In collaboration with
Bain & Company

WORLD ECONOMIC FORUM

Asia's Carbon Markets: Strategic Imperatives for Corporations

INSIGHT REPORT

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Foreword

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The global imperative to address climate change has reached a critical juncture, with the Paris Agreement's goal of limiting warming to 1.5°C demanding urgent, coordinated action. Central to this effort is Article 6 of the Paris Agreement, which has emerged as a transformative framework for international cooperation – enabling cross-border carbon trading, harmonizing standards and mobilizing global capital to scale up climate solutions.

In this context, carbon markets have become indispensable tools, aligning environmental ambition with economic pragmatism to accelerate the transition to net zero. According to the International Monetary Fund (IMF), countries across the Asia-Pacific region face a climate financing shortfall of at least $800 billion. As innovative instruments, carbon markets serve as critical mechanisms for mobilizing resources and reducing costs, granting countries and companies the flexibility to smooth their low-carbon transitions. Asia, with more than 50% of global emissions and 55% of GDP, stands at the forefront of this transition.

Against this backdrop, the World Economic Forum in collaboration with Bain & Company offers this insight report, which presents a comprehensive review of the Asian carbon market. It decodes the region's pioneering innovations, dissects critical market dynamics and distills hard-won lessons.

By spotlighting Asia's unique carbon market practices, we aim not only to empower the region's decarbonization journey but also to inspire global climate action, offering a blueprint for nations worldwide.

The evolving landscape of carbon markets in Asia forces corporations to take the initiative amid changes to tackle challenges and capture opportunities. We move beyond generic decarbonization strategy analysis, weaving together market evolution, core participants and the broader ecosystem of stakeholders. By anchoring corporate thinking in this interconnected web, we reveal how businesses can navigate carbon market complexities, not just as participants but as catalysts for systemic change.

As we move through 2025 and towards ever-escalating climate crisis, the urgency of reaching peak emissions and carbon neutrality has never been more acute. This report fuels that momentum. It calls for Asia to leverage its carbon market innovations, for corporations to embrace strategic climate leadership and for global stakeholders to unite in harnessing market mechanisms to drive irreversible, transformative change. Together, let us seize the opportunity to move from ambition to impact, exploring how economic progress and climate stewardship can be aligned.

Executive summary

Asia's carbon markets are becoming increasingly integrated, offering businesses the opportunity to revamp decarbonization plans and secure a competitive edge in the low-carbon transition.

Carbon markets across Asia have entered a pivotal stage of evolution and structural transformation. Corporations should act now and harness the power of carbon markets to advance their decarbonization journeys.

The Asian carbon market is crucial in achieving global net-zero goals.

The region accounts for more than 50% of global emissions[1] and 55% of global GDP,[2] yet its carbon markets currently cover only 28% of regional emissions.[3] As critical enablers, carbon markets play a key role in mobilizing resources and reducing costs. Unlike the European Union's mature, unified carbon market, Asian carbon markets are characterized by rapid scaling-up, diverse development stages and strong potential for regional synergy.

Asia hosts quite advanced carbon markets (e.g. Japan, South Korea, Singapore) and is developing nascent systems (e.g. India, South East Asia). China, which hosts the world's largest carbon market and the biggest mandatory national emissions trading system (ETS), has relaunched its voluntary carbon market, Chinese Certified Emissions Reduction (CCER). This report's projections suggest that China's ETS could reach RMB 400-600 billion ($56-84 billion) in market size by 2030, driven by 2 billion tonnes of carbon traded at RMB 200-300 ($28-42) per tonne.[4] Such developments serve as models for other emerging economies in the region.

Interconnectivity among Asian carbon markets offers substantial potential to facilitate cross-border cooperation and regional integration.

Integration could be achieved through establishing unified rules, enabling trading interconnections, sharing data, providing mutual assistance in capacity building and ensuring interoperability with international standards. Initiatives such as the ASEAN Common Carbon Framework (ACCF) and Japan's Joint Crediting Mechanism (JCM) are pioneering in their alignment of rules, data sharing and capacity building. Such collaboration could enhance the effectiveness of regional carbon markets and drive collective progress towards low-carbon development.

For businesses, carbon markets are strategic tools that can accelerate their low-carbon transformation and boost their competitiveness.

Corporations can integrate carbon markets into decarbonization strategies to optimize emissions reduction pathways, aligning with Asia's evolving regulatory frameworks. This includes operational emissions reduction via structured roadmaps, value chain decarbonization through supplier collaboration, and strategic carbon credit portfolio design to balance short- and long-term objectives.

The growth of carbon markets also fuels demand for low-carbon technologies and services (including carbon removals), unlocking significant commercial opportunities for new business growth opportunities.

Engaging in ecosystem collaboration and aligning with regional policy dynamics further enables corporations to enhance efficiency, manage compliance and strengthen their position in Asia's low-carbon transition.

Carbon markets encourage innovation in low-carbon technologies and services.

Carbon markets foster advancements in renewable energy projects (e.g. grid-connected solar thermal power, offshore wind), forestry carbon sinks (e.g. afforestation, mangrove restoration) and industrial energy efficiency improvements (e.g. energy-saving in highway tunnel lighting systems).

Digital technologies such as blockchain and privacy computing are increasingly applied to enhance the authenticity and security of carbon data management, supporting more efficient measurement, reporting and verification (MRV) systems.

Innovations also extend to market mechanisms and methodologies, such as diversified carbon credit portfolios balancing nature-based solutions (NbS) and technology-based solutions (TbS). These innovations create new growth avenues and position corporations as key contributors to the low-carbon ecosystem.

To harness the full potential of carbon markets, it is essential to create an efficient and transparent market ecosystem.

Policy-makers should enhance domestic frameworks by clarifying rules and building robust data infrastructure for transparency. They can activate liquidity by expanding market coverage to more sectors, engaging in multilateral cooperation to attract international demand and supporting high-quality carbon credit projects. Expanding carbon financial products will boost vitality, while prioritizing international dialogue for mutual recognition of standards paves the way for global interconnectivity.

Corporations should participate in policy development to align rules with industry needs and collaborate with stakeholders on sector-specific methodological standards, enhancing carbon accounting credibility. Partnering with financial institutions and service providers can innovate carbon asset models, broadening revenue streams and injecting liquidity.

Collective capacity building through training and technology sharing will also elevate market maturity. Collaborative mechanisms among stakeholders can further enhance the effectiveness of carbon markets and maximize their potential for driving sustainable economic growth.

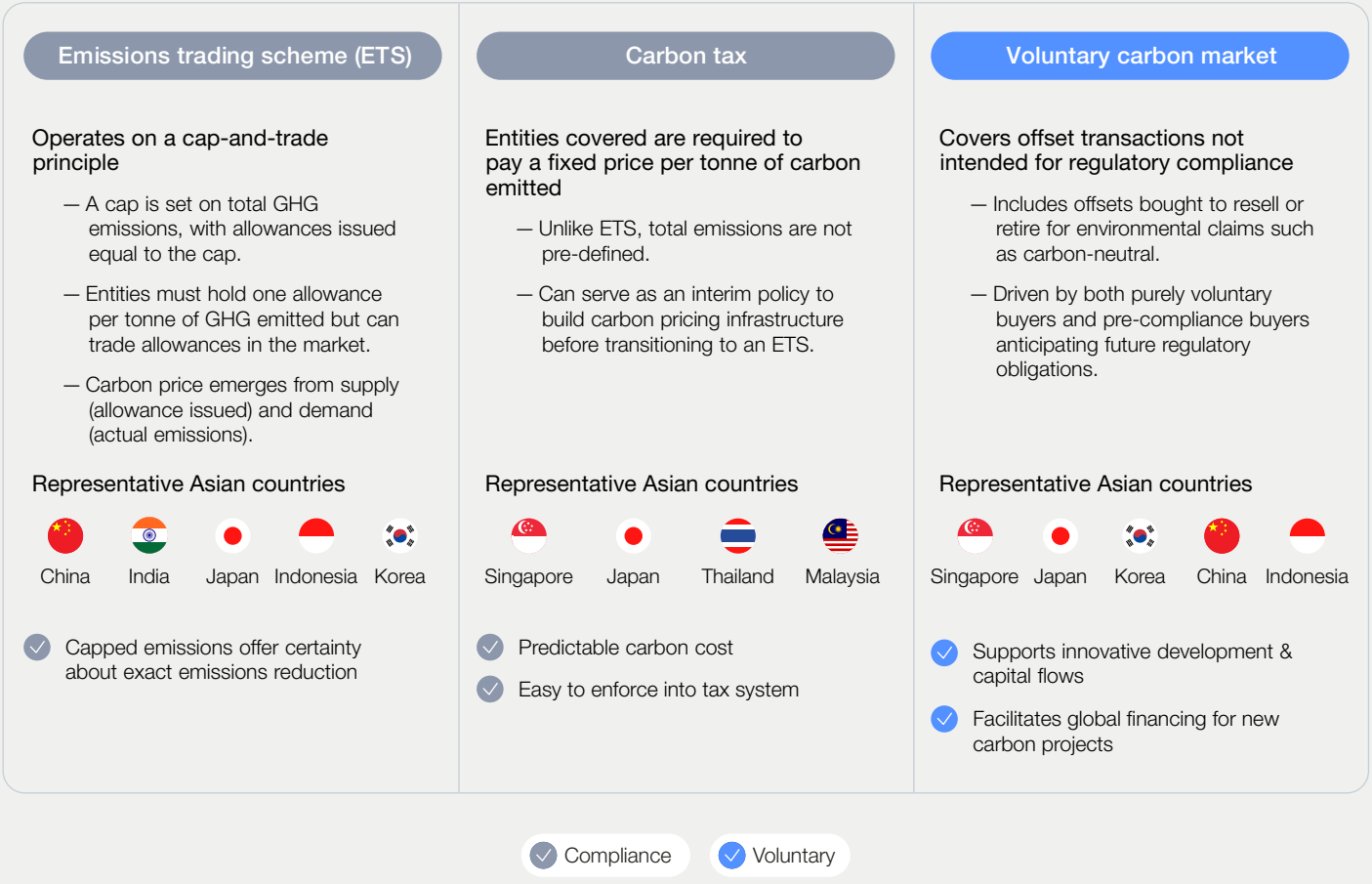
Introduction

This report examines the evolution of Asian carbon markets in both established and emerging economies, and discusses the strategic implications and opportunities for corporations.

Carbon markets provide a structured platform for trading carbon allowances and credits for market. Figure 1 outlines the different types of carbon pricing instruments, including carbon markets. Carbon markets are critical for global decarbonization, offering a market-based mechanism to reduce greenhouse gas (GHG) emissions while promoting economic efficiency and enhancing business competitiveness.

These markets incentivize innovation and adoption of green transitions through carbon pricing and trading. Recent advancements in Article 6 of the Paris Agreement, which establishes rules for countries to voluntarily collaborate on emissions reductions, bolster international cooperation, further amplifying the global impact of carbon markets.

FIGURE 1 **Existing carbon pricing mechanisms**



Source: United Nations Framework Convention on Climate Change.[5]

The Asian carbon market is of unique significance

Globally, carbon markets cover 23% of GHG emissions and jurisdictions representing 58% of global GDP have certain carbon markets in place,[6] with developed economies primarily leading. Asia, accounting for more than 50% of global emissions[7] and 55% of GDP,[8] has carbon markets covering approximately 28% of regional emissions.[9]

Asia's carbon markets are multi-layered and diverse. The region hosts quite advanced carbon markets (e.g. Japan, South Korea, Singapore) and is developing nascent systems (e.g. India, South East Asia), while China represents the largest carbon market in the world and is strategically expanding. Whether advanced or developing, each country is innovating its own institutional framework. Asian carbon markets are actively exploring various models and schemes, including high-potential voluntary carbon markets and interconnectivity mechanisms that are both regional (e.g. ASEAN's Common Carbon Framework) and global. This focused evolution is accelerated by policies such as the Carbon Border Adjustment Mechanism (CBAM) of the European Union (EU) and has positioned the region as a critical contributor to global climate solutions, offering innovative models for other economies worldwide.

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23%

of GHG emissions and jurisdictions representing 58% of global GDP have certain carbon markets in place.

The evolving Asian carbon market has strategic implications for corporations

As 2030 approaches, Asian carbon markets will need to undergo a transformative integration of economic and environmental priorities, creating both challenges and opportunities for companies. Corporations should adopt a new carbon market-informed strategy to thrive in this evolving landscape, as carbon pricing will increasingly affect operational and product costs.

Moreover, evolving carbon market and technological advancements will accelerate next-generation solutions, such as low-emission fuels and carbon capture, utilization and storage (CCUS), creating new profit pools. To succeed, corporations should help to foster a robust ecosystem by advocating for effective policies and enhancing market liquidity to lead in Asia's low-carbon transition.

About this insight report

This insight report delivers a strategic analysis of selected Asian carbon markets, presenting actionable insights for corporations, financial institutions and policy-makers. As Asian carbon markets evolve, their interconnection emerges as a systemic endeavour requiring collaboration across these three sets of stakeholders.

The report comprises two main chapters:

- **Chapter 1** examines the evolution of Asian carbon markets, with an in-depth focus on China's system and developments in established markets (Japan, South Korea, Singapore), as well as in emerging markets (India, South East Asia). It highlights the importance of regional and international collaboration in scaling-up these markets.
- **Chapter 2** discusses strategic implications for corporations, detailing how businesses can integrate carbon market strategies to manage risks, seize opportunities and drive sustainable growth amid Asia's low-carbon transition, supported by case studies from outstanding Asian corporations.

By connecting policy, market dynamics and business strategy, this report equips corporate leaders and financial institutions to align their strategies with the transformative potential of Asian carbon markets and remain competitive in a low-carbon global economy. It also offers a fresh perspective for policy-makers, aiding them in designing policies that can foster market growth more effectively while aligning with broader climate and economic objectives.

1 The carbon market landscape in Asia

Carbon markets could cut the cost of implementing nationally determined contributions by more than half – saving up to $250 billion by 2030.

27 countries in the Asia-Pacific region account for

76%

of current global coal generation capacity, with ongoing economic growth needs across the region.

Asia contributes more than half of the world's carbon emissions.[10] The region is pivotal to global climate action and is advancing in its global green transition towards meeting its long-term net-zero ambitions. It is striking that 27 countries in the Asia-Pacific region account for 76% of current global coal generation capacity,[11] given the ongoing economic growth needs across the region. This reality stands in stark contrast to the Net Zero by 2050 scenario of the International Energy Agency (IEA), which requires an 89% decline in coal-derived energy supply by 2050.[12] This divergence underscores a monumental, time-critical opportunity: Asian carbon markets must drive transformative integration of economic and environmental priorities to accelerate this transition.

As critical enablers, carbon markets help mobilize resources and reduce the overall cost of decarbonization, granting countries and companies the flexibility to balance economic growth and emissions reductions as they navigate their low-carbon transitions. Although carbon pricing will affect operational and product costs, it is estimated that carbon credit trading could cut the overall price-tag for implementing nationally determined contributions (NDCs) by more than half – saving up to $250 billion by 2030.[13] Last year, global carbon pricing mechanisms mobilized over $100 billion for public budgets,[14] highlighting their strategic value in financing climate action.

1.1 Regional overview

Compared to the EU's mature, single jurisdiction carbon market, Asia features multiple large, diverse and fast-growing carbon markets, each at a different stage of development. In total, the region hosts 17 national or sub-national carbon-pricing instruments and four national emissions trading systems (ETS) that generate over $4 billion from carbon schemes.[15] As pivotal instruments for a just transition, these markets require greater alignment, particularly given the significant variability in carbon pricing across Asian economies. Achieving carbon price convergence will be key to mobilizing large-scale investment for low-carbon transformation.

Asia's carbon markets are evolving with distinct characteristics, which can be categorized into three groups:

- **China as a unique case**, which operates the world's largest carbon market, underpinned by its vast emissions profile, a complex, rapidly scaling ETS, and its relaunched voluntary carbon market (Chinese Certified Emissions Reduction or CCER).
- **Developed Asian economies**, such as Japan, South Korea and Singapore, which have established advanced carbon pricing mechanisms, leveraging their economic maturity and policy innovation to reduce emissions.
- **Emerging Asian economies**, including India, Indonesia, Thailand, Malaysia and Vietnam, which are developing nascent carbon markets, overcoming structural and regulatory challenges to lay the groundwork for future growth.

Recognizing the potential of cross-border interconnectivity, Asian nations are undertaking preliminary efforts to connect markets, exploring pilots and models that could serve as global examples to amplify their collective impact. Many Asian countries are embracing innovation by embedding digital technologies into their carbon markets, highlighting the need to further discuss shared data infrastructure for enhancing market integrity. Meanwhile, Asia's high degree of industrial supply chain integration in manufacturing, renewable energy and other sectors means that intra-regional carbon market cooperation can significantly accelerate the application of low-carbon technologies across value chains.

This chapter explores China's carbon market as a cornerstone of regional and global climate action, given its scale and influence, emphasising the importance of strengthening China's role in global climate governance. It also examines the pioneering approaches of Japan, South Korea and Singapore, alongside the potential of emerging Asian markets. By exploring these developments, the chapter identifies opportunities for regional collaboration, including market linkages, knowledge sharing and harmonized standards.

TABLE 1 **Carbon markets in key Asian countries**

Region	Market overview
China	The world's largest ETS market, with market capacity reaching 8 billion tonnes CO_2-equivalent by 2025 and expanding to an estimated 9-11 billion tonnes by 2030. Voluntary market (CCER) relaunched in 2024.
Japan	National GX-ETS (2026) builds on 15+ years of regional pilots in Tokyo (2010) and Saitama (2011). J-Credit (domestic) and JCM (tech-transfer credits) dominate voluntary market.
South Korea	First national ETS in East Asia, covers 816 top emitters as of 2024. K-ETS offsets drive the voluntary market.
India	Voluntary carbon market dominates (led by renewable energy projects), with 10 certified sectors by 2024. Piloting a national compliance market with detailed regulations adopted in 2024.
South East Asia	Piloting compliance markets: ETS in force in Indonesia, under development in Viet Nam and Malaysia, under consideration in Philippines and Thailand. Singapore has adopted carbon taxes with carbon credit compensation mechanisms. Voluntary market features NbS carbon credits with high forest coverage rate. Regional cooperation frameworks (e.g. ACCF) are emerging.

Notes: CO_2e = carbon dioxide-equivalent; CCER = Chinese Certified Emissions Reduction market; GX-ETS = Japan's Green Transformation Emissions Trading Scheme; J-Credit = Japan's domestic carbon credits scheme; JCM = Japan's Joint Crediting Mechanism, by which Japan provides developing countries with advanced decarbonization technologies; K-ETS = Korea's Emissions Trading Scheme; NbS = nature-based solutions; ACCF = ASEAN Common Carbon Framework.

Sources: International Carbon Action Partnership, World Bank Group, Bain & Company analysis.[16]

1.2 China – the world's largest carbon market

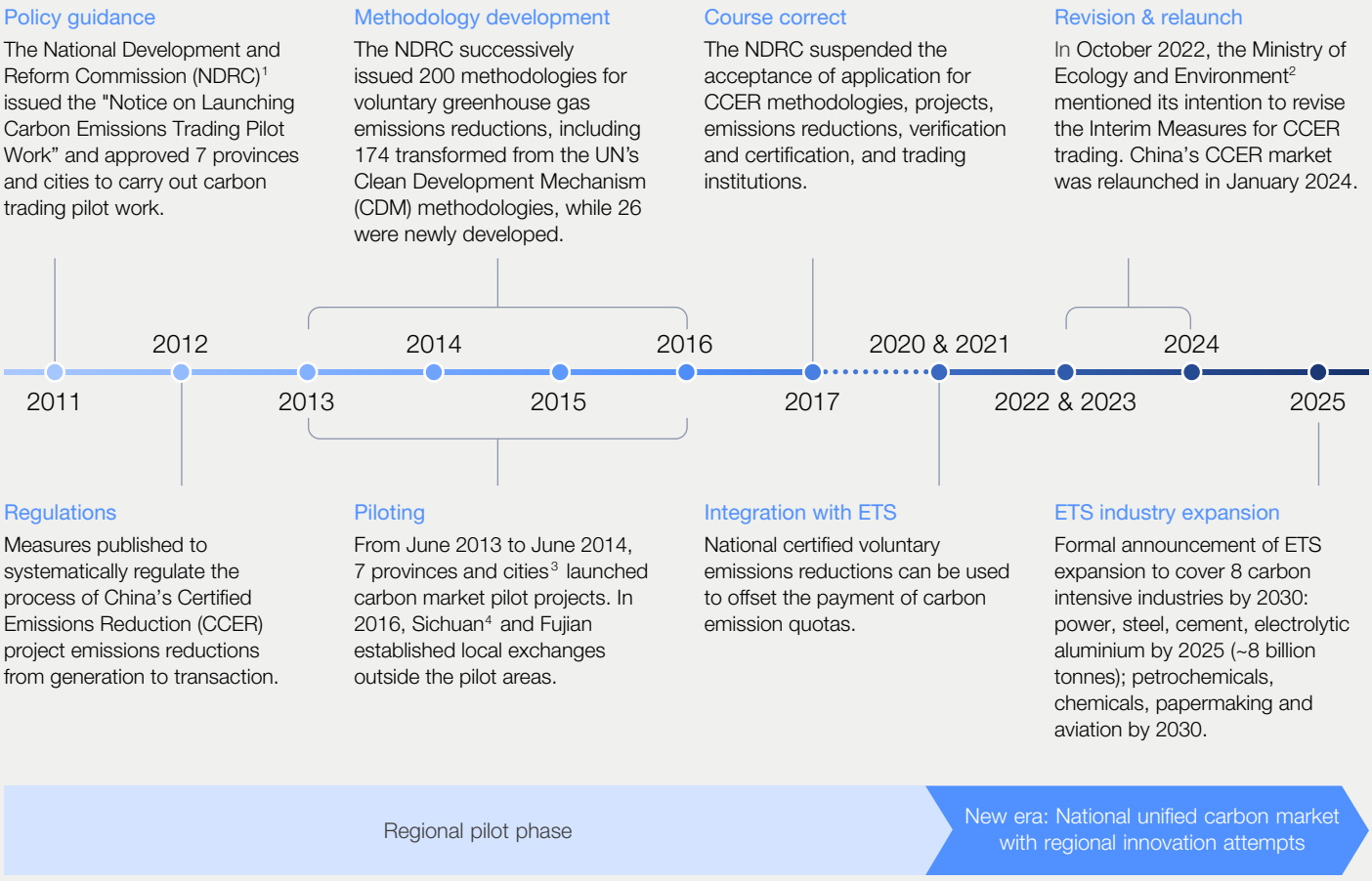
Overview: a journey of evolution

China's carbon market, the world's largest by emissions coverage, has evolved over a decade, integrating global expertise with local context. Its roots lie in extensive participation in the Clean Development Mechanism (CDM) under the Kyoto Protocol, which provided valuable carbon market experience. Drawing on global carbon market models, significant adaptations of a dual-track system were made to align with China's economic and industrial realities. The system is composed of both compliance and voluntary carbon markets, promoting the development of new technologies and decarbonization.

As illustrated in Figure 2, this journey, which began in 2011, was marked by iterative experimentation. These steps refined mechanisms and built capacity to align global practices with China's needs.

The 2020 "dual carbon" goals – peaking emissions by 2030 and achieving neutrality by 2060 – further strengthened the policy framework, cementing the carbon market's strategic role. As of 2025, the national ETS regulates over 8 billion tonnes of carbon emissions, covering 60% of industrial emissions.[17] This pragmatic evolution has created a unified national market, advancing China's climate agenda. Meanwhile, China's carbon market fully recognizes the complexity and difficulty of low-carbon transformation. It is a delicately designed system for balanced development and emissions reduction, which can provide a wealth of experience for developing markets.

FIGURE 2 **Development history of China's carbon market (2011-2025)**



Notes:

1. The NDRC (a ministerial department) oversees economic and industry policy frameworks, guiding carbon market alignment with national targets .
2. The Ministry of Ecology and Environment (MEE) of the People's Republic of China is the primary regulator of carbon market operations.
3. Beijing, Tianjin, Shanghai, Chongqing, Hubei, Guangdong and Shenzhen. Shenzhen is a city in Guangdong province, but is treated as a separate pilot area.
4. Sichuan's carbon exchange only carried out CCER transactions.

Source: Bain & Company analysis.

China's ETS: steady expansion

By 2024, cumulative trading volumes in China's ETS reached

630

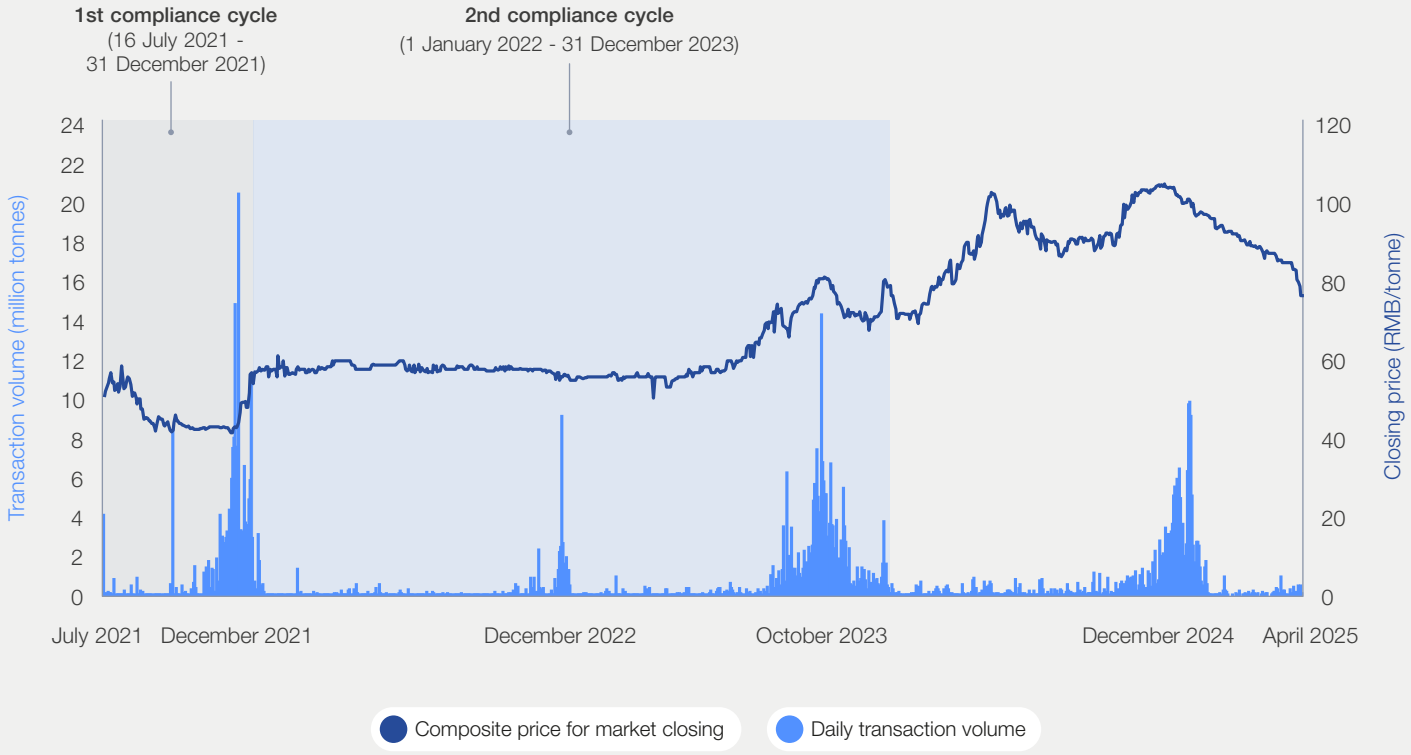
million tonnes

valued at RMB 43 billion, with carbon prices rising from RMB 46.6 per tonne in 2021 to over RMB 100 in 2024.

The national ETS, operational since July 2021, was initially focused on the power sector but expanded in 2025 to include steel, cement and electrolytic aluminium industries. The system's robustness continues to improve by strengthening data integrity and compliance via a sophisticated measurement, reporting and verification (MRV) framework, with monthly verifications and a three-tier auditing structure across national, provincial and municipal levels. Trading performance also reflects growing maturity (see Figure 3): by 2024, cumulative trading volumes reached 630 million tonnes, valued at RMB 43 billion, with carbon prices rising from an average of RMB 46.6 per tonne in 2021 to over RMB 100 per tonne in 2024.[18]

China's ETS is set to grow to a relatively mature stage by 2027 and expand coverage to eight high-emission sectors by 2030, adopting a phased approach to balance economic growth and decarbonization. Figure 4 details the phased expansion of China's ETS across these sectors from 2024 to 2030, highlighting the varying projected carbon peaking timeframes and peak emissions volumes in eight industrial sectors (see Appendix for model assumptions).

FIGURE 3 **Operational performance of China's national ETS (2021-2025)**



Sources: Ministry of Ecology and Environment of the People's Republic of China, Wind Financial Database.[19]

FIGURE 4 | **China's ETS coverage and expansion projections, by industry sector (2024-2030)**

Notes:

1. Peak time and peak emissions volume are estimated based on 2024 emissions levels and industry development trajectory outlook, considering speed of energy transition and tech improvement, demand change, production capacity, industry landscape and data infrastructure etc.
2. e.g. copper smelting.

Sources: Ministry of Ecology and Environment of the People's Republic of China, IEA, Euromonitor, Bain & Company analysis.[20]

China's ETS market mechanism is evolving. Looking ahead, this expansion is estimated to cover 8.7–10.6 billion tonnes of emissions during peak years (2028–2029) (see Figure 5 and Appendix).

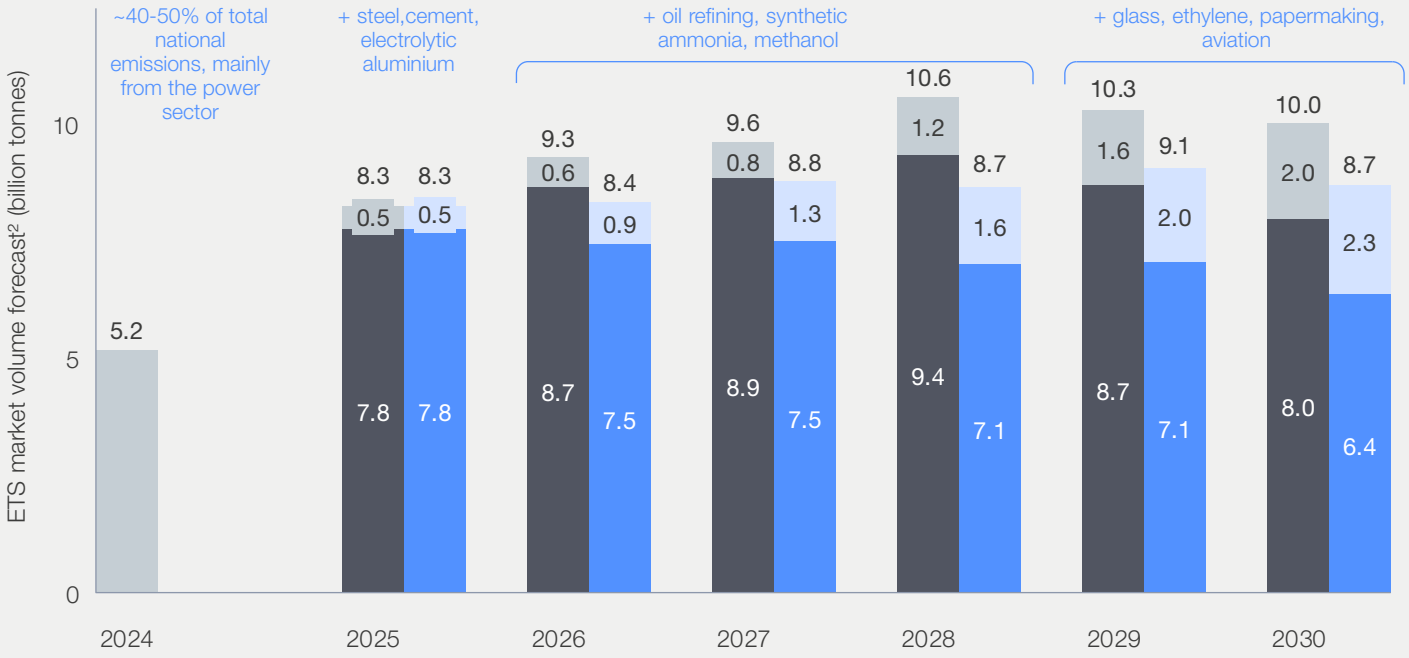
After China reaches peak emissions, its national carbon market will shift from controlling carbon emissions intensity to setting caps on absolute carbon emissions. Free allowances will gradually be replaced by a mix of free and auctioned permits,[21] with new one-way bidding models being explored.[22]

Research conducted for this report finds that China's ETS could reach a market size of RMB 400-600 billion ($56-84 billion) by 2030, based on 2 billion tonnes of carbon traded at prices of RMB 200-300 ($28-42) per tonne,[23] assuming free allowances are cut by 5% each year after peak emissions.

As coverage expands and prices rise, China's ETS is on track to become a major tool for cutting emissions and driving innovation in low-carbon technologies by 2030.

FIGURE 5 | **China's ETS market volume forecast (2024-2030)**

Expect China's ETS market to cover ~8-10 billion tonnes of total emissions volume before 2030



Scenario 1: Rapid sector expansion with conservative industry emission estimate (higher emissions).

Free volume | Exposed to priced emissions[1]

Scenario 2: Stable sector expansion with optimistic industry emission estimate (lower emissions).

Free volume | Exposed to priced emissions[1]

Notes:

1. Depends on evolution of quota design mechanism; directional estimate based on assumption that % of free quota gradually declines by 5% a year from 100% as covered industries reach peak emissions.
2. Base scenario for industry emissions trajectory and ETS expansion pace is same as in Figure 4.

Sources: Ministry of Ecology and Environment of the People's Republic of China; ClearBlue Markets; IEA; Euromonitor; Bain & Company analysis.[24]

China's voluntary carbon market – revitalization of CCER

300-500
million tonnes
of CCER demand potential by 2030.

The 2024 CCER relaunch has revitalized China's voluntary carbon market (VCM), complementing the ETS. Demand for voluntary carbon credits is driven primarily by the ETS's expansion, which increases offset requirements at national and local levels. This report's projections suggest 300-500 million tonnes of CCER demand potential by 2030, based on a 5% ETS offset limit on using emissions offsets.[25] Additional demand stems from the Carbon Offsetting and Reduction Scheme for International Aviation (CORSIA), which enters its mandatory phase in 2027, as well as from corporate carbon neutrality commitments.

On the supply side, six mitigation methodologies have been approved (see Box 1), with second-round solicitation closing in April 2025.[26] However, only nine projects were approved from the relaunch in January 2024 up to March 2025, with an expected issuance of 9.48 million tonnes.[27]

The VCM is likely to see sustained demand growth, but supply constraints may persist without intervention. Expanding the number and diversity of methodologies will be essential to closing the supply gap. Future approvals will likely focus on potential areas, including low-emission fuels, carbon removal, energy efficiency improvement and methane recovery and utilization. Innovative approaches such as quantifying "avoided emissions" (GHG differences between scenarios with and without a solution) will further aid the evaluation of methodologies. Despite efforts to expand methodologies to sustain supply, it is important to remain mindful of risks such as greenwashing, double-counting and low-quality credits.

Looking ahead, the CCER will be vital in fostering innovative decarbonization solutions to achieve China's climate objectives. Success will depend on balanced regulatory and market development. The value of carbon assets will rise, as the achievement of the dual-carbon targets in the 15th Five-Year Plan period will create demand for CCER. As a result, the demand for carbon credits will further increase during the carbon neutrality phase.

BOX 1 **Approved Chinese Certified Emissions Reduction (CCER) methodologies**

Renewable energies:

- Grid-connected solar thermal power generation
- Grid-connected offshore wind

Forestry carbon sinks:

- Afforestation carbon sinks
- Mangrove afforestation

Industrial energy efficiency:

- Energy efficiency in highway tunnel lighting systems

Other sectors:

- Utilization of low-concentration coal mine methane

Source: Xinhua News Agency.[28]

Three pathways to unlock China's full potential

As China's carbon market gains momentum, three strategic pathways strengthen its role in global climate governance: harnessing data and technology, unlocking financial potential and building policy synergies. These interconnected pathways can drive innovation, enhance efficiency and offer insights for emerging markets seeking market-based decarbonization.

Harnessing data and technology

Data and technology are vital for accelerating the growth of China's carbon market. In conjunction with adequate protection of intellectual property rights, three core levers can drive enhanced transparency, efficiency and scalability.

- **Harmonization of standards for digitalization:** aligning accounting standards, emissions factors and monitoring protocols across local, national and international levels will ensure consistency and enable digitalization.
- **Digital tech-empowered MRV:** advanced technologies, including AIoT (Artificial Intelligence + Internet of Things), blockchain, advanced robotics and satellite sensing, optimized for diverse applications such as ETS-regulated facilities and CCER projects, can overcome cost and efficiency barriers.
- **Cross-value chain data infrastructure:** robust data governance and technologies such as blockchain and privacy computing break silos, enabling secure data flows across value chains, empowering use cases such as compliance, trade and supply chain management.

Unlocking financial potential

Initially focused on decarbonization, China's carbon market aims to evolve into a dynamic financial instrument post-peak emissions, enhancing liquidity and price discovery. Key opportunities for this evolution include:

- **Diverse participants:** non-regulated entities, such as financial institutions, investors and sustainability-focused corporations, can invigorate market dynamics. Clear guidelines would enable these players to boost liquidity while maintaining emissions reduction integrity.
- **Harmonized carbon credit standards:** transparent, streamlined standards and approval processes balance integrity with accessibility for VCMs, reducing uncertainties, mitigating market risks and encouraging broad market engagement. To enhance global interoperability, aligning China's CCER with international frameworks – such as the Integrity Council for the Voluntary Carbon Market (ICVCM) and Article 6 of the Paris Agreement – would facilitate cross-border recognition and trading. This linkage is particularly critical for derivatives. For futures, forwards and options to be viable, high volume, liquidity and clear, transparent markets for voluntary carbon credits traded on the spot are needed.
- **Diversified financial instruments:** standardized, tradable carbon futures and options ensure better risk management and price discovery, while meeting compliance needs in carbon markets. Complementary tools such as green bonds and carbon asset-backed financing also help attract more investment by making it easier to fund low-carbon projects.

Building policy synergies

China's carbon market exists within a robust policy framework, but its potential hinges on deeper cross-disciplinary collaboration in areas such as industry, energy, product sustainability and green financing. Integrating tools such as green certificates with carbon credits and aligning organizational-level and product-level carbon accounting can unify standards and goals, reduce compliance costs and avoid conflicting decarbonization efforts. This kind of smart institutional design creates synergies between policy frameworks, helping accelerate the low-carbon transition.

Additional policy opportunities include:

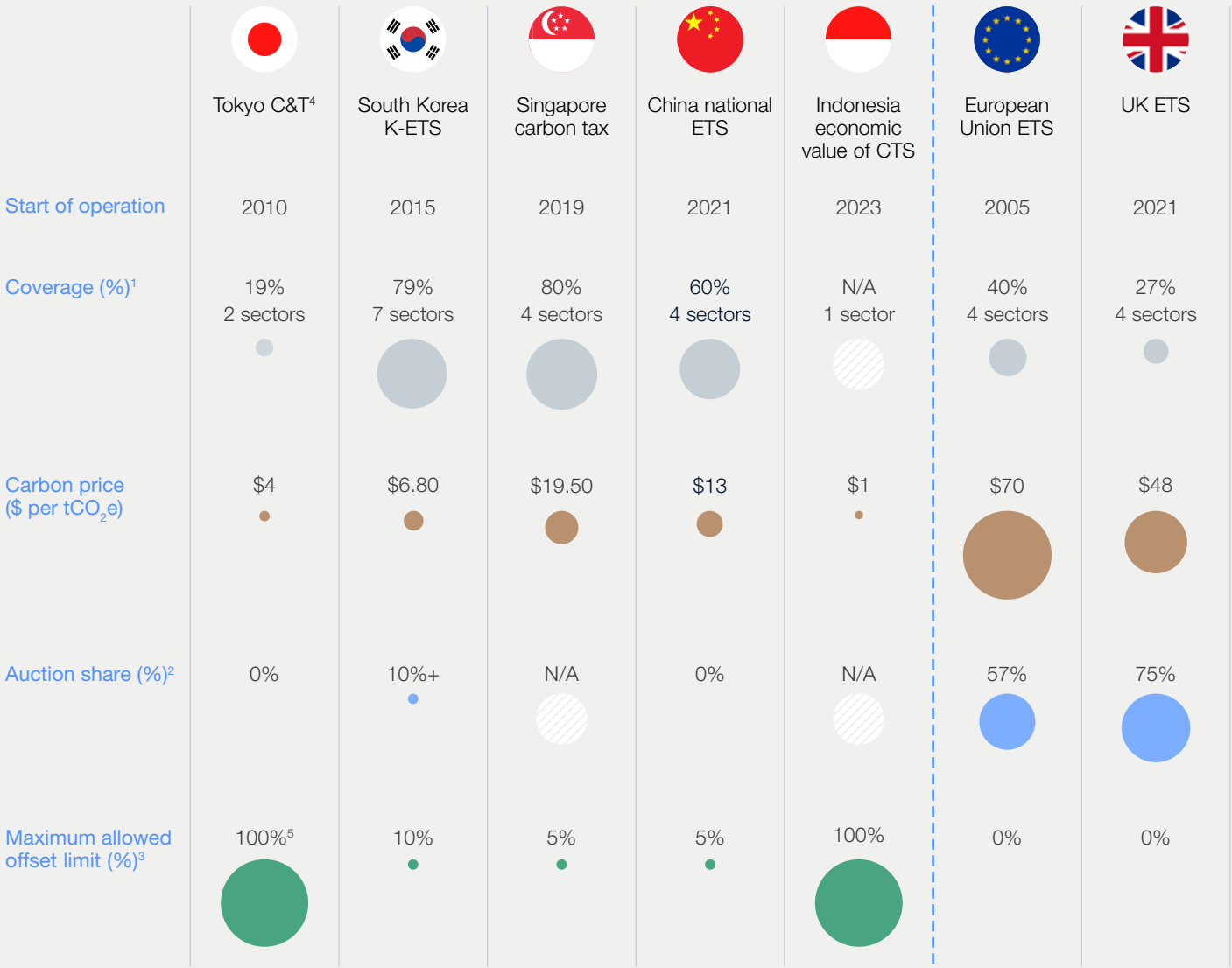
- Harmonizing carbon market rules with complementary industry policies to create a cohesive data ecosystem.
- Coordinating industrial and financing policies to support carbon pricing.
- Channelling carbon revenues into green investments to bolster low-carbon projects.
- Providing supply-side support for innovative, first-of-a-kind emissions reduction and removal projects – such as through contracts for difference, subsidies and tax breaks – to accelerate their development and growth.

1.3 Developed Asian economies – pioneers in robust carbon pricing

Established pricing schemes

Apart from China, other developed Asian economies such as Japan, South Korea and Singapore are taking significant steps to develop both regional and global carbon markets (see Figure 6 and Table 2). They have long been pioneers in implementing robust carbon pricing schemes, serving as powerful catalysts in their carbon strategies. They are now embarking on the path towards absolute carbon reduction, guided by their respective NDCs.

FIGURE 6 **Carbon pricing schemes in developed Asian economies (end-2024)**



Notes:

1. Share (%) of the jurisdiction's GHG emissions covered under the ETS.
2. Share (%) of allowances that have been offered for auction in the primary market.
3. Share (%) of a compliance entity's obligations that can be met using approved offsets.
4. C&T = cap and trade.
5. Quantitative limits apply for "outside Tokyo" credits.

Source: International Carbon Action Partnership.[29]

Japan: The evolution of the compliance market began with the Tokyo Cap and Trade Programme (2010) and the Saitama ETS (2011). Building on these foundations, Japan launched the Green Transformation ETS (GX-ETS) in 2023 as a national-level voluntary system. GX-ETS is set to transition into a full compliance market by 2026, marking a strategic shift from subnational experimentation to a unified, nationwide carbon pricing framework.[30]

South Korea: Launched in 2015, South Korea's ETS (K-ETS) was East Asia's first national-level compliance carbon trading scheme. It has gradually expanded to cover 79% of national emissions and shifted towards an increased proportion of sector-specific benchmarking allowance allocation to incentivize carbon abatement efforts.[31]

Singapore: Due to its small size, Singapore did not introduce a carbon market; but in 2019 it put a price on its emissions through a carbon tax that covers 80% of emissions. Initially set at S$5/tCO$_2$e (2019-2023), the tax increased to S$25/tCO$_2$e ($19.50) in 2024 and is expected to continue rising up to 2030 to strengthen the price signal and drive business actions.[32]

Due to mature carbon pricing schemes, evolving policies and constrained local supply of carbon credits, developed economies often welcome high-quality overseas carbon credits to support emitters in meeting their compliance requirements. Article 6 of the Paris Agreement has emerged as an essential mechanism to enable such international voluntary carbon credits to be formally used for compliance purposes. In June 2025, Singapore and Japan also released new rules for voluntary carbon credits to promote transparent, financially sound and investor-protective transactions.[33]

TABLE 2 **Regional and international collaboration in developed Asian economies**

Country	System
Japan	Established the Joint Crediting Mechanism (JCM) in 2013, which enables bilateral low-carbon projects across 30 partner countries. Its ETS is the first to explicitly include international carbon dioxide removal (CDR) projects (e.g. BECCS, DACCS, Blue Carbon)[1], integrating these via the JCM framework.
South Korea	Allows carbon credits generated from international CDM projects if the project is either: a) developed by a company with at least 20% of Korean company ownership or operating rights; or b) supplied by a Korean company of low-carbon technology worth at least 20% of the project cost.
Singapore	Eligibility criteria are outlined through seven environmental integrity principles for companies to source internationally eligible carbon credits in a cost-effective manner. Actively engages in Article 6.2 activities, having signed multiple implementation agreements and MOUs to facilitate cross-border carbon transactions.

Note:

1. BECCS = bioenergy with carbon capture and storage; DACCS = direct air carbon capture and storage.

Sources: Intelligence, Q. C.; International Carbon Action Partnership; National Climate Change Secretariat, Singapore Prime Minister's Office.[34]

Market expansion towards global leadership

With growing pressure to meet NDC targets and accumulating experience from pilots, developed Asian markets are advancing their carbon pricing schemes.

- **Compliance market expansion:** Korea's K-ETS is set to encompass more sub-sectors in phase 4 (2026 to 2030);[35] Japan's GX-ETS is becoming mandatory by 2026.[36]
- **Intensifying carbon pricing signals:** Singapore's carbon tax rate was raised with effect from 2024;[37] the proportion of auction-based emissions permits will increase for both K-ETS in phase 4 (2026 to 2030) and GX-ETS (starting 2033).[38]

These markets have the chance to lead with their market frameworks and advanced low-carbon technologies. Meanwhile, both the Singapore and South Korea governments aspire to establish regional or even global hubs to facilitate international connectivity and communication, capitalizing on their advantages in stable regulation, robust infrastructure and financial systems.

1.4 Emerging Asian economies – aiming for connected carbon markets

Proactive exploration

Numerous emerging Asian economies are at the early stages of establishing local carbon markets, facing initial structural and regulatory challenges. They must balance carbon emissions mandates with economic growth and business vitality, while safeguarding development aspirations and natural assets. These countries are in the process of carefully refining regulatory frameworks and designing pilot schemes before they can fully implement national compliance markets (see Table 3).

South East Asia's voluntary carbon market outpaces compliance markets (see Table 4). Nations are actively developing infrastructure such as exchanges and registries to realize the significant potential of nature-based carbon credits.

TABLE 3 **Advancement of compliance carbon markets in South East Asian economies**

Country	System	Status	Journey and outlook
Indonesia	ETS	In force	2018: Published MRV guidelines for power plants, after emissions profiling and cost study 2021: Issued national framework for carbon pricing 2023: Launched mandatory ETS for coal-fired plants 2025-27: Expanding ETS coverage to oil and gas power plants
India	ETS	In pilot	2012: Launched perform, achieve and trade (PAT) scheme for energy management 2023-24: Rolled-out carbon credit trading scheme (CCTS) and piloted trading 2025-26: Carbon trade begins
Viet Nam	ETS	In development (initial target – steel, cement, thermal)	2021: Established mandate to design national crediting mechanism (NCM) and domestic ETS 2022: Outlined sectoral roadmap 2025: Piloting ETS begins in power, iron, steel and cement industries
Philippines	ETS	Under discussion	2025: Approved carbon trading framework for domestic enterprises, to accelerate ETS development
Thailand	ETS Carbon tax	In development (initial target – GHG-intensive industrial sectors)	2013: Developed pilot MRV system with industrial sectors 2018: Established mandate to design pricing instruments 2022: Conducted capacity building activities 2025: Submitting the final draft of Climate Change Act; plans to implement carbon tax on petroleum products
Malaysia	ETS Carbon tax	In development (initial target – steel, energy)	2021: Engaged state governments and corporate sector to align policy; explored mechanisms (e.g. carbon tax, ETS) 2026: Plans to impose carbon tax targeting steel and energy sectors

Sources: Bain & Company et al., International Carbon Action Partnership (ICAP).[39]

TABLE 4 **Voluntary carbon markets in South East Asian economies**

Country	Carbon registry and voluntary carbon market status		
	Carbon credit projects	Standards	Progress to date
Malaysia	Host country for renewable energy certificates, technology-based and nature-based carbon credits.	Adopted Verified Carbon Standard (VCS) from Verra and Gold Standard.	Transacted ~17k Verra-registered carbon credits.
Viet Nam	In process of establishing voluntary domestic ASEAN Carbon Credit Exchange (CCTPA) with pilot in 2025 - expected to be operational by 2028. Currently trades on global carbon markets.		-
Thailand	Host country for renewable energy certificates and nature-based carbon credits.	Adopted local carbon standards verified by Thailand Voluntary Emission Reduction and other standards.	Transacted ~ 1m carbon credits.
Indonesia	Host country for technology-based and nature-based carbon credits.	Own standard (SRN) with mutual recognition agreements (MRAs) with JCM and Gold Standard.	Transacted ~500k carbon credits from energy sector.
Singapore	Buyer of carbon credit projects from other host countries.	Accepts credits verified by global standards such as Verra and Gold Standard.	Transacted ~1m nature-based carbon credits.

Source: Bain & Company et al.[40]

Strategic pathway for fully functional markets

Emerging Asian markets are gradually improving frameworks and expanding carbon credit development, but they still face challenges in capturing full-abatement potential. To fully harness their capabilities, these countries must urgently address critical challenges to stimulate domestic demand, while enhancing a high-quality supply pipeline to satisfy increasing international demands.

Actions could include the following:

- **Catalyse domestic demand to boost local carbon market activity:** emerging economies must enhance carbon pricing tools to raise local demand. Clear credit-use policies across scopes 1, 2 and 3 emissions are needed to ensure corporate confidence. Incentives such as tax benefits and subsidies can further boost credit purchases.

- **Strengthen support for high-quality carbon credit projects:** expanding high-quality supply requires clear standards and methodologies that explicitly distinguish between removal credits (e.g. forest carbon sinks, direct air capture) and avoidance credits (e.g. renewable energy substitution), as well as making carbon projects more bankable through long-term offtakes. Companies can co-develop or pre-finance high-quality projects to secure future offsets. Early-stage concessional finance and aggregated offtake models can help capital intensive projects to reach final investment decision (FID).

- **Develop collaborative infrastructure to improve integrity:** investment in MRV systems and integrated registries is critical for trust and transparency. Domestic exchanges and a strong ecosystem of intermediaries will ensure market liquidity and integrity, allowing efficient and transparent trading.

In addition to supplying growing local demand, these nations have the potential to become major carbon credit suppliers globally, leveraging their abundant natural assets for nature-based projects. Enhancing international connectivity and harmonizing global standards, with support from initiatives such as the Integrity Council for the Voluntary Carbon Market (ICVCM) and Article 6 of the Paris Agreement, are essential for them to capture this opportunity. These frameworks provide governments with established guidelines to align standards, verify credit integrity and facilitate cross-border recognition, strengthening their position in global carbon markets.

1.5 Regional and international collaboration

Article 6 of the Paris Agreement holds significant potential to usher in a transformative era of global multilateral carbon pricing by creating a cohesive framework for international cooperation.

Each of these Asian markets has distinct characteristics and should follow its own development path. However, they can achieve greater effectiveness by complementing one another, bridging their differences and optimizing outcomes. Article 6 of the Paris Agreement holds significant potential to usher in a transformative era of global multilateral carbon pricing by creating a cohesive framework for international cooperation. It facilitates linking regional and national systems through Internationally Transferred Mitigation Outcomes (Articles 6.2 and 6.4), promoting collaboration and reducing market fragmentation. The Asia region is the leading issuer of Article 6.2 deals, with Japan, Singapore and South Korea among the most actively involved buyers. The region, led by China, also represents a substantial proportion of the CDM credits that have applied for transfer to the new Article 6 mechanism.

International connectivity could be a transformative force in global markets, by driving development in:

- **Market scale and liquidity:** expanded cross-border participation stimulates supply-demand matching and attracts global capital.
- **Economic optimization:** access to global resources can secure the most cost-effective solutions and suitable financing options.
- **Climate goal acceleration:** fostering synergies across jurisdictions, mobilizing global resources and expanding mitigation opportunities can accelerate the achievement of global climate goals.

From regional collaboration to global linkage

In the near term, deepening cooperation among neighbouring markets lays the groundwork for longer-term global integration. Early signs of progress are emerging in efforts to accelerate the development of harmonized, interoperable carbon credit markets across Asia, for example: the ASEAN Common Carbon Framework (see Box 2); the Coalition to Grow Carbon Markets, launched by Singapore, UK and Kenya; and the JCM launched by Japan. A more interconnected Asian carbon market can be built on these foundations, to drive closer regional cooperation and synergy.

BOX 2 The ASEAN Common Carbon Framework

The ASEAN Common Carbon Framework (ACCF) operationalizes the ASEAN Strategy for Carbon Neutrality by creating an integrated, interoperable carbon market across ASEAN member states. ACCF emphasizes localized methodologies, standard recognition, compliance linkages and shared MRV tools to drive collaboration.

ACCF adopts a phased implementation roadmap, focused initially on expanding high-integrity carbon projects, then improving market liquidity and price discovery, and eventually advancing deeper integration.

Source: ASEAN Business Council.[41]

Multiple carbon credit exchange platforms are being established across Asia to foster interconnectivity. More mature platforms include: China's Beijing Green Exchange, Shanghai Environmental Energy Exchange, and Hong Kong Exchanges and Clearing Limited (HKEX); Japan's Tokyo Carbon Credit Market; South Korea's K-ETS (traded in KRX Exchange); and Singapore's Climate Impact X (CIX) and AirCarbon Exchange (ACX). Emerging platforms such as Malaysia's BCE (Bursa Carbon Exchange), Indonesia's Indonesian Carbon Exchange and Thailand's FTIX are also gaining traction. Collaboration between exchanges could enable international projects to achieve interconnectivity and interoperability.

Linking carbon pricing mechanisms while respecting national priorities is challenging, as the push for carbon pricing can conflict with domestic economic growth. Hence, for both regional and global collaboration, various forms can be adopted to match needs in each jurisdiction and boost efficiency. Three distinct types of collaboration opportunities are emerging:

- **Cross-border market matching:** Asian markets exhibit distinct supply-demand dynamics. For example, China shows substantial demand potential as the world's largest compliance market, while India and South East Asian countries possess the capacity to supply abundant carbon credits in the near term, if robust MRV systems are ready.

- **Joint capacity and project building:** regional disparities within Asia have led to uneven capabilities in carbon market participation. Established markets with strong financial infrastructures and academic expertise can complement resource-rich but less developed markets. China with its unique "dual-layer framework" (coordinated national and local carbon markets) and Japan with its experience from JCM can offer valuable insights on improving efficiency and effectiveness. For example, leading Asian carbon markets can pilot model clauses for carbon credit mutual recognition, data-sharing protocols or common MRV templates and advise emerging markets on next steps.
- **Innovative linkage mechanisms:** countries are exploring mechanisms that facilitate interoperability between national and international systems. For example, China's Belt and Road Initiative is attracting the participation of state-owned enterprises by managing overseas carbon assets in infrastructure projects. Japan's JCM is partnering with developing nations to co-develop projects and share emissions reduction credits. The Coalition to Grow Carbon Markets – launched by Singapore, the UK and Kenya – establishes globally recognized principles for high-integrity carbon credits and provides clear guidelines for businesses to encourage the development and trade of high-integrity projects.

Strategic initiatives for accelerated interlinkage

Against the backdrop of interoperability barriers – such as legal, technical and regulatory discrepancies across national systems – achieving interlinkage grows difficult and demands joint efforts. To effectively accelerate international connectivity, three critical dimensions must be addressed:

- **Fostering communication:** this builds the foundation for cross-border cooperation. Establishing platforms such as a regional carbon market council can reduce policy fragmentation, align regulatory frameworks and support capacity building among policy-makers and regulators.
- **Harmonizing consistent and fair standards, while building infrastructure:** this provides the structural basis for scalable, credible market operations. Alignment of MRV and offset standards, guided by ICVCM's integrity principles and Article 6's cross-border recognition rules – plus the establishment of shared, interoperable and AI-powered data infrastructure – can reduce redundant verification costs, improve data reliability and transparency, and support the development of traceable carbon-linked products. Singapore exemplifies this by developing policies to accept internationally generated carbon credits for domestic compliance.
- **Strategic cooperative partnerships:** countries could aim to join hands in driving green and low-carbon technologies to achieve breakthroughs and large-scale applications.

> Regional hubs, as envisioned by Singapore and South Korea, can amplify efforts by facilitating best practice exchange and knowledge spillovers.

As barriers to market interoperability are removed, trading platforms and participants can drive transformative market upgrades. Once communication channels and market infrastructure are in place, it becomes more feasible to enable transactions. Cross-border trading corridors under Article 6 – critical for accessing compliance markets including CORSIA – can improve liquidity and price discovery, reduce transaction costs and connect fragmented pools of supply and demand.

To leverage these corridors, countries must establish robust infrastructure, streamlined processes and clear decision frameworks to grant letters of approval (LoAs) and implement corresponding adjustments, to ensure environmental integrity and avoid double-counting. For example, countries can engage in the development, scaling-up and transaction of carbon credits within the scope of the voluntary carbon market. If establishing such nation-to-nation transactions is complex, smaller-scale pilots, such as city-to-city or industry-to-industry mechanisms, can serve as practical starting points.

Engaging participants ensures sustained growth and market depth. Acceleration programmes targeting regional industrial champions can catalyse technology validation and value chain transformation, particularly in hard-to-abate sectors. Regional hubs, as envisioned by Singapore and South Korea, can amplify efforts by facilitating best practice exchange and knowledge spillovers, laying the groundwork for broader industrial transformation at the global level.

2 Strategic imperatives for corporations

Carbon markets are a strategic accelerator for corporations to embark on a low-carbon transition journey and achieve sustainable business value.

The rapid evolution of Asia's carbon markets is profoundly reshaping the business landscape. Companies – whether directly involved, soon to be regulated or affected through supply chains – must reassess their market strategies.

To navigate this dynamic environment, corporations must prioritize three strategic imperatives (see Figure 7):

Imperative 1 **Overcome challenges on the net-zero journey** – by engaging with carbon markets.

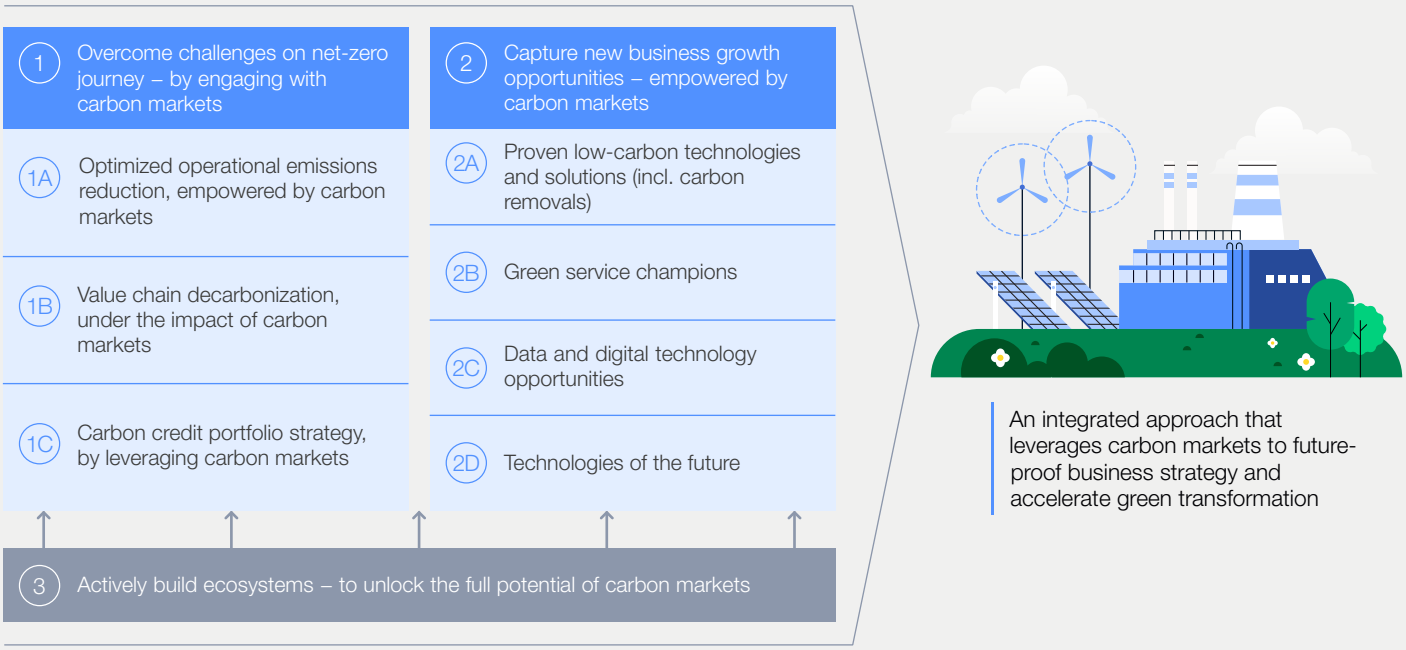
Imperative 2 **Capture new business growth opportunities** – empowered by carbon markets.

Imperative 3 **Actively build ecosystems** – to unlock the full potential of carbon markets.

These imperatives not only address cost and compliance challenges but also support market competitiveness. This chapter explores actionable levers across these strategic imperatives, with corporations advised to tailor their own roadmaps for transformative engagement based on their unique needs and characteristics.

Corporations must adopt a holistic perspective when assessing the impacts of carbon markets. While compliance may target specific entities – such as individual factories or subsidiaries – strategic opportunities span the entire organization. By understanding carbon markets, businesses can revamp decarbonization plans, drive enterprise-wide innovation and secure a competitive edge in the low-carbon transition.

FIGURE 7 | **Strategic corporate imperatives for carbon market engagement**



Source: Bain & Company analysis.

By understanding carbon markets, businesses can revamp decarbonization plans, drive enterprise-wide innovation and secure a competitive edge in the low-carbon transition.

Carbon markets act as strategic enablers rather than distractions, complementing direct decarbonization efforts. For example, China National Building Material Group (CNBM) uses carbon price signals to optimize emissions reduction investments (see Case Study 1), while Baofeng Energy's green hydrogen projects achieve both emissions cuts and business growth (see Case Study 8).

The combination of rising carbon prices – for example, China's ETS climbing from RMB 46 per tonne in 2021 to over RMB 100 per tonne in 2024 – and diversified credit portfolios – such as blending low-cost nature-based solutions (NbS) with high-investment CCUS – demonstrates meaningful benefits. Corporations can strengthen credibility via transparent MRV systems and active participation in standard-setting, turning scepticism into momentum for systemic change.

Imperative 1

Overcome challenges on the net-zero journey – by engaging with carbon markets

> It is critical that companies set science-based decarbonization targets and evaluate their engagement in both compliance and voluntary carbon markets to achieve these goals.

Carbon markets, both compliance and voluntary, are powerful enablers of corporate decarbonization, going beyond regulatory mandates. They provide strategic leverage to accelerate and optimize the net-zero journey, empowering businesses to achieve impactful emissions reductions. These markets drive progress in three critical dimensions:

- **Optimizing operational decarbonization** while sustaining competitiveness.
- **Driving value chain decarbonization** to enhance supply chain resilience and customer engagement.
- **Strategizing carbon credit portfolios** for cost-effective compliance and industry leadership.

Optimizing operational decarbonization while sustaining competitiveness

A robust four-step roadmap can help businesses upgrade their decarbonization strategies, leveraging carbon markets for cost-effective, competitive and impactful emissions reductions (see Figure 8). The four steps, presented in more detail below, are as follows:

1. Carbon fact base and ambition
2. Baseline and data infrastructure
3. Emissions reduction levers
4. Decarbonization economic analysis

This roadmap integrates actionable insights from carbon market signals to drive efficiency and strategic alignment. It is critical that companies set science-based decarbonization targets and evaluate their engagement in both compliance and voluntary carbon markets to achieve these goals in a cost-effective and high-integrity manner.

FIGURE 8 | **Operational carbon reduction roadmap**

Four steps to arrive at an actionable, operational carbon reduction plan to maximize value creation, empowered by carbon markets

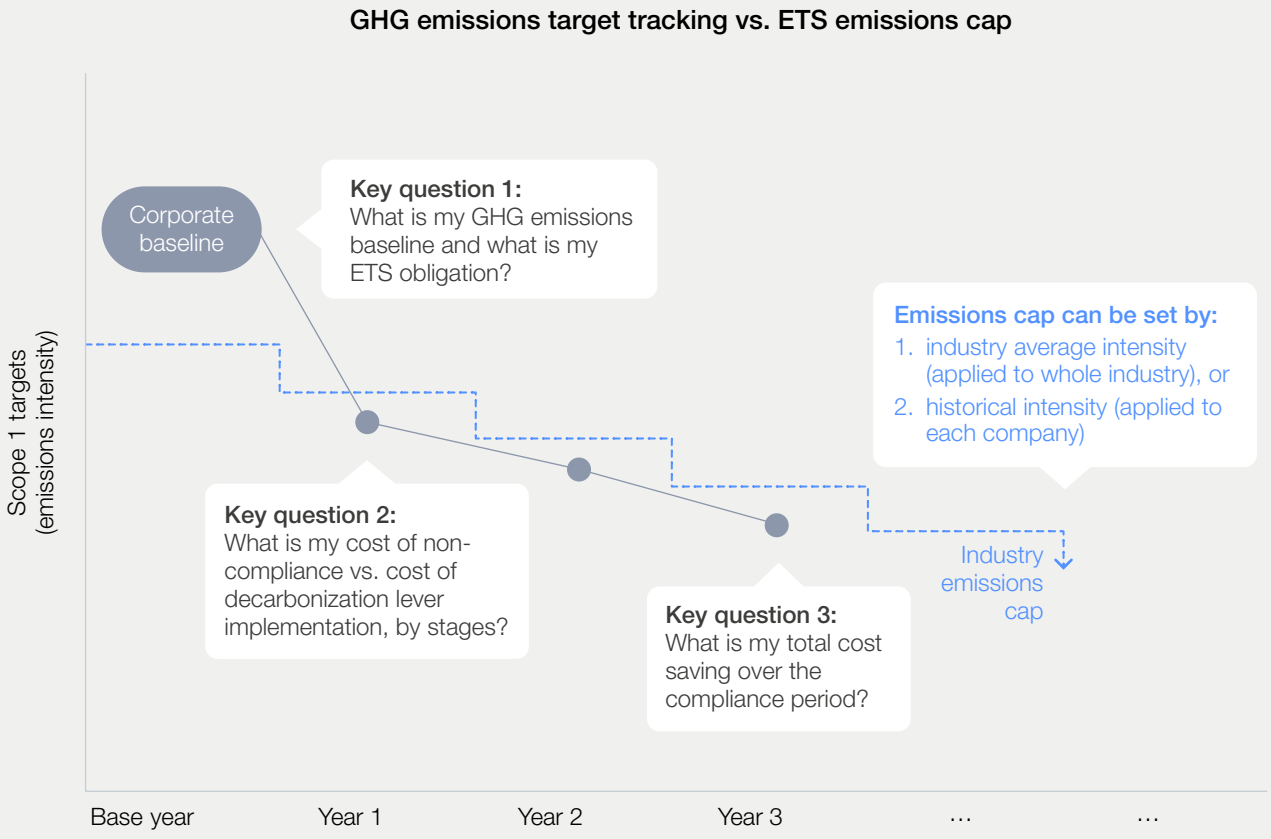
Note:
1. MACC = marginal abatement cost curve.

Source: Bain & Company analysis.

Roadmap step #1:
Carbon fact base and ambition

Companies must align their science-based decarbonization targets with their business strategy, balancing regulatory compliance and competitive positioning. They must leverage policy insights, market signals (e.g. carbon pricing trends) and evidence-based analysis (e.g. peer benchmarking) to set clear, ambitious goals that reflect strategic priorities and market context, as illustrated in Figure 9. Companies should be aware of their emissions baseline and gradually reduce towards their industry cap to avoid the extra costs of non-compliance.

FIGURE 9 | **Set GHG emissions targets**

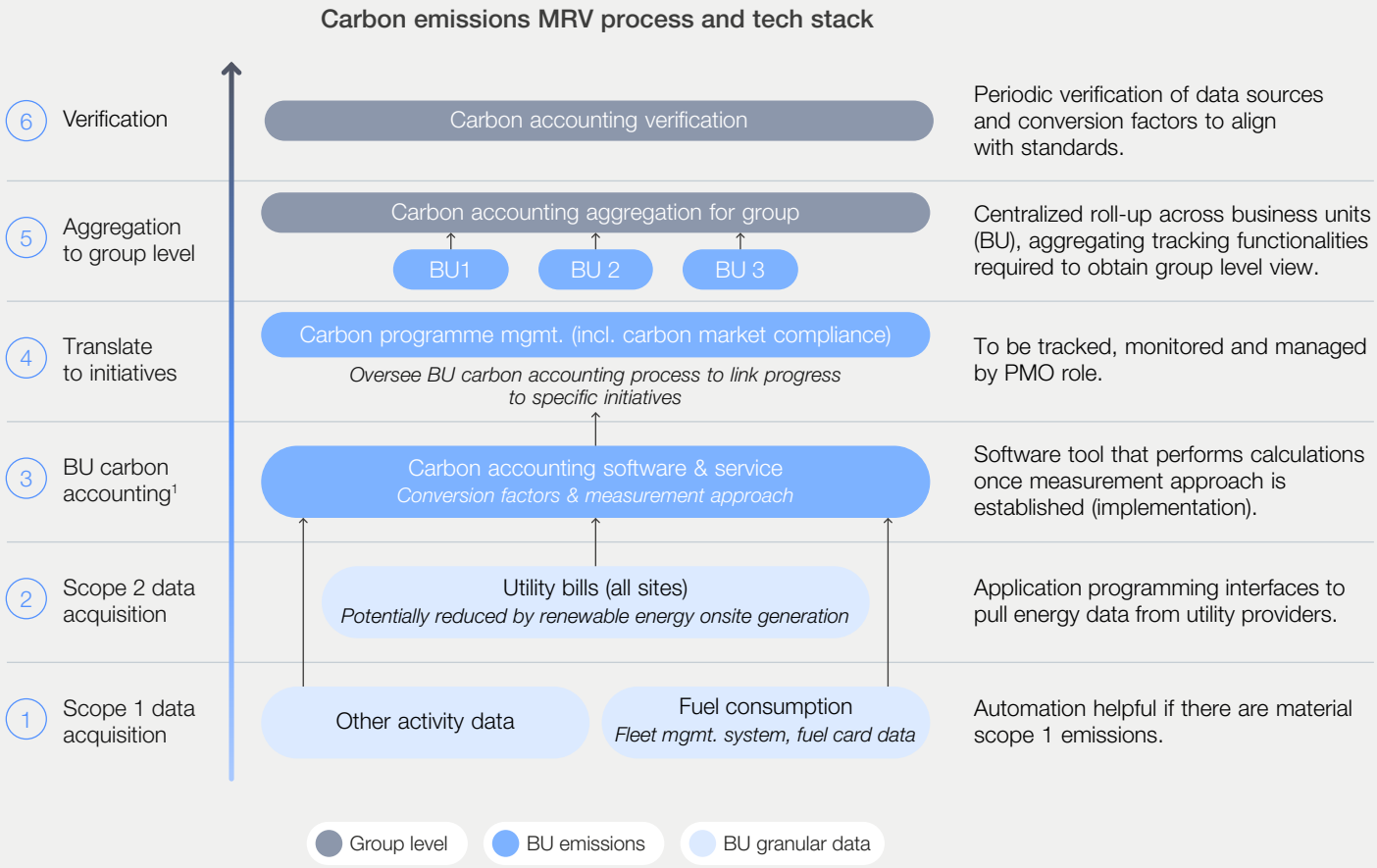


Source: Bain & Company analysis.

Roadmap step #2:
Baseline and data infrastructure

A solid emissions baseline, underpinned by an MRV system, anchors strategic decarbonization. Regulatory standards and international guidelines ensure consistent, auditable emissions inventories. An efficient MRV system, integrating top-down and bottom-up data flows, allows for robust emissions analysis, progress tracking and disciplined execution (see Figure 10). Leveraging technologies, especially artificial intelligence for scope 1 and scope 2, proactively identifies risks, refines action plans and fosters continuous improvement beyond compliance.

FIGURE 10 **Establish MRV data infrastructure**

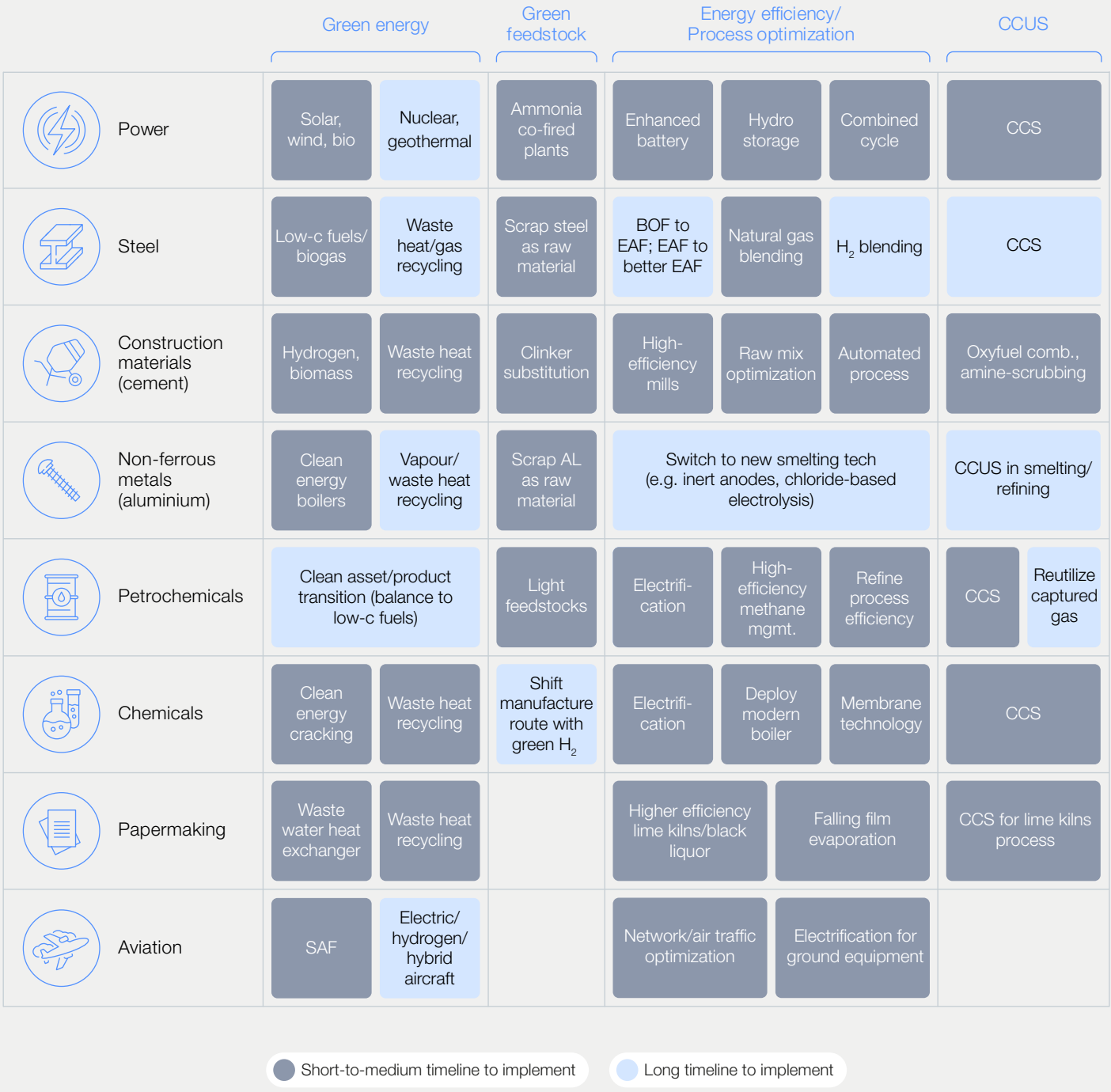


Notes: BU = business unit, PMO = project management office.
Source: Bain & Company analysis.

Roadmap step #3:
Emissions reduction levers

Businesses must systematically assess decarbonization technologies and levers that are tailored to their industry context. The feasibility, scalability and cost-effectiveness of these levers differ across sectors and regions. For example, in the case study of China National Building Material Group (CNBM), an innovative financing approach was derived from the carbon market mechanism to support decarbonization lever development (see Case Study 1). In Baofeng Energy's case, a forward-looking commitment and investment to green hydrogen has not only led to decarbonization but has also created new opportunities for business growth (see Case Study 8). Figure 11 highlights potential decarbonization levers for high-emissions industries in China, emphasizing the need for adaptive prioritization as market dynamics evolve.

FIGURE 11 **Potential decarbonization solutions for key industries in China**



Notes: This figure is illustrative and non-exhaustive; low-c = low-carbon; SAF = sustainable aviation fuel; AL = aluminium; H_2 = hydrogen; BOF = basic oxygen furnace; EAF = electric arc furnace; CCS = carbon capture and storage; CCUS = carbon capture, utilization and storage.

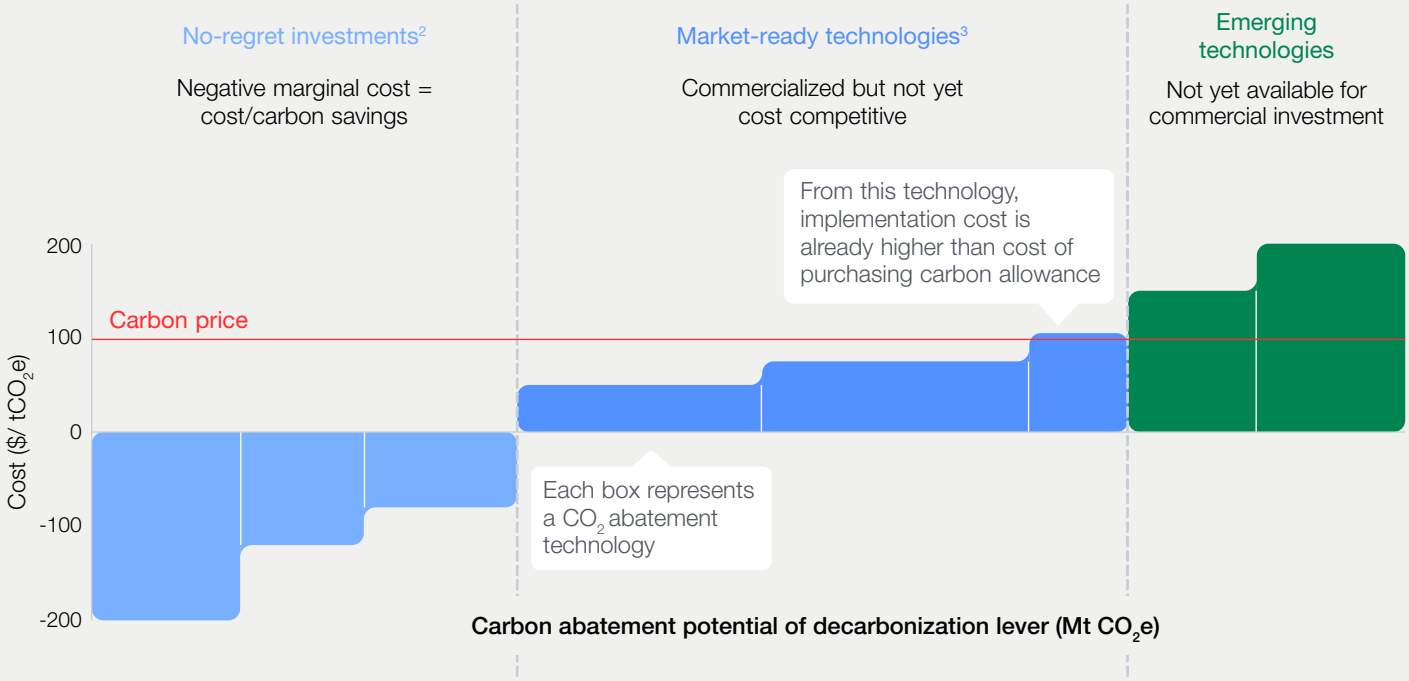
Source: Bain & Company analysis.

The marginal abatement cost curve framework can be used to identify cost-effective decarbonization levers by assessing abatement potential against costs.

Roadmap step #4:
Decarbonization economic analysis

The marginal abatement cost curve (MACC) framework can be used for rigorous economic analysis to identify cost-effective decarbonization levers by assessing abatement potential against costs – and its practical significance will grow as carbon prices converge (see Figure 12). Innovative financing – including green bonds, sustainability-linked loans and carbon asset management – unlocks capital for decarbonization while enhancing liquidity through monetized emissions reductions. China National Building Material Group (CNBM) provides an example of using the carbon price to inform decarbonization investment and leveraging future carbon credit revenue to finance current projects (see Case Study 1).

FIGURE 12 **MACC[1] analysis for key decarbonization levers (illustrative)**



Notes:

1. MACC = marginal abatement cost curve; marginal cost = cost to abate one additional unit (of carbon).
2. No-regret investments include, for example, high-efficiency motors, LED lighting to improve energy efficiency, utilization of waste water biogas to manage waste and resources.
3. Market-ready technologies assume a carbon price of $100.

Source: Bain & Company analysis.

CASE STUDY 1

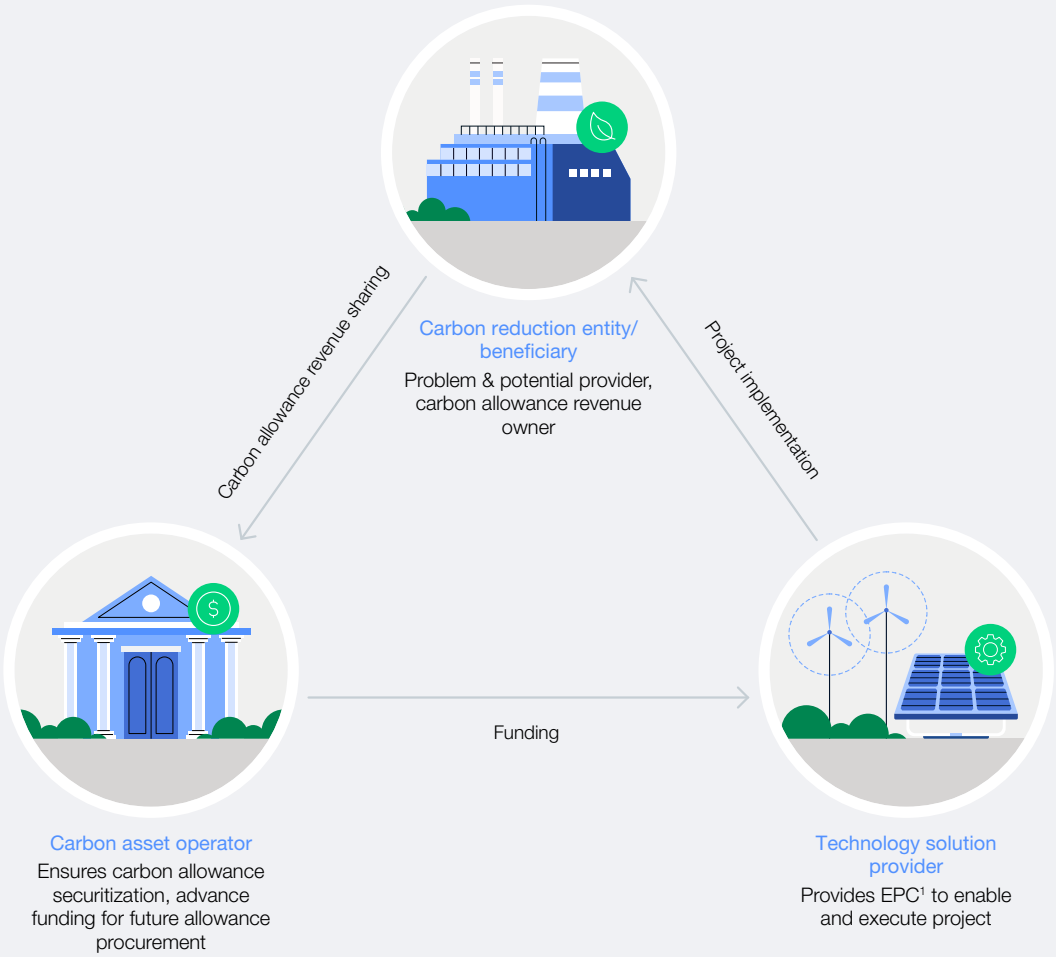
China National Building Material Group – financial innovation for carbon-aligned investment

Operational carbon reduction in heavy industries faces distinct financial challenges, primarily the high upfront costs of technological upgrades and the need to sustain liquidity over extended payback periods.

China National Building Material Group (CNBM) offers a practical model by integrating carbon market expectations into its investment decision-making. Rather than applying uniform facility upgrades, CNBM assesses the timing of its investments in abatement based on comparisons between carbon prices and marginal abatement costs. So the company defers investments when carbon prices are lower than the marginal cost of carbon abatement (e.g. RMB 100 per tonne compared to RMB 200 for CCUS) and initiates R&D or early deployment if carbon prices are forecast to exceed the cost of abatement. This price-responsive approach optimizes capital allocation and positions the company for long-term carbon cost advantages.

In parallel, CNBM strategically leverages carbon pricing signals to pioneer innovative financing mechanisms, providing upfront capital for decarbonization projects in exchange for carbon allowance reserves in the future. In one case, facing a funding gap of ~RMB 40 million, CNBM facilitated a tripartite structure in which a carbon trading entity provided upfront financing, later repaid using surplus carbon allowances post-upgrade. This arrangement enabled debt-free project execution and allowed the trading partner to hedge future carbon credit revenues.

Transaction diagram



Note: 1. EPC = engineering, procurement & construction.

Source: expert interview with CNBM.

Driving value chain decarbonization to enhance supply chain resilience and customer engagement

Value chain decarbonization is driven by four strategic imperatives

Supply chain resilience: Compliance carbon markets impose carbon costs on high-emission, hard-to-abate sectors such as steel, aluminium, chemicals and building materials, with these costs cascading through the supply chain to downstream products. To avoid disruptions from rising carbon expenses, enterprises should transition to a low-carbon supply chain to secure competitiveness.

Customer pressure: Pressured by their own carbon market compliance (e.g. scopes 1, 2 & 3 accounting), major brands enforce decarbonization commitments (e.g. Science Based Targets initiative – SBTi), requiring suppliers to reduce emissions to retain partnerships.

Export market pressure: Trade policies such as the EU's Carbon Border Adjustment Mechanism (CBAM) effectively force exporting enterprises (e.g. for photovoltaic components) to align with importers' carbon footprint requirements to avoid carbon tariffs or market access restrictions.

Regulatory requirements: Mandatory carbon footprint rules developed and implemented by countries underpin carbon market functionality, compelling enterprises to cut value chain emissions for transparency and compliance.

To address these imperatives, businesses must adopt a two-pronged approach

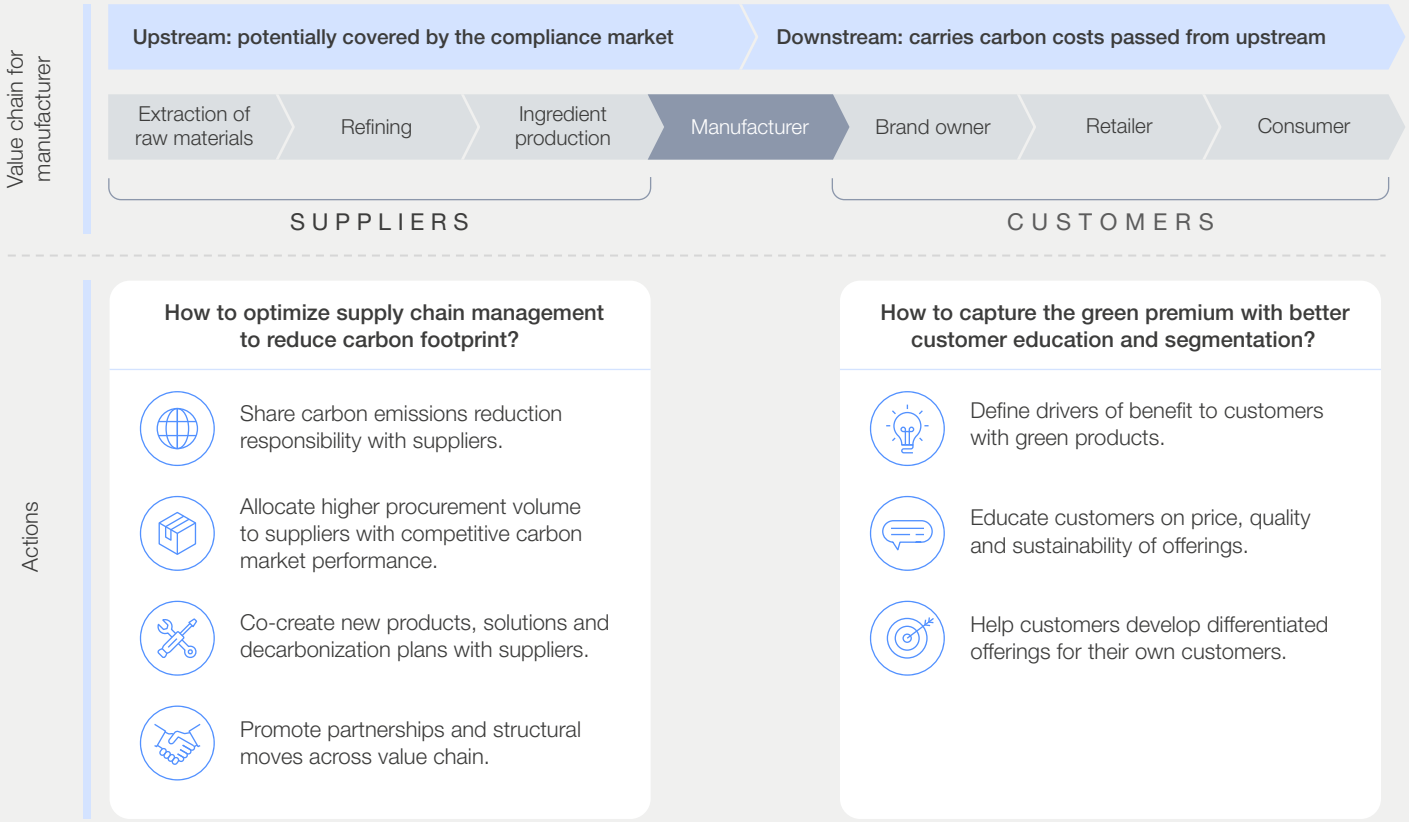
First, strengthen value chain management: A robust value chain management strategy can leverage a comprehensive set of decarbonization levers tailored to value chain partners, ensure traceability, reduce emissions, and build cost-efficient, future-proof supply chains. This strategy includes effective supplier management, strategic volume allocation, enhanced product design and cross-value chain partnerships and innovation (see Case Study 2).

Second, respond to evolving customer and consumer demands: As outlined in Figure 13, the impact of carbon markets will be transmitted along the value chain, affecting end consumers. Corporations can capture green premiums by responding to evolving customer needs. A recent Bain & Company survey highlights sustainability as a rising priority for both corporate customers and end consumers:

- For corporates, sustainability will become the second-most critical purchasing criterion within three years (see Figure 14).
- For consumers, nearly 80% say they have begun shopping sustainably in the last five years and most expect to spend more on sustainable products in the future (see Figure 15).

Businesses that effectively respond to these demands via effective commercial and marketing strategies can transform decarbonization into a source of competitive advantage and growth. By integrating these strategies, businesses can navigate the transmission effects of carbon markets, meet stakeholder expectations and position decarbonization as a driver of value chain resilience and market differentiation.

FIGURE 13 | Decarbonization along the value chain for manufacturers

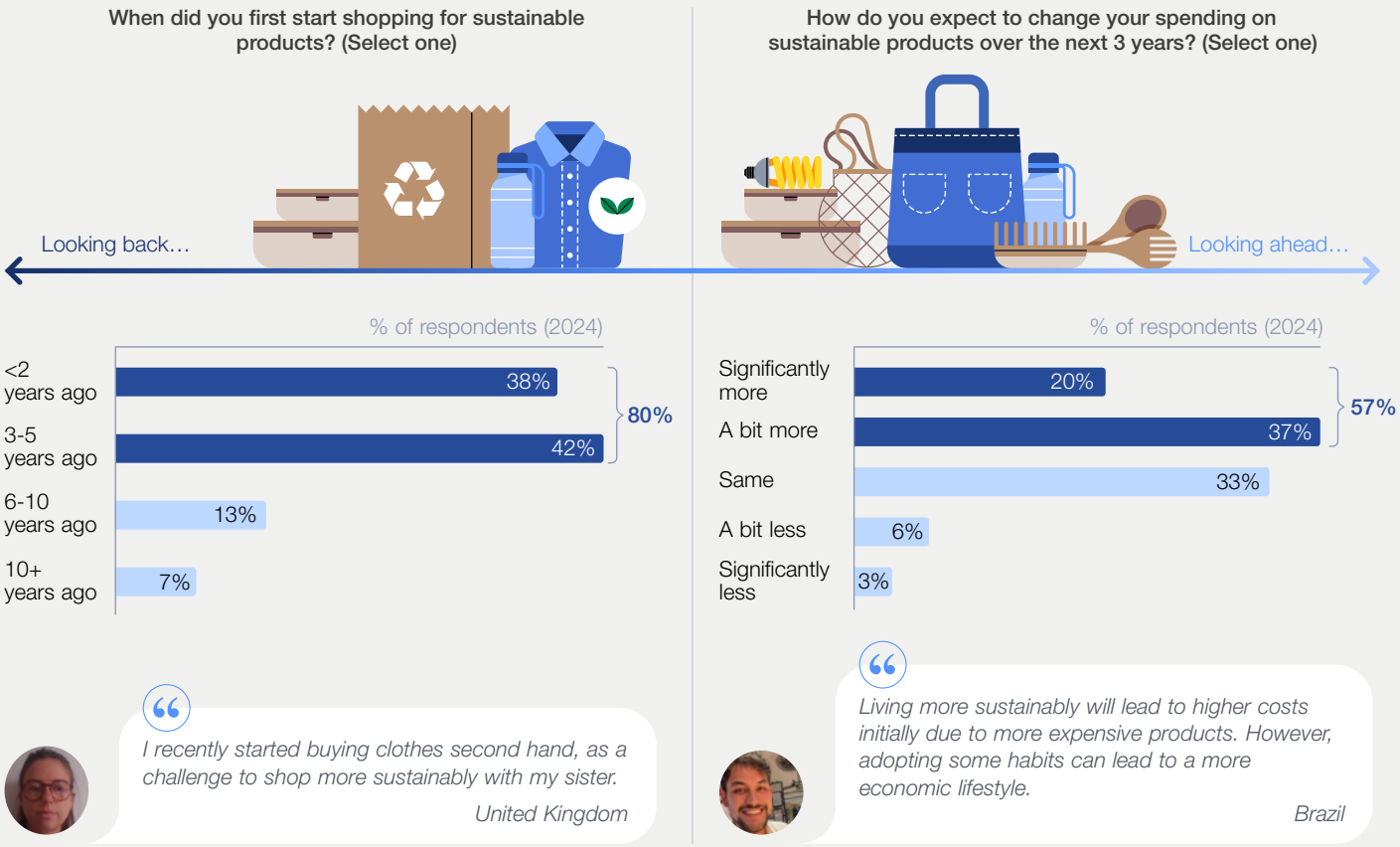


Source: Bain & Company analysis.

FIGURE 14 | Top purchasing criteria of B2B customers

Source: Bain & Company survey, 2024.[42]

FIGURE 15 | **Global consumers willing to pay premium for sustainable products**



Sources: Bain & Company surveys, 2024.[43]

CASE STUDY 2

Contemporary Amperex Technology – solid end-to-end value chain management

As a global leader in energy technology, Contemporary Amperex Technology (CATL) is a Chinese battery maker that aims to achieve carbon neutrality in core operations by 2025 and across its battery value chain by 2035.

One core initiative for reducing carbon footprint across the value chain is through zero-carbon factories. Nine such facilities have been built, with zero-carbon electricity comprising 74.5% of battery bases' power supply and energy consumption dropping 14.6% year-on-year via 285 energy-saving projects.

For its supply chain, CATL integrates carbon footprint assessments into supplier evaluations, setting zero-carbon electricity targets for key raw materials providers and offering technical support for PV projects. This has raised zero-carbon electricity usage to 57% among anode/cathode suppliers and 45% among aluminium product suppliers, with carbon footprints of anode/cathode materials and structural components dropping 18.6% and 10.4% respectively. The company has also electrified light commercial vehicles in all wholly owned battery bases, advancing heavy truck electrification in Fujian's upstream logistics.

Launched in 2022, CATL's "CREDIT" programme – covering 114 internationally compliant evaluation indicators – has conducted onsite assessments for 82 suppliers and provided 92 sustainability training sessions. The initiative links evaluation results to procurement decisions, driving suppliers to enhance carbon management, recycling and energy efficiency.

These initiatives have enabled CATL to significantly reduce its product carbon footprint. In the future, it is critical to explore potential carbon reduction benefit-sharing frameworks covering the entire manufacturing value chain, thereby promoting equitable distribution of carbon credits across the industrial chain.

Source: expert interview with CATL.

Strategizing carbon credit portfolios for cost-effective compliance and industry leadership

> Corporations should proactively discover their own carbon assets and strategically develop them.

With the mounting pressure to achieve carbon neutrality after reaching peak emissions and the value of carbon assets on the rise, corporations should proactively discover their own carbon assets and strategically develop them. For example, they require carbon credits to address two primary drivers of demand:

- **Compliance requirements:** companies engaged in compliance carbon markets or bound by international mechanisms, such as CORSIA, require immediate access to carbon credits. These immediate needs prioritize credits from validated, cost-competitive projects with accelerated delivery timelines.

- **Market-driven commitments:** companies pursuing voluntary targets (e.g. Science Based Targets initiative – SBTi) or net-zero goals, typically set for 2040 or 2050, utilize carbon credits to support their decarbonization efforts and demonstrate commitment, reinforcing market leadership. By using carbon removal credits to neutralize residual emissions, credits enable organizations to achieve carbon neutrality, advancing mid- to long-term sustainability goals.

A successful portfolio approach to carbon credit procurement consists of the following features

Balancing short- and long-term objectives: a diversified portfolio of projects with varying timelines and technological maturity addresses both immediate and strategic priorities, with clear roles for different carbon credit types:

- Carbon dioxide removals (CDR – e.g. direct air capture, mangrove afforestation) target residual emissions and align with SBTi/ISO net-zero frameworks.

- Carbon reduction credits (e.g. renewable energy, energy efficiency) address ongoing emissions and support carbon neutrality claims.

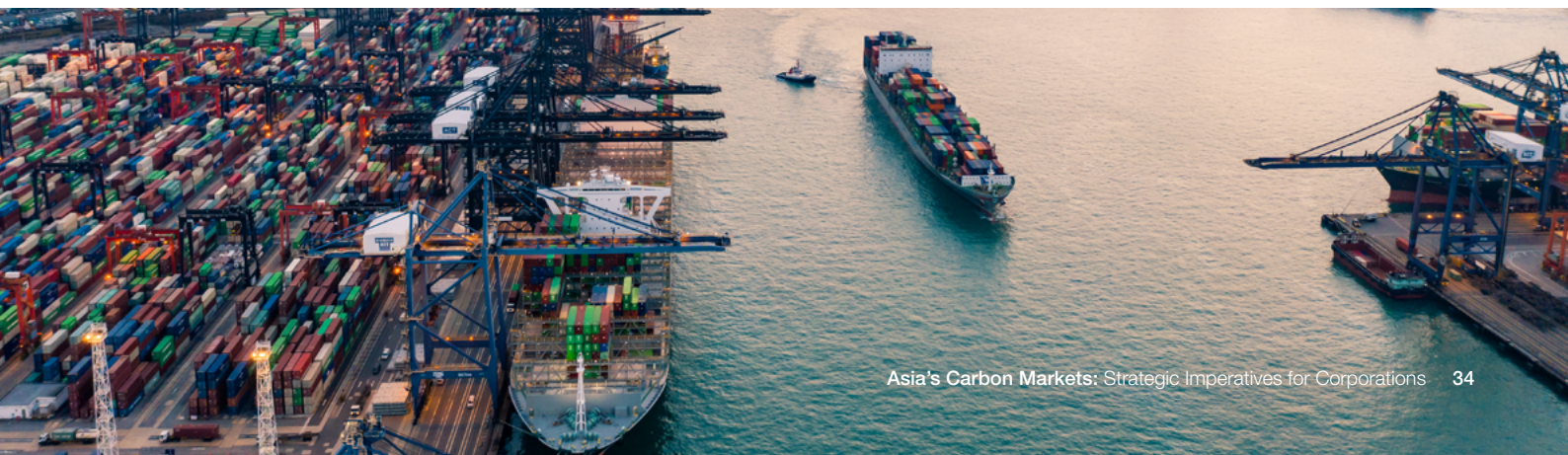
For example, through projects such as forest and mangrove regeneration, Mitsui O.S.K. Lines (MOL) – a Japanese shipping and logistics company – blends credits from NbS (nature based solutions), which support near-term emissions reductions as part of broader decarbonization efforts, and credits from TbS (technology-based solutions), which foster innovation and cost efficiencies over time, to support progress on dual timelines (see Case Study 3).

Meanwhile, investing in vessels operating on green fuels directly addresses operational emissions, enabling the decarbonization of shipping and aligning with the International Maritime Organization (IMO)'s decarbonization pathway. Even so, these advanced fuels still generate emissions throughout their lifecycle. This necessitates not only investment in green fuel-powered vessels but also the development of a robust CDR ecosystem. Actively building the CDR ecosystem proves essential to address these unavoidable residuals by permanently removing CO_2, while also supplying clean CO_2 feedstock. The two strategies form a closed loop and play complementary roles along the decarbonization journey.

Diversifying and hedging risk: sourcing credits from multiple project types mitigates risks of underperformance or unexpected challenges in individual projects. A portfolio approach spreads risks, enhancing stability and resilience in investments – an approach that has been adopted by corporations including MOL and Tencent (see Case Study 3 and Case Study 4).

Aligning with Sustainable Development Goals (SDGs): a varied portfolio amplifies contributions to the 17 SDGs, offering broader environmental, social and economic impacts and reinforcing corporate sustainability leadership.

Supporting regional and international connectivity: regional and international carbon credit trading helps integrate voluntary carbon markets and addresses fragmentation, as seen with frameworks such as ACCF. This interconnectivity cultivates a global perspective, equipping corporations to build impactful portfolios that capitalize on diverse market opportunities. Tencent, for example, has expanded credible carbon credit supplies through long-term ecosystem collaboration with a Singapore-based investor (see Case Study 4).



CASE STUDY 3

Mitsui O.S.K. Lines – building a carbon dioxide removal ecosystem

For hard-to-abate sectors such as global shipping, achieving net-zero requires moving beyond operational efficiencies to invest in vessels operating on green fuels and actively building the carbon removal ecosystem. Mitsui O.S.K. Lines (MOL) adopts a strategic approach to securing carbon dioxide removal (CDR) through long-term commitments both to direct involvement with projects and to purchasing removals from others.

MOL is promoting nature-based CDR solutions through its support for projects such as forest and mangrove regeneration. Since January 2022, MOL has participated in a blue carbon project aimed at restoring and conserving mangroves in South Sumatra, Indonesia. The project aims to reduce CO_2 emissions by about 5 million tonnes through forest conservation activities and to absorb or store another 6 million tonnes of CO_2 through afforestation of mangroves and other plants on about 9,500 hectares of bare land, over the next three decades.

Concurrently, MOL is also supporting technology-based solutions, by committing to purchase at least 50,000 tonnes of CO_2 removals utilizing CDR technologies by 2030. One leading example is its multi-year deal for over 10,000 tonnes of permanent carbon removal via direct air capture (DAC) with Climeworks. By investing in and purchasing from leading DAC pioneers, MOL not only addresses its own residual emissions but also provides the crucial demand signal needed by CDR suppliers to scale up these vital climate technologies.

Source: expert interview with MOL.

CASE STUDY 4

Tencent – building an impact-driven carbon credits portfolio

Tencent, a leading technology company based in China, prioritizes impact and innovation in its carbon credit procurement, focusing on high-integrity global credits.

Tencent is building supplies of credible carbon credits through long-term investment and ecosystem collaboration. A 15-year agreement with a Singapore-based investor has secured over 1 million high-quality credits from forestry and engineered removal projects, strengthening cross-border transactions and enhancing global VCM connectivity. Meanwhile, Tencent provides catalytic funding for early-stage projects, such as an Indonesian feasibility study for peatland restoration.

Tencent treats carbon credits as financial instruments to accelerate climate solutions, integrating digital tools to strengthen methodological innovation and market supply. Partnering with Chinese research institutions, Tencent is co-developing methodologies for blue carbon (e.g. seagrass, saltmarsh), afforestation projects and innovative agriculture (e.g. water-saving and drought-resistant rice – WDR), supported by digital innovations such as forestry carbon credit measurement platforms and WDR planting apps. These tools facilitate data automation and accuracy, making it easier to document sustainable practices and scale up eligible credits.

Tencent also collaborates with multilateral development banks and financial institutions to provide grants that enhance the design and monitoring of nature-positive projects, boosting returns through advanced credit purchase agreements.

Tencent's portfolio blends both technology-driven and nature-based projects, supporting carbon removal and reduction. It invests in composite credit instruments, combining high-cost with lower-cost credits to optimize both climate impact and cost-effectiveness. This approach delivers co-benefits such as biodiversity protection and community development, while supporting the scale-up and cost reduction of next-generation carbon removal technologies.

Source: expert interview with Tencent.

Imperative 2

Capture new business growth opportunities – empowered by carbon markets

The growth of carbon markets fuels demand for low-carbon technologies and services (including carbon removals), unlocking significant commercial opportunities. Companies can pursue these opportunities by strengthening core business – for instance, renewable energy firms accelerating scale and offering – or by developing "Engine 2 businesses"[44] such as conventional energy or chemical companies expanding into green sectors.

Figure 16 identifies commercial opportunities in four business model archetypes:

- Proven low-carbon technologies and solutions.
- Green service champions.
- Digital tools.
- Technologies of the future.

FIGURE 16 **Use cases for carbon credits in the net-zero journey**

	Proven low-carbon technologies and solutions	Green service champions	Digital tools	Technologies of the future
Description	Proven products enabling the energy transition (e.g. green energy natives, electrification etc.).	Services supporting the energy transition (e.g. carbon asset mgmt. services, green financing etc.).	Advanced digital tools (e.g. AI, digital twins, blockchain, cloud computing) and digital-driven model shifts.	Promising emerging carbon reduction tech for a faster transition (e.g. CCUS, green H_2 etc.).
Capital intensity	Varied across assets	Low	Varied across tools	Varied across assets
Risk profile[1]	Varied across assets	Low	Moderate	High
Investment thesis/what you need to believe	— High differentiation potential. — Scalable business models with potential for margin improvement. — Critical components with limited substitutes, yet broad applicability and strong underlying demand. — Exclusive access to more customers and penetration potential.	— Direct customer access to optimize profitability (vs. broker-led). — High degree of expertise. — Scalable business models (demand/regulatory growth) and clear monetization model. — Clear benefit for employer (vs. all with service personnel).	— Clear regulatory frameworks and certainty on winning tech. — Innovations can significantly enhance production efficiency and optimize energy consumption.	— Clear regulatory frameworks and certainty on winning tech. — Leading player with a defensible competitive advantage. — (Exclusive) access to early adopters (OEMs/ customers). — Clear path of monetization with models that are not easily replicable.
Opportunities fostered by carbon markets	Significant increase in overall demand is catalysed by carbon markets			
	Empowerment of high-emissions enterprises as a decarbonizing solution; overseas competitiveness while exporting to markets with externalities.	Emerging needs for **end-to-end carbon asset management** solutions from high potential sectors (e.g. new industries covered by ETS).	Incubation and incentivization of technnologies **enabling market efficiency** (e.g. AI, blockchain etc.).	Incubation and incentivization of **innovative decarbonization technologies** empowered by CCER.

Note:

1. Risk profile accounts for financial risks (e.g. magnitude of multiple, stability of cash flows) and projected market growth.

Source: Bain & Company analysis.

Proven low-carbon technologies and solutions

As carbon markets expand, quotas tighten and prices rise, mature low-carbon technologies are primed for accelerated adoption and deeper market penetration (see Case Study 5). These technologies, which tackle decarbonization across multiple segments, include alternative feedstocks, alternative energy sources, and process optimizations.

Certain technologies are industry-specific, while others, such as green power and fuels, offer cross-industry applicability. The collaborative development of regional carbon markets further expands demand for these technologies, fostering regional scale and positioning Asia as a leader in low-carbon innovation.

CASE STUDY 5

Longyuan Power – transitioning to renewable energy leadership

In response to increasing demand for renewable energy due to carbon pricing schemes, corporations face the challenge of reducing their emissions. The demand for compliant, low-cost green electricity has surged as companies strive to transition to renewable energy sources. Longyuan Power, the largest wind power producer in China and Asia, addresses this demand with its renewable energy solutions.

Longyuan divested from its coal power plants in 2024 and transformed itself into a pure renewable energy provider. This strategic pivot enabled Longyuan to offer innovative solutions to corporate clients, including green electricity and green certificate trading services, thereby meeting the growing demand for sustainable energy solutions. In 2024, Longyuan transacted 6.7 billion kWh of green electricity, delivering year-on-year growth of 288%.

As one of the instruments under China's overall green transition policy framework, the carbon market is playing a key role, along with other instruments such as green certificates. Longyuan facilitated the exchange of 10 million green certificates in 2024, a year-on-year increase of 141%.

These achievements underscore the economic and environmental benefits of Longyuan's offering, providing a scalable model for other companies in the renewable energy sector.

Source: expert interview with Longyuan Power.

Green service champions

The growing complexity of carbon markets has fuelled demand for diverse, specialized services, including:

- Consulting services such as carbon accounting, decarbonization strategies and implementation support.
- Operation and maintenance services, such as managing battery energy storage stations.
- Financial services, including carbon trading and project financing.

Such offerings may be delivered by independent specialized firms or as extensions of traditional companies' offerings, as demonstrated by the carbon-related services of the State Grid Corporation of China (see Case Study 6). These comprehensive solutions fill capability gaps for organizations navigating the intricate carbon market landscape, enabling them to meet strategic goals and capitalize on market opportunities with confidence.

CASE STUDY 6

State Grid Corporation of China – carbon accounting as an enabler

Accurate emissions data is essential for transparency, credibility and effective decarbonization. Yet regional energy variability, complex power systems and limited real-time data access hinder carbon factor standardization and end-user participation. The State Grid Corporation of China (SGCC) tackles these via digital carbon accounting, leveraging its energy infrastructure and data capabilities.

In Shandong Province, SGCC has been developing a dynamic electricity-carbon factor system that combines real-time emissions from upstream power plants with advanced metering and algorithms. In 2024, a major steel producer piloted the system and corrected a 5.7% overestimation in its reported emissions. SGCC is targeting an official release of the system, which will enable minute-level, region-specific data for key stakeholders.

Since 2021, SGCC has piloted the "carbon efficiency code" in Zhejiang Province through its new energy cloud platform. This tool integrates data across sectors to calculate and grade enterprise emissions into five efficiency levels, mitigating challenges of fragmented energy data and unclear baselines. Now covering over 40,000 industrial enterprises in Zhejiang Province, it has facilitated a cumulative reduction of 64,000 tCO_2e.

Source: expert interview with SGCC.

Digital tools

As discussed earlier in this report, data and technology are pivotal to unlock the potential of carbon markets. Advances in artificial intelligence (AI) have significantly expanded possibilities for expediting the implementation of solutions across diverse scenarios. By integrating innovations including blockchain, privacy computing, AIoT, infrared and satellite technologies, digital technologies could tackle specific challenges, such as MRV efficiency and data integrity. These solutions deliver value by reducing costs, enhancing efficiencies, building trust, unlocking the value of data assets, enabling smart trading and improving access to financing.

Actionable steps for corporations include:

- Piloting biodiversity monitoring projects with sensor technology.
- Building partnerships with robotics providers.
- Investing in internal capacity building.

In the case study of Ant Group, blockchain and privacy computing help the company address bottlenecks of data authenticity and security, while empowering MRV systems, green certifications and green financing (see Case Study 7).

CASE STUDY 7

Ant Group – digital empowerment in carbon market development

As expectations grow for more detailed data disclosure, enterprises are demanding stricter security and privacy protections in data sharing. Ant Group has built a trusted data circulation foundation to address the issue. Ant Digital Technologies, the technology arm of the Ant Group, participates in the "TianGong Initiative" – providing a trusted data circulation framework that leverages blockchain and privacy computing to address this challenge. Established by the Carbon Footprint Industry Alliance (CFIA), a non-profit, research-driven alliance, and led by Tsinghua University, the TianGong Initiative is dedicated to building a localized and internationally recognized carbon data framework. This foundation effectively alleviates the privacy concerns when reporting data and can be applied into the MRV systems in the carbon market: the tamper-proof nature of blockchain ensures data authenticity, while privacy computing technologies such as federated learning and homomorphic encryption enable secure data usability without visibility.

Ant Group also empowers corporates to utilize reliable carbon data for obtaining green certifications and accessing green financing opportunities. For example, Ant Digital Technologies has built a high-throughput, low-latency asset digitization platform based on blockchain technology, establishing a "two-chain-one-bridge" architecture comprising the "asset chain", "trading chain" and "AntChain trusted cross-chain bridge" to facilitate efficient global capital and asset flow.

The platform now covers multiple sectors including renewable energy, connecting 15 million renewable energy generation devices for immutable on-chain storage of operational data. This advancement enhances the accuracy and reliability of carbon management and the scalable nature of this technology offers potential for replication across sectors and geographies.

Source: expert interview with Ant Group.

Technologies of the future

Future technologies are critical for achieving net-zero goals, but they have not yet attained full maturity and economic scale. Examples include green hydrogen and CCUS, which require accelerated cost reductions and broader market adoption to cross the adoption chasm. Carbon markets play a pivotal role in this transition, for example:

- Compliance carbon markets, supported by industrial policies such as China's green hydrogen initiatives, signal long-term opportunities and encourage early investment, as exemplified by Baofeng Energy's green hydrogen trial (see Case Study 8).
- Voluntary carbon markets, such as China's CCER scheme, provide economic incentives for next-generation technologies such as offshore wind and concentrated solar power. For instance, bolstered by policy support and CCER, China's offshore wind sector has rapidly expanded, with projections indicating a compound annual growth rate (CAGR) of nearly 20% over the next five years[45] (S&P Global Ratings, 2024), underscoring the market's role in driving innovation and scale.

> **As an innovative chemical enterprise, we are committed to replacing all raw materials by new energy – addressing emissions while advancing sustainable energy for humanity.**
>
> Yanbao Dang, Chairman, Baofeng Energy

CASE STUDY 8

Baofeng Energy – trialling green hydrogen substitution

Hydrogen energy is widely acknowledged as a critical pathway for decarbonization, due to zero-carbon emissions throughout its lifecycle and high mass energy density. With its green hydrogen (GH_2) innovation, Baofeng Energy has achieved hydrogen fuel substitution within its coal chemical operations, generating growth opportunities for both traditional produces (e.g. olefins) and other chemicals, while leading the chemical industry towards decarbonization. This is despite green hydrogen's slow commercialization, which is currently hindered by its immature economic viability. Globally it is viewed as a future technology awaiting breakthroughs in either technical advancement or business models.

Baofeng operates one of China's first large-scale solar-powered hydrogen and oxygen production plants, which replaces traditional coal-based hydrogen and oxygen production. The electrolysers in Baofeng's plants, with a single-unit capacity of 1,000 Nm^3/h, can produce green hydrogen with a purity of over 99%. The generated GH_2 and oxygen directly supply chemical systems to produce a series of chemicals, including not only low-carbon olefins, but also green and low-carbon chemicals such as methanol and ammonia, demonstrating new business opportunities and growth potential.

Baofeng's chairman Yanbao Dang notes: "As an innovative chemical enterprise, we are committed to replacing all raw materials by new energy – addressing emissions while advancing sustainable energy for humanity." In future, Baofeng aims to accelerate fossil energy replacement at a 5% annual growth rate via clean energy substitution, with plans for 3.1 billion cubic metres of annual GH_2 production.

Source: expert interview with Baofeng.

Imperative 3

Actively build ecosystems – to unlock the full potential of carbon markets

Corporations should join or even lead this collaboration to transform compliance-driven carbon markets to value-driven ones.

Achieving success in this dynamic and evolving carbon market demands more than individual effort. A vibrant ecosystem, underpinned by diverse stakeholders, is crucial to drive innovation, enhance resilience and expand opportunities for all participants. Given the fragmented nature of Asian markets, developing such an ecosystem requires time and coordinated action, which must begin now.

Corporations should collaborate with more stakeholders to build a cross-disciplinary ecosystem. A robust carbon market should involve direct participants, market enablers, regulators/policy-makers, standard setters and convening platforms. Corporations should join or even lead this collaboration to transform compliance-driven carbon markets to value-driven ones.

While policy-makers lead carbon market regulation, corporations can significantly influence policy by sharing sector insights and data, establishing a feedback loop of "implementation review–dynamic rule adjustment." As discussed earlier, advancing carbon markets' frameworks and liquidity requires policy synergies that call for constructive feedback from corporations.

Innovation in technical standards, particularly for voluntary markets, is another area where corporations can support and even take the lead. They should collaborate with standard setters to develop niche standards and engage with convening platforms to enhance influence and promote global adoption. In Alibaba's case (see Case Study 9), partnerships are expected to improve not only its own carbon management but also support the global carbon neutrality agenda; meanwhile, China Southern Power Grid (CSG) supports carbon management capacity building across the market (see Case Study 10).

CASE STUDY 9

Alibaba Group – fostering multistakeholder collaboration

Alibaba Group, a leader in technology and e-commerce, is promoting international collaboration by working with other large enterprises to set standards, frameworks and methodologies for emissions avoidance, while promoting its Scope 3+ concept to a broader ecosystem.

Together with other tech giants, Alibaba has been working on setting the emissions removal framework and methodologies for avoided emissions and developing international accounting standards. This initiative reinforces Alibaba's sustainability commitment, enhances connectivity between China's carbon market and global systems, and supports the global carbon neutrality agenda.

Scope 3+, a new concept promoted by Alibaba, refers to GHG emissions from all participants in a company's ecosystem beyond direct value chain partners. Scope 3+ reflects the potential to enable and engage a wider group of stakeholders to promote low-carbon products through its digital technology and platforms.

Source: expert interview with Alibaba Group.

CASE STUDY 10

China Southern Power Grid – building carbon management capacity

A successful decarbonization strategy relies on solid infrastructure and carbon management. This demands specialized expertise, such as emissions reduction planning and low-carbon investment strategies. However, many enterprises still lack standardized tools, actionable methodologies and skilled personnel, hindering their low-carbon transitions.

In addition to its internal carbon market development, which is expected to cover 80 entities and approximately 30 million tCO_2e in the first batch in 2025, China Southern Power Grid (CSG) has supported capacity building across the market.

One key initiative is the co-investment of near-zero/zero-carbon demonstration zones, where CSG provides end-to-end services such as carbon inventories, emissions reductions and evaluation standards. By January 2025, 36 zones had been established across office buildings, data centres, industrial parks and other scenarios, with 25 certified as carbon neutral. CSG has compiled practical insights into toolkits that are publicly shared, enabling others to replicate successful models.

CSG also contributes to talent development. As a certified training and competency evaluation base, it delivers professional training programmes on carbon accounting, emissions reduction and regulatory compliance. These efforts help build the human capital foundation necessary for the high-quality development of China's carbon market.

Source: expert interview with CSG.

By collaborating with market enablers such as financial institutions, investors and international organizations, corporations can co-create carbon-related products or projects that allow them to capture opportunities from carbon markets beyond mere compliance. Equally, financial institutions should also play their part in advancing the "marketization" of carbon credits and carbon assets.

As carbon markets and carbon price signals become mature, financial institutions may also consider incorporating carbon pricing into risk assessments. Examples of such innovative projects include those carried out by Standard Chartered (see Case Study 11), GenZero (see Case Study 12) and Mizuho (see Case Study 13).

CASE STUDY 11

Standard Chartered – enhancing carbon market liquidity

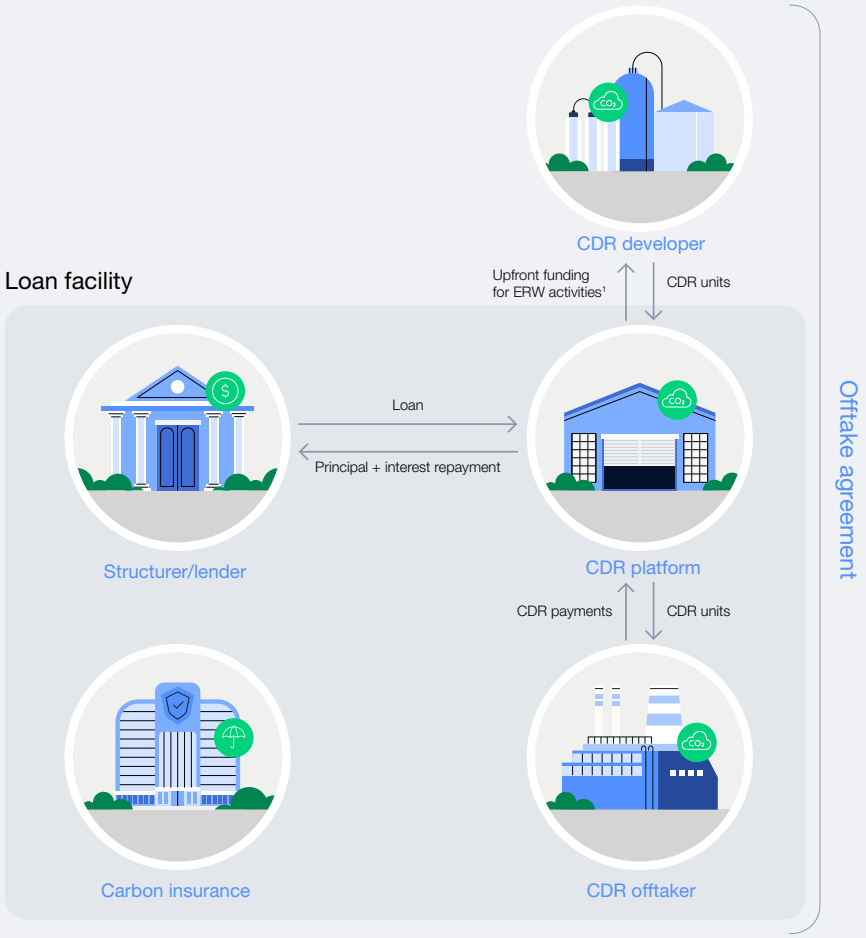
Liquidity plays a critical role in the development and credibility of carbon markets, enabling capital to flow efficiently into high-impact mitigation projects. To support this, Standard Chartered (SC) has developed innovative financing models that help bridge the gap between project development and capital access.

In one case, SC structured a first-of-a-kind loan to support enhanced rock weathering (ERW)-based carbon removal credits (CDR) for offtakers. The loan provided upfront capital for project implementation and monitoring, with repayment tied to the future delivery of CDR credits under a long-term offtake agreement. Risk was partially mitigated through specialized insurance. By aligning near-term financing with future carbon revenue, SC offered a scalable, bankable structure that improves liquidity and helps new projects and technologies get access to capital.

The case had a wide range of applications across industries. For airlines to reach net-zero, for example, they will need to buy CDRs, which are currently high cost and small-scale. By getting capital in early and providing projects with cashflow certainty, SC's goal is to scale up new technologies and reduce unit costs by using bank financing rather than more expensive sources such as venture capital. By including the insurance wrapper, SC along with specialist insurer CFC Underwriting were able to de-risk the structure and rely on the offtaker's creditworthiness to price the loan. This structure can also be used for any operational carbon project that needs upfront financing with a long-term creditworthy offtaker.

In another transaction, SC arranged a $3 billion sustainability-linked revolving credit facility for a major airline group.[47] The facility includes a carbon credit purchase mechanism triggered if decarbonization targets are missed. SC, acting as carbon counterparty, sources and retires high-quality credits under strict criteria. More importantly, this structure illustrates how carbon markets are expanding the toolkit available to financial institutions, enabling them to better support clients' decarbonization and net-zero strategies.

Transaction diagram



Note: 1. ERW = enhanced rock weathering, a nature-based CO_2 removal strategy that helps address climate change by taking carbon out of the air and storing it in rocks.

Source: expert interview with Standard Chartered.

CASE STUDY 12

GenZero – leveraging carbon credits to accelerate the coal-to-clean transition

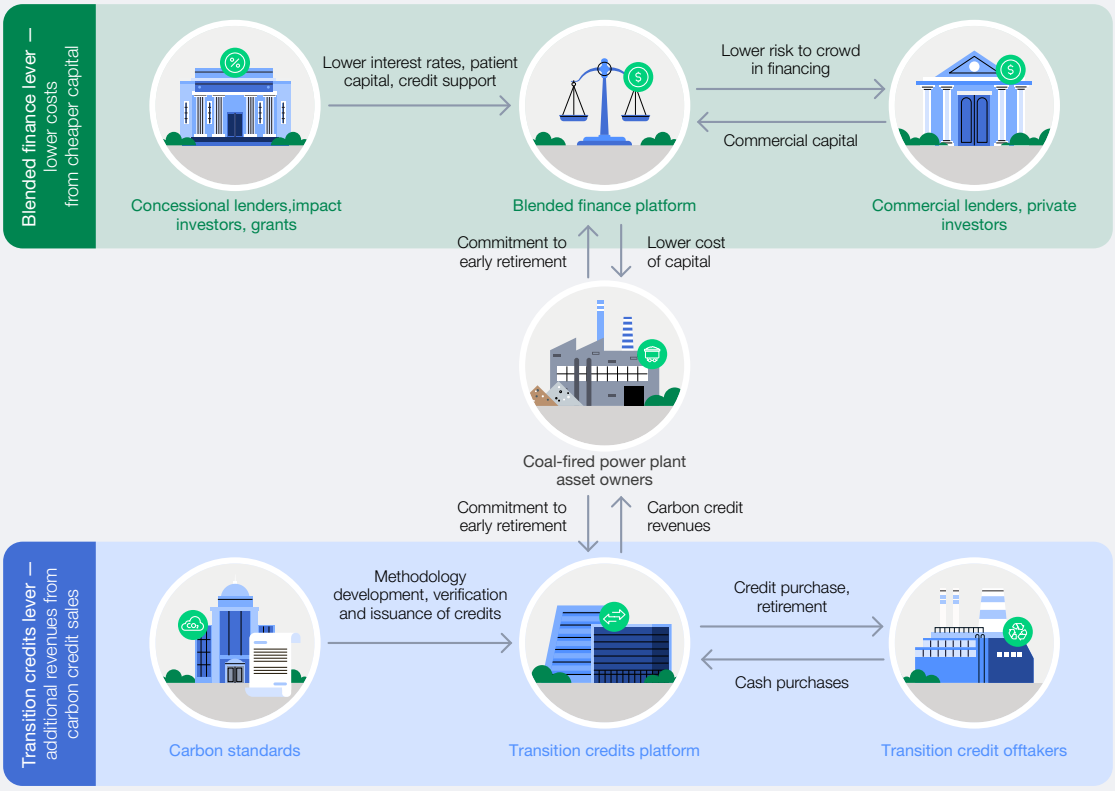
Today, around 15% of global greenhouse gas emissions stem from Asia's coal-fired power plants (CFPPs). However, Asia's energy transition is a complex challenge that needs to balance energy security, economic growth and decarbonization. Despite the falling costs of renewable energy, there remain substantial barriers to phase out coal in the region. These include renewables intermittency, grid constraints, CFPP sunk costs, long-term power purchase agreements (PPAs) and coal-dependent socioeconomic structures.

Phasing out CFPPs early requires addressing the economic gap from foregone cashflows. Blended finance can help by lowering costs with cheaper capital, but the loan tenor must be sufficiently long and the cost of borrowing sufficiently low to meaningfully accelerate coal phase-out. However, to reach net zero by 2050, the IEA calls for unabated coal generation to decline rapidly, falling 50% by 2030. Transition credits can complement blended finance to enable Paris-aligned coal transitions.

Transition credits are a proposed new category of carbon credits that aim to monetize the emissions avoided through early closures of CFPPs and their replacement with clean energy. They address three gaps: economic (compensating equity, debt and PPA holders), energy (replacing lost CFPP output with renewables) and social (supporting just transitions for local communities). They come with robust environmental and social safeguards such as additionality tests, permanent decommissioning, clean energy replacement and just transition plans. In May 2025, Verra approved the first transition credit methodology by the Coal-to-Clean Credit Initiative (CCCI), led by the Rockefeller Foundation and supported by South Pole.

To demonstrate the potential of transition credits, GenZero is partnering ACEN, Keppel, Mitsubishi and Mitsubishi subsidiary Diamond Generating Asia on a pilot project to accelerate the retirement of the 246 MW South Luzon Thermal Energy Corporation (SLTEC) CFPP from 2040 to 2030 and replace it with clean energy. ACEN had already executed a refinancing deal to shut SLTEC after 25 years in 2040 instead of its technical life of up to 50 years. The project now explores transition credits to further accelerate this to 2030, reducing an additional 19 million tonnes of carbon emissions while ensuring a just transition.

GenZero sees transition credits as an innovative solution to catalyse system-level transformation in the energy sector, accelerating the shift from coal to clean energy while ensuring a just transition for local communities. By directly addressing the barriers that hinder the coal transition, transition credits help Asia to close the gap to Paris-aligned decarbonization pathways.



Source: expert interview with GenZero.

CASE STUDY 13

Mizuho – carbon credits as a funding mechanism for decarbonization projects

Since Japan's launch of the J-Credit scheme in 2013, Mizuho Research & Technologies has been appointed by the Ministry of Economy, Trade and Industry and the Ministry of the Environment to serve as the scheme's secretariat and has contributed to its development. Mizuho Bank operates as a market maker in the carbon credit market on the Tokyo Stock Exchange and has been recognized as the best market maker for two consecutive years. Outside of Japan, Mizuho has partnered with the London Stock Exchange Group and Climate Impact X, a carbon credit exchange based in Singapore, to enhance global collaboration and joint efforts.

Mizuho is focusing on transition credits, an advanced financial mechanism designed to encourage the early retirement of coal-fired power plants and the transition to renewable energy sources – also discussed in Case Study 12. This mechanism involves a quantitative assessment of CO_2 emissions from the continued operation of coal-fired power plants and the reductions resulting from their retirement. The reductions are converted into environmental value (generation of carbon credits) and the profits from the sale of these credits are directed towards the costs of early retirement and alternative energy generation.

Recently, Mizuho has joined the NextGen CDR Facility as a buyer of technology-based carbon dioxide removal (CDR) credits, becoming the first Japanese bank to conclude a long-term purchase agreement for these credits. By participating in this collaboration, Mizuho will gain insight into the characteristics of technology-based CDR projects and develop expertise in resolving issues related to the distribution of carbon credits. The company also plans to design frameworks and develop trading market platforms to establish a technology-based CDR market in Japan. In the long term, it aims to support Japanese companies in commercializing technology-based CDR, providing both financial services and consultancy.

Source: expert interview with Mizuho.

Conclusion

Integrating Asia's carbon markets will play a critical role in creating the unified global carbon market system needed to propel countries and corporations towards net zero.

The further development and integration of Asia's carbon markets is crucial in supporting the global climate agenda. This vision requires collaboration between policy-makers and market participants in rule-setting, market activation and capacity strengthening to create a coordinated and feasible blueprint.

At the policy level, Asian carbon markets vary in maturity, yet foundational improvement and coordination can be implemented in four ways:

- **Enhance domestic frameworks** by clarifying market rules and establishing more robust data infrastructure for transparent operations.
- **Activate liquidity** by expanding market coverage to more sectors, engaging in multilateral cooperation to attract international demand, and supporting high-quality carbon credit projects for supplies.
- **Expand opportunities** for carbon-based financial products to boost market vitality.
- **Prioritize international dialogue** for mutual recognition of standards and certification to pave the way for global market interconnectivity.

As market participants, corporations should seize the strategic opportunities brought by the carbon market and treat it as an accelerator for low-carbon transformation and as a potential growth driver.

Corporations should actively participate in the market and help develop it in the following ways:

- **Engage in policy development**, providing insights to align rules with industry needs.
- **Enhance standard-setting**, by collaborating with stakeholders to develop specialized, sector-specific methodological standards, boosting the credibility of carbon accounting and verification.
- **Collaborate with market enablers**, such as financial institutions and service providers, to innovate carbon asset models, broadening revenues and injecting market liquidity.
- **Accelerate capacity building** through training and technology-sharing to elevate market maturity.

Integrating Asia's carbon markets is a systematic process that requires multistakeholder collaboration. It will eventually drive global climate governance and a unified global carbon market system that will propel countries and corporations alike towards their net-zero goals.

Appendix

Model assumptions on China's ETS market outlook

The emission coverage of China's ETS market depends on two variables: the total emissions volume trajectory of the industries to be covered and the sequence and speed of ETS expansion into new industries. Future ETS market coverage is the largest when both the total emissions and the expansion speed are high – indicated by scenario 1 below. On the contrary, if both total emissions and the expansion speed are low, that results in the smallest estimation of ETS emissions coverage, as indicated by scenario 2.

Scenario 1

Total emissions from the eight industries are assumed to reach their peak during 2026-2027, with peak emissions of around 10.0-10.6 billion tonnes CO_2. Total emissions are assumed to gradually reduce to around 9.5-10.0 billion tonnes CO_2 by 2030. After encompassing power, steelmaking, electrolytic aluminium and cement by 2025, the ETS market is assumed to include the steel processing, oil refining and synthetic ammonia industries by 2026, the methanol industry by 2027, and the glass, copper smelting, ethylene, papermaking and aviation industries by 2029. Note that this is a relatively optimistic assumption of the pace of ETS expansion.

Scenario 2

Total emissions from the eight industries are assumed to reach their peak during 2027-2028, with peak emissions of around 9.5-10.0 billion tonnes CO_2. Total emissions are assumed to gradually reduce to around 8.5-9.0 billion tonnes CO_2 by 2030. The ETS market is assumed to include the steel processing, oil refining, synthetic ammonia and methanol industries by 2028 and the copper smelting, ethylene, papermaking and aviation industries by 2030.

Abbreviations

ACCF — ASEAN Common Carbon Framework

ACX — AirCarbon Exchange

AIoT — Artificial Intelligence + Internet of Things

ASEAN — Association of Southeast Asian Nations

BCE — Bursa Carbon Exchange

CAGR — Compound annual growth rate

CBAM — Carbon Border Adjustment Mechanism

CCER — Chinese Certified Emissions Reduction

CCTS — Carbon credit trading scheme

CCUS — Carbon capture, utilization and storage

CDM — Clean Development Mechanism

CDR — Carbon dioxide removal

CIX — Climate Impact X

CNBM — China National Building Material Group

CORSIA — Carbon Offsetting and Reduction Scheme for International Aviation

CSG — China Southern Power Grid

DAC — Direct air capture

ERW – Enhanced rock weathering

ETS — Emission trading system

FID — Final investment decision

FTIX — Federation of Thai Industries Carbon Credit Exchange

GDP — Gross domestic product

GHG — Greenhouse gas

GX-ETS — Japan's Green Transformation Emission Trading System

HKEX — Hong Kong Exchanges and Clearing Limited

JCM — Joint Crediting Mechanism

K-ETS — Korean Emission Trading System

MACC — Marginal abatement cost curve

MEE — Ministry of Ecology and Environment

MOL — Mitsui O.S.K. Lines

MRV — Measurement, reporting and verification

NCM — National Crediting Mechanism

NbS — Nature-based solutions

NDC — Nationally Determined Contributions

NDRC — National Development and Reform Commission

PAT — Perform, achieve and trade

SBTi — Science Based Targets initiative

SDG — Sustainable Development Goal

SGCC — State Grid Corporation of China

SLTEC — South Luzon Thermal Energy Corporation

SOE — State-owned enterprise

TbS — Technology-based solutions

UNFCCC — United Nations Framework Convention on Climate Change

VCM — Voluntary carbon market

WDR — Water-saving and drought-resistant rice

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