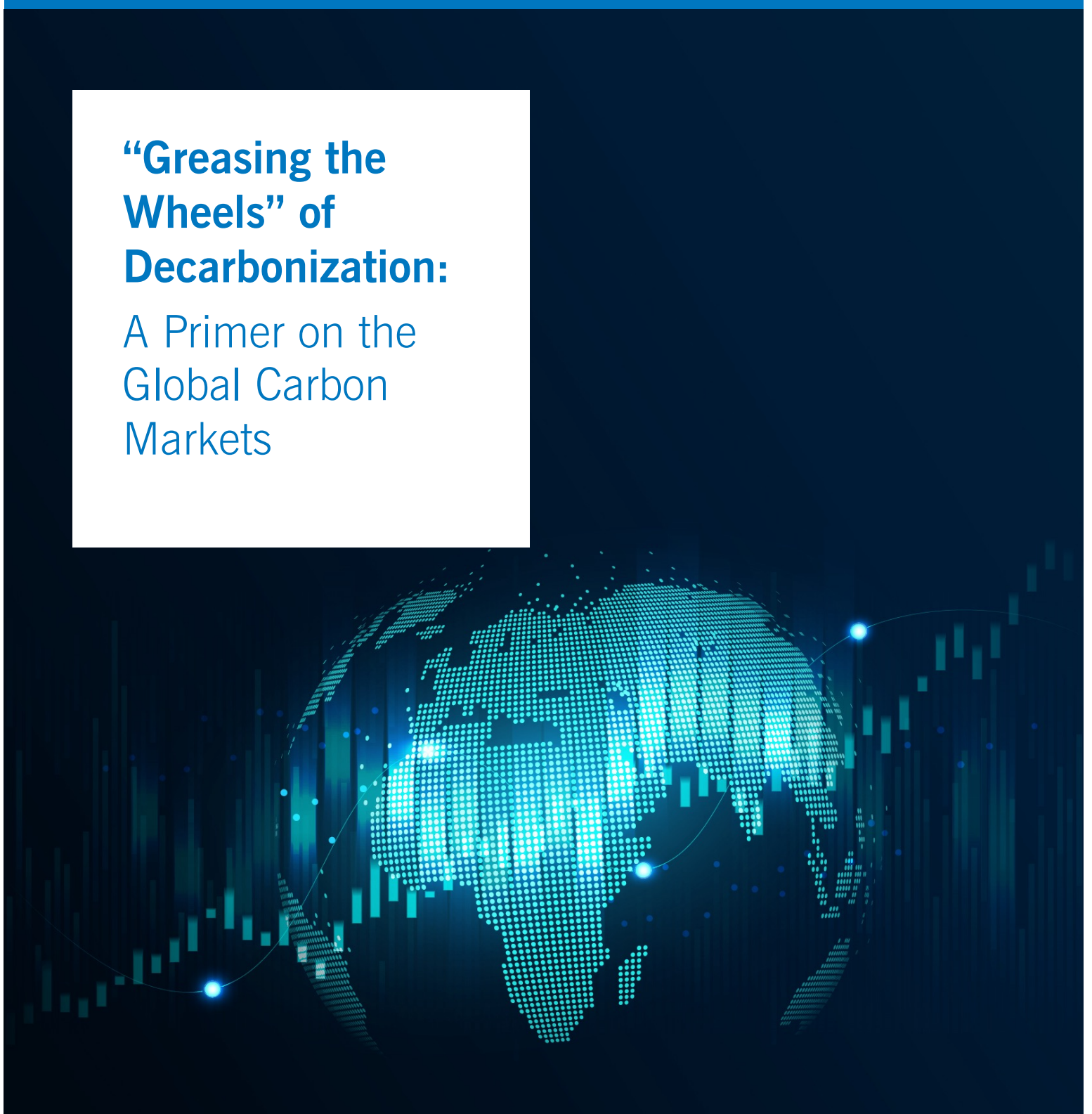


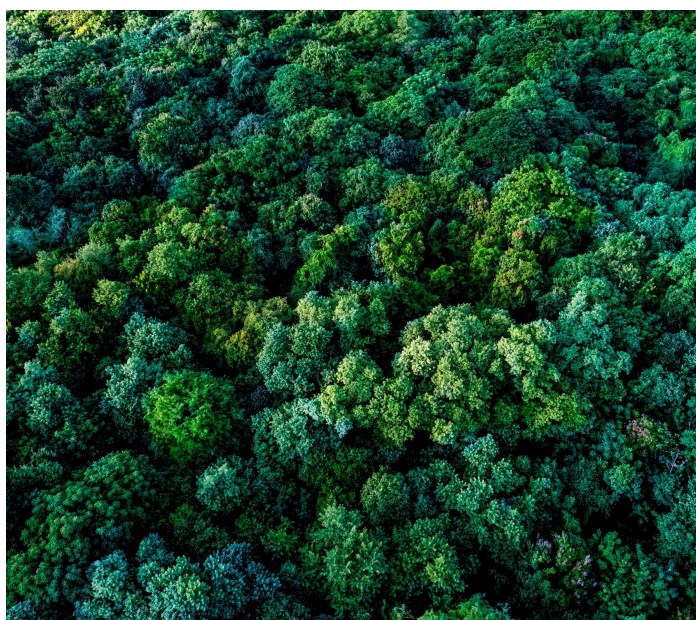
# INSIGHTS

April 2024

## **“Greasing the Wheels” of Decarbonization:**

A Primer on the  
Global Carbon  
Markets





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**Preface**

*Kim Stanley Robinson's 2020 science-fiction novel The Ministry for the Future begins with a climate catastrophe and ends on a hopeful note as nations come together to solve climate change. One of the game-changers is the introduction of the carbon coin, a tradeable digital currency managed by the world's central banks and produced when a tonne of carbon is eliminated from the atmosphere. The new currency catalyzes powerful market forces behind decarbonization. By the end of the novel, the carbon coin has become the most widely traded and most valuable currency in the world.<sup>1</sup>*

- As climate change and its effects become more apparent, nations and companies are setting increasingly ambitious and necessary decarbonization targets. Carbon Markets have begun to play an integral role in meeting these objectives by creating market-based, environmentally effective and economically efficient mechanisms for CO2 and other greenhouse gas emissions reduction.
- In essence, Carbon Markets<sup>2</sup> turn emissions into a tradeable commodity with a visible price. Through supply and demand, Carbon Markets provide “carrot and stick” financial incentives to reduce emissions, generate capital to fund new carbon removal solutions and create a growing climate finance solution for the Global South<sup>3</sup>. Carbon Markets also change the calculus for CO2 and other greenhouse gas emissions from an “economic externality” to a visible, clear and consequential factor in business and consumer decisions. By doing so, we believe they correct an enormous and persistent market failure.
- Just as financial markets “grease the wheels” of the economy by optimally allocating and pricing capital, Carbon Markets will play a similar role with decarbonization. We believe investing and scaling the companies supporting rapid market development will present some of the most exciting and important areas within Climate Solutions<sup>4</sup>.

Although no more complex than many financial and commodity markets, the organization and nomenclature of the Carbon Markets is unfamiliar to many investors with new terms, acronyms and jargon. This white paper provides an introduction and general overview of the Global Carbon Markets.

## Executive Summary

Six things you need to know about the Carbon Markets.

### 1 The Global Carbon Markets<sup>5</sup> come in two flavors.

*Compliance Carbon Markets (“CCM”)* — also called *Emissions Trading Schemes (“ETS”)* — are regulated markets where participation is mandatory and rules, standards and oversight are set by government. The securities traded are carbon allowances — rights to emit CO<sub>2</sub> — issued by the regulatory body managing the market. Market participants are corporations in high emission industries, but the number of companies subject to regulation is growing. *Voluntary Carbon Markets (“VCM”)* are self-regulated and allow buyers — businesses, organizations or individuals — to voluntarily reduce their emissions footprint by purchasing carbon offsets generated from projects that avoid, reduce or remove emissions. Voluntary markets link the purchasers of these offsets — primarily companies that are not regulated in a Compliance Market, e.g., IT, travel, and banking businesses — with sellers of offsets, who are typically other businesses, non-profits or private individuals managing projects that contribute to decarbonization (e.g., by planting trees or removing CO<sub>2</sub> from the air).

### 2 The markets are growing and reaching scale.<sup>6</sup>

Since they were first introduced almost twenty years ago, the Carbon Markets have grown to an estimated aggregate trading volume of \$978 billion in 2022<sup>7</sup> compared with \$851 billion in 2021<sup>8</sup>, up 146% from 2020, and well above the 2012-2017 average size of ~\$55 billion annually<sup>9</sup>. The Global Carbon Markets are expected to reach \$2.7 trillion by 2028<sup>7</sup>.

### 3 The Carbon Markets are poised for near-term expansion driven by strong tailwinds.

National decarbonization commitments are increasing and as they do the number of companies required to participate in Compliance Markets will grow. Corporations that committed to meeting Net Zero and 2030 decarbonization targets have limited time to act and are facing growing shareholder, activist, and compliance pressure to report progress towards these goals. They will be looking to high-quality offsets on the VCM to help. Regulatory oversight from multiple authorities is increasing and adding to overall market confidence, and progress towards standards is also coming from the private sector.

### 4 “CBAM” will be a game-changer.

The European Union’s Carbon Border Adjustment Mechanism (referred to as “CBAM”) — a border tariff that would apply when emissions-intensive products are imported into the EU from countries with less stringent regulations — will be a potential game changer for the Carbon Markets as it will catalyze other countries to adopt Compliance Markets consistent with the EU’s high standards.

### 5 The growth and maturation of the Carbon Markets is critical to meeting climate goals.

Scenarios that keep the increase in global temperatures below 2.0C<sup>10</sup> rely on international cooperation through Carbon Markets; almost half of all current Nationally Determined Contributions (“NDCs”) related to the Paris Agreement, representing 31% of global emissions, depend on international cooperation through Carbon Markets.<sup>11</sup> If Carbon Markets are not well developed, these commitments — which are already off target — will fall further behind. In addition, functioning Carbon Markets are critical to funding carbon removal technologies and nature-based solutions, particularly in the Global South, required to reach Net Zero.

### 6 Development of the Carbon Markets presents one of the most compelling investment opportunities in Climate Solutions.

As the Carbon Markets grow, they will require new infrastructure, technologies, financial products, trading, and brokerage and consulting services. Many of the services and operations that are standardized in other financial markets — e.g., rating agencies, market intelligence, transactional systems — are at an early stage in the Carbon Markets. The sector provides a unique investment opportunity to “do well” and “do good” by bringing private sector capital and expertise to one of the most important areas within Climate Solutions.

## Brief History of the Global Carbon Markets

Compared to the long history of financial markets, the Carbon Markets are young. They were initiated at the 1997 United Nations Framework Convention on Climate Change (“UNFCCC”) meeting<sup>12</sup>, which took place in Kyoto, Japan. There, for the first time, countries agreed to binding obligations for greenhouse gas emissions reductions and limits. The “Kyoto Protocol” had 192 signatory parties, but due to the complex endorsement process, it did not come into effect until 2005. To help countries meet their newly established emission targets, and to encourage the private sector and developing countries to contribute to emission reduction efforts, the agreement included three “market-based” mechanisms: Emissions Trading, the Clean Development Mechanism and Joint Implementation. These initiatives form the foundation of today’s Global Carbon Markets.

With Emissions Trading, the Kyoto Protocol encouraged the development of national level markets for emissions similar to the structure that had been used successfully in the United States’ Clean Air Act of 1990 (which established a market-based “cap and trade” plan to reduce sulfur dioxide emissions). The first carbon emissions trading market was the European Union’s Emissions Trading Scheme which started in 2005.<sup>13</sup> Other government-sponsored emissions trading markets followed shortly thereafter. These markets were referred to as Compliance Carbon Markets since participation was mandatory.

With the Clean Development Mechanism (known by its acronym “CDM”), the Kyoto Protocol established the world’s first international carbon trading scheme consisting of a set of standards that would enable developed countries to fund climate mitigation projects in developing countries.<sup>14</sup> The carbon emissions reduction attributed to these projects could then be credited against the sponsor country’s targets. This structure was consistent with the Kyoto Protocol’s distinction between the obligations of the developed countries (called Annex 1 countries) and developing countries (Annex 2). Although the CDM has had mixed success, it is the precursor to today’s Voluntary Carbon Markets. The Joint Implementation mechanism was similar to the CDM but enabled developed countries to carry out emission reduction or removal enhancement projects directly with each other.

By the time of COP22 held in Paris in 2015, these market mechanisms had been in place for ten years with some ups and downs in adoption. The major breakthroughs of The Paris Agreement were (i) to strengthen the Kyoto Protocol’s national decarbonization commitments from “intended commitments”

to much firmer “national commitments” (“Nationally Determined Contributions” or NDCs), and (ii) to do away with the distinction made in the Kyoto Protocol between developed countries and developing countries (given the practical challenges of defining what was a developing country and the recognition that climate change was a shared challenge and responsibility).

In line with these advances, The Paris Agreement proposed to strengthen and expand Carbon Markets based on lessons learned since Kyoto. Under Article 6 of the Agreement, parties to the Agreement would be enabled to trade with each other and offset projects would be allowed to be incorporated into these markets. However, the text of Article 6 did not provide sufficient detail as to how it would work in practice, and these details have continued to be debated in subsequent climate meetings.

Along with developments in the Compliance Carbon Markets, a private sector marketplace developed where buyers and sellers could exchange units in projects that remove or avoid emissions. The exact specifications were unregulated, non-standardized and left to independent organizations to verify. The result was and remains a largely fragmented ecosystem that is broadly referred to as the Voluntary Carbon Markets. However, as these markets have matured, there is an emerging class of Carbon Markets that are also voluntary but are more organized and structured. They represent attempts by commercial and governmental bodies to create regulated and centralized but still voluntary marketplaces that cover their respective jurisdictions, industries or interests.

Today multiple national Carbon Markets have been implemented for trading emissions within a country or region and multiple private sector markets have also developed. There are regulatory bodies either overseeing or interested in the Carbon Markets – from the United Nations to country and regional regulators such as the European Commission, Japan’s Ministry of Trade, Economy & Industry, the California Air Resources Board and the United States CFTC. There are multiple private sector coalitions focused on Carbon Markets, including the Taskforce on Scaling Voluntary Carbon Markets (“TSVCM”), the Integrity Council for the Voluntary Carbon Market (ICVCM) and the Carbon Offsetting and Reduction Scheme for International Aviation (“CORSIA”). The interest and level of activity in Carbon Markets is strong, reflecting that in a little over twenty-five years, Carbon Markets have gone from being a proposal on paper to a rapidly growing and dynamic climate solutions sector and key area of international climate policy.

## The Global Carbon Markets Landscape

Like other financial markets, the Global Carbon Markets ecosystem is complex with different types of markets, operations, securities and regulation. The primary market division is between Compliance Carbon Markets and Voluntary Carbon Markets. Within these two categories, there are sub-markets organized by industry or region. In addition, as noted above, there are other market-like mechanisms to purchase carbon offsets as well as the potential for broader carbon market integration under Article 6. The principal differences revolve around who participates, how the market operates, what is traded and how it is regulated.

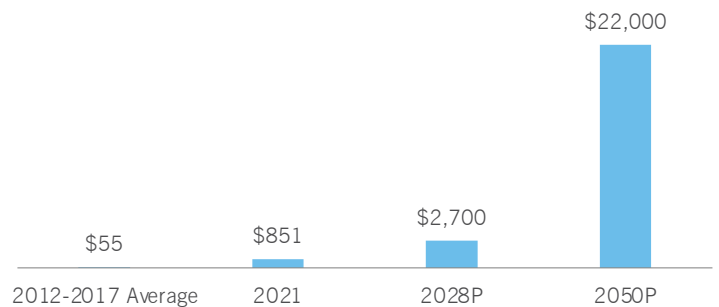
Figure 1. The Carbon Markets Landscape

Market	Participants	Operation	Securities	Regulation
Compliance Carbon Markets	National governments	Cap-and-trade / Emissions Trading Schemes	Carbon emission allowances	Government regulated
	Regions & states	Baseline-and-credit	Offsets allowed in certain markets	Mandatory participation
Voluntary Carbon Markets	Corporates	Project-based	Removal / sequestration offsets	Independent certification bodies
	Non-profits Individuals		Avoidance / reductions offsets	Voluntary participation
Clean Development Mechanism (“CDM”)	National governments Allows corporate & organizational participation	Project-based	Certified Emission Reduction (“CER”) credits	Designated national authority CDM Executive Board
Article 6 of The Paris Agreement	National governments	Integrated global markets	Internationally Transferred Mitigation Outcomes (“ITMOs”)	Conference of the Parties
Industry-specific Markets	Industry participants	Cap-and-trade	Carbon emission allowances Verified Emission Reduction (“VER”) Credits	Self-regulated by industry

## Size of the Global Carbon Markets

The size of the Carbon Markets combines the trading volumes on national and regional Compliance Carbon Markets and trading volumes on the Voluntary Carbon Markets. Like the underlying Carbon Markets, these data sets are also fragmented and do not yet have easily accessible information sources and reporting services. Taken together, the total Carbon Markets size was an estimated \$851 billion in 2021, up 146% from 2020, and well above the 2012-2017 average size of ~\$55 billion annually. This figure reflects the size of the Compliance Carbon Markets at \$850 billion (representing the equivalent of 15.8Gt of CO<sub>2</sub>e traded on the CCMs in 2021), and the much smaller Voluntary Carbon Markets with an estimated size of approximately \$1 billion.<sup>9</sup> Research and Markets, an industry research provider, and Wood Mackenzie, a global data and analytics provider for natural resources and energy markets, have released ambitious predictions for future market growth with Global Carbon Markets reaching \$2.7 trillion by 2028<sup>7</sup> and \$22 trillion by 2050<sup>9</sup>, respectively.

Figure 2. Global Carbon Markets Size (\$ in billions per year)<sup>7,9</sup>



Looking at the two markets separately, the Compliance Carbon Markets have been growing rapidly in recent years, more than doubling to \$850 billion in 2021 and are estimated to have reached \$949 billion in 2023<sup>15</sup>, an increase of 12%. Compliance Carbon Market growth is expected to be driven by the number of countries and regions implementing emissions trading schemes, the expansion of existing markets and rising allowance prices. As of March 2023, the CCMs consisted of 36 Emissions Trading Schemes that cover almost one-fifth of global carbon emissions.<sup>16</sup> BloombergNEF estimates that by 2030 the price of a single allowance could reach \$93 per tonne on the California market (up from \$29 in 2024) and \$162 per tonne on the EU ETS (up from \$57 in 2024).<sup>17</sup>

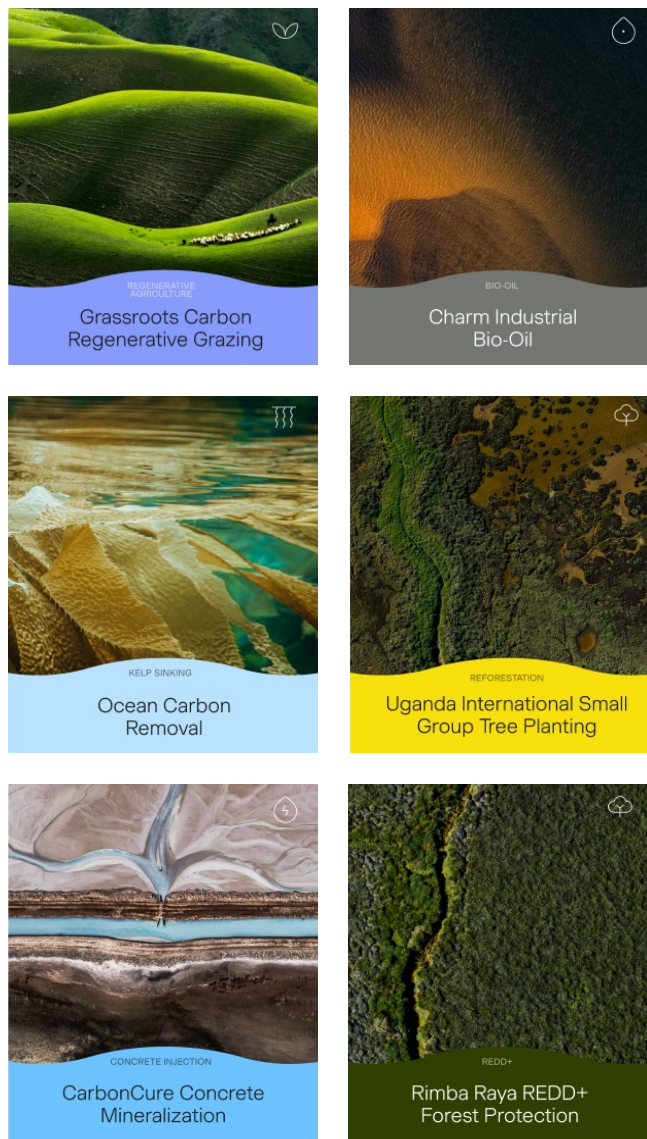
The Voluntary Carbon Markets have also been growing but stagnated in 2023 due to concerns over market integrity. Long-term market growth is driven by offset demand from corporate net-zero strategies – companies that are unable to reduce their emissions operationally will be forced to purchase offsets to reach their emission goals. The TSVCM, Trove Research/MSCI and BloombergNEF estimate demand for Voluntary Carbon Markets offsets to range from 0.5 to 2.0 GtCO<sub>2</sub>e by 2030 largely based on estimated demand from corporates. Pricing will vary by offset, with perceived lower quality avoidance projects – e.g., avoiding deforestation and clean energy development – pricing in the \$10 to \$15 per ton range, and higher-end, removal projects – e.g., monitored reforestation or Direct Air Capture (“DAC”) – pricing as much as \$200 per ton.

Taking these demand and pricing assumptions together, market size by 2030 could reach anywhere between \$10 billion at the low end of the range (assuming an oversupply of low-quality credit offsets) to over \$200 billion at the high end (assuming removal offsets only).<sup>9</sup>

McKinsey forecasts that annual global demand for VCM offsets could reach up to between 1.5 to 2.0 GtCO<sub>2</sub>e by 2030 and up to 7.0 to 13.0 GtCO<sub>2</sub>e by 2050. Depending on different pricing scenarios, the market size in 2030 could reach between \$5 billion and \$30 billion at the low-end and more than \$50 billion at the high-end.<sup>18</sup> Trading volumes within these ranges imply the VCM will grow by a significant multiple of its current size in a relatively short period of time.

Figure 3. Voluntary Carbon Markets Scenarios for 2030<sup>9</sup>

Scenario	Pricing (USD/Ton)	Demand (GtCO <sub>2</sub> /Year)	Market Size (USD Billion)
<b>TSVCM Projections</b>			
Prioritization for low-cost supply	\$10-20	1-2	\$10-40
Preference for local supply	\$50-90	1-2	\$50-180
<b>Trove Research</b>			
Trove Research	\$20-30	0.5-1.5	\$10-40
<b>Bloomberg NEF Projections</b>			
Status Quo (Primarily low-quality credits)	\$11	1	11
SBTi Scenario (removal credits only)	>\$200	1	>\$200
Hybrid Scenario (gradual phase-in to removal only)	\$48	1.7	\$80



Source: Patch.io. Images are sample carbon offset projects available for purchase on Patch.io – a carbon offset marketplace.

Sources: BloombergNEF (January 2022), Trove Research (October 2020), TSVCM (January 2021), Credit Suisse (August 2022).

## The Primary Carbon Markets Securities

The primary tradeable securities on the Carbon Markets are (1) *carbon allowances*, which represent, in effect, rights to emit GHGs, and (2) *carbon offsets*, which represent either the avoidance of emissions or the removal of emissions. (The distinction between avoidance and removal offsets is an important one, as discussed below.) With carbon allowances and offsets the unit of measurement is one metric ton or “tonne”<sup>19</sup> of CO<sub>2</sub> equivalent emissions (CO<sub>2</sub>e).<sup>20</sup> Although the two types of securities are often bundled together and referred to simply as “carbon credits”, they are not the same and have different goals, intended uses and climate impact.

Carbon allowances work like permission slips for emissions. They are used primarily in the government regulated Compliance Carbon Markets. The allowances are issued by regional, national or international governmental organizations *and belong to the regulatory market where they trade*. Allowances are issued or sold to the organizations that are required to participate in the market – one “unit” of allowance allows the entity to emit one tonne of CO<sub>2</sub>e.

In contrast, carbon offsets trade between companies or between companies, non-profits and individuals. They are used primarily in the self-regulated Voluntary Carbon Markets.<sup>21</sup> There are two ways to generate a carbon offset: through avoidance projects (i.e., the use of renewable energy to replace fossil fuels) or through removal projects through natural carbon removal (e.g., reforestation) or engineered carbon removal (e.g., Direct Air Capture). When one company avoids or removes one tonne of CO<sub>2</sub>e from the atmosphere either as part of their normal business practices, new activity or specific project, it can generate a carbon offset that another company can purchase to reduce its own emissions footprint.

A fundamental difference between the two types of securities is that carbon allowances are not inherently reducing emissions on their own; they are permitting an emission. However, when they are used within a tightening, regulatory framework, carbon allowances can be a strong, market-driven change agent. On the other hand, carbon offsets are intended to directly reduce emissions through verified avoidance or removal projects. A second major difference is that carbon allowances enable capital flows only within the market in which they trade. Carbon offsets, on the other hand, provide a mechanism for businesses and individuals to fund the development of renewable energy capacity, decarbonization solutions, as well as nature preservation and enhancement in multiple places, in particular in the Global South where the funding need is critical.

Within these two broad categories there are further sub-divisions of securities. In the Compliance Carbon Markets, securities are specifically aligned to the sponsoring market and regulator, and credits cannot trade between Compliance Carbon Markets (i.e., an allowance issued in the European market cannot be used in the California market). The pricing of the securities is likewise market specific, even though each security represents, in theory, the same tonne of emissions. For example, in the California Cap-and-Trade Program a tonne of CO<sub>2</sub> traded for \$29 per unit at the beginning of 2024, and in the European Union Emissions Trading Systems (“EU ETS”) the same amount of emissions traded for \$57.<sup>22</sup>

In the Voluntary Carbon Markets securities are segmented by the type of project. For example, REDD+ (Reducing Emissions from Deforestation and Forest Degradation) carbon offsets are a specific type of avoidance carbon offset that help reduce carbon emissions through a reduction in deforestation. Similarly, another popular type of offset on the Voluntary Carbon Markets is the Clean Cooking Offset, which subsidizes the distribution of efficient cookstoves in developing countries to reduce greenhouse gas emissions by switching from emissions-intensive cooking methods.

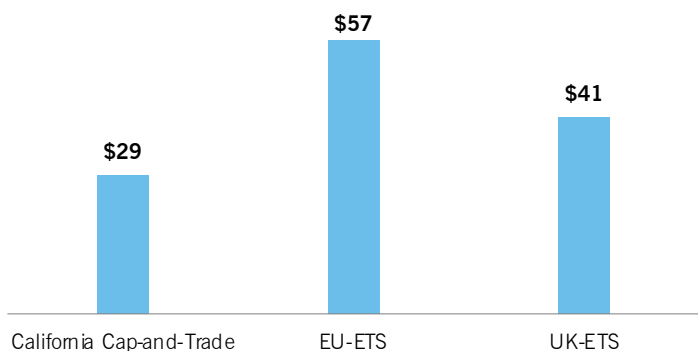


Image depicts a group of people using clean cooking stoves during a scene from the television series *Shamba Shape Up*. The series aims to raise awareness on the pressing need for fuel-efficient and cleaner cooking options in Kenya.

Each of these offset types also trade at different price points although each again, in theory, represents the same amount of emissions. Pricing depends on factors such as the perceived quality and supply of the offset; higher quality offsets are scarcer and therefore more costly. Perceived quality of offsets and pricing can change rapidly; for example, cookstove carbon offsets traded around \$13.00<sup>23</sup> in 2011, \$4.50<sup>24</sup> in 2019 and \$5.00<sup>25</sup> in 2023.

Figure 4: Illustrative CCM Allowance Prices<sup>22</sup>

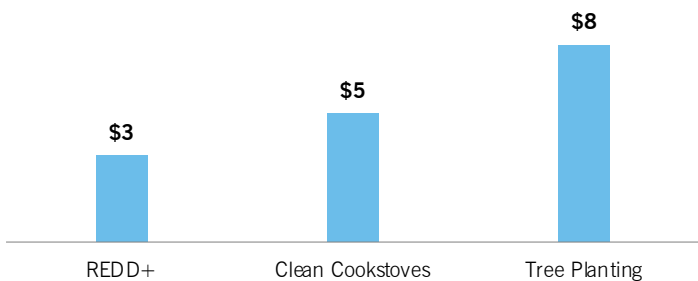
Data represents ICE future prices as of February 23, 2024 (\$ per tonne)



Note: California Cap-and-Trade pricing data is based on the California Carbon Allowance Specific Vintage 2023 Future, traded on ICE Futures U.S., which represents a physically delivered greenhouse gas emissions allowance where each is an allowance issued by the California Air Resources Board or linked program representing one metric tonne of CO2 equivalent. UK-ETS pricing data is based on the UKA Daily Futures Contract, traded on the ICE Futures Europe, where each UKA represents an entitlement to emit one tonne of carbon dioxide equivalent gas, as further defined in the ICE Futures Europe Regulations. EU-ETS pricing data is based on the EUA Daily Futures contract, traded on ICE Endex, which is a futures contract for the purposes of trading and delivering European Union Allowances, where one EUA allows the holder to emit one ton of CO2 or CO2 equivalent greenhouse gas.

Figure 5: Illustrative VCM Offset Prices<sup>25</sup>

Data represents 2023 average prices (\$ per tonne)

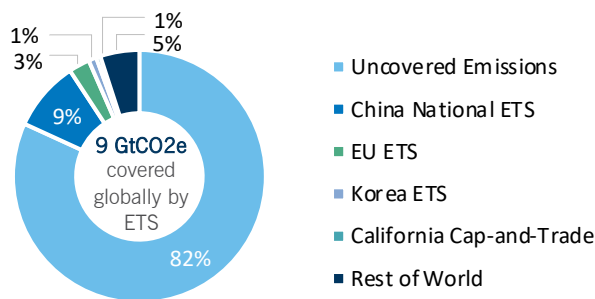


Source: 8 Billion Trees.

## The Compliance Carbon Markets

Compliance Carbon Markets (CCMs), also called simply “Compliance Markets” are mandated and regulated by national, regional or international bodies to help meet emissions reduction targets. As noted above, these targets are set by countries’ Nationally Determined Contributions (NDCs) to global emissions reduction under The Paris Agreement. Since the trading on these markets is of rights to emit, they are also called Emissions Trading Schemes (ETS). As of March 2023, 36 ETS initiatives were implemented globally, representing over 40 countries at the national or subnational level and covering 18% of global GHG emissions.<sup>16</sup> The largest market is the China ETS. Other major economies include the EU, Canada, Japan, the UK, Switzerland, Australia, South Korea, New Zealand, South Africa and Mexico.

Figure 6: ETS Coverage of Global Emissions<sup>16</sup>



Source: World Bank Carbon Pricing Dashboard as of March 31, 2023.

The majority of the Compliance Markets operate using a “cap-and-trade” system. Under this system, businesses within a covered sector are each given an allowance (or “cap”) of how many tonnes of CO2 equivalents each can emit based on an industry-specific benchmark. The benchmark is determined by the regulator and may be set by looking at averages across an industry or by looking at best practices. As described above, these allowances take the form of tradeable securities with each security representing the right to emit one tonne of CO2e. Each year, businesses are provided with allowances up to a cap either for free or by entering an auction – a method for allocating allowances where participating members need to bid for their share of allowances. At the end of the year, a business must turn over enough allowances to cover its actual emissions for the period. If a business has emitted less than its allotment, it can sell any excess allowances (“trade”) to other businesses. If a business has emitted more than its allotment, it must either purchase additional allowances or pay a fine.



Allowances are traded in secondary markets where the market price is determined by supply and demand. Since the number of allowances declines over time to match the overarching decarbonization goals of the government market sponsor, as the pool shrinks, the price goes up, putting more pressure on participants to reduce, mitigate, or eliminate emissions. The cap-and-trade structure thereby creates a strong and increasingly punitive financial incentive for companies to decarbonize.

## Regional Compliance Markets



The U.S. did not ratify the Kyoto Protocol and, therefore, never established a compliance carbon trading system at a national level, but the U.S. has state and regional markets. The earliest of these was the Regional Greenhouse Gas Initiative (“RGGI”), the first mandatory cap-and-trade program in the U.S. which limited CO<sub>2</sub> from the power sector and launched in 2009.<sup>26</sup> The RGGI consists of Connecticut, Delaware, Maine, Maryland, Massachusetts, New Hampshire, New York, Rhode Island and Vermont. Across the country, California’s cap-and-trade program, launched in 2013, is now the seventh largest in the world (behind China, the European Union, the Republic of Korea, Germany, Indonesia and Mexico).<sup>16</sup> The program is managed by the California Air Resources Board and covers large electric power plants, large industrial plants and fuel distributors (e.g., natural gas and petroleum). In total, about 450 businesses, responsible for around 85% of California’s total greenhouse gas emissions, must comply.<sup>27</sup> California has also linked its system with the Canadian province of Quebec’s cap-and-trade program, meaning that businesses in one jurisdiction can use emission allowances issued by the other for compliance. The linked California-Quebec cap-and-trade program is also called the Western Climate Initiative (WCI).

## The Voluntary Carbon Markets

In the Voluntary Carbon Markets (VCM), companies, non-profits, certain governments and individuals purchase carbon offset credits to reduce their emissions footprint to meet decarbonization commitments or social responsibility goals. The participants in the VCM are generally companies that are not required to participate in a Compliance Market. Between 2020 and 2022, two-thirds of the world’s largest companies by revenue that had net-zero targets were using carbon offsets to meet their goals.<sup>28</sup> As described above, offsets are provided by other businesses, organizations or private individuals who have operations, assets or projects that reduce emissions.

Offsets are verified, certified and registered by independent third-party organizations. Once this is done, they are called Verified Emission Reductions (VERs) or Verified Emissions Credits which certifies the project has undergone a verification process to ensure its legitimacy and adherence to the certifier’s standards. Various standards and programs exist such as the Verified Carbon Standard (VCS) managed by Verra or the American Carbon Registry (ACR) managed by Winrock International Management.

Figure 7. **Carbon Crediting Standards**

Standard	Description
 <b>Verified Carbon Standard</b> A VERRA STANDARD	World’s most widely used GHG crediting program run by non-profit Verra
 <b>American Carbon Registry</b>	Carbon crediting program that operates in global compliance and voluntary markets
<b>Gold Standard</b>	Voluntary carbon offset program focused on progressing the UN SDGs

Sources: Company websites.

Another well-known standard is the “Gold Standard for the Global Goals,” established by the non-profit Gold Standard Foundation, which denotes the high-quality projects that also contribute to sustainable development, environmental protection and social benefits goals. Once an offset has been verified, it can be made available for purchase on one of the private marketplaces run by the registering entity. After it has been purchased, the offset can be held for future use or retired, which represents a permanent reduction in GHG emissions, and offsets the emissions footprint of the buyer.

Unlike Compliance Markets, Voluntary Carbon Markets are neither legally mandated nor enforced but self-governed. While this provides flexibility, it also raises potential concerns regarding lack of transparency, strength of oversight and monitoring of offsets and trading, and conflict of interest questions as the private sector verification services and registries make money from certifying projects. Likewise, the lack of a central authority means a project could be registered on several different registries that report different data.

Concerns about the quality and veracity of certain projects, well publicized in the news, have led to a slowing down of the growth rate of the Voluntary Carbon Markets. Potential corporate purchasers worry about accusations of “greenwashing” – the use of low-quality offsets enabling a business to announce it is on track for net zero by funding projects with overstated or dubious emissions reduction impact. Concerns are also raised that funding lower quality offsets diverts capital from investment in higher quality technologies, like Direct Air Capture, that sequester carbon permanently. For these reasons, independent groups and market participants have been pushing for a common and clear set of standards.

Last year the ICVCM released its “Core Carbon Principles” an attempt to establish a global benchmark for high-integrity carbon credits that sets rigorous thresholds on disclosure and sustainable development and provides a means of identifying carbon offsets that create real, verifiable and scientifically valid climate impact. Many of these principles were included in the U.S. CFTC’s proposed guidance on carbon credit derivative contracts that was released during COP28 in December 2023.



Image depicts a plane at San Francisco International Airport being fueled with sustainable aviation fuel.

## Industry-specific Carbon Markets

In addition to regional and state-level Compliance Markets, there are industry level initiatives which operate by joint agreement amongst private sector companies. While these are voluntary, the industry-wide nature makes them more of a hybrid between the VCM and Compliance Markets. For example, in 2016, multiple governments adopted CORSIA – the Carbon Offsetting and Reduction Scheme for International Aviation – to stabilize net CO2 emissions from international aviation. CORSIA uses a baseline year and requires international flights to either align with the baseline through technological improvements, operational improvements and sustainable aviation fuels or to offset any emissions above the baseline. To ensure environmental integrity, CORSIA has an approved list of criteria that must be met for offsets to be eligible. While more ambitious goals are needed to bring aviation in line with the Paris Agreement, it is an important first step for the sector.

## The Clean Development Mechanism – The First Project Based Market

As noted earlier, the Clean Development Mechanism (CDM) was established in the Kyoto Protocol and was the first international carbon market mechanism. The CDM allows a country with an emission-reduction or emission-limitation commitment to implement an emission-reduction project in a developing country (for example, a rural electrification project using solar panels or the installation of more energy-efficient boilers). The project would earn an offset – called a Certified Emission Reduction (CER) – equivalent to one tonne of CO2, which could be counted towards meeting the sponsor country’s emissions targets. The goal of the CDM was to give industrialized countries flexibility in how they met their emission reductions targets while also supporting projects that would not be financially viable without the revenue generated from selling CERs.



Image depicts a Direct Air Capture system.

To be certified, a CDM project must provide emission reductions that are “additional” to what would otherwise have occurred, and the project must qualify through a public registration and issuance process. In addition, certified CDM projects can be sold to non-government buyers through an online registration system thereby exposing CERs to a wider group of potential purchasers. Operational since the beginning of 2006, the CDM has registered more than 7,800 projects globally as of February 2024, according to the UNFCCC website.<sup>14</sup>

While its intentions were good and it was a testing ground for project-based offsets, the CDM ran into a number of difficulties. Many of the development projects, in hindsight, were not rigorously reviewed raising questions about the quality of the CERs. More importantly, when the EU ETS opened itself up to the use of CERs in 2013 to fulfill emissions targets, the market was flooded with projects. The increase in supply drove down overall carbon credit prices on the EU ETS, and the EU was forced to change its policy two years later. However, many new projects had been initiated to meet the expected new demand and ended up with no buyers. The CDM market has never fully recovered.

## The Paris Agreement’s Article 6

One of the most potentially high-impact developments in Carbon Markets is found in Article 6 of The Paris Agreement. Article 6 aims to provide for voluntary cooperative arrangements between countries for the reduction of emissions. One of the means for doing so is through the creation of an integrated international Compliance Carbon Market versus the fragmented, country-specific market structure today. In an integrated market, a country seeking to meet its NDC could purchase emissions reduction credits, called Internationally Transferred Mitigation Outcomes or “ITMOs,” from another country. The credits would have to be approved as bona fide credits and to avoid “double counting” only one country would be able to count the emission reduction toward its NDC (called a “corresponding adjustment”).

Within Article 6, Article 6.2 creates the basis for trading in emission reductions across countries and lays out the core principles (i.e., no double counting). Article 6.4 enables the creation of a “mechanism” (expected to be similar to the Clean Development Mechanism above) for trading GHG emission reductions between countries under the supervision of the U.N.

Similar to the Clean Development Mechanism, a major benefit of Article 6 will be that developed countries receive credit for emission reductions they finance outside their borders, allowing these states to reach ambitious targets they would otherwise miss, and the host country receives attractively priced capital to execute a project. Because many of the projects would take place in the Global South, ITMO trading is seen as an innovative way to channel investments into decarbonization projects while also promoting sustainable development.

The details around how Article 6 will operate have not yet been decided and several points have been difficult to resolve including the tracking of ITMOs between the different types of registries and ensuring the quality of mitigation outcomes so that the CDM experience is not repeated. Negotiators also expressed concern regarding the transparency of Article 6.2 and to what extent reporting would remain confidential or open to further stakeholder engagement. Another point of contention was the lack of firm measures protecting the rights of indigenous people and local communities when countries procure ITMOs – often sourced from the Global South.

## Secondary Carbon Markets

As the Global Carbon Markets have grown, the range of “emissions-based securities” is also growing, and we expect this trend to continue. In the Compliance Markets, there are derivative futures contracts for the EU ETS, California Cap-and-Trade Market, RGGI and UK Compliance Markets. There are also exchange-traded funds (ETFs) that provide exposure to the Compliance Markets. For the VCM several products are offered and traded that serve as an alternative to purchasing specific offset projects on a carbon registry. For example, the Global Emissions Offset or GEO product was launched by the Chicago Mercantile Exchange. These futures contracts are based on carbon offsets from three major registries (Verra, the American Carbon Registry and the Climate Action Reserve) and is comprised of a basket of technology-based or engineered offset projects. A variation to GEO, N-GEO, represents nature-based projects only.

## Carbon Markets Headwinds & Tailwinds

The Carbon Markets have faced three recent headwinds. First, national and corporate commitments to decarbonization have lacked “teeth” for failure to comply, and as a result, many decarbonization plans are behind schedule, driving less volume to the markets. Second, the Carbon Markets are immature and fragmented, lacking clear standards and limited interoperability resulting in shallower pools of trading activity and less total trading volume. Third, negative press regarding the quality and veracity of offsets in the Voluntary Carbon Markets has slowed participation by corporates who want to avoid accusations of “greenwashing.” Critics of Carbon Markets also argue that corporate purchases of carbon credits hinder more aggressive and long-lasting emissions reduction efforts by business by providing a “get out of jail” pass. As a result, after a very strong performance from 2018 to 2022, carbon offset prices stalled in 2023 with prices dropping from \$18 per tonne in January 2022 to \$6 per tonne in January 2023, ultimately dipping below \$2 in October.<sup>29</sup>

However, we believe the winds are shifting and see five strong tailwinds supporting expansion of the Global Carbon Markets:

1. **Increasing government NDCs.** The Paris Agreement requires NDCs to be updated every five years (2020, 2025, etc.) and for countries to increase the ambition of their commitment in each cycle. The increasing tightening of NDCs will require national Compliance Carbon Markets to extend to more industries and companies, as has already been occurring, increasing the number of market participants and the market size. In addition, to reach long-term carbon emission targets, the yearly cap reductions in key Compliance Markets is ratcheting down. In the EU ETS, the annual reduction was recently boosted from 2.2% to 4.2%<sup>30</sup>, and in California it reduces by 4% each year with built-in floor price increases of 5% per year (plus an inflation adjustment)<sup>31</sup> which will drive up the cost of allowances.
2. **Increasing corporate commitments to net-zero – and scrutiny of those plans.** Today over half of the world’s largest 2,000 publicly listed companies have announced commitments to Net Zero targets, and as the key target dates approach (i.e., 2030) many companies will be reviewing progress towards those goals.<sup>32</sup> Shareholders and regulators are also focusing on the data behind the headline statements. Offsets can bridge the gap to meeting targets and increased corporate activity has already been shown in the Voluntary Carbon Markets growth.

3. **More climate disclosure rules.** Climate-related disclosures (publicly disclosed data on a company’s greenhouse gas emissions) are expanding worldwide. In the U.S. California passed two laws that will require public and private companies that do business in California to disclose their greenhouse gas emissions and their climate-related financial risks. The first law, the Climate Corporate Data Accountability Act, requires entities whose annual revenues exceed \$1 billion to disclose scope 1 and 2 greenhouse gas emissions in 2026 and scope 3 in 2027.

The second law, *Greenhouse Gases: Climate - Related Financial Risk*, requires entities whose annual revenues exceed \$500 million to post their climate-related financial risks on their websites with a description of how they plan to reduce or adapt to those risks. The implementation timelines for these disclosure laws are uncertain.

On March 6<sup>th</sup>, 2024, the SEC adopted rules to enhance and standardize climate-related disclosures by public companies. The ruling is in response to investors’ demand for more consistent, comparable, and reliable information about the financial effects of climate-related risks on a company’s operations and how it manages those risks. The rule will be phased in over the next decade with certain aspects taking effect in 2025 for large companies.

The European Union’s CSRD in effect since January 5, 2023, requires EU businesses – including qualifying EU subsidiaries of non-EU companies – to report on the environmental and social impact of their business activities, and on the business impact of their environmental, social and governance (ESG) efforts and initiatives. Similarly, the EU’s CBAM began its transitional phase, with the first reporting period for importers ending January 31, 2024. The CBAM will initially apply to imports of certain goods and selected precursors whose production is carbon intensive and at most significant risk of carbon leakage: cement, iron and steel, aluminum, fertilizers, electricity and hydrogen. While there will be compromises and further refinement of the above, the clear direction is more mandatory vs. voluntary emissions reporting.

4. **Climate finance pathway for the Global South.** Carbon Markets will also benefit from increasing focus on providing a decarbonized pathway for growth in the Global South. The role of Carbon Markets in facilitating investment in emissions abatement projects, particularly nature-based carbon removal solutions, will deliver immediate climate benefits and provide economic development assistance.

- 5. Increasing interoperability.** Initial cooperative models for the Carbon Markets – the European Union’s ETS, the Western Climate Alliance, the RGGI and CORSIA – have shown the viability and success of industry-based and international integration, as well as the value of deeper and broader trading pools. Article 6 would further this integration. In addition, there are clear opportunities for integration between the Compliance Markets and Voluntary Carbon Markets to expand the pool of buyers and increase the volume of offsets.

## Carbon Markets Role in Decarbonization

There is a final tailwind for the Global Carbon Markets, and it is the most important reason they must be successful: they are critical to decarbonization and meeting The Paris Agreement targets.

- First, estimates are that half of all current NDCs related to the Paris Agreement, representing 31% of global emissions, depend on international cooperation through Carbon Markets.<sup>11</sup> If Carbon Markets do not exist, these commitments, which are already behind schedule and below needed levels of change, will fall further behind.
- Second, most Intergovernmental Panel on Climate Change (IPCC) scenarios consistent with warming to below 2C assume some degree of CO<sub>2</sub> removal which can be and will need to be funded through offsets projects.<sup>33</sup> Today new removal technologies such as Bioenergy with Carbon Capture and Storage (BECCS), biochar, DAC and enhanced rock weathering are uneconomic without the offset revenue funded through Carbon Markets.
- Third, robust carbon trading could cut the cost of implementing NDCs by more than half – as much as \$250bn – by 2030.<sup>34</sup> Reinvesting these cost savings could facilitate the removal of 50% more emissions (approximately 5 GtCO<sub>2</sub>e per year by 2030) at no additional cost.<sup>34</sup> The rationale is that lower marginal abatement costs in low-income economies means a dollar spent in these markets can abate more emissions than in high-income economies.

## Conclusion

The Global Carbon Markets will play a critical role in meeting decarbonization targets by providing strong market-based incentives for change and enhancing optimal capital allocation. Like other financial markets they can act as “grease on the wheels” that accelerate the transitions and new solutions already underway. We believe the growth of the Global Carbon Markets will create multiple new winners and highly attractive investment returns as many of the services and operations that are standardized in other financial markets – e.g., rating agencies, market intelligence, transactional systems, brokerage support – are at an early stage in the Carbon Markets and will need to rapidly scale. While there are challenges to address to ensure market integrity and oversight – as there have been in financial markets throughout history – the successful development of the Global Carbon Markets is urgent given the limited time to hit climate targets.

## Endnotes

1. “The Ministry for the Future: A Novel.” Kim Stanley Robinson, 2020.
2. Although called “Carbon Markets” as defined can include other critical greenhouse gases such as methane and nitrous oxide.
3. The “Global South” refers to various developing countries around the world. Several of these countries are in the Southern Hemisphere, largely in Africa, Asia and Latin America.
4. “Climate Solutions” refers to businesses providing products, services and technologies that support and accelerate decarbonization and address the impacts of climate change.
5. “Global Carbon Markets” refers to the global trading networks spanning across the Compliance Markets and Voluntary Carbon Markets.
6. The size of the Carbon Markets combines the trading volumes on national and regional Compliance Carbon Markets and trading volumes on the Voluntary Carbon Markets. Like the underlying Carbon Markets, these data sets are also fragmented and do not yet have easily accessible information sources and reporting services.
7. “Global Carbon Credit Market.” Research and Markets, April 2023.
8. “Carbon Markets Year in Review 2021.” Refinitiv, 2021.
9. “Treeprint: Carbon Markets – The Beginning of the Big Carbon Age.” Credit Suisse, August 2022.
10. “Key aspects of the Paris Agreement”, UNFCCC. <https://unfccc.int/most-requested/key-aspects-of-the-paris-agreement>
11. “Making Carbon Markets Work for Faster Climate Action.” The Nature Conservancy, March 2021.
12. In response to growing concern about the risks of climate change, The United Nations convened the first Conference on Environment and Development in Rio de Janeiro in 1992, producing the UNFCCC. The Convention established an international framework within which it would be possible to limit anthropogenic (human caused) greenhouse gas emissions and demanded that “policies and measures to deal with climate change should be cost-effective so as to ensure global benefits at the lowest possible cost”. Participant states of the UNFCCC meet annually at the Conference of the Parties (“COPs”).
13. EU Emissions Trading System (EU ETS), European Commission. [https://climate.ec.europa.eu/eu-action/eu-emissions-trading-system-eu-ets\\_en](https://climate.ec.europa.eu/eu-action/eu-emissions-trading-system-eu-ets_en)
14. Clean Development Mechanism (CDM), UNFCCC. <https://unfccc.int/process-and-meetings/the-kyoto-protocol/mechanisms-under-the-kyoto-protocol/the-clean-development-mechanism>
15. “Global carbon markets value hit record \$949 bln last year – LSEG.” Reuters, February 2024.
16. Carbon Pricing Dashboard, The World Bank Group, March 31, 2023. <https://carbonpricingdashboard.worldbank.org/>
17. “Global Carbon Market Outlook 2024.” BloombergNEF, February 2024.
18. “A blueprint for scaling voluntary carbon markets to meet the climate challenge.” McKinsey & Company, January 2021.
19. A “tonne” is the standard measurement used for GHGs and is based on the Metric System; a metric tonne is slightly more weight than an Imperial “ton”.
20. CO2 equivalent (CO2e) provides a standard metrics for all greenhouse gases, i.e., Methane, Nitrous Oxide, F-gases, because each gas has different properties that must be normalized (e.g., Methane, for example, has a much higher warming effect than carbon over short periods of time). One tonne of CO2e is the common unit of measurement used by organizations on their path to net zero goals. One gigatonne of CO2e – one billion tonnes – expressed as gtCO2e is the unit used in climate science references and national goals.
21. Offset credits can also be used in the Compliance Carbon Markets if the projects have been classified as Certified Emissions Reductions (CERs).
22. California Cap-and-Trade pricing data is based on the California Carbon Allowance Specific Vintage 2023 Future, traded on ICE Futures U.S., which represents a physically delivered greenhouse gas emissions allowance where each is an allowance issued by the California Air Resources Board or linked program representing one metric tonne of CO2 equivalent. UK-ETS pricing data is based on the UKA Daily Futures Contract, traded on the ICE Futures Europe, where each UKA represents an entitlement to emit one tonne of carbon dioxide equivalent gas, as further defined in the ICE Futures Europe Regulations. EU-ETS pricing data is based on the EUA Daily Futures contract, traded on ICE Exend, which is a futures contract for the purposes of trading and delivering European Union Allowances, where one EUA allows the holder to emit one ton of CO2 or CO2 equivalent greenhouse gas.
23. “Voluntary Carbon Markets Funneled \$42 Million Into Clean Cookstoves in 2011: Report.” EcoSystem Marketplace, June 2011.
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25. “Carbon Credit Pricing Chart: Updated 2023.” 8 Billion Trees, January 2024.
26. Regional Greenhouse Gas Initiative (RGGI), Center for Climate and Energy Solution. <https://www.c2es.org/content/regional-greenhouse-gas-initiative-rggi/>
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## About Investcorp

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Investcorp is proud of its commitment to sustainability. Investcorp is a signatory to the United Nations Principles for Responsible Investment ("UNPRI") and the Abu Dhabi Sustainable Finance Declaration, a licensee of the Sustainability Accounting Standards Board (SASB) standards, and a member of the ESG Data Convergence Initiative. Investcorp sponsored the 28th Conference of the Parties to the United Nations Framework Convention on Climate Change (COP28) in Dubai, United Arab Emirates. Additionally, Investcorp is a partner of the Abu Dhabi Sustainability Week ("ADSW"), a global platform which brings together government leaders, policy makers, investors and youth to explore ways to tackle climate change.

## About Investcorp Climate Solutions

Investcorp's Climate Solutions business brings Investcorp's combination of capital, business-building services, international network and investment experience to the leading companies addressing decarbonization and climate change. The overarching objective of Investcorp's Climate Solutions business is to accelerate the global transition to a zero-carbon economy with a focus on the deployment and rapid scaling of commercially proven climate solutions that have the potential to transform industries. Investcorp believes the Climate Solutions investment opportunity is comparable to the disruption and wealth creation of the digital revolution which gave rise to rapidly dominant new businesses, created new markets, and drove major operational changes. However, the Climate Solutions opportunity will transpire in a more limited timeframe given near-term climate risks.

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