in 2014 and 10 million CO2 allowances each year thereafter. The program allows for unlimited banking of covered facilities' allowances and offset allowances for use in future compliance periods, although the amount of banked allowances does factor into future state emissions budgets. A CO2 offset represents project-based greenhouse gas emissions reductions or carbon sequestration achieved outside of the capped electricity sector. RGGI States currently limit offset to five project categories sequestering CO2, CH4 and SF6 within the nine-state region. Regulated Entities can utilize offsets to meet up to 3.3 percent of their compliance obligations. By enabling these provisions, the program keeps price stability in check while allowing for flexibility to meet their compliance targets.

RGGI has a structured and well-defined monitoring, reporting and verification mechanism. On January 30 of a compliance year, covered facilities are required to submit their previous years CO_2 emissions data through the US EPA's Clean Air Markets Division Business System, which then transfers emissions data to the RGGI CO2 tracking system. On March 1, facilities have to surrender allowances amounting to 50% of their generated emissions in year-one and year-two of the compliance period, and 100% all the remaining emissions at the end of the final year of the

[6] All figures and facts quoted are sourced from (RGGI 2018 https://www.rggi.org/)

compliance period. Member states then examines if the regulated facilities have submitted enough allowances to meet their compliance obligation. The facilities are subjected to a fine, penalty if they have failed to comply with the annual obligation (interim compliance obligation). In case they fail to comply with the 3-year obligation, the facility will be required to surrender allowances amounting to three times the number of units of emissions exceeded and may also be subjected to specific penalties imposed by member state.

According to New York State Energy Research and Development Authority, from 2005-09, the RGGI has led to emission reductions well below 2005. This decrease has been attributed to variety of factors including lower electricity load, switching to natural gas (due to low prices), reduced coal capacity and increased wind & hydro capacity. However, the number of allowances in emission budget were higher than actual emissions leading to low allowance prices due to less demand and banking of 51.7 million tCO_2 by emitters. This motivated the RGGI compliant states to make appropriate adjustments to their state emissions budgets leading to increased demand for allowances resulting in a higher carbon price ($5.41 in 2015).

Takeaways for India: Since, RGGI allocates most of the allowances through auctioning, large amount of revenue generated is invested in energy efficiency and renewable energy projects which results in multiple dividends including improved environment, innovation in low carbon technologies, job creation and cost optimization. According to estimates, through investment in cap and trade revenue by regulated states, RGGI can benefit from an additional $3.2 billion in funding, adding up to its value and creating additional 57,000 job years for regulated state economies. However, emissions leakage is a key concern since it has been observed that that in order to comply to the local emissions caps, regulated entities are importing electricity from non-RGGI regulated states, thus increasing emissions outside the program.

From an Indian perspective, RGGI, being a limited multi- state program, can offer good insight in case such a mechanism is to be implemented on state wise basis in India as RGGI explicitly allows regional allowance allocation with every regulated province having its own emissions budget, this feature would suit India as per capita income, power plant feasibility and industrial emission reduction infrastructure varies with each state in India. Furthermore, the scope of the RGGI scheme considers only CO_2 emissions from fossil fuel based power plants, a source which accounts for over 65% of GHG emissions in India (Sharma et al. 2011). However, as in case of RGGI, leakage to non-regulated states could be a potential fallout that would have to be dealt with at the design phase.

Apart from the scope, another takeaway for an Indian market based trading mechanism from RGGI is the price stability provision which includes reserve price for allowance auction and cost containment reserve acting as a price floor and ceiling respectively, such a measure will keep the price in check and while maintaining competitiveness for regulated Indian entities in the trading market. Additionally, the reinvestment of auction revenue in promoting energy efficiency and renewable energy by RGGI can also be emulated for the Indian market. Further, RGGIs's requirement for demonstration of interim compliance is a unique feature that ensures consistent reductions, as well as predictability and stability in the market. Finally, another feature from RGGI worth referencing for an Indian carbon market is the ability to offset a fraction of obligatory CO_2 emissions reductions from specific sectors covering other GHGs. For India, other major industries like iron & steel, textiles and petrochemicals can be included in such specific sectors providing opportunity to

regulated entities to offset their emissions and at the same time capturing and reducing more emissions from other emission intensive industries in India thereby lowering emissions even outside the scope of the scheme.

California ARB Emissions Trading Program[7]

As of 2014, California was the world's eighth largest state economy and second largest emitter of greenhouse gases (GHG) in the United States. The California Air Resources Board (ARB) cap-and-trade program, currently in its second phase, launched in 2012 following a multi-year stakeholder process and consideration of impacts on impacted communities. GHG emissions to 1990 levels by year 2020 and further 80% reduction below 1990 levels by 2050. In 2007, it joined Western Climate Initiative (WCI) in 2007, which is a sub national policy collaborative with independent jurisdictions in provinces of Canada and United States working together to facilitate cost effective GHG reductions.

The scheme covers all entities with emissions exceeding 25,000 tCO_2e and covers all GHGs from over 19 sectors making up almost 450 regulated entities. Each compliance period, covered entities submit emission allowances and a limited number of offsets to cover the remainder of emissions in that compliance period. The cap on total amount of emissions is set by ARB based on emission projections for the particular year based on product- and energy-based benchmarks and the level of reductions and tightness of caps required. The allowance cap decreases over time, in 2014 it declined 2% below 2013 cap and is set to decline 3% annually from 2015 to 2020.Post emission cap determination, allowances are distributed to regulated companies as a combination of limited free and remainder auction based allowances with the free allowances depending on an ARB developed industry assistance factor. This factor is a percentage based on an industry's economic leakage risk which describes the risk that the industry may leave the state due to competitive disadvantage caused by this trading program. Although 90% of allowances were freely allocated in the first and second compliance period, regulated entities in medium and low leakage risk categories are freely allocated 75% and 50% of their allowances respectively. Allowance allocations are determined by multiplying total product output or energy consumed by an emissions benchmark, an industry assistance factor and cap adjustment factor. Apart from the facility output, all other variables are calculated at the sector level. The California ARB program (CARB) holds two auctions on quarterly basis: Current Auctions offer current and previous year vintages and Advance Auctions offer vintages of the subsequent calendar years.

CARB sets a reserve auction price below which allowances cannot be sold while 'settlement price' being the lowest price at which allowance supply is exhausted. The CARB program utilizes multi year compliance periods to buffer annual variations in product output and sets designated number of allowances from each compliance period into allowance containment reserve which reduces the risk of higher than expected allowances prices. Reserve volumes vary by compliance period: 2015-2017: 4% of allowance budget; 2018-2020: 7% of allowance budget. These allowances are available for quarterly purchase at three tiers of pre-established prices that increase annually by 5% plus rate of

[7] All figures and facts quoted are sourced from (CARB https://www.arb.ca.gov/cc/capandtrade/capandtrade.htm)

inflation. Price controls for auctioning include a floor price and an allowance price containment reserve. CARB also allows regulated entities to bank allowances to protect against allowance shortages and price swings. Although non-expiring, banked allowance quantities are subject to holding limits. Future period borrowing of allowances is permitted but only to satisfy an excess emissions obligation. CARB also allows an offset program covering up to 8 percent of a facility's compliance obligation but limited to emissions-reduction projects in U.S. and restricted to five areas: forestry, urban forestry, dairy digesters, destruction of ozone depleting substances, and mine methane capture. Offsets needs to be independently verified. Also, the partial annual compliance obligation offers a form of flexibility to participants regarding how they use their allowances and meet their compliance obligations.

The CARB Monitoring, Reporting & Verification (MRV) infrastructure is based on The Mandatory Reporting Rule (MRR117) approved in 2007 which obligates California facilities to report and verify their in-state emissions to the ARB. Usually, applicability thresholds for reporting are lower than those for compliance. Since 2008, covered entities are required to report their emissions and additional data annually and get it verified through a third party. If found guilty of non-compliance at the end of the period, it must forfeit four allowances for each allowance it did not submit.

Compared to the peak emissions of 487.6 million metric tons in 2004, California's greenhouse gas emissions have dropped 9.5 percent. The ARB predicts that emissions in 2020 will be below the limit set in the cap and trade program. After linking of California and Québec trading programs, market price per ton of CO_2 has remained around $11-12, close to auction reserve price. By 2015, 99.95% of regulated entities in both the programs had used allowances to comply with their obligation, however since 2014, share of offsets use has been slowly increasing.

The CARB cap and trade program uses an innovative hybrid model for allowance allocation based on competitiveness of the industry within the state. The auction revenues can further mobilise funds to raise competitiveness and promote climate action through renewable energy and low carbon technologies. The MRV mechanism of the program ensured caps and targets are based on real emissions data rather than estimates reducing probability of over allocation. Further, the MRV is builds on an existing mandatory reporting provision, thus avoiding replication of efforts. The program's periodic allowance estimation method is a dynamic approach considering economy and sectoral level production factors as well as efficiency factors which results in allowance demand and supply balance. However, the threat of carbon leakage or industry reshuffling (to a non-regulated state) can impact the carbon price and increase net emissions thus undermining the efficacy of the CARB cap and trade program.

Takeaways for India: From an Indian perspective, CARB can be a good program to refer considering the competitiveness and equity concerns amongst industry players. In particular, the emission based threshold defined in CARB along with industrial benchmark based cap can be a constructive approach to manage the diversity of sectors ranging from cement production, iron and steel to petroleum products. The hybrid allocation method in CARB is a good example of giving preference to leakage prone industries through the ARB industrial factor and can be replicated in the national meta registry for an Indian market to give free allowances to industries with limited emission reduction resources. The inflation adjusted allowance auction prices for allocation in CARB can also be a

pragmatic tool for India considering the presence of a constant industrial inflation in the market, this will reflect the real price per unit of emission leading to a corrected price per unit emission.

Another innovative method in CARB is the purchase of offset credits to fulfil allowance through forestry projects outside the regulation, such a method should be included for an Indian carbon market since this will not just result in greater flexibility for covered entities but also lead to carbon sequestration through forestation, contributing to the larger goal of a carbon sink of 2.5–3 $GtCO_2e$ through additional forest and tree cover by 2030 as per India's NDC at Paris Agreement.

Tokyo Cap and Trade[8]

Japan, the third largest economy in the world and Tokyo, its biggest city and one of the largest metropolitan areas in the world emitted 59.6 million tons CO_2 in 2012. Given that this volume is comparable to some of the country emissions in Europe, the Tokyo Metropolitan Government launched the mandatory cap and trade scheme in 2010, becoming the first city-level emissions trading market and Asia's first emission trading program.

This program is unique in that it includes the commercial buildings sector, which accounts for roughly 37% of Tokyo's total emissions. It aims to reduce CO_2 emissions by 30% by year 2020 relative to 2000 levels. The baseline emissions are determined as the average CO2 emissions from any three consecutive years between 2002 and 2007, giving entities a certain degree of flexibility. (11) It covers all offices, commercial and public buildings, district heating and cooling plants consuming energy more than or equal to 1,500 kilolitres per year. In 2017, the number of covered facilities accounted to 1232. The program is split into two phases with Phase I spanning from 2010-2014 and Phase II from 2015-2019. The program set an absolute cap of 6% in the first compliance period and 17% in the second compliance period.

Except for allowances reserved for new entrants, the regulated facilities are allocated the gross capped allowances for all five years of a phase free of charge through the grandfathering approach based on past emissions. An entity's base year emissions are multiplied by the compliance factor (set by the TMG) and then by the length of the compliance period to allocate the emissions cap. Like other ETS, the Tokyo cap and trade program also has price stability provisions which focus on increasing the supply of allowances to stabilize the prices. If the metropolitan governor reckons that there is a chance of price surge despite these measures, he implements further measures like use of external credits and enabling use of Kyoto credits from small and medium sized enterprises in Tokyo to control the price. It also offers flexibility provisions like allowing trading from the 2nd year of each compliance period for entities exceeding the yearly obligation in year one and also banking of allowances. However, the program doesn't permit borrowing of allowances. Further, to comply with

[8]All figures and facts quoted are sourced from
http://www.metro.tokyo.jp/ENGLISH/TOPICS/2016/161116.htm

the emission obligation, facilities can choose to reduce emissions by purchasing offsets credits. Four types of offset credit mechanisms are allowed:

- Excess emission reductions credits: When a facility reduces emissions more than its obligation it can apply for a credit issuance through which it can sell its excess credits amounting up to one-half of its base year emissions. Credits obtained during the first compliance period could be banked up to the end of the second compliance period.

- Small and midsize facility credits within the Tokyo Area: Emissions reductions achieved through energy-saving measures by small and medium-sized facilities other than facilities under the scope of the TMG's cap-and-trade program.

- Outside Tokyo Credits: Emissions reduction achieved through energy-saving measures from facilities outside the scope of the program and outside of Tokyo. The TMG sets restrictions, including upper limits, on transaction volumes.

- Renewable Energy Certificates: Environmental value of electricity generated through renewable energy is recognized in form of a tradable certificate. The TMG decided to include these certificates as offset credits effective under its cap-and-trade program.

At the end of the first compliance period of the program in December 2014, emissions reduction of 23% were achieved as compared to base year emissions during the four-year period. Over 90% of covered facilities had surpassed their reduction targets for the first compliance period and 69% of facilities had already exceeded their second compliance period targets of 15-17% reductions by February 2015. The Tokyo program has successfully achieved the initially set target of 25% reduction by 2020 and has further set a revised target of 30% reduction in CO2 emissions by year 2030 compared to 2000 baseline emissions. More than 100 facilities have left the program since they have complied with the rule of reducing their emissions below the threshold level for the stipulated time period. However, despite the success in reduction of emissions, market price of the emission allowances has been extremely high reaching JP¥4,500 for excess credit and JP¥5,500 for RECs in October 2014.

Takeaways for India: The Tokyo program has succeeded in reducing emissions and has certain unique features like the five 5 year-long compliance period for entities to reduce their emissions thus giving them flexibility to achieve compliance without hindering the effective use of emissions trading. It also incorporated the inclusion of commercial buildings in the emission reduction schemes as it contributes to 30% total GHG emissions globally. The provision for buying offsets from small and medium scale companies under this program to meet the emission obligation is a salient feature which can be replicated in a potential Indian carbon market keeping the local requirements in mind, such a move will not only spur investment and innovation in low carbon technologies in smaller firms but will also provide a flexible offsetting option to the companies under regulation, while achieving overall reduction targets. Another addition could be the interlinkage of PAT and REC based credits providing further liquidity in existing markets and ensuring cost effective reductions across different policy measures.

Global Trends – emerging markets

Republic of Korea

The Republic of Korea launched its cap and trade program on 1st January 2016. This program is the first national level cap-and-trade programme in East Asia, and world's second biggest (Reuters 2015). The programme covers 68% of Korea's emissions with a voluntary opt-in for companies and facilities not mandated. With a commitment of achieving 37% reduction in its absolute emissions by 2030 (compared to business-as-usual scenario), the carbon market has capped emissions at 573 MTCO2e in 2015 with progressive decrease in the cap of approximately 2% per year. While 100 percent allowances were distributed freely in the first phase, this will progressively be tapered down with increases in auctioned allowances. Special considerations are made for energy intensive and trade exposed sectors which receive 100 percent of allowances free in all phases of the program. Out of the capped emissions, 5% of allowances have been retained in a market stabilization reserve. Finally, while voluntary reductions from other ETSs are allowed, the market will not be linked to any other carbon market until the third phase (post-2020), where the limit for international offsets is currently limited to 10% of the entity obligation.

While trade in its first year of operation was limited, 2015 saw a steady flow of credits from national offset projects, with price levels of approximately USD 18.28 per tonCO_2 (ICAP 2018b).

China Regional Pilots and National level ETS

At 29.5%, China is world's second largest GHG emitter. Within its NDCs, China has committed to peak its emissions by 2030, with a targeted intensity reduction of 64-70% by 2030 (compared to 2005 levels). To that effect, China has been steadily reducing its coal consumption, which dropped for a third consecutive year in 2016, with an aim to limit coal use to 58% by 2020 and increase renewable energy deployment. Additionally, China has also announced a national level carbon market covering almost 8000 companies to be gradually to reduce emissions further. Accordingly, in 2013 and 2014, it instituted seven regional pilots in five cities and is expected to launch a national level carbon market by 2017-18. These seven pilots account for 7% of China's emissions, 28% of its Gross Domestic Product (GDP), and cover a variety of regions and jurisdictions – including the rich provinces such as Guangdong and Beijing as well as less developed ones like Hubei.

Some of the elements common to all pilots include sectoral coverage, the use of free allowances, and flexibility provisions such as banking of allowances. Furthermore, all seven pilot ETSs cover both direct emissions from fossil fuel use and emissions attributable to electricity use, including those from electricity generated outside their boundaries. With the exception of the Chongqing, all pilots schemes regulate only carbon dioxide.

Mexico

With an NDC target of 22% reduction against BAU scenario with 36% conditional reduction (ICAP 2018c), in October 2017, Mexico announced launched a year-long simulation of a cap-and-trade which would act as a test run for a national carbon market expected to launch in 2019 (ICAP 2018d). This would be the first emissions trading scheme pilot in Latin America and would be facilitated by the Mexican Secretariat of Environment and Natural Resources (SEMARNAT) along with the Mexican Stock Exchange (Grupo BMV) and MéxiCO2 (the voluntary carbon platform at the BMV). The cross sectoral simulation includes transportation, aviation, electricity generation and industry, including but not limited to: oil refineries, producers of iron, cement, paper, glass, ceramics and chemical industries with a cap of 70 million tons of carbon dioxide equivalent (tCO2 e). The pilot program will involve the voluntary participation of up to 70-120 companies (ICAP 2018c), giving them a chance to adapt to a forthcoming carbon credit system in which polluters will be obligated to offset emissions with tradeable certificates.

Canada

In September 2017, Ontario joined the Western Climate Initiative (WCI) Cap and Trade Market (EDF 2017). The WCI cap and Trade is a collaborative effort by regional carbon markets to tackle climate change by reaping the benefits of interlinking. Thus far, the WCI comprises the Canadian provinces of British Columbia, Ontario, Quebec and Manitoba along with the state of California. Additionally, in 2017, Ontario and Quebec announced collaboration with Mexico on the carbon market simulation initiative (The Globe and Mail 2017). The trilateral declaration will see the two Canadian provinces and Mexico share their expertise on carbon markets with one another, as well as exchange other opportunities to reduce greenhouse gas emissions.

Brazil

In order to meet its Nationally Determined Contribution (NDC) targets, the Brazilian government is considering the implementation of market instruments to meet Brazil's voluntary GHG reduction commitment and reduce overall mitigation costs. Brazil is currently assessing different carbon pricing instruments including an ETS and a carbon tax.

For this, a group of leading companies within the company have been participating in a voluntary ETS simulation since 2013 (ICAP 2018e). The ETS simulation initiative led by Empresas Pelo Clima (EPC) uses live corporate data to engage Brazilian companies in discussions around what a robust cap and trade market might entail and how it could be designed and implemented. In 2015, 23 companies from diverse sectors of the Brazilian economy took part in this exercise. The allocation process and trading is managed by the Rio de Janeiro Green Stock Exchange (BVRio) and the ETS design is coordinated by the Centro de Estudos em Sustentabilidade da Fundação Getúlio Vargas (GVCes/FGV) (ICAP 2018e).

Key Trends

While noting the emergence of newer markets signifies a rise in the number of carbon markets globally, it is also important to analyze the key trends that underpin their design and development. The urgency to act on climate and the consequent Paris Agreement spurred global action on carbon

pricing. However, it was the idea of international cooperation on least cost reductions as evident in the Paris text on ITMOs that encouraged the uptake of market mechanisms, especially by developing countries. As is evident from the ambitions and design of newer markets, some key trends cut across a variety of new markets. These include measures such as planning for future international linkage from the design stage, provisioning for economic shocks through market reserves and price collars, providing entities flexibility to enable efficient reductions while setting caps with a long-term clarity on reduction goals, accommodating short-term competitiveness challenges through sector specific annual caps and an overall learning-by-doing approach. As we look at a potential carbon market in India, we consider these trends as key signals to what the future holds for an Indian carbon market and how India can best keep up with the trends while seizing opportunities they present.

Developing a Carbon Market in India

Carbon Markets Explained

A Carbon Market (or a cap and trade or emissions trading scheme) is a market-based approach to internalizing the climate costs of greenhouse gases by creating a market where none exists and allocating property rights (or the right to emit) to a predetermined lower amount. By doing so, carbon markets provide an economic incentive to reduce emissions. In contrast to command-and-control environmental regulations such as best available technology (BAT) standards, emission limits and government subsidies, carbon markets are a type of flexible environmental regulation that allows regulated entities to decide how best to meet policy targets. In theory, polluters who can reduce emissions most cheaply will do so, achieving the emission reduction at the lowest cost to society. Over a period of time, the economic incentive created by the market also encourages regulated entities to invest in research and innovation to reduce their compliance costs. A carbon market, thus, provides the private sector with the flexibility required to reduce emissions while stimulating technological innovation.

In a typical carbon market, the government imposes a limit (cap) on the total emissions in one or more sectors of the economy, and issues tradable allowances equivalent to the level of the cap. Allowances can be allocated for free—based on some combination of historical emissions, output, and/or performance standards—or auctioned. Each allowance typically corresponds to one unit of emissions (1 tCO2e). At the end of the compliance period, the regulated entities are required to surrender one allowance for every tonne of emissions for which they are accountable. Participants that hold more allowances than they have emitted during the period can sell them, or bank them for future use (depending on the banking provisions of the market); entities that have exceeded the cap and require additional allowances may buy them on the market or pay the penalty for underachieving the target. The trade or exchange of allowances between those with surplus and deficient allowances generates a market clearing price for allowances (carbon price).

Depending on the provisions of the program regulated entities may also be able to use eligible emissions units from other sources, such as domestic or international offsets mechanisms. Linking broadens access to least-cost mitigation, supports market liquidity, increases price predictability, and enables political cooperation on carbon pricing. The environmental integrity of the system needs to be ensured through adequate accounting rules (to avoid double counting) as well as robust emissions monitoring, reporting and verification (MRV) systems and enforcement of penalties for noncompliance. The market is facilitated through registries that are responsible for issuing allowances, tracking them as they are traded between different participants, and canceling them when they are used for compliance or social responsibility purposes.

Towards Carbon Market Development

Defining the Objectives

Developing an effective carbon market begins with identifying and defining the goals and objectives. While the primary objective of the carbon market would be to reduce emissions, there are other aligned objectives that a carbon market policy helps achieve and thus, can be planned for at the outset. Among other outcomes, a successful carbon market in India can contribute to reduction in local air pollutants as a result of decreased particulate emissions due to efficient technologies deployed to meet targets, and the subsequent improvement in health outcomes and reduced public health costs. Economic outcomes of a carbon market would be greater adoption of efficient technologies and practices improving overall economic efficiencies of production and technological innovation, thus making goods globally competitive. Apart from these, policymakers may also aim to develop capacity on energy efficiency, climate change risks and mitigation amongst regulated as well as non-regulated entities through deployment of a carbon market. Finally, Indian policymakers may also define objectives in terms of distributional effects of carbon market on employment, industrial output and improvement in energy security, given India's national priorities.

It is recommended that these objectives be clearly defined at the outset, and communicated in measurable, quantifiable terms. This would not only give a clear pathway for the design of an effective carbon market but would also help in creating acceptance and buy-in across stakeholders and the larger population. Such targets and goals would also help measure progress and effectiveness of the carbon market and thus guide design improvements in subsequent phases. Some of the key parameters that should be defined at this stage are the long-term level of reductions that the carbon market aims to achieve, compared to the business as usual scenario, by when, and the rate of reductions or reductions pathway. Apart from this, it is also essential to earmark or budget for the implementation costs for the market and allocate revenues raised from the market, if any, towards other relevant policy priorities.

Developing the Institutional Framework

A robust institutional framework is critical to ensure market effectiveness, transparency and accountability. Such an institutional framework allocates legal, regulatory and administrative responsibilities while considering core competencies of the institutions involved, minimizing transactional costs and ensuring adequate oversight and operational ease. A proposed institutional framework is elaborated below and illustrated in Fig:1. Considering that in the Indian legal and legislative framework, climate change and GHG emissions fall under the purview of the Ministry of Environment, Forests and Climate Change (MOEFCC) (MOEFCC 2018), MOEFCC would be the national authority for carbon markets and would provide the overall oversight of the market, ensuring its integrity and effectiveness by setting the rules of the game through inclusive democratic processes. The Ministry would be responsible for designing and implementing a carbon market policy based on due legislative processes among publicly elected representatives along with adequate time and space for direct stakeholder feedback on the emerging regulation. Acting as the Regulatory Authority, the Ministry would define the legal nature and treatment of allowances as commodities or transferable assets, lead development of the standards and guidance while ensuring adequate engagement across relevant governmental institutions and ministries as well as industry and societal stakeholders and experts. The Administrative Authority, on the other hand would be the focal point for the implementation of the market and will be responsible for the day-to-day functioning of the carbon market by developing and managing the technical infrastructure, target setting and allocation of allowances through distribution or auctioning, coordinating and

communicating with the regulated entities, ensuring due processes defined by the Regulatory Authority are followed and ensuring Monitoring, Reporting and Verification protocols are followed on an ongoing basis. Another key role the Administrative Authority would play is of building overall capacity of the stakeholders on the functioning of the market and providing implementation support to stakeholders as needed. Judicial courts in India would have an overarching Legal Authority to enforce the regulation and execute penalties in cases of defaults or discrepancies. They would also be responsible for carrying out due legal processes in cases of grievances or market frauds, while ensuring the ownership rights and transfers of allowances are in line with the regulation and the legal nature of allowances. The courts of justice would also be responsible for holding the Regulator and Administrator accountable and upholding fairness principles as well as rights of regulated entities and other involved stakeholders.

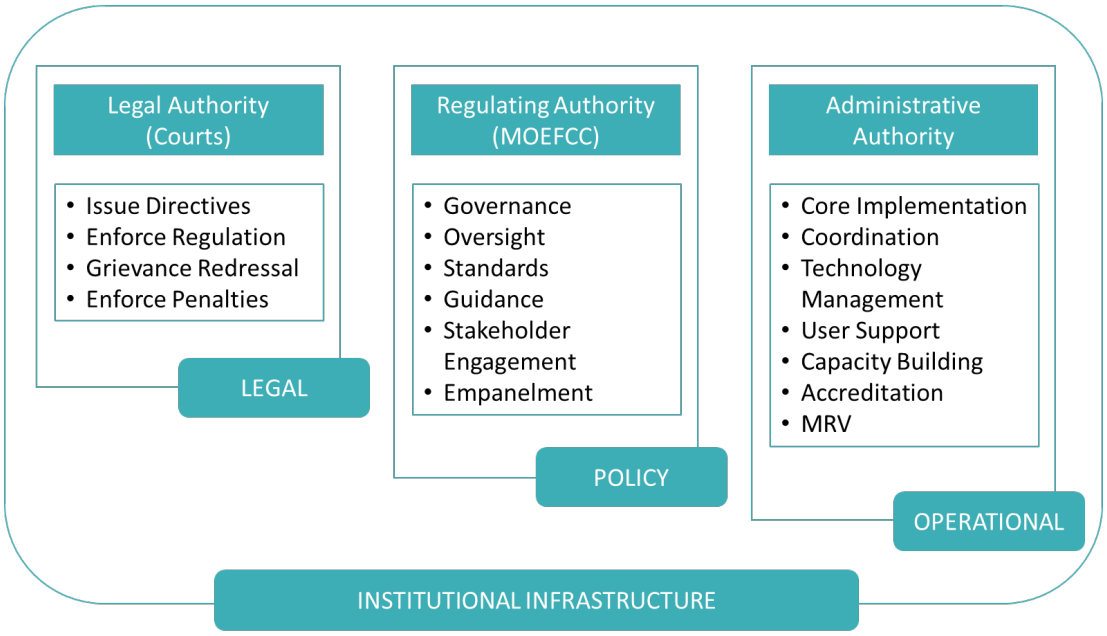

Figure 2 Institutional Framework for a Carbon Market in India

Carbon Market Development

Defining Market Principles

While the specific design of a carbon market in India would dependent on the defined goals and objectives, as well as limitations of availability of finance and technology, the following principles would act as guiding considerations to ensure a fair and effective carbon market in India:

- **Climate Change Mitigation -** through reduction in greenhouse gas emissions. Would also be among the key criteria to determine the success or effectiveness of the market in India.

- **Environmental Credibility** – that would ensure that the reductions achieved through the market in India are real, measurable, verifiable and thus credible and adding explicit value.

Minimizing carbon leakage (the shifting of production or investment to areas outside the cap resulting in an increase in global emissions) or compensatory increase in other greenhouse gases not covered by the program are also important to ensuring environmental credibility and thus value of reductions from the market.

- **Least-cost reductions** – through flexibility on where, how and when emission reductions take place, by minimizing transaction costs, and ensuring complementarity and integration with other policies (e.g., energy efficiency, clean energy, industrial standards) influencing regulated sectors

- **Local relevance** – through design of the market in keeping with local context and realities such as the size, growth rate and composition of the Indian economy; the emissions and abatement opportunity profile for Indian sectors; the ambition of policymakers and competing priorities; and the level of capacity of relevant institutions and stakeholders

- **Predictability** - to allow regulated entities to plan future emission reduction investments effectively by deciding on, and clearly communicating long-term reduction pathway for the market and its key design features and implementation guidelines early on.

- **Stability** – to protect the market from large spikes in supply and demand of allowances due to external shocks such as local or global economic events or shocks from global carbon markets.

- **Accountability and transparency** – in design and implementation of the market to help build trust and credibility

- **Administrative ease and cost effectiveness** – to ensure economic efficiency and long-term sustainability of the market

- **International compatibility** – for future linking potential and thus facilitate least cost reductions through international cooperation

Designing the Market

A carbon market defines a cap on the total emissions lower than the baseline or the business as usual scenario, which provides the primary incentive for regulated entities to reduce their emissions. The overall cost at which the reduction targets are met is determined by the level of ambition, the allocation mechanism, the marginal costs of reduction for the different entities and the ease of ability to trade allowances, thus establishing the value for each allowance. To ensure GHG emissions are reduced truly and valued fairly, the cap and trade program requires well-defined and clear GHG emissions monitoring, reporting, verification (MRV) protocol, and stringent enforcement and noncompliance penalties. In order to ensure least cost reductions, markets design flexibility through provisions such as banking, borrowing and offsets. Finally, in order to compensate for external shocks and structural changes in the economy, carbon markets often include price stability provisions such as a strategic reserve of allowances or a floor and ceiling prices.

The following section outlines the key features for each of these market design elements. The final choice on the elements depends largely on the aims and objectives of the program and the local economic and market realities.

1. Scope

Patterns of emissions differ across sectors and regions. In designing a carbon market for India, it would be essential to look at the range of greenhouse gases released, the source industries in the regulated region, the proportional contribution of emissions to the economy, availability of abatement technology, administrative costs involved in program implementation as well as the market dynamics. Another consideration in deciding the scope may be sectors and regions already regulated under other policies, considerations to include areas that may otherwise have no financial incentive to reduce emissions and where co-benefits may be realized from achieving emissions reductions. Finally, with the PAT Scheme and REC mechanisms in place, defining the scope would also involve decisions to be made on excessive regulation for high emissions sectors already covered versus integrating the different schemes to complement each other. Scope defines the emissions covered under the program:

i. **Greenhouse Gases covered:** Which greenhouse gases – Carbon dioxide (CO_2), Methane (CH_4), Nitrous Oxide (N_2O), and Ozone (O_3), Hydrochlorocarbons (HFCs), Chloro-fluorocarbon (CFCs), Sulphur hexafluoride (SF_6), Nitrogen Trifluoride (NF_3) – are covered under the program
ii. **Level of Aggregation**: Whether the program would look at national or sectoral level of aggregation or aggregate in terms of fuel use (e.g. natural gas usage, electricity consumption in the economy)
iii. **Sectors covered**: Which economic sectors are covered by the program. Covering sectors composed of many small, diffuse, or remote emissions sources may involve high administrative costs relative to benefits. Covering sectors dominated by a small number of large emitters can provide high benefits relative to administrative effort.
iv. **Threshold**: If all emitters or only those above a certain threshold of emissions are regulated. Which entities within the sector are mandatorily part of the program. The threshold is often based on annual emissions, installed capacity, energy consumption, market capitalisation, turnover etc. Strategically choosing thresholds can significantly reduce the number of covered entities without losing much of the covered emissions and mitigation opportunities.

2. Point of Regulation and Reporting

At what point in the economy would the program be applied:

i. **Upstream Approach:** In case of an upstream approach, the point at which the materials that will result in the emissions first enter the economy (i.e. fuel production - coal mining or oil & gas extraction, or fuel imports or electricity generation) are regulated. Such an approach enables a large fraction of energy CO2 emissions to be covered while regulating relatively few entities, thus lowering administrative and monitoring costs.
ii. **Downstream Approach:** In case of the downstream approach, the point where the emissions actually occur and where maximum options for abatement are available are regulated. This approach is straightforward for manufacturing facilities but difficult for

individual buildings, cars, and trucks, etc. due to the increased costs of monitoring and administration.

iii. **Hybrid Approach:** A program may also include a mixture of upstream and downstream approaches, or "midstream" approaches (for example, oil refineries and natural gas processing plants).

Another important design characteristic concerns at what level does the program set caps or expects reporting. The options here depend on the point of regulation and accordingly may be:

i. Company level – Where regulated entities are companies. These entities may have operations in more than one geographical location and regulation may be applicable to all or part of the company's operations. Accordingly, the company would have to report emissions from all its regulated operations under the market, and demonstrate compliance at the company-level.

ii. A specific plant site or unit level – Where regulated entities are specific sites or facilities that fall under the regulation threshold criteria or geographical scope.

3. Setting the Cap

The cap defines the total amount of emissions allowed within a carbon market or the total allowances allocated to entities regulated under the market. The cap determines how much and how quickly the target is achieved and is the fundamental determinant of the system's ambition to reduce emissions as well as of the stability of the market created thereof. Engaging with stakeholders is a crucial element of the cap setting process to arrive at a level that allows maximum emission reductions while being reasonably ambitious and feasible. The cap may be equivalent to the amount of absolute annual emission allowances at the end of the compliance period or based on emissions intensity metric, or both.. Since India's overall mitigation target is based on an emissions intensity basis, it would be important to set a cap that easily translates into emissions intensity per unit GDP for India, while also allowing for absolute reductions from the regulated market. The level of emissions allowed under the cap eventually determines the price at which emission allowances are traded. Depending on the cost of abatement of emissions, a cap too high could lead to an oversupply of allowances, thus lowering the market clearing price and vice versa. While this is not a problem in itself, a price lower than the actual cost of reductions lowers the incentive for non-compliers to reduce their emissions.

4. Allocation of Permits

The government can sell allowances through an auction, or it can give allowances away for free. Free allowances can be allocated through three main methods, making four allocation options available:

i. **Auctions -** Auctioning involves the allocation of allowances through a market mechanism, ensuring efficient functioning of the trading market and strong incentives for carbon abatement. It also creates a source of public revenue that can then be distributed to a wide range of potential beneficiaries. Auctioning also provides a market signal on the cost of abatement to the regulating entity. While theoretically this is the most recommended approach, India may, as other markets have, choose to introduce auctions at later stages of the market when entities are

ii. **Free allocation using grandfathering** – This allocation approach uses historical emissions to freely distribute allowances in line with reduction targets and individual firms' past emissions or fuel input multiplied by a standard emissions factor. However, the amount received remains independent of future output decisions or decisions to reduce carbon intensity. While this approach is used frequently, as in the case of PAT Phase I, it is often regarded as an approach that rewards high historic emissions with higher allowances, and is hence not recommended.

iii. **Free allocation using output-based allocation** – Here entity-level allocations are based on their own pre-program emissions intensities and actual or projected outputs. When firms increase or decrease their output, the allowances that they receive correspondingly rise or fall, accordingly. This output based approach complements the growth priorities of a developing economy as India but does not consider best available technology and hence may not be most effective in encouraging emission reductions.

iv. **Fixed sector benchmarking with infrequent updating** - Compared to the grandfathering the allocation is dependent on product or sector level benchmark emissions intensity rather than by reference to the current or historical emissions intensity of each individual firm. The use of sectoral benchmarks has the potential to safeguard incentives for cost-effective emissions and it also rewards early action. The output used to determine the free allowances to covered entities could be either historical or real data, and updating is necessary in the latter case. With great diversity in sectoral reduction potential and low carbon technology available, this approach allows for due consideration for sectoral challenges while rewarding early action and is the most suited to India's priorities given it allows ambitious output growth while ensuring chosen low emission pathway.

In addition, as a measure to avoid giving undue advantage to larger market players or emitters, markets may issue a **purchase limit,** which prevents regulated entities from purchasing more allowances than a fixed percent of their target or of the total allowances sold at auction, in order to avoid market capture from very large entities

5. Price Stability Provisions

Price fluctuations in a carbon market are a result of changes in demand and supply and represent the cost of abatement. These fluctuations are natural and desirable. However, for long term low carbon pathway and encourage investments, large fluctuations in prices may act as a deterrent to investments. In order to ensure market stability and price certainty in case of exogenous shocks causing excessive fluctuations in demand and supply, policy interventions that act as checks may be used. These ensure a stable market that helps regulated entities gain predictability and confidence in price stability thus helping them plan reduction strategies more efficiently and affect reductions over the long term. The measures that may be used, often in combination, are:

i. Establishing a **strategic reserve** of allowances that the regulator may add to or remove from the market in case of extreme variations in demand and supply. Maintenance of a strategic reserve of allowances helps maintain the price of carbon within a range and thus allows regulated parties to plan their compliance strategies. This is increasingly adopted by carbon markets to ensure price stability

ii. A **price ceiling**: The purpose of the ceiling is to prevent economic disruption from very high carbon prices or from prices that rise too quickly. In general, a price ceiling will result in higher emissions over time, since the primary response to hitting the ceiling is likely to be an increase in the supply of allowances.

iii. Price floor can be used to prevent the collapse of the carbon price, ensuring that clean energy investments will at least be supported by a known minimum carbon price. **Setting a minimum price level** through an auction reserve price provides the certainty that emitters need to plan investments, and provides a clear signal that low-carbon innovation will have market value. Allowances available at auction would not be sold below a minimum price, known as the reserve price. To ensure that prices in the market cannot drop below a certain level the government may commit to buy back as many allowances as needed at a predetermined price. This provides more price certainty than a simple reserve price.

Price ceilings limit how high (or how fast) allowance prices can rise, and a price floor limits how low they can fall. Used together, they form a price collar. The drawback of price ceilings and floors is that they create inefficiencies in the markets for emissions allowances. These often increase costs to regulators. Further, buyers and sellers who might wish to trade at a price higher than the ceiling or lower than the floor, but they are prohibited from doing so. Therefore, the use of price collars must be planned judiciously considering the benefits and costs of these market inefficiencies.

6. Flexibility Provisions – Banking and Borrowing

One of the key advantages of a carbon market is the flexibility available on how and when emission reductions are achieved. By providing flexibility to regulated entities on when emission reductions are achieved, the program promotes long term planning on low carbon investments and reduces price volatility without affecting the level of reductions achieved over the long term. Multi-year compliance periods along with flexibility mechanisms like banking of excess allowances from present for future use and ability to borrow allowances from future compliance periods allows covered entities to plan and implement the compliance strategies that create least cost reductions, create price stability and ensure maximum compliance. This helps to manage compliance costs, while ensuring that the environmental integrity of the program is maintained. While borrowing is highly contentious and unreliable, it has been largely avoided in most carbon markets, including India's PAT and REC schemes, banking offers incentive for entities to take early action and may be implemented in India to encourage low carbon investments.

7. Offsets

Offsets are documented emissions reductions that occur outside the regulated sectors, and can be used by regulated entities in lieu of reducing emissions covered by the system. By allowing the option of buying mitigation outcomes from domestic, international or regional programs beyond the system, offsets expand the options available to regulated entities to meet their targets. Offsets can reduce program costs (because a regulated entity will utilize offsets when they are less expensive than covered emissions reductions) while achieving the same level of emissions reductions. Offset credit projects may also produce co-benefits including health, social, and benefits in addition to GHG reductions. However, offsets may reduce the amount of low carbon investment in the sector due to

availability of low price credits, thus lowering the overall cost of allowances. Thus, offset approaches should be designed and implemented in a manner that ensures the environmental integrity of units. Again, one of the ways this has been carried out is by limiting the type of credits eligible to meet the program targets as well as setting limits to the extent to which offsets may be used to demonstrate compliance; e.g. only 10% of the target may be achieved by the use of offsets. While India may choose to include the offsets mechanism, as elaborated later, it is recommended to tailor this create a domestic offset market where MSMEs may supply renewable energy and energy efficiency generated offsets for regulated entities. This has the potential to manage reduction costs for regulated entities while encouraging voluntary reduction initiative from the MSME sector.

8. Monitoring, Reporting and Verification (MRV)

A key prerequisite for an effective carbon market is a robust monitoring, reporting and verification system with strong compliance management. Monitoring involves emissions quantification through calculation or direct measurement, which must then be consolidated in an emissions report that is comparable across regulated entities. Typically, these reports are then verified by independent service providers (verifiers). A strong MRV framework with a clear and well-defined reporting and compliance cycle provides confidence that emissions covered by the market are accurate, consistent, reliable, transparent and without material misstatement. This is especially relevant for India, where no mandatory reporting mechanism exists, thus creating a capacity gap in accurate and reliable monitoring.

Monitoring and reporting for such a system needs to be appropriately planned for the selected point of regulation and within the legal framework of the regulated jurisdiction in a way that ensures accounting of real emission reductions at the least added cost. Monitoring guidelines must be available for each sector covered by the ETS. The market can be based on most widely accepted available standards and methodologies, product and activity descriptions, emissions factors, and relevant assumptions, which may be tailored to local circumstances and sectors. Reliable reporting systems that provide information transparently and in standardized formats are part of a strong MRV framework. Such a framework also provides reasonable and predictable timelines for reporting at the end of a compliance period. Such systems are often already in place for other purposes such as mandatory reporting programs. Piggy backing on existing reporting systems to the extent possible reduces costs and simplifies implementation for both regulated entities as well as the responsible regulator.

Because the addition of a carbon price creates direct economic consequences, verification of entities' emission reports is essential. Different approaches to verification are possible, from independent third-party verification to self-certification with strong penalties. Whatever approach is chosen for quality assurance, it should take into account the administrative costs for the regulator and the regulated entities, the capacity of regulators and verifiers, and the context of business compliance with other government regulations in a jurisdiction, as well as the likelihood and impact of incorrect emissions quantification. While such independent auditing agencies are available in India owing to CDM and PAT, capacity building would still be important to align expertise to the guidelines and requirements of the new market mechanism. Registries that develop, record and monitor the creation, trading, and surrender of all units within a system—need to be institutionalized. This

requires an assessment of the legal and governance framework in which the registry will be situated as well as the its functional and technical requirements.

9. Compliance

Finally, a credible enforcement regime with appropriate penalties ensures compliance in the market. Globally, carbon markets typically rely on a combination of naming and shaming and fines for enforcement. Another approach used by programs in addition to the above is "Make-good" requirements, wherein defaulters are made to comply within a certain period, by buying units from the market or borrowing from their future allocation (usually at an unfavorable exchange rate). This measure goes further to help maintain environmental integrity of the program. This is especially important in India given the experience of the REC mechanism. Higher compliance penalties and actual enforcement mechanisms for the same would have to be clearly defined for an Indian carbon market, at the outset.

Stakeholder Engagement

To develop an effective carbon market in India, it is critical to not only give due consideration and address stakeholder concerns, but also to create overall buy-in for a long-term carbon market and ensure the market is designed based on ground realities in the country. Effective stakeholder engagement would begin with a comprehensive Stakeholder Engagement Plan covering workshops, roundtables, and ongoing communication and dialogue with various stakeholders including industry (regulated as well as nonregulated), experts, auditors, registry operators, accreditation agencies, academics, civil society as well as relevant government ministries. These engagement avenues would help seek inputs on the target, reduction pathway, institutional framework, design and supplementary policy support required, discuss and debate operational guidelines and requirements, as well as technology options available and develop consensus on the best available options for the market. Apart from this, the stakeholder engagement should also provide platforms for stakeholders to provide feedback through online portals and public consultations throughout the design phase. Additionally, it is also important to ensure structured engagement with stakeholders is carried out during the implementation phase and at regular intervals to seek feedback on operational challenges faced by stakeholders and address issues through design improvements in subsequent phases. Finally, it is also strongly recommended to document stakeholder engagement proceedings and make it accessible to the larger public to build in transparency and accountability in the process.

Building Capacity

Lack of adequate capacity across participants as well as the larger set of stakeholders can substantially undermine even the best designed carbon market. Building capacity thus forms an important part of designing and implementing a carbon market in India. In spite of the exposure to Clean Development Mechanism as well as PAT and REC in India, the aggregate capacity on the imperative to reduce emissions, the technology options, as well as measurement and reporting remain low in India. With the large number of entities involved across diverse sectors and level of capacities, the carbon market would need to play a bigger role in building the capacity across the

large as well as smaller entities. This is especially important to ensure that demand and supply in the market are adequately balanced with equal opportunities, especially for the smaller entities, thus ensuring they stay competitive and are not disadvantaged due to the market. A robust capacity development plan is thus required to train entities involved for implementation and operational aspects such as monitoring, reporting and verification, as well as to trade allowances and participate effectively in auctions, if conducted. A pilot carbon market program preceding the final implementation is also a crucial step in building the initial operational capacity across participants and ironing out issues based on their feedback, thus preparing the industry for the carbon market through hands-on experience. Further, additional capacity building efforts and handholding would be required to ensure participants are duly prepared to take reduction efforts and comply with market requirements. Finally, it is recommended to also develop capacity across other actors and stakeholders on climate change issues, need for a carbon market and other climate policies, the case for low carbon business practices as well as practical tools and guidance in supporting positive action.

Learning by Doing

To ensure long term sustainability and relevance of a carbon market, the market must improve on the existing design and evolve over time with economic and technological developments. An objective review of the carbon market at periodic intervals is essential to take stock of its progress against the set targets and objectives, to identify challenges and inefficiencies and seek feedback. Such a review may also reveal measures to reduce costs. Further, as the market matures, policymakers may introduce more stringent allocation approaches, higher penalties and higher ambition. The readiness for such design changes can be evaluated during the review of the market. Finally, along with the long-term targets and market vision, periodic evaluations help keep the market progress on track and underscore its credibility and relevance.

Key Design Considerations for India

The pathway to developing a stable and effective carbon market involves careful consideration of local conditions including the economy, legal system, geography and institutional setup. Programs that are locally smart provide the right incentives for emission reductions while allowing for economic opportunities and competitiveness, making them sustainable in the long run. As a first step towards this end, this section contextualizes the learnings from global case studies as well as insights from the Indian context to arrive at some of the key considerations while defining the design for a potential carbon market in India.

Importance of Stakeholder Engagement

Carbon markets development and operation are politically sensitive and of interest to a broad array of stakeholders. These include different industries and their trade associations, government agencies, and environmental advocacy groups. Some jurisdictions have found that it took five to ten years of engagement and capacity building on climate change market mechanisms to enable informed and broadly accepted policy making on an ETS. The involvement of and engagement with stakeholders who would be directly and indirectly affected by the program is increasingly seen as a vital step to implementing a program that is accepted and supported by the relevant parties. Moreover, all stakeholders will need the capacity to make informed judgments about the acceptability of the proposed market. This requires familiarization with the objectives of an ETS, its design features, and potential impacts. A deeper level of understanding will be required for those more closely involved in design, decision making, implementation, and technical advice. Moreover, engagement with stakeholders during the design phase ensures the implementation program that accommodates market realities on ambition level, sectoral challenges, technological options, marginal costs and costs as well as possible challenges. Adequate engagement with stakeholders provides an opportunity for policymakers to seek feedback from regulated entities on experience in markets as well as on design parameters planned for the program under consideration. The process also generates buy-in from critical stakeholders early in the process and also helps develop capacity on the modalities and procedures of the market.

Cap Setting

One of the key determinants of the market price of carbon is the level of ambition or the emissions cap for the market. As seen from the case of PAT as well as the EU ETS, when the level of ambition is low, or not at par with the level of economic activity, targets are often overachieved thus increasing the supply of reductions and lowering the trading price of carbon. While this is not an inefficiency in itself, it does not truly reflect the cost of reduction nor does it adequately compensate entities that have made investments in emission reductions, thus discouraging progressive action. While long term certainty in reduction path way and targets are crucial, annual or phase specific reductions need

to be planned to take into consideration the marginal abatement costs as well as sector specific growth estimates, as seen in the California Cap and Trade program.

Piloting and Phasing in

Implementing a carbon market requires extensive preparatory phase to collect and analyse data, develop the necessary legal and institutional framework, and develop the modalities required for the market implementation. Increasingly, jurisdictions are using explicit pilot or simulation periods to test the model and incorporate any necessary adjustments to the implementation design. These allow all parties to test policies, systems, and institutions; build capacity; and demonstrate effectiveness. Further, such piloting provides a test run to regulated entities and helps build capacity on the modalities and procedures of the market. An alternative or addition is to gradually phase-in some design features of the market to allow for learning-by-doing, easing the burden on institutions and sectors and progressively make the program more comprehensive, ambitious and stringent, as seen in the case of the EU ETS. This may be particularly valuable if the jurisdiction faces internationally distinctive local conditions. However, if the pilot reveals challenges, it runs the risk of undermining public confidence in the ETS before it fully commences. In spite of this challenge, the benefit of a pilot or simulation is that provides real on ground evidence that is relevant to the local economic and market conditions and allows for an opportunity to take corrective steps and overcome the identified barriers.

Periodic Review and improvement

As seen with the various programs reviewed, phased compliance periods allow for significant learnings that can be institutionalized in the following phases allowing for progressive improvement of the program over time. A periodic review at the end of a compliance period acts as a method to analyze and evaluate the effectiveness based on real data and thus improvise over time. A successful review must be conducted by an independent agency to allow for non-partisan and fair evaluation of the programs successes and shortcomings, thus also ensuring transparency and accountability.

Providing Flexibility

While the emission reductions in carbon markets are predictable, the greatest drawback of a carbon market is the uncertainty of the carbon price and the vulnerability of the market to exogenous shocks. Carbon prices vary largely due to an imbalance in the demand and supply of allowances. These in turn depend on design factors such as the ambition level or cap vis a vis the marginal cost of abatement, as well as exogenous factors such as surges and falls in economic activity. The use of price floors, ceilings, and other price stabilizing policies have proven to be key design elements to increase programmatic stability and confidence in the program by accommodating for exogenous shocks. Further, mechanisms to borrow from future compliance periods or bank allowances for future compliance periods help smooth uneven periods and large variations in demand and supply of allowances.

Providing Predictability

As evident from the industry feedback, one of the key concerns for industry towards carbon reduction policies is the predictability. While carbon taxes provide short to medium term certainty on the charge levied on emissions, taxes are highly sensitive to the local political environment, leading to higher uncertainty while making investment decisions in technology and expansion. On the other hand, a carbon market that provides long term certainty on emission reduction pathway allows businesses to plan for reduction in emissions and align the same with their business goals. Most of the global carbon markets studied provide good examples on how a long term (10-15 year) horizon of reduction pathway with interim goals provides businesses with the predictability on their future obligations and hence allows them to comply and facilitate least cost reductions within their operations.

Building Stability

Another area of uncertainty for businesses is the market price of allowances. The price of allowances plays a key role in helping businesses make reduction decisions. While in an ideal market, prices would be allowed to move freely with demand and supply, a carbon market would be vulnerable to a number of external shocks such as economic highs and lows, prices of critical inputs such as iron ore or fuel, as well as sectoral shocks that would influence the aggregate demand and supply of allowances. In order to ensure reduction activities have monetary value, a floor price of allowances is determined for some markets. This ensures that at minimum, reduction efforts of companies would have a predetermined value and trading can only happen at prices at or above the floor price. At the same time, in cases where overall allowance supply is too low, prices are vulnerable to spikes that may be unviable for most participants. In order to protect the market from such temporal shocks, a ceiling price is often implemented. Another option markets implement to ensure stable prices is implementation of a market reserve. A market reserve acts similar to a price collar (floor and ceiling), where the regulator adds or removes allowances into or from the market in when market prices spike or dip beyond a predetermined threshold. This market reserve also acts as a corpus of allowances which may be distributed to new entrants to the market or be distributed to vulnerable sectors in cases of unprecedented external shocks. Overall, with high unpredictability in market prices, price collars or market reserves ensure allowance prices move within reasonable limits to ensure a fair and competitive market that encourages real reductions.

Avoiding Leakage and Double Counting

While these are material issues, especially for a country that has a steep development curve ahead, an effective design of carbon market can ensure the costs and loss of competitiveness can be duly addressed by incorporating special provisions, higher thresholds, free allocation of allowances as well as distribution of auction revenues or provision of subsidies linked to compliance, in order to compensate for losses. Such provisions could be specifically targeted to vulnerable and leakage prone sectors.

Ensuring Compliance

Setting targets and allocating emission allowances while providing the primary incentive to drive reductions may not be sufficient to ensure compliance. As seen in the case of RECs in India, in the

absence of a strong compliance default penalty and enforcement of such penalties, the demand for allowances declines sharply, making existing allowances lose value and credibility, thus destabilizing the overall market. In order to have a sustainable balance between supply and demand along with trust in the market and value of allowances, it would be important that the Indian carbon market define penalties high enough to drive compliance, and ensure the enforcement of such penalties in cases of default. Additionally, as seen in the Regional Greenhouse Gas Program (RGGI), interim compliance requirements also help ensure entities are taking consistent and timely efforts to meet their targets. A carbon market in India can implement such interim targets to ensure compliance at the end of the compliance cycle.

MRV and robust registry

While a robust MRV would add to the operational and transactional costs for a carbon market in India, especially considering a relatively lower percentage of entities currently measuring and reporting their emissions and the level of capacities, it is critical to the environmental credibility and the final value of emission allowances, to have a strong MRV protocol that builds on existing processes, as in the case of PAT, while ensuring emissions are real, are measured accurately, are verifiable. Additionally, it would be important to ensure the registry offers transparency, security and flexibility to facilitate enlisting and transfer of allowances across entities. Investing in a technologically robust registry that meets international standards is also important towards a potential linkage with global or regional carbon markets in the future.

Policy Package/Enabling Policies

While a carbon market in India can help drive emission reductions from the industry thus enabling accelerated progress on India's NDCs and mitigating climate risks, it needs to be built as part of an overall enabling policy package. Such a policy package supports regulated entities by compensating for losses in competitiveness and incentivizes low carbon technologies. Furthermore, such a policy package should also include institutional measures to ensure greater transparency and accountability from the carbon market, as well as help build awareness and capacity on climate change mitigation.

Way Forward

It is evident that carbon markets-with a comprehensive framework and structured implementation-can aid and catalyse India's emission reduction objectives while ensuring sustainable economic growth. A carbon market in India can not only complement the existing emission reduction frameworks, but can also help meet other policy objectives such as improvement in energy security, reduction in health costs and climate vulnerability as well as sustainable economic development.

While this paper serves as a first step towards exploring the implementation avenues for a carbon market in India, greater research is required to develop policy recommendations and design features for the implementation of a carbon market in India. It would be essential to delve deeper into understanding the industry and other stakeholder perspectives on the design of a carbon market in India. Similarly, a simulation of a carbon market would help provide useful insights on what can work or not work in the Indian context, thus paving the way for a robust carbon market in the future.

Appendix A – Global Carbon Markets

	EU ETS	RGGI	CARB	Tokyo Program
GHG'S & Sector Covered	CO2 eq. only; Sectors: Power and heat generation energy-intensive industry sectors. Nitrous oxide from production of nitric, adipic and glyoxylic acids and glyoxal. Perfluorocarbons from aluminium production.]]	CO2 only; only Power sector covered.	Carbon Dioxide (CO2), Methane (CH4), Nitrous Oxide (N2O), Sulphur Hexafluoride (SF6), Hydrofluorocarbons (HFCs), Perfluorocarbons (PFCs), Nitrogen Trifluoride and other fluorinated GHGs; Sectors: Cement production, cogeneration, glass production, hydrogen production, iron and steel production, lead production, lime manufacturing, nitric acid production, petroleum and natural gas systems, petroleum refining, pulp and paper manufacturing, self-generation of electricity, stationary combustion, CO2 suppliers, first deliverers of electricity, suppliers of natural gas, suppliers of reformulated blend stock for oxygenate blending (RBOB) and distillate fuel oil, refineries that produce liquid petroleum gas in California, facilities that process natural gas liquids to produce liquid petroleum gas, and suppliers of liquefied natural gas.	CO2 only; Sectors: office, commercial and public buildings, district heating and cooling plants

Level of Aggregation & Threshold	Level of Aggregation: Facility Level; Threshold: Sector Specific	Level of Aggregation: Fossil Fuel plants; Threshold: Plant Capacity >25 MW.	Level of Aggregation: Covered Entities ; Threshold: All entities with emissions >25,000 tCO2e	Level of Aggregation: Facility Level; Threshold: Covered installations consuming 1,500 Kl/year (crude oil equivalent)
Allocation of Permits	Phase I and Phase II, allowances largely allocated for free but auctioning of allowances in Phase III	Quarterly regional allowance auctions by participating State according to state's regulations.	Allowances distribution a combination of limited free allowances (via industry assistance factor) and a remainder of auctioned allowance.	Except for allowances reserved for new entrants, allowances offered free of charge through grandfathering approach.
Price Stability Provisions	Market Stability reserve :5% of the allowances placed in the new entrants' reserve and backloading of 900 million allowances.	Each auction has a reserve price, a price floor. Cost Containment Reserve (CCR) of CO2 allowances for a fixed additional supply of allowances if allowance prices exceed certain price levels.	Allowance Price Containment Reserve to reduce the risk of higher-than-expected allowance prices available for purchase quarterly at three tiers of pre-established prices that increase annually by 5% plus rate of inflation. Price controls for auctioning include a floor price and an allowance price containment reserve.	To stabilize the emissions trading prices, measures to increase the supply of reductions are used. On governor's decision, measures like use of credits outside Tokyo and enabling the use of Kyoto Credits only from Tokyo based small and medium-sized enterprises.

Flexibility Provisions	Unlimited banking of allowances allowed in Phases II and III. Offset usage for the period 2008-20 constrained to 50% of the abatement relative to 2005. Use of flexibility mechanisms established by the Kyoto Protocol, Clean Development Mechanism (CDM) and Joint Implementation (JI) permitted.	Unlimited banking of covered facilities allowances and offset allowances for use in future compliance periods. Offset allowances restricted five project categories. Regulated sources must hold allowances equal to 50 percent of their emissions during each Interim Control Period. Offset allowances can be used to satisfy up to 3.3 % of regulated source's compliance obligation	Allows banking of allowances against shortages and price swings. Subject to holding limits, borrowing from future periods for compliance in the current period allowed. 8 % of a facility's compliance obligation limited to emissions-reduction projects in U.S restricted to five areas Offsets must be independently verified.	Emission reduction exceeding the yearly obligation may be traded from the 2nd year of compliance period. Banking is allowed, but borrowing is not allowed. Only 4 categories of offsets can demonstrate target achievement.
Baseline	21% reduction below 1990 levels by 2020; 43% below 1990 levels by 2030	45% reduction in CO2 emissions from the power sector by 2020 relative to 2005 emissions levels.	Reduction of GHG emissions to 1990 levels by 2020 & 80% reduction in GHG emissions below 1990 levels by 2050.	Target of 25% reduction by 2020 completed target now revised to reduce 30% of carbon emissions to 2000 baseline level by year 2030.
Time Period	First compliance period (2005 – 2007), second compliance period (2008 – 2012), third compliance period (2013 – 2020), fourth compliance period (2021 – 2028). Currently in Phase III of operation (2013-2020);Reporting period: annual (1st January to 31st December).	First compliance period (2009 – 2011); second compliance period (2012 – 2014); third compliance period (2015 – 2017), currently in third phase ; Reporting period: annual (1st January to 31st December)	First compliance period (2013-14); second compliance period (2015 – 2017); third compliance period (2018 – 2020); Currently in third phase ; Reporting period: annual (1st January to 31st December).	First compliance period (2010 – 2014); second compliance period (2015 –2019) ; Currently in second phase ;Reporting period: annual (1st January to 31st December).

MRV & Non-Compliance Penalties	MRV: All emitters required to develop and submit a monitoring plan and report the emissions annually. Once verified, operators have to surrender the equivalent number of allowances by 30 April of the current year. Capped firms have to report their emissions annually and get them independently verified ; Non-Compliance: Non independently verified firms ineligible to sell allowances. If surrendered units are not enough, entities are subjected to a penalty which has increased over time along with the EU consumer price index. Non-complying entities have their names published and may have to pay additional national level penalties.	MRV: On 30 January of a compliance year, covered facilities have to submit their previous years CO2 emissions data via US EPA's Clean Air Markets Division Business System, which then transfers data to RGGI COATS . On 1 March, entities are required to surrender allowances up to 50% of their generated emissions in year 1 and year 2 and all the remaining emissions at the end of the final year of the compliance period; Non-Compliance: Post compliance, Member States have to evaluate if entities have surrendered enough allowances to meet their obligation. Post evaluations, covered facilities are required to "True-up". If entity fails interim compliance obligation then the Member State in which the facility is located pays a fine, penalty or another assessment remedy. If entity fails 3 year compliance obligation then the facility has to surrender allowances equal to three times the amount of emissions exceeded. They may also be subject to additional penalties from the host RGGI State.	MRV: The Mandatory Reporting Rule of 2007 obligates California facilities to report and verify their in-state emissions to the ARB. Applicability thresholds for reporting are lower than those for compliance. Reporting of emissions and additional data must be done annually. The program also mandates independent third-party verification.; Non-Compliance: If an entity is non-compliant at the end of the period, it must forfeit four allowances for each allowance it did not submit. The partial annual compliance obligation is a form of flexibility to participants regarding how they use their allowances and meet their compliance obligations.	MRV: Entities are required to submit an annual report of last year's emissions and their emission reduction plans by the end of November of the following year. Report covers CO2, CH4, N2O, PFC, HFC and SF6 emissions. Verification from a registered independent verification agency must be attached to the emission data report. Annual emissions and actual reductions are publicized once per year on the TMG website; Non-Compliance: If market misconduct is suspected, TMG will first provide guidance to the participant and later apply penalties if necessary. For non-compliance, the facility will have to reduce emissions by the 1.3 times the shortfall. If they fail, the violation will be published for public viewing and the facility would be fined up to ¥500,000. In the specific case of failing to comply with the order, TMG purchases the reduction shortage and records them and registers that the reduction target has been fulfilled. Thereafter, the cost of TMG's purchase is billed to the facility.

Linkages with other markets	EU ETS has been linked with many cap and trade systems of various countries like Normay, Australia, Iceland, 27 European nations. It is also linked with credit system of CDM and JI.	Linked with 10 USA states.	The program has established emission trading system with Québec. They are the only members of the Western Climate Initiative (WCI) who has such linkage. By the first quarter of 2015, Californian and Québecois entities have mainly used allowances (99.95%) to comply with their cap-and-trade obligations. The linking of such carbon markets has expanded the scope of the two systems.	It has linkage with CDM. The Tokyo Cap and Trade also has a linkage with the Saitama Prefecture in April 2011 when the Saitama ETS was launched. Credits from excess emission reductions and Small- and Mid-Size Facility Credits (offsets) are officially eligible for trade between the two jurisdictions. During the first compliance period, 14 credit transfers took place between the Saitama Prefecture and Tokyo (8 cases from Tokyo to Saitama, 6 cases from Saitama to Tokyo).

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