Sustainable Stock Exchanges

How exchanges can maximize the opportunities of carbon markets

An action framework to guide exchanges

Note

Published in 2023. The designations employed and the presentation of the material in this paper do not imply the expression of any opinion whatsoever on the part of the Secretariat and member States of the United Nations concerning the legal status of any country, territory, city or area, or of its authorities, or concerning the delimitation of its frontiers or boundaries. This paper is intended for learning purposes. The inclusion of company names and examples does not constitute an endorsement of the individual exchanges or organizations by UNCTAD, UN Global Compact, UNEP, or the PRI. Material in this paper may be freely quoted or reprinted, but acknowledgement is requested. A copy of the publication containing the quotation or reprint should be sent to info@SSEinitiative.org.

Acknowledgements

This paper was prepared in the context of the United Nations Sustainable Stock Exchanges (SSE) initiative. The paper was prepared by Anthony Miller (SSE Coordinator), Lisa Remke (SSE Deputy-Coordinator) and Corli Le Roux (SSE Senior Specialist) under the overall supervision of James Zhan (UNCTAD Director of Investment and Enterprise, and Chair of the SSE Governing Board).

Corli Le Roux played a crucial role in conducting research and drafting text, as well as coordinating inputs to the document, organizing its layout and assisting with its overall production.

The preparation of this document relied on the hundreds of valuable inputs made by 88 experts from 58 organizations across 39 countries, making up the informal SSE Carbon Markets Advisory Group (see **Annex 3** for a full list of members).

Special thanks is extended to the Co-Chairs of the SSE Carbon Markets Advisory Group, Mr Ahmed Abdel Rahman El Sheikh (Executive Chairman, The Egyptian Exchange) and Mr Datuk Muhamad Umar Swift (CEO, Bursa Malaysia Berhad).

Additional substantive contributions were received from Tiffany Grabski (SSE Academy Head), Vanina Vegezzi (SSE Project Officer), and Naveen Varshan Ilavarasan (SSE Research Assistant).

The design of the cover, charts and infographics, and the typesetting of the report were done by SSE Design Assistant Sylvana Kempka.

The views expressed in this paper are those of the SSE organizing partners (UNCTAD, UN Global Compact, UN Environment and the PRI) unless otherwise stated; the paper does not necessarily reflect the official views of individual members of the advisory group or their respective organizations.

About the SSE

The SSE initiative is a UN Partnership Programme organized by UNCTAD, the UN Global Compact, UNEP FI and the PRI. The SSE's mission is to provide a global platform for exploring how exchanges, in collaboration with investors, companies (issuers), regulators, policy makers and relevant international organizations can enhance performance on environmental, social and corporate governance issues and encourage sustainable investment, including the financing of the UN Sustainable Development Goals. The SSE seeks to achieve this mission through an integrated programme of conducting evidence-based policy analysis, facilitating a network and forum for multi-stakeholder consensus-building, and providing technical guidelines, advisory services and training.

Message from Co-Chair of the Advisory Group: The Egyptian Exchange

The Egyptian Exchange (EGX) has long recognized that climate action and sustainable development are cornerstones for resilient business and a greener future. In another step by the exchange to contribute to the mainstreaming of ESG in capital markets, we introduced Africa's first regulated voluntary carbon market as an outcome of COP27.

The carbon market provides those undertaking emissions-reducing projects with the opportunity to buy or sell carbon credits through a local market. Hence, the need to establish an African carbon market that is well-regulated, fully transparent in providing fair pricing for African credits. We believe that the new market will support the efforts of the African continent at both the governmental and private levels towards achieving economic, environmental and social benefits, and will further accelerate and promote the ambition of mitigation and adaptation through the creation of unified assets in the form of carbon credits.

When the development of the EGX carbon market was first initiated, we approached the UN SSE for further discussions with key stakeholders and to learn about the experiences and opportunities for exchanges in this environment. These interactions played a significant role in the UN SSE's creation of a work stream on carbon markets, and we are very pleased to have been a part of the process culminating in co-chairing the Advisory Group for this publication.

United by the common purpose to combat the climate crisis, all players in the carbon market ecosystem should work together to achieve real impact towards achieving global climate goals, while creating new business opportunities for the capital markets through a transparent and fair ecosystem. Collaborations such as these can increase the liquidity in the market and give investors access to high-quality carbon credits that can be used to offset their residual emissions and progress towards achieving net-zero goals.

We have no doubt that this timely UN SSE publication on carbon markets marks a significant step towards strengthening the knowledge of exchanges on carbon markets. This guidance can open doors for exchanges to explore ways to improve liquidity and accessibility of carbon markets through the benefits that exchanges can bring, such as increased transparency, stable price discovery and reliability.

Mr Ahmed Abdel Rahman El Sheikh
Executive Chairman, The Egyptian Exchange

Message from Co-Chair of the Advisory Group: Bursa Malaysia

Globally, nations are battling the degradation of natural ecosystems. As with other countries, the economy and people of Malaysia are facing expectations for clear decarbonisation efforts. Malaysia's natural resources play an important role and potential in the country's actions to address climate change. Malaysia's forest cover of nearly 18 million hectares stores a significant amount of carbon dioxide (CO2). Malaysia has also identified more than 46 trillion cubic feet of potential storage in depleted gas reservoirs offshore, which can function as a carbon storage regional hub, while contributing to GDP. Within this context, demand and improved transparency are fuelling the growth of carbon markets among Malaysian businesses, and around the world.

Following a relatively quick and steep learning curve and engagements with both potential buyers and suppliers, Bursa Carbon Exchange (BCX), Malaysia's voluntary carbon market, was launched in 2022. The BCX is a spot exchange that facilitates the trading of high-quality carbon credits via standardized carbon contracts. Corporates can purchase these credits to offset their carbon footprint, while the sale of carbon credits will help to finance and drive the development of domestic GHG emissions reduction, as well as removal solutions and projects. We believe BCX can serve as an important lever in supporting the private sector's voluntary climate commitments and decarbonisation journey. We were pleased with the initial interest as demonstrated by the participation in our first auction of carbon credits in March 2023. In the near future, we look forward to offering Malaysian-based carbon credits to both Malaysian and global businesses.

As the first Shariah-compliant carbon exchange in the world, BCX will continue to expand its product offerings in the voluntary carbon credit market by accelerating the development of a healthy pipeline of carbon offset projects, via a series of awareness and capacity building programmes drawing on the expertise of local and international practitioners. The Exchange will also facilitate engagements between the public and private sectors towards developing conducive policies to support the emerging VCM industry. The VCM will help develop the local carbon market ecosystem and spur readiness, as Malaysia looks to eventually institutionalize compliance-based pricing instruments such as the carbon tax and compliance carbon market. The VCM is a key part of Malaysia's effort to meet the nation's commitment towards achieving net zero greenhouse gas (GHG) emissions by as early as 2050.

I very much laud the UN SSE's proactive effort to develop this guidance on carbon markets for exchanges. Bursa Malaysia is pleased to have supported its development based on our experience. I believe that the information and proposed actions provided in this publication will significantly contribute in raising awareness on voluntary carbon markets, and opportunities for exchanges around the world. I encourage our peers to use it, in exploring how to serve the needs in a growing market, by providing a trusted market mechanism. I anticipate that there will be more entities involved in carbon markets, and greater potential synergies and harmonization. Bursa Malaysia looks forward to continuing to work with the UN SSE and other member exchanges, to facilitate the development of a vibrant and effective carbon market ecosystem, to support net zero aspirations of nations and organizations.

Mr Datuk Muhamad Umar Swift
CEO, Bursa Malaysia Berhad

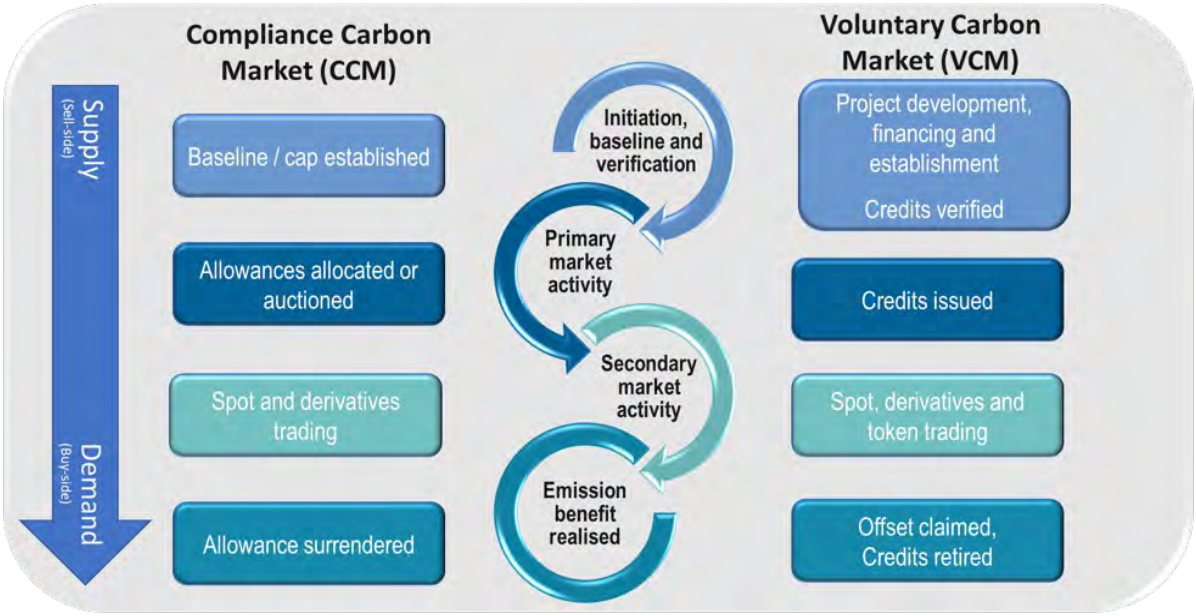
EXECUTIVE SUMMARY

The present rate of removal and reduction of greenhouse gas (GHG) emissions is insufficient to reach global targets to avoid catastrophic climate change. As a result, there are many urgent calls for governments, corporations and individuals alike to accelerate climate action without delay.

Policy makers around the world have identified carbon emissions trading as one of a range of market mechanisms that provide opportunities to support emissions reduction and removal efforts and to enhance capital flows to projects and programmes that enable offsets. Compliance carbon markets (CCMs) and voluntary carbon markets (VCMs) are examples of such marketplaces.

CCMs enable the issuance and trading of allowances to ensure that direct emissions limitations and baselines set by policy or regulatory requirements are met. In turn, VCMs facilitate the buying and selling of credits issued by projects that target avoidance, reduction, removal or sequestration of carbon emissions, enabling buyers to complement emission reduction efforts through offsets. Both types of markets also enable trading of derivative instruments in the form of futures and options contracts on emission units and carbon credits.

Carbon market value chain



Source: UN SSE

While carbon markets have been growing significantly, both CCMs and VCMs face challenges in concept and in practical execution. A core consideration is the question of whether these markets are successfully facilitating absolute emission reductions. Achieving the desired environmental impact and continued economic viability of any type of carbon market is reliant on the credibility of market participants and the quality and integrity of product components along the value chain.

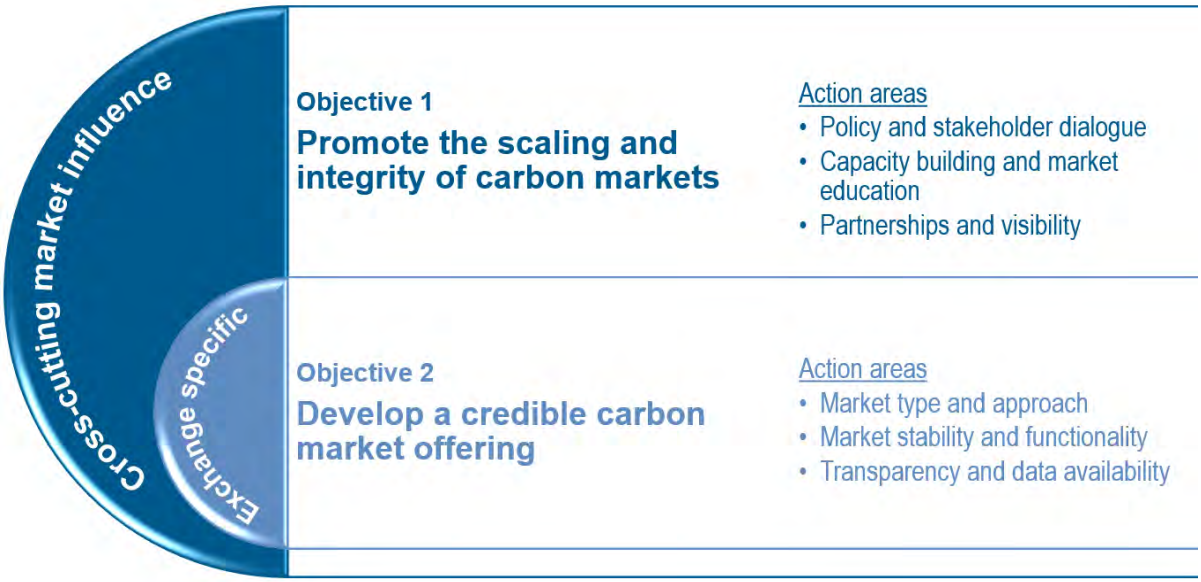
Other challenges include the need to ensure balance in policy approaches and governance of CCMs and VCMs, and achieving greater stability and transparency in carbon pricing, which is variable, often volatile, and misaligned across CCMs and VCMs. Further, a lack of clarity persists about the regulatory status of the instruments traded in these markets, which may inform the level of regulatory oversight. All of these complexities contribute to perceptions that carbon markets are not as effective as they could be.

The market infrastructure that exchanges offer is well suited to support effective scaling and reliable carbon trading. Alongside regulators, exchanges can play an important role in efforts to maximize the opportunities that CCMs and VCMs offer to contribute to the climate transition, while promoting more alignment and supporting processes to maintain market integrity and credibility.

At the time of publication, at least 31 exchanges in 24 countries were at various stages of engaging with carbon markets in different parts of the value chain. Involvement from exchanges can bolster carbon markets through increased liquidity and scale, transparent price discovery, standardized reporting and stable system functionality.

This guidance is designed to assist exchanges, regulators and market participants with the effective implementation of carbon markets. It offers a practical action framework for exchanges that are looking to optimize the opportunities of involvement in carbon markets. The action framework has two main objectives, each with three action areas that contain a range of suggested actions that exchanges can consider for application as appropriate.

SSE Action framework for exchanges



Source: UN SSE

TABLE OF CONTENTS

INTRODUCTION

Purpose and scope

This guidance contextualizes the relevance of carbon markets for exchanges, outlining the typical structures and steps in the carbon market value chain, and exploring key challenges and opportunities. Carbon markets are typically categorized as compliance carbon markets (CCMs) or voluntary carbon markets (VCMs).[1] The content of this guidance focuses on CCMs and VCMs as the two primary types of carbon markets that exchanges are currently engaging with. The guidance seeks to provide practical considerations to serve as a useful starting point for exchanges that are exploring options for becoming involved in carbon markets or to optimize involvement that may already be in place. The guidance will also be of use to market regulators and policymakers to further inform them of the practical challenges faced by exchanges.

This guidance covers the main issues associated with carbon markets but it is noted that this is a fast-evolving environment and markets (whether compliance or voluntary) still vary both across jurisdictions and maturity levels. While it is beyond the scope of this guide to analyze the principles of Article 6 of the Paris Agreement, it is recognized that the evolution of carbon markets may be influenced by implementation of mechanisms under this article, in which case further guidance may be developed. Likewise, this guidance discusses general aspects of trading, clearing and settlement, but does not go into the technical details of these functions.

The Guidance will be complemented by an online database on the SSE website tracking and detailing exchange involvement in carbon markets. In this way it represents a "living document", taking stock of new practices and lessons learnt as the basis for further deliberation among the multi-stakeholders of the global sustainable finance community, including through the UN World Investment Forum.

Background

"We are in the fight of our lives, and we are losing. Greenhouse gas emissions keep growing, global temperatures keep rising, and our planet is fast approaching tipping points that will make climate chaos irreversible."

UN Secretary General António Guterres, UN Climate Conference COP27, 2022.

The urgency for action to address the climate crisis and its resulting impacts is increasingly more pronounced. The tangible effects of droughts, floods and extreme weather disasters resulting in destruction and loss of lives and livelihoods is becoming more widespread.[2] The Intergovernmental Panel on Climate Change (IPCC)'s Synthesis Report for the Sixth Assessment Report[3] painted a stark picture of the need for rapid (in some cases immediate) and deep GHG emission reductions. The Global Carbon Budget 2022 report[4] also noted that despite a flattening emissions curve since 2015, a sharper decrease is critical to meet global climate targets.

---

[1] In its State and Trends of Carbon Pricing 2022 report on p. 35, the World Bank identifies another category, namely Results-Based Climate Finance, which deals with payments that are made in return for the achievement of emission reductions, and in the context of carbon markets covers the purchase of emission credits to fund a project after delivery of results. Also see: World Bank Group website (17 August 2022) What You Need to Know About Results-Based Climate Finance

[2] World Food Programme (13 January 2023) Climate action: What's New and what's next in 2023

[3] IPCC (2023) AR6 Synthesis Report: Climate Change 2023

[4] Carbon Brief (11 November 2022) Analysis: Global CO2 emissions from fossil fuels hit record high in 2022

Participants across the public and private sector are identifying opportunities to leverage market mechanisms to mobilize resources and reduce the cost of the transition to a net zero economy. One of the fastest growing mechanisms in recent years is the development of public carbon markets.

Carbon markets are marketplaces or facilities where emission allowances, credits and derived financial instruments are bought and sold. Carbon markets have the effect of directly or indirectly putting a price on carbon that can incentivize emissions reduction, and (in some types of carbon markets) channel investment capital towards climate mitigation efforts.

A growing number of countries have indicated their intentions to use carbon markets to meet their Nationally Determined Contribution (NDC) commitments to the Paris Agreement,[5-6] with many investing in state-of-the-art digital infrastructure to enable participation in international carbon markets.[7] The World Bank estimates that trading in carbon credits could reduce the cost for countries to achieve NDCs by more than half.[8] Many exchanges are already involved in the carbon market ecosystem to some extent, and momentum is growing in this regard. Capital market actors such as stock or derivatives exchanges are increasingly expected by policymakers to play a prominent role in establishing carbon trading infrastructure and better carbon pricing in an organized market (**Box 1**).

Building on the Market Monitor[9] released by the UN Sustainable Stock Exchanges (SSE) initiative at COP27 in 2022,[10] an Advisory Group on Carbon Markets was convened by the SSE to further explore the role of exchanges in the fast-growing carbon market environment. This Advisory Group was made up of 88 members from 58 organizations across 39 countries (**Annex 3**) and its objective was to explore how exchanges can support the optimization of carbon markets for climate action. This guidance is the result of the Advisory Group's work.

Box 1: Government mandates prompt exchanges to implement VCMs - examples from Malaysia and Egypt

In 2021, the Government of Malaysia announced the implementation of a voluntary carbon market (VCM) as one of the key initiatives to address the climate crisis.[11] While the initiative falls under the responsibility of the Ministry of Finance and the Ministry Of Natural Resources, Environment and Climate Change (formerly the Ministry of Environment and Water), the national stock exchange, Bursa Malaysia Berhad, was mandated to implement the VCM.[12] In December 2022, Bursa Malaysia launched the nation's first government-backed VCM, Bursa Carbon Exchange (BCX).[13] The first auction was successfully executed on 16 March 2023. The carbon exchange is managed by Bursa Malaysia, and the first auction facilitated the price-discovery of carbon credits from two new products offered by the BCX — the Global Technology-Based Carbon Contract (GTC) and the Global Nature-Based Plus Carbon Contract (GNC+).[14] BCX is the world's first Shariah-compliant carbon exchange.[15] The Government is also exploring the implementation of a domestic Emissions Trading System (ETS) and carbon tax.

5 A "Nationally Determined Contribution" (NDC) is a climate action plan to cut emissions and adapt to climate impacts. Each Party to the Paris Agreement is required to establish an NDC and update it every five years.
6 World Resources Institute (22 October 2021) Making Sense of Countries' Paris Agreement Climate Pledges
7 World Bank Group (24 May 2022) Countries on the cusp of carbon markets
8 World Bank Group (17 May 2022) What You Need to Know About Article 6 of the Paris Agreement
9 UN SSE (November 2022) Market Monitor: Voluntary Carbon Markets
10 UN SSE (9 November 2022) COP27: UN SSE engages Voluntary Carbon Markets, launches new Market Monitor and Advisory Group
11 The Star (29 October 2021) Budget 2022: Voluntary carbon credit trading platform to debut at Bursa Malaysia
12 S&P Global (9 December 2022) Malaysia launches Bursa Carbon Exchange for voluntary credits | S&P Global Commodity Insights
13 Bursa Carbon Exchange website and Bursa Malaysia (9 December 2022) Bursa Malaysia Launches A Voluntary Carbon Market Exchange
14 The Edge (17 March 2023) Bursa Malaysia completes inaugural carbon credit auction with a total of 150,000 Verra credits
15 Bursa Malaysia website Voluntary Carbon Market

In Egypt, Prime Minister Decree No. 4664 of 2022 declared carbon credits as financial instruments and pointed to the establishment of a voluntary carbon market by The Egyptian Exchange (EGX) as the suitable initial model. It further formed a high level committee chaired by the Financial Regulatory Authority in coordination with the Ministry of Environment to draft the framework of the market. Legislative reforms by the economic committee in the Egyptian Parliament are underway to regulate carbon trading in Egypt. The Egyptian Prime Minister and other government officials, alongside EGX, announced the launch of the first regulated African Voluntary Carbon Market at COP27 in November 2022.[16] The market is in line with the country's National Climate Change Strategy 2050, with its fourth pillar aiming to strengthen the climate finance infrastructure and consistent with Egypt's vision to achieve the goals of the green economy and support sustainable development.

Sources: Bursa Malaysia Berhad and The Egyptian Exchange

SECTION A: OVERVIEW OF CARBON MARKETS

A Brief History

The concept of a marketplace for trading carbon emissions is not new.[17] The notion of offsetting carbon emissions arose more than three decades ago, as the climate crisis attracted the attention of policymakers and private companies who started to develop voluntary deals offsetting greenhouse gas (GHG) emissions with carbon credits. Former Executive Secretary of the UNFCCC, Yvo de Boer, noted in 2007[18] that by putting a price on carbon, a "unique environmental commodity on the international market" was created.

In 1997 the Kyoto Protocol introduced three market-based mechanisms: Emissions Trading (ET) for the buying and selling of allowed units of emissions that have not been used, and two offset programs referred to as the Clean Development Mechanism (CDM)[19] and Joint Implementation (JI). CDM and JI incorporated different types of carbon credit instruments aimed at incentivizing the removal or reduction of GHG emissions (such as removal units, certified emission reductions (CERs) and emission reduction units (ERUs)).

The Paris Agreement of 2015 replaced the Kyoto Protocol,[20] aiming to provide new rules for governing action to combat climate change. The mechanisms coined under the Paris Agreement are intended to intensify and accelerate action through more ambitious target setting, new markets and large reductions in global GHG emissions. The new markets that are evolving see all countries (beyond mainly industrialized countries as was the case under the Kyoto Protocol) committing to reductions and developing their own emissions trading schemes.

Article 6 of the Paris Agreement creates the possibility for countries to cooperate and use international carbon markets to meet their NDCs, expanding the impact and utility of this market mechanism.[21] Specifically, Article 6.2 enables cooperative international approaches to carbon trading through the development of Internationally Transferable Mitigation Outcomes (ITMOs) as a unit for trade among and between countries and private sector entities on a bilateral basis. Furthermore, Article 6.4 enables the trading of emission reduction and removal credits generated through specific activities implemented in host countries,[22] falling under the authority of a supervisory body designated by the Conference of

[16] The Egyptian Exchange (EGX) (9 November 2022) Launch of the First African VCM
[17] Environmental Defense Fund website Three Decades of Carbon Markets Success
[18] At the Bali Climate Change Conference in December 2007
[19] UNDP Climate Promise (18 May 2022) What are carbon markets and why are they important? | Climate Promise
[20] The Kyoto Protocol expired in 2020 with the Paris Agreement in effect. As a result, no new projects are being created under the CDM, however, there are still some established projects that are ongoing, instituted before the protocol's expiration.
[21] IOSCO (July 2023) Compliance Carbon Markets - Final Report page 6
[22] UNFCCC (13 March 2023) New Mechanism Provides a Key Tool for Countries to Meet Their Climate Goals

the Parties.[23] Uncertainty remains regarding the workings of Article 6, however, including for example how corresponding adjustments will be used to avoid double counting, which instruments may be used and how it will be applied to NDCs. More clarity around these matters is needed and market participants should remain aware of developments in this regard.[24]

Compliance Carbon Markets (CCMs)

Compliance carbon markets or CCMs are created through national, regional and/or international policy or regulatory requirements.[25] International compliance carbon markets are primarily the result of emission reduction commitments made by countries under international agreements or treaties, but can also be based on domestic or regional obligations under a domestic law, with instruments issued under international, domsetic or independent mechanisms.

These mandatory or compliance carbon market models prescribe a set amount of carbon emissions (either a maximum "cap" or a target "baseline") for those that are subject to the program.[26] The cap or baseline covers a set timeline known as a commitment period, which is further divided into compliance years. The emitters that are covered in the scheme (called participants or compliance entities) may originate from a single industry sector or a number of sectors, or be included upon application, as prescribed by the rules of the scheme. Allowances or permits for emissions can be allocated freely by the program, be purchased when auctions are held, or be purchased from other entities that have excess.[27] Transacting in the emission units in a CCM usually takes place through Emission Trading Systems (ETSs). According to the Organisation for Economic Co-operation and Development (OECD), ETSs contribute to economic efficiency by facilitating the reduction of emissions in an economically efficient manner for those who may find direct emissions reduction efforts too costly.[28]

The two main types of ETSs are cap-and-trade and baseline-and-credit, which differ based on the expected emissions norm or benchmark (cap or baseline) which is set, the timeline of emissions (forward-looking or for a preceding period) that are targeted and when the tradable instrument is issued (at the beginning or end of a compliance period). Cap-and-trade systems continue to be more prevalent.

The two systems can briefly be described as follows:

- A *cap-and-trade system* defines a cap or upper limit on the total permitted emissions or emission intensity by all emitters captured in the scheme, for a future commitment period.[29] Corresponding permits or allowances are issued (by free allocation or auction).[30] In this system, the maximum amount of emissions allowed by the compliance entities within each compliance year, is constrained.

  Over time the cap is reduced to ensure that emissions decline. Compliance entities must surrender a set amount of allowances at the end of each compliance period. Entities that reduce their emissions below their allowance can retain their unused emissions allowances for future use or sell them to other compliance entities that exceed their allowance. Polluters, or entities whose emissions are higher than the cap, can borrow allowances from their allotment for a future compliance year, or

[23] UNFCCC website Article 6.4 Supervisory Body
[24] Abatable (23 June 2022) How Article 6.4 will affect the voluntary carbon market?
[25] UNDP Climate Promise (18 May 2022) What are carbon markets and why are they important? | Climate Promise
[26] Carbon Offset Research and Education program - Carbon Offset Guide Compliance Offset Programs and IOSCO (November 2022) Compliance Carbon Markets Consultation Report
[27] Carbon Offset Research and Education program - Carbon Offset Guide: Allowances
[28] OECD website Emission trading systems
[29] IFRS (September 2014) World Standard-setters Meeting Agenda Paper 9: Emissions Trading Schemes – research project (Background Information)
[30] UNCTAD (2022) Carbon pricing: A development and trade reality check. p.23

buy allowances from entities who do not use their full allotment. By purchasing such allowances, the emitter is effectively paying someone else to reduce emissions on their behalf.[31] Trading in allowances can commence as soon as they are issued.

- In *baseline-and-credit systems*, rather than a fixed upper limit or cap, a baseline (or standard) level of emissions is assigned to each participant using historical data and environmental objectives. Participants that produce fewer emissions than their baseline, are issued with allowance credits,[32] which can then be retained or sold to other entities that are unable to stay below the baseline.[33] If a participant has exceeded its baseline, it has to purchase and surrender 'credits' equal to the difference. The trading mechanism is not drastically different from cap-and-trade given that emitters who reduce can trade excess or credited amounts of carbon to entities with higher emissions in both systems. However, in the baseline-and-credit system, instruments are only issued to below-baseline emitters while in a cap-and-trade system all compliance entities receive allowances for future emissions and can either use them for their own emissions or sell them if they will not emit the full allowance. Note that the design of baseline-and-credit schemes can vary by jurisdiction and may or may not include a penalty for entities whose emissions are above the baseline.[34]

A benefit of CCMs is that by setting a gradually decreasing cap (i.e. maximum level of total emissions permitted) or baseline (i.e. target level of emissions), the market presents predictable emission pathways through which it can provide long-term market signals for businesses and investors.

Although the first carbon offset projects were mostly voluntary arrangements between private parties,[35] CCMs that implement ETSs have emerged as the broader market mechanism for climate policy instruments at national or regional levels. Research by the International Carbon Action Partnership (ICAP)[36] tracks the implementation of ETS schemes supporting CCMs globally, finding 48 markets globally in operation or under development / discussion as at the date of publication of this guidance.[37]

The growing range of CCMs is being developed at multiple levels, from local or city-level up to regional and international. The European Union launched the world's first international ETS in 2005, now making up the largest carbon market by traded value (**Figure A.1**). During 2021 it experienced record trading activity and prices in both spot and futures markets.[38] The Carbon Offsetting and Reduction Scheme for International Aviation (CORSIA) is an example of a sector-specific compliance carbon pricing scheme representing a global market-based measure for any sector based on a harmonized cooperative approach.[39]

China launched its national ETS in July 2021 following a range of pilot ETS programmes at city and provincial level, and currently hosts the world's largest carbon market by emissions. In 2022, China's ETS saw the market complete its first full compliance cycle, although it is still taking key phase-in steps

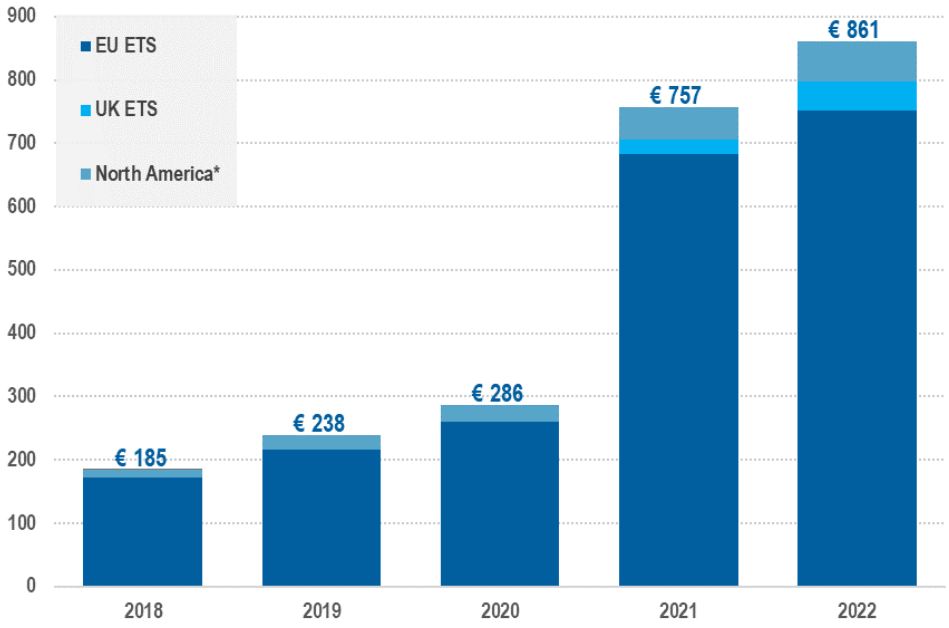
[31] Lexology (13 February 2023) Carbon trading is booming globally - what is it and how does it work?
[32] World Bank Group (2022) State and Trends of Carbon Pricing 2022 p. 13
[33] IOSCO (July 2023) Compliance Carbon Markets - Final Report page 5 and OECD website Emission trading systems
[34] Climate Change Authority (2014) Coverage, Additionality and Baselines: Lessons from the Carbon Farming Initiative and other schemes p.15
[35] According to Climate Focus The Voluntary Carbon Market Explained Chapter 1 page 2, private offsets of GHG emissions with carbon credits emerged in the late 1980s, with the first known offset deal materializing in 1989 when American electric power company, Applied Energy Services financed an agri-forest in Guatemala to offset the emissions of a new coal-fired power plant. In the mid-90s the first private registry for voluntary offsets was launched, the Environmental Resources Trust (later rebranded as the American Carbon Registry). Also see Carbon View (7 August 2021), Carbon Offsetting – Part 1.
[36] The ICAP ETS Map | International Carbon Action Partnership provides an overview of ETSs around the world
[37] The World Banks's State and Trends of Carbon Pricing 2022 Report puts this number at 34, which includes ETSs scheduled for implementation.
[38] World Bank Group (2022) State and Trends of Carbon Pricing 2022 p. 18
[39] International Civil Aviation Organization (ICAO) Carbon Offsetting and Reduction Scheme for International Aviation (CORSIA) website

and dealing with challenges.[40] Other national examples include Mexico, which was the first country in Latin America to establish a national ETS in 2020. Currently, the National Congress of Brazil is also working on specific legislation for carbon markets, covering both compliance and voluntary markets.[41] In Türkiye, draft climate legislation is under development which is expected to be the foundation of the Türkiye ETS that will be operated by Borsa Istanbul. Other examples of countries with compliance markets include Canada, New Zealand, the Republic of Korea and the United Kingdom.

State-level markets have also been developed in the USA in California and Washington (forming the Western Climate Initiative with Quebec in Canada) and a number of states along the East Coast of the United States (the Regional Greenhouse Gas Initiative (RGGI)). Japan also hosts regional schemes, and in 2022 established a forum known as the GX League that aims to pursue carbon neutrality.

Figure A.1: Growth of the largest global compliance carbon markets 2018-2022

(Billions of euros)



*Western Climate Initiative (WCI) and Regional Greenhouse Gas Initiative (RGGI)

Source: Refinitiv, February 2023

Voluntary Carbon Markets (VCMs)

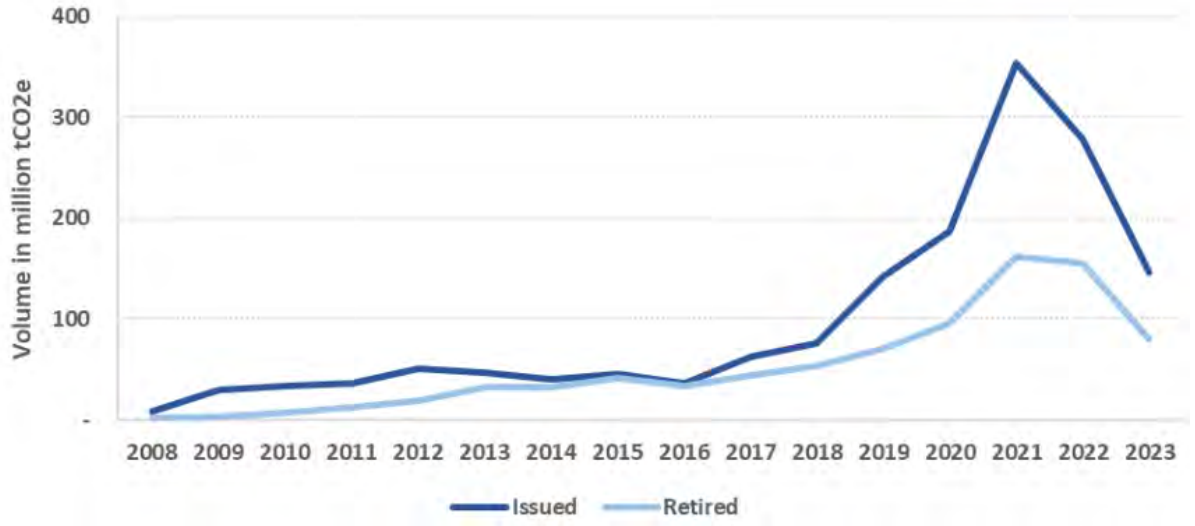
Structurally different, voluntary carbon markets (VCMs) have been growing in parallel to CCMs. The amount of issuances and retirements[42] increased significantly over the five years between 2016 and 2021. While issuances of voluntary carbon credits were lower in 2022 due to a number of economic and geopolitical factors, there remains a growth trajectory for the future (**Figure A.2**). Carbon projects developed by private entities constitute the majority of voluntary carbon credit supply, supplemented by government programs that generate emission reductions and/or removals as certified by carbon standards. Historically, the demand for carbon credits outside of regulated schemes evolved from a rise in voluntary corporate sustainability programs and in the creation of projects that target positive environmental outcomes and emission reductions.

[40] World Bank Group (2022) State and Trends of Carbon Pricing 2022 p. 18

[41] Radio Senado (17 January 2023) Regulamentação do mercado de carbono será debatida em audiência pública na CMA

[42] A carbon credit is retired when the climate benefit is claimed and the credit is removed from circulation. See section on VCM market flow for further discussion.

Figure A.2: Growth of the VCM market: Yearly issuances and retirements 2008-2023



Source: Climate Focus[43]

VCM participants have not traditionally formed part of national emissions trading schemes and most buyers of credits are driven by their own objectives for carbon-neutrality or net zero or to offset corporate emissions for other reasons. Voluntary carbon credits are available to everybody from governments or corporations to private individuals aiming to reduce their personal carbon footprint. For example, many individuals may be familiar with carbon credits offered by airlines, which they can purchase to offset the carbon emissions of their flight.

Growing corporate net zero commitments continue to drive demand in VCMs, leading to forecasts of strong growth. In 2022, Shell and Boston Consulting Group surveyed over 200 environmental and sustainability leaders across industries and sectors globally, to assess trends in the carbon market.[44] Most respondents believed that despite increased economic difficulty, demand for credits will grow. Buyers expect an increase in the volume of emissions compensated through carbon credits traded given the rise in net zero commitments.

The projects that issue credits into VCM mechanisms target avoidance, reduction, removal or sequestration of carbon emissions. While the emissions source and targeted outcome is regulated in a compliance market, voluntary markets rely on verification or certification of projects to provide prospective buyers with confidence about the claimed amount of carbon emissions to be avoided, reduced or removed. One carbon credit equates to one metric tonne of CO2 equivalent (CO2e) avoided, reduced or removed. Projects typically fall into two main categories, technology- or nature-based,[45] covering a range of project types, which categorize similar projects or activities from which carbon credits can be generated (**Table A.1** and **figure A.3**).

[43] Climate Focus (2023) Voluntary Carbon Market Dashboard
[44] Shell and Boston Consulting Group (19 January 2023) Shell and BCG's new report shows accelerated growth in carbon markets
[45] S&P Global Commodity Insights (March 2023) FAQ: What is a Voluntary Carbon Market Credit?

Table A.1: Categorization of carbon credit project types

	Avoidance / Reduction	Removal / Sequestration
Technology-based solutions	■ Renewable energy ■ Energy efficiency / fuel switching ■ Household support efforts such as the cookstove projects[46] ■ Transport ■ Methane abatement strategies (such as reduction of methane emissions from open landfills) ■ Waste to energy	■ Carbon capture and storage mechanisms (e.g. direct air capture (DAC) and bioenergy carbon capture and storage (BECCS)). ■ Biochar production ■ CO2 mineralization ■ Ocean-based methods (e.g. ocean alkalinization and fertilization, artificial upwelling and downwelling)
Nature-based solutions	■ Reducing deforestation and forest degradation ■ Restorative agricultural practices (such as no-till farming or methane from livestock)	■ Reforestation / afforestation ■ Wetland, peatlands, coastal and marine habitat conservation and restoration ■ Restoration and creation of urban natural habitats

Source: UN SSE

Figure A.3: Diversity of carbon projects

Source: Ecosystem Marketplace[47]

[46] EcoAct website Darfur Sudan Cookstove Project | EcoAct
[47] Ecosystem Marketplace (August 2022) The Art of Integrity: State of the Voluntary Carbon Markets 2022 Q3

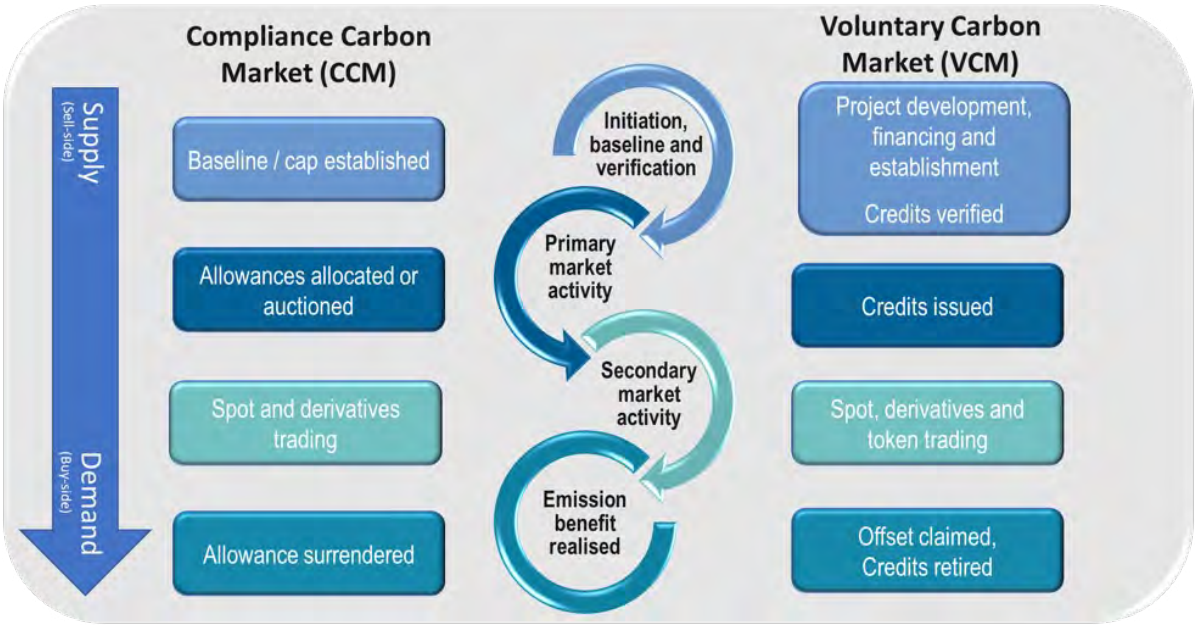
Voluntary carbon credit issuances in 2021 were dominated by renewable energy (RE) and nature-based solutions (NBS) projects which jointly account for 76% of issuances over the year.[48] The increased mainstreaming of renewable energy has resulted in many of these projects struggling to meet the requirement of additionality, which considers the reduction above and beyond that which would occur without the project.[49] As a result, carbon credit registries such as Verra and Gold Standard are no longer accepting new projects except from the 46 Least Developed Countries (LDCs). Existing projects running in other countries will still issue carbon credits in the next few years, given that renewable energy projects typically have ten-year crediting periods.[50]

It should be noted that carbon credits from renewable energy projects should be distinguished from Renewable Energy Certificates (RECs) which are issued in kWh and are used to offset direct electricity use. Carbon credits from renewable energy projects are issued in tonnes CO2e, and are applied to offset greenhouse gas emissions more broadly.

Typical Carbon Market Value Chain

The carbon market value chain (**figure A.4**) encapsulates various processes and activities, which differ slightly for the CCM and VCM systems. The environmental impact and continued economic viability of any type of carbon market is reliant on the credibility of the market participants and product components along the value chain. The SSE's ongoing research indicates that at least 31 exchanges in 24 countries are at various stages of engaging with carbon markets across different parts of the value chain (**figure A.5** and **Annex 2**).

Figure A.4: Carbon market value chain



Source: UN SSE

[48] Climate Focus (2022) Voluntary Carbon Market Dashboard
[49] See Section B (Quality characteristics of carbon credits) and Annex 1 for more on the concept of additionality
[50] Ceezer (25 April 2023) Navigating the murky waters of renewable energy carbon credits: A guide to distinguishing the good from the bad

Figure A.5: Exchanges involved in carbon markets

CCM Market Flow

Initial allocation of allowances

In a cap-and-trade CCM, initial distribution of allowances for emissions in an upcoming compliance period is done by the issuing government or authority under a free allocation regime or by means of an auctioning mechanism.[51] In a baseline-and-credit CCM, entities are allocated emission credits equal to the amount of emission reductions below the entity's baseline or target level of emissions.

Most CCMs operate with a free allocation mechanism, where allowances are given away for free, particularly to the covered industries. The amount of allocation should normally decrease each year, to ensure that emissions are reduced. This typically takes place either via grandparenting (where entities receive allowances according to historical emissions) or benchmarking (allowances are allocated according to performance indicators).[52]

Selling allowances (usually by auction) more closely reflects the actual need for allowances. It also gives covered entities equal opportunity to buy allowances, stimulating price formation, while enabling industries that are not bound to compliance to purchase allowances.[53] Moreover, auctions raise revenues for the regulator that can then be spent on other measures to address climate change.

The OECD recommends that cap-and-trade systems use the auctioning mechanism instead of free allocation, to ensure that the benefit goes to public authorities, rather than being captured by the existing polluters.[54] IOSCO similarly recommends that relevant authorities place greater reliance on auctions over free allocation, where consistent with the approach taken by national authorities.[55] However, while

[51] IOSCO (July 2023) Compliance Carbon Markets - Final Report page 12
[52] International Carbon Action Partnership (ICAP) website Allocation
[53] Some compliance markets allow the finance and trading community access to carbon trading, for example to act as intermediaries for compliance entities or trading derivatives. According to BloombergNEF's Carbon Knowledge Hub, these entities can include retail speculators, commodity traders, brokers and financial intermediaries such as commercial banks.
[54] OECD website Emission trading systems - OECD
[55] IOSCO (July 2023) Compliance Carbon Markets - Final Report page 40

IOSCO's work recognizes the benefits of auction over free allocation, it also recognizes the need to address carbon leakage risks[56] before jurisdictions can fully move to auction allocation. **Box A.1** provides an example of an auctioning platform that covers a wide range of participants.

Box A.1: Example of carbon allowance auctioning: the European Energy Exchange (EEX)

EEX provides a common auction platform for the entire auction volume of carbon allowances under the EU ETS. This covers 25 EU Member States, three EEA EFTA states as well as the Innovation Fund, Modernisation Fund and the Recovery and Resilience Facility for REPowerEU. EEX also conducts emissions auctions for Poland during a transitional period, for the UK in respect of generation of electricity in Northern Ireland and EEX has been selected as Germany's opt-out auction platform.[57] In these functions, EEX holds regular auctions of EU general allowances (EUAs) and EU aviation allowances (EUAAs) on its spot market. EEX.

The auctioning of allowances is governed by the EU Auctioning Regulation, which defines the categories of participants who are eligible to apply to bid in the auctions, and requires certain admission criteria to be fulfilled. (The EEX emissions secondary market offers spot and derivatives trading of EU ETS allowances (EUA, EUAA), as well as related spreads.)

Source: EEX[58]

Trading

Companies who have surplus allowances available can either sell these or (if allowed by their ETS rules) save them for future use. In markets where spot allowances can be traded, participants can purchase further allowances or sell their own surplus. Where trading of derivatives on allowances is allowed, they may be used to manage price risks associated with allowances (some schemes only allow trading of spot products).[59] The majority of carbon allowances is traded on an exchange (across primary and secondary markets) (**Box A.2** and **Annex B**).

Research by IOSCO[60] indicates that a broader set of financial participants is increasingly active in the secondary market than in the primary market, particularly as intermediaries supporting compliance entities to meet their obligations. These intermediaries include, for example, financial institutions and investment firms beyond banks, such as high frequency traders or hedge funds who support greater market depth and liquidity without holding large positions.

IOSCO further notes that the secondary market is important for several reasons: [61]

- Enabling firms that are not bound to compliance to access emission allowances.
- Providing a hedging mechanism against future price volatility.
- Enhancing market liquidity.
- Providing an indicative carbon price which supports informed investment decisions.

[56] Carbon leakage risk arises where businesses transfer production to countries with laxer constraints on GHG emissions, to avoid costs for emission abatement activities, resulting in an increase in their total emissions. The risk of carbon leakage may be higher in certain energy-intensive industries. To compensate for the risk the EU ETS for example allocates a higher share of free allowances to sectors deemed to be exposed to a significant risk of carbon leakage.

[57] EU Member States who opt out from the common auction have to select an opt-out platform where it intends to conduct auctions, in accordance with the EU and national public procurement rules. See the EU ETS Auctioning web page

[58] EEX website EU ETS Auctions

[59] IOSCO (July 2023) Compliance Carbon Markets - Final Report page 22

[60] IOSCO (July 2023) Compliance Carbon Markets - Final Report page 22

[61] IOSCO (July 2023) Compliance Carbon Markets - Final Report page 23

Box A.2: Examples of exchange involvement in carbon allowance trading

The Intercontinental Exchange (ICE)

ICE has been active in global environmental markets for almost two decades and hosts trading for the four largest and most liquid carbon cap-and-trade markets in the world: the European Union Emissions Trading Scheme (EU ETS), the Western Climate Initiative (California Cap and Trade Program), the Regional Greenhouse Gas Initiative (RGGI), and the UK Emissions Trading Scheme (UK ETS).

Since launch, allowances equivalent to over 100 billion tons of carbon, over 250 million renewable energy certificates, 3 billion carbon credits, and the equivalent of over 3 billion Renewable Identification Numbers (RINs) have traded on ICE. According to the World Bank,[62] ICE is the largest secondary market platform for EU allowances, with spot prices increasing almost threefold in 2021, and over 15 billion emission allowances traded.

In 2020, ICE Data Services launched the ICE Carbon Futures Index Family. The ICE Carbon Futures Index Family is made up of pricing from the four most actively traded carbon markets in the world. Together these markets represent some of the largest regional economies in the world, and the secondary futures market for those programs predominantly trade on ICE's futures markets. The ICE Carbon Futures Indices are derived from ICE's quoted carbon markets which account for approximately 95% of global exchange traded volumes - sitting at the top of the fair value hierarchy and providing the most precise measure of value. The ICE Global Carbon Futures Index has produced a higher return than indices representing U.S. equities, U.S. bonds, energy futures and precious metals futures.

Source: ICE[63]

The Korea Exchange (KRX)

KRX has been operating a compliance carbon market since 2015. In accordance with government policies, KRX has implemented various measures to establish and operate a phased-in national allocation plan. These measures include introducing a market maker program, expanding the proportion of auction-based allocations, and establishing market-stabilizing measures, among others. Now in its third phase (2021-2025), the market actively encourages the inclusion of third-party participants, beyond the existing eligible entities, to bolster market liquidity and enhance the market's price discovery function.

Since 2021, principal trades by securities firms have been introduced. Additionally, the implementation of customer trading will soon enable participation from asset managers and other financial institutions. Active third-party participation is expected to stimulate the development of new carbon-related financial products such as Exchange Traded Funds (ETFs), Exchange Traded Notes (ETNs), and other derivatives. These offerings, in turn, will attract a diverse range of retail and institutional investors, thereby raising public awareness of climate change issues.

Source: KRX

Surrendering allowances

Many jurisdictions have ETS registries which are intended to ensure that issued allowances are properly accounted for and double counting is avoided when allowances are surrendered.[64] Compliance entities to whom allowances were issued must surrender a prescribed amount of allowances to the relevant authority at the end of a compliance period, to compensate for the emissions that they created within that time-frame (in cap-and-trade systems) or that exceed their set baseline (in baseline-and-credit systems).

[62] World Bank Group (2022) State and Trends of Carbon Pricing 2022 p. 18
[63] ICE website ICE Data Indices | ICE Carbon Futures Index Family
[64] IOSCO (July 2023) Compliance Carbon Markets - Final Report page 19

Typically the quantity of allowances surrendered should be equivalent to the amount of greenhouse gas emissions from the previous year (in cap-and-trade systems) or equivalent to the amount by which the baseline has been exceeded (in baseline-and-credit systems). However, in some ETS environments, the registry or the authority can specify what proportion of emissions should be surrendered within each compliance year. Penalties may be raised for non-compliance.

VCM Market Flow

Project development

The projects that generate the environmental benefits that carbon credits are issued against, can be categorized into two broad groups: i) avoidance and reduction, and ii) removal and sequestration.[65] Different approaches are taken,[66] but broadly speaking, projects can be further classified into technology-based solutions and nature-based solutions,[67] within which exist a range of projects (**Table A.1** and **Figure A.3**).

Project developers collate the required information in order to prepare the Project Design Document[68] that covers all the project details, for submission to a standard setting body for validation and verification. Both the financial feasibility and environmental benefits will be evaluated jointly. Feasibility studies are usually part of the project initiation and may be required by the developer as part of the financing decision. Environmental benefits can also be measured throughout the project lifecycle, using impact investing industry standards to ensure that benefits are not overstated.

It is becoming increasingly common for projects to also generate broader environmental, social, and economic co-benefits (**Box A.3**), including increased biodiversity or benefits for local communities such as job creation, greater gender equality or health benefits from avoided pollution. In some cases these co-benefits are embedded into the standard applied from the outset, while in other cases it may be added on. Such co-benefits may enhance the business case for financing, however it may make the verification and realization process more demanding to ensure integrity of the targeted outcome. Research indicates that credits from projects with co-benefits (whether embedded or included with carbon benefits) have a price premium over the benchmark carbon price.[69]

Box A.3: Examples of co-benefit approaches applied by standard setting bodies

Gold Standard: Global Standard for the Global Goals

Gold Standard was founded on the principle that climate projects must deliver meaningful sustainable development benefits beyond emission reductions.[70] Since its creation, Gold Standard has required projects to deliver co-benefits, and now requires all projects to make a direct verified contribution to at least 3 UN Sustainable Development Goals (SDGs), offering different levels of integration. For example, the gender policy at Gold Standard identifies two levels of certification that a project can achieve - gender sensitivity, which is a mandatory requirement, or a deeper level of gender responsiveness which is optional.[71]

Source: Gold Standard

[65] Taskforce On Scaling Voluntary Carbon Markets Report (January 2021) A blueprint for Scaling Voluntary Carbon Markets
[66] EIC (2 December 2020) 4 Types of Carbon Offset Projects - EIC and Ecosystem Marketplace (August 2022) The Art of Integrity: State of the Voluntary Carbon Markets 2022 Q3
[67] S&P Global Commodity Insights (March 2023) FAQ: What is a Voluntary Carbon Market Credit?
[68] See for example the Gold Standard's Project Design Document
[69] Ecosystem Marketplace (August 2022) The Art of Integrity: State of the Voluntary Carbon Markets 2022 Q3 p.4
[70] Gold Standard website Vision + Impacts | The Gold Standard
[71] Gold Standard Gender Equality Requirements and Guidelines

The W+ Standard: Climate action and gender equality

The W+ Standard, created by Women Organizing for Change in Agriculture and Natural Resource Management (WOCAN), allows for the accreditation of carbon projects and the credits that are issued, to be certified with quantifiable contributions to women's empowerment.[72] The standard provides a framework to measure results of women's empowerment activities and report on SDG 5 (Gender Equality). It measures six domains that are critical for women's empowerment: Time savings, income & assets, health, leadership, education & knowledge and food security.[73] Through applying the W+ Standard, a climate project may be able to certify the impact of its activities for gender equality and women's empowerment in a manner that also generates revenue from the sale of W+ labeled carbon credits. Verra (a carbon standard-setting body) collaborates with the W+ Standard to allow for the generation of W+ labeled Verified Carbon Units (VCUs) from projects that are certified to both the VCS Program and the W+ Standard. Projects that apply the VCS of Verra can register for the W+ through the same process and registry. Buyers can purchase W+ labeled VCUs, thus demonstrating both climate and gender benefits.

Source: Women Organizing for Change in Agriculture and Natural Resource Management (WOCAN) and Verra

Verra: Social and broader environmental impacts

Verra's Climate, Community and Biodiversity (CCB) Standard[74] and the Sustainable Development Verified Impact Standard (SD VISta) Program[75] both assess the social and environmental impacts of projects. The CCB Program applies to agriculture, forestry, and land use (AFOLU) projects, and requires that a project generates net climate, community, and biodiversity benefits. SD VISta applies to any project that wishes to demonstrate contributions to the SDGs.

Source: Verra

SOCIALCARBON[76]

SOCIALCARBON has been a standard promoting the social benefits of carbon projects for 15 years. It is now evolving to become a standard focused on nature-based solutions. Projects using the standard go beyond carbon, embedding meaningful social, environmental, and economic benefits to the projects and their local stakeholders. The SOCIALCARBON Standard embeds co-benefits into nature-based projects by default, rather than through the utilization of an additional co-benefit's standard.

Source: SOCIALCARBON

Credit Verification and Issuance

To certify and issue a carbon offset credit, a set of standards is applied through a GHG accreditation program. The World Bank divides crediting mechanisms into three categories based on how the credits are generated and the administration of the crediting mechanism:[77]

- *International mechanisms* are governed by international climate treaties and are usually administered by international institutions under a treaty, for example the Kyoto Protocol (including the Clean Development Mechanism) and the Paris Agreement, concluded as part of the United Nations Framework Convention on Climate Change;
- *Domestic mechanisms* can be regional, national or subnational, and are governed by the relevant governmental body under jurisdictional legislature, for example the Australia Emissions Reduction Fund and the California Compliance Offset Program;
- *Independent mechanisms* are administered by private and independent third-party organizations, often non-governmental organizations. These include, for example, Verra and Gold Standard.

[72] Verra (2021) WOCAN and the W+ Standard: How the scaling of voluntary carbon markets can amplify gender equality impacts
[73] WOCAN About the W+ Standard - Wplus Standard
[74] Verra website Climate, Community & Biodiversity Standards
[75] Verra website Sustainable Development Verified Impact Standard
[76] Social Carbon website
[77] World Bank Group (2022) State and Trends of Carbon Pricing 2022 p. 35

Due to the voluntary nature of the VCM, the quality and integrity of the product being traded are highly reliant on the credibility and robustness of the accreditation and verification methodology and process applied. Carbon standard organizations set the rules and requirements that projects need to comply with in order to be certified and for carbon credits to be issued. Most of these are international non-governmental organizations (**Table A.2**). Currently an estimated 70% of carbon credits have been issued under the Verified Carbon Standard operated by Verra.[78] Governments can also develop their own rules and standards. In France for example, the government launched a Low Carbon Label in 2018 for the official certification of agricultural projects and engagements to reduce greenhouse gas emissions and capture CO2. Farmers can obtain the label through different agronomic techniques, such as agroecology or conservation agriculture, and then obtain financial support when emitters buy the credits linked to the certification.[79]

Once the project's claim for emission avoidance / reduction or removal / sequestration has been verified, based on evidence of compliance having been reviewed by an independent third-party auditor approved by the standard setter, credits are issued for trade. A registry tracks all credits that have been generated, transfers tradable credits, and traces transactions between buyers and sellers.[80]

Table A.2: Examples of carbon offset standards and standard-setting bodies

Standard (Related organization)	Name of credits	Geographical Scope of projects	Sectoral Scope
Verified Carbon Standard (Verra)	Verified Carbon Unit (VCU)	Global	All project classes
Gold Standard for the Global Goals (Gold Standard)	Verified Emission Reduction (VER)	Global (99% of projects in developing countries)	Most project classes except REDD+ [81]
Climate Action Reserve (CAR)	Climate Reserve Tons (CRT)	United States and Mexico	Agriculture, forestry, energy, waste, non-CO2 GHG abatement
American Carbon Registry (ACR) Standard	Emission Reduction Tons (ERT)	United States	Industrial processes, land use, forestry, carbon capture, waste
Puro Standard (Puro.earth)	Carbon Removal Certificate (CORC)	Global	Engineered carbon removals
Plan Vivo Standard (Plan Vivo)	Plan Vivo Certificate (PVC)	Global (particularly developing countries)	Smallholder and community projects
The REDD+ Environmental Excellence Standard (TREES) (The Architecture for REDD+ Transactions (ART))	Emission Reduction credits (ERs)	Global (particularly developing countries)	Forestry (specifically jurisdictional REDD+)

Source: UN SSE

[78] Adapted from Climate Focus (2022) The Voluntary Carbon Market Explained Chapter 7
[79] UNDP (16 May 2022) Report on international voluntary and compulsory carbon markets with special emphasis to mechanisms applied in case of carbon farming and potential opportunities for Ukrainian developers Page 26
[80] Climate Focus (2022) The Voluntary Carbon Market Explained Chapter 7
[81] See Annex 1 for definition

To aid in the debate around quality and comparability of credits, rating agencies[82] are emerging to assess whether a given carbon credit will indeed achieve the climate improvement that is asserted.[83] Ratings are based on social and economic data, academic research and satellite imagery, and may flag risks (for example whether a particular project is issuing too many credits or whether a project is financially dependent on revenue from credit sales).

The timeline from project initiation to the first credits being issued varies with consideration of processes such as identifying a suitable approach to measurement, reporting and verification for the project, involving an appropriate validation and verification expert and independent auditors before certification by the selected registry body. The complexity and manual nature of some of these steps could have a direct impact on the scaling of the market to meet growing demand.

Trading

Once a project is verified and the credits are issued it can go to market. A wide variety of technologies and methods currently exist to transact in credits and allowances, but the following are typical paths for carbon credits to reach buyers:[84]

- **over-the-counter (OTC)** where buyers and sellers seek each other out,[85] either by means of a direct arrangement between the buyer and project developer; or via brokers or other intermediaries, who buy and resell the credits;
- via **exchange platforms** where buyers and sellers are matched centrally, with credits traded on a spot basis[86] or further developed into securities, carbon futures and options contracts or index products;
- **token trading**, where carbon credits are represented and traded digitally as a token.[87]

The diverse types of transactions (for example across OTC and commoditized markets) serve to meet the needs of a broad range of buyers, which can be instrumental to the market's success. **Table A.3** and **Box A.4** provide examples of trading through exchanges (see also **Annex 2**).

In a VCM, carbon credits can also be pooled based on a suite of project-specific factors (such as the project type, co-benefits, vintage etc.). Buyers can obtain credits or tokens based on specified characteristics of a package of projects rather than investing in a single project. Credits matching the offsetter's requirements can be retired as needed, or tokens can be traded further. While this aids in price predictability, the end investor may not necessarily have clear sight through to the project benefit that has been realized. This approach is still very small in the context of the market, as most buyers remain interested in understanding the specific projects they are buying from, however, as the market scales, pooling may increase in prevalence.

---

82 Such as BeZero Carbon, Sylvera, Calyx Global and Renoster Systems

83 WSJ Pro Sustainable Business (7 February 2023) Carbon-Credit Raters Aim to Assess a Notoriously Opaque Market

84 RMI (2 September 2022) How to Build a Trusted Voluntary Carbon Market

85 International Carbon Action Partnership (Icap) website Market Oversight & Trading

86 Spot trading involves the buying and selling of the instrument (such as the carbon credit) for immediate (often physical) delivery.

87 See Toucan (2022) Tokenization of carbon credits | A deep dive for more information. While this practice is currently not allowed by the major standards, there are views that tokenization will bring more flexibility and liquidity into the market; carbon standards bodies Verra, Gold Standard and American Carbon Registry are all conducting extensive consultations on tokenization, but concerns about the highly speculative nature of these products persist.

Table A.3: Examples of dedicated carbon exchanges

Exchange	Background	Products
AirCarbon Exchange (ACX)	■ Established in 2019 ■ Based in Singapore and Abu Dhabi ■ Digital online trading	Carbon and environmental contracts, including: Corsia Eligible Tonnes (CET), Renewable Energy Tonnes (RET), Global Nature Tonnes (GNT), Global Nature+ Tonnes with co-benefits (GNT+), Sustainable Development Goals Tonnes (SDGT), Household Offset Tonnes (HOT)
Carbon Trade Exchange (CTX)	■ Established in 2009 ■ Based in UK and Australia ■ Member-based online spot exchange	Trades Gold Standard, Verra and CDM credits, including Voluntary Emission Reductions (VER), Certified Emission Reductions (CER), Verified Carbon Units (VCU), EU Allowances (EUA) and EU Aviation Allowance (EUAA)
Xpansiv	■ Established in 2019 through merger of CBL (founded 2009) and Xpansiv (founded 2016) ■ Offices in USA, Australia, UK, Canada and Europe	Offers spot trading in The CBL GEO: Global Emissions Offset, CBL N-GEO: Nature-Based Global Emissions Offset, and CBL C-GEO: Core Global Emissions Offset. Futures contracts: CBL GEO and CBL N-GEO futures contracts

Source: UN SSE

Box A.4: Spot and derivatives trading through CBL and CME Group

CBL is a global exchange platform for transacting energy and environmental commodity products such as carbon, renewable energy, water, and natural gas. The platform connects buyers and sellers to trade multiple environmental products on one screen. The Global Emissions Offset (GEO) product range is an example of a standardized approach which enables market participants to buy carbon offsets without having to evaluate the vast universe of disparate offset projects. Each GEO contract is based on an offset that meets the eligibility criteria defined by the International Civil Aviation Organization (ICAO) for CORSIA. The GEO spot contract is traded on the CBL exchange and GEO futures on CME Group exchange. Together, the contracts provide liquidity, transparent price discovery, risk transference mechanisms, and a benchmark for the global carbon market.

Source: Xpansiv.com

Retiring of carbon credit

A carbon credit can be resold several times in the secondary market,[88] before being removed from circulation through a retirement mechanism, when the last buyer claims the climate benefit from the credit. Retiring the credit prevents it from being claimed for another project or being sold to another buyer, ensuring that the intended beneficiary is the only one who can claim the reduction in their carbon footprint. One cannot, for example, claim reduced emissions and then resell the credit. The process is intended to protect the integrity of the carbon-offsetting system, supporting legitimacy of the reductions that are claimed. Avoiding the risk of double counting thus enables the actual offset to be measured accurately.

[88] Trading in the secondary market can enhance liquidity and price discovery, while enabling companies to hedge their exposure to future price increases.

Carbon credit registries have rules and procedures in place to avoid double counting and ensure that there are no competing claims to the emission reductions relating to the credits being retired.[89] They maintain databases, tracking the issuance and retirement of carbon credits. All the major independent registries maintain public databases with information about the credits that have been issued, connecting it to the protocol applied for certification and basic information about the underlying project. These databases typically also specify when each credit was issued, and when it was retired.[90]

The rate of issuance and retirement is considered to reflect the economic supply and demand principles of the carbon market. While issuances remain higher than retirements, the first quarter of 2021 showed more retirements than issuances when compared to the same period since 2017,[91] and the gap further narrowed in 2022 compared to 2021 (**Figure A.3**). Overall retirements in the registries tracked by Ecosystem Marketplace were down in 2022, but still much higher than levels in 2019 and 2020 levels.[92] The retirement trends reflect a growing demand for voluntary carbon credits while issuance (and supply) appears to be slowing down.[93]

SECTION B: CHALLENGES TO INTEGRITY AND CREDIBILITY OF CARBON MARKETS

In order for carbon markets to realize their potential in being part of economy-wide efforts to keep global warming below 1.5°C, they need to be reliable and stable and meet the needs of the wide array of players that are involved. Ensuring integrity is an existential requirement for the successful functioning of carbon markets, as it is for all financial markets and instruments.

A core consideration pertaining to carbon market integrity is the question of whether carbon markets are genuinely facilitating absolute emission reductions. For example, with an increasingly complex legal landscape and consequences for making unsubstantiated environmental claims, or “greenwashing”, corporations and governments that participate in VCMs may face criticism for using offsets rather than working to achieve direct emission reductions. Critics of offsets argue that these instruments enable entities to continue polluting. States may be subject to perceptions of an over-reliance on private sector credits as a mechanism to reduce emissions, rather than implementing regulatory interventions for emission reduction elsewhere in the economy.[94]

Both CCMs and VCMs face a number of challenges, in concept and in practical execution. A lot of debate and research is being dedicated to investigating some of the challenges that these markets face. Being aware of these issues (and the potential solutions that are being developed) is important for relevant parties such as exchanges and policymakers if they want to maximize the opportunities of carbon markets. A few challenges are touched on in the remainder of this guidance.

[89] Carbon Offset Guide website Ownership of emission reductions
[90] CarbonPlan (2022) Why carbon offset disclosure matters – CarbonPlan
[91] Quadriz (5 May 2021) Carbon offsets surge in 2021 with forestry carbon credits leading the pack
[92] World Bank Group (2023) State and Trends of Carbon Pricing 2023 p. 39
[93] Aegis (23 May 2022) Voluntary Carbon Credit Registry Issuances and Retirements, January-April 2021 vs. 2022 | Aegis Market Insights
[94] Voluntary Carbon Markets Global Dialogue (2021) Project Developer Engagement with the VCM

Policy and Governance

Policy developments around carbon markets need to bear in mind that they are part of a broader ecosystem of mutually supportive efforts to enable the transition to a net zero economy.[95] In this context, different vehicles may be created to enable emission reductions, some driven by policy, others by market forces. In all cases, however, there may be relevant policy considerations to ensure integrity and efficacy.

The issuance of instruments such as allowances for CCMs or credits for VCMs functions better within a clear policy framework. In CCMs, the policy provisions that inform issuances and allocations can cause price volatility or stabilize it. In many markets, policy aspects are under ongoing review to ensure that efficient governance frameworks underpin market processes. Efforts are also made to ease price volatility arising from policy decisions, such as operating an allowance reserve program and enhancing predictability. For example, without sufficient governance frameworks in place, risks may arise related to market function, integrity and confidence (**Table B.1** provides an example of risks that were identified in New Zealand). Because CCMs are governed by a central regulatory authority, it's important that this authority sets appropriate governance requirements / structures to ensure efficient and stable functioning of the market.

Table B.1: Market governance risks and themes for New Zealand ETS

Theme	Risk
Theme A Governance of advice	Risk 1: Inadequate, false or misleading advice to NZ ETS users
	Risk 2: Conflicts of interest involving the New Zealand Emissions Trading Register
Theme B Governance of trading	Risk 3: Potential lack of transparency, oversight and monitoring of trades in the secondary market
	Risk 4: Credit and counterparty risks
Theme C Governance of market conduct	Risk 5: Insider trading and information asymmetry
	Risk 6: Manipulation of NZU prices
	Risk 7: Money laundering and financing of terrorism

Source: New Zealand Ministry of Environment[96]

VCMs markets and some CCMs. VCMs are typically governed by private standards rather than regulatory bodies (although some are subject to regulatory requirements, particularly derivatives and securities involving carbon credits).

When pursuing commitments under the Paris Agreement, projects and programs have to comply with the rules under Article 6 of the Paris Agreement.[97] The rules (particularly under Articles 6.2 and 6.4) make provision for voluntary cooperative approaches giving flexibility to governments in the implementation of NDCs,[98] thereby opening the door to carbon market transactions such as through VCMs. However, knowledge gaps persist across public and private sectors about how best to leverage VCMs to support the achievement of NDCs.[99]

---

[95] Voluntary Carbon Markets Global Dialogue (2021) Project Developer Engagement with the VCM
[96] New Zealand Ministry of Environment (2021) Designing a governance framework for the New Zealand Emissions Trading Scheme
[97] Climate Focus (2022) The Voluntary Carbon Market Explained Chapter 3
[98] For example, Switzerland has committed to halving its emissions from 1990 levels by 2030 (Nationally Determined Contribution, NDC). This is to be achieved in part by funding climate protection projects under Article 6.2 of the Paris Agreement. A number of bilateral treaties have been concluded to this end. See the Swiss Federal Office for the Environment website Bilateral climate agreements.
[99] Climate Focus (Aug 2021) Balancing the needs of stakeholders for a successful voluntary carbon market

Despite differing views on how best to implement the interaction between VCMs, CCMs and the Paris Agreement, ongoing convergence is expected to continue. The main distinctions between them lie in the different drivers of market demand, with compliance markets driven by policy makers' efforts to meet NDCs, and voluntary markets driven by company-level objectives such as achieving carbon neutrality or 'net zero'. Some measure of integration or interoperability may be useful, for example catering for a scenario where the allocation of allowances via CCMs is insufficient to accommodate the removal of residual emissions, which may be accommodated through the purchase of offset credits via VCMs.

Cooperation between private actors and authorities that are involved in carbon markets is critical to ensure a balance in policy approaches and market-driven mechanisms and incentives. In addition, national targets need to be supported by clear policies and implementation plans to inform where the range of carbon instruments (allowances, offset credits and related projects) may be able to contribute towards achievement of the targets.

Within the context of ensuring credibility and transparency, any policy or regulation should leave sufficient scope for flexibility to allow the market to evolve and to operate in an agile fashion. Processes are underway to explore optimal approaches to regulation in relation to CCMs and VCMs (**Box B.1**). There are views[100] that, to fully leverage the benefits of VCMs, they should remain mainly complementary to regulatory action, as they allow broader contributions. However, it has also been suggested[101] that regulatory authorities and market participants should consider whether applying principles and standards similar or analogous to those in financial markets could support the scaling and efficient functioning of VCMs. While there may be more interaction between different carbon markets in future, CCMs and VCMs provide access to different opportunities and enable different actors to contribute to climate mitigation.

Box B.1: Regulators explore the role of policy making in relation to carbon markets

International Organization of Securities Commissions (IOSCO)

At COP27 in November 2022, IOSCO published two papers considering approaches to foster fair and efficient carbon markets: a Consultation Report on CCMs and a Discussion Paper on VCMs.[102] The documents acknowledge issues and challenges to CCMs' and VCMs' ability to achieve their environmental objectives, including greenwashing, criminal activity (such as fraud and market abuse), and a lack of market integrity.

A final report on CCMs was published in July 2023.[103] The report explores characteristics of CCMs compared to traditional financial markets and includes twelve recommendations relating to primary market and secondary market functioning, to promote efficient markets that function with integrity, learning from the experience of others. Since different aspects of CCMs are overseen by different types of authorities, the recommendations intend to allow the flexibility that may be needed for regulators to act in a manner that is consistent with their legal mandates.

In the VCMs Discussion Paper, IOSCO set out 14 key considerations for a potential approach that regulatory authorities and market participants could take to foster sound and well-functioning VCMs. The key considerations cover open access, market integrity, transparency, product standardization and environmental integrity, interoperability, financial integrity, legal certainty, governance, conflicts, and enterprise risk management.

Source: IOSCO

[100] Voluntary Carbon Markets Global Dialogue (2021) Project Developer Engagement with the VCM
[101] IOSCO (November 2022) Voluntary Carbon Markets Discussion paper page 21
[102] IOSCO (November 2022) Voluntary Carbon Markets Discussion paper
[103] IOSCO (July 2023) Compliance Carbon Markets - Final Report

United States Commodity Futures Trading Commission (CFTC)

The CFTC, the derivatives markets regulator of the United States, has also been considering what role it should have in the voluntary carbon markets, to ensure that the related products and markets have integrity and adhere to basic market regulatory requirements. The CFTC has an important policy responsibility in relation to ensuring the quality of carbon credits as the underlying commodity for derivatives products listed on CFTC-registered exchanges. It also has an increasingly critical role in policing for fraud and manipulation in underlying and related markets.

Feedback from a consultation process in 2022 indicated that stakeholders felt the Commission should use its anti-fraud and anti-manipulation enforcement authority to the fullest extent possible and that it should support the development of standards to promote the growth of high-integrity carbon offsets. Two enforcement-oriented efforts followed: the CFTC's Whistleblower Office within the Division of Enforcement issued an alert in June 2023 notifying the public on how to identify and report potential Commodity Exchange Act violations connected to fraud or manipulation in the carbon markets. Further, the Division of Enforcement announced the establishment of two new task forces, one of which will focus on environmental fraud and misconduct in derivatives and relevant spot markets, which may include investigations into potential fraud with respect to purported environmental benefits of purchased carbon credits and material misrepresentations and misconduct regarding environmental products and strategies.[104]

In July 2023, at a second convening on voluntary carbon markets,[105] the CFTC launched a workstream aimed at drafting agency guidance addressing VCM standards. Building on the work of the private sector, the Commission aims to support standards for high-integrity carbon credits and ensure the financial integrity of all transactions within its jurisdictional space. It is anticipated that a draft for public comment will be forthcoming.

Source: CFTC

European Securities and Markets Authority (ESMA)

In March 2022, ESMA, the European Union's securities markets regulator, published its Final Report on the European Union Carbon Market, which plays an important role for the EU's transition to a low-carbon economy.[106] ESMA's report is intended to offer a basis for the EC, the Council of the EU and the European Parliament to determine whether additional measures to regulate the carbon market are necessary.

Following in-depth analysis of the trading of emission allowances (EUA) and emission allowance derivatives, the report's analysis did not find major deficiencies in the functioning of the EU carbon market. However, based on its findings and observations, ESMA formulated a number of policy recommendations on transparency and monitoring. The proposed measures aim to provide more information to market participants, regulators and the public, thus contributing to the continued smooth functioning of the market. ESMA also identified two possible actions for the European Commission (EC)'s consideration regarding the introduction of position limits on carbon derivatives and centralized monitoring of the carbon market at EU level.

Source: ESMA[107]

[104] CFTC (July 2023) Opening Statement of Chairman Rostin Behnam at the Second CFTC Voluntary Carbon Markets Convening, Washington, DC
[105] CFTC (July 2023) CFTC Announces Second Voluntary Carbon Markets Convening on July 19
[106] ESMA (March 2022) Final Report: Emission Allowances and Associated Derivatives
[107] ESMA (28 March 2022) ESMA publishes its Final Report on the EU Carbon Market

A lack of transparency in the trading environment can increase the risk for market misconduct, inefficient price discovery and low levels of market confidence. This is particularly the case as it relates to the nature of issuance and clear rules for ensuring equitable trading. In VCMs specifically, project implementation may be delayed, and project developers may view the development of new projects as prohibitively high in risk.[108] Governance arrangements, both at the global level and for individual CCMs and VCMs, need to ensure clarity in the rules that apply, while balancing the needs of stakeholders across the value chain. It would be worthwhile to leverage the longstanding experience that others may already have in implementing VCM projects to help inform technical discussions.[109]

Status and Standardization of Carbon Market Instruments

A lack of clarity persists about the regulatory status of the instruments in both VCMs and CCMs. The regulatory qualification of the carbon instrument often determines the level of oversight by a regulator. Financial product classification is currently not in place in many jurisdictions, and is inconsistent across those jurisdictions that have it.[110] This creates limitations for some regulated exchanges to provide marketplaces within their regulatory operating model. VCM credits are considered commodities in some cases due to their ability to be delivered and consumed (**Box B.2**).

Government regulation may not be required for projects or the issuance and trading of credits. Classification as financial products or instruments may however render them within the scope of regulation of securities or financial instruments. If a carbon credit is classified as a financial instrument, certain transactions will become subject to regulatory treatment, which may vary across jurisdictions. This is likely to hinder international flows of finance.[111] For example, derivatives based on carbon credits and certain pricing benchmarks are already regulated under financial regulation, while the spot instruments are not. Considerations for classification may therefore include whether compliance costs could result in barriers to entry for new players into the market. The features of carbon credits may be subject to jurisdictional interpretation which impacts how they are treated in a regulated exchange environment, as well as what the relevant tax implications are and how ownership is considered.

Box B.2: Regulatory status of voluntary carbon credits in the United States

Thus far, there have been no official determinations made by regulatory agencies in the United States as to the legal status of voluntary carbon credits. Both the International Swaps and Derivatives Association (ISDA) and the United States Commodity Futures Trading Commission (CFTC) have proceeded under the presumption that these instruments are commodities. In June of 2022, ISDA published an analysis of US regulatory oversight of voluntary carbon markets and argued that voluntary carbon credits would be classified as commodities given the broad nature of the definition found in the US Commodity Exchange Act (CEA).

Likewise, the CFTC appears to have based its assertion of jurisdiction over voluntary carbon credits on the fact that the CEA's definition of commodity is quite broad and includes "…all services, rights, and interests … in which contracts for future delivery are presently or in the future dealt in." Voluntary carbon credits would fall within the scope of "services, rights, and interests." Furthermore, CFTC Chair Rostin Behnam reinforced the notion of CFTC jurisdiction over this market in a speech given before ISDA's 36th Annual General Meeting in May of 2022, where he expressed the view that under US law, carbon credits are classified as commodities.

Source: Nasdaq

[108] Voluntary Carbon Markets Global Dialogue (2021) Project Developer Engagement with the VCM
[109] Climate Focus (Aug 2021) Balancing the needs of stakeholders for a successful voluntary carbon market
[110] IOSCO (November 2022) Compliance Carbon Markets Consultation Report
[111] International Emissions Trading Association (IETA) (March 2023) The Evolving Voluntary Carbon Market Page 16

VCMs offer unique opportunities in the variety of instruments that can be leveraged and their relative independence and agility. Given the historical characteristic of VCMs being driven by the private sector, they can mobilize a broader array of private investments and infrastructure that governments may not have direct access to. For example, a project issuing a credit on a VCM may be financed through multiple routes. As a result, VCM projects are more varied than the pure emissions allowances in CCMs.

One of the most fundamental differences between the CCM and the VCM is in the standardization of the instrument issued on the primary market. The allowances issued in the CCM environment are standardized, defined and fungible. In the VCM environment, issued credits are typically heterogeneous and non-fungible. This presents a challenge for exchanges that rely on standardized instruments, particularly in the context of issuing derivatives contracts. VCM trading has traditionally mostly taken place through private deals or over the counter (OTC),[112] which allows for more specific and tailored messaging around project impacts and a closer relationship between investors and local communities. However, as the markets scale and exchanges increasingly become involved, efforts are being made to increase fungibility. Carbon credits are complex due to the wide range of factors that affect their price, however through leveraging common attributes such as project type or category, location, vintage year etc. some basic specifications can be achieved, thus enabling standardization and pooling. Standardized products are preferred by traders who want to buy credits in anticipation of increases in carbon credit demand.[113]

Carbon Pricing

Carbon prices vary greatly and are driven by a range of mechanisms and instruments that can also exist beyond the carbon markets, with the main mechanisms being as follows:[114]

- Direct or explicit pricing mechanisms which put a direct price on emissions such as through carbon taxes, CCMs or crediting mechanisms such as on VCMs,
- Implicit or indirect pricing mechanisms which affect the marginal cost of emitting carbon without targeting emissions directly,[115] through for example subsidies and fossil fuel levies, broader energy and fuel taxes, and
- Internal or shadow carbon pricing, by which organizations put a value on their greenhouse gas (GHG) emissions internally, as a decision-making tool to support aspects evaluating the impact of mandatory carbon prices on their operations and as a tool to identify potential climate risks and revenue opportunities.[116]

The World Bank has developed a Carbon Pricing Dashboard tracking which countries have implemented compliance offset programs and other carbon pricing instruments.[117]

As compliance markets are based on a compliance program in which allowances are generated and traded to achieve regulatory compliance, pricing is driven by the dynamics of supply and demand within the program, regardless of project type and other characteristics.[118] As noted earlier, however, lack of clarity in the issuance of allowances may cause uncertainty and volatility in pricing.

---

[112] S&P Global Commodity Insights (10 June 2021) Voluntary carbon markets: how they work, how they're priced and who's involved
[113] S&P Global Commodity Insights (10 June 2021) Voluntary carbon markets: how they work, how they're priced and who's involved
[114] World Bank Group (2023) State and Trends of Carbon Pricing 2023
[115] Goran Dominioni (25 February 2022) Pricing carbon effectively: a pathway for higher climate change ambition
[116] World Bank Group website What is Carbon Pricing?
[117] World Bank Carbon Pricing Dashboard
[118] Carbon Offset Guide website Compliance Offset Programs

In voluntary markets, the pricing can vary significantly. As is often seen in other types of markets, lower volumes lead to lower prices, and liquidity is a significant challenge in most existing VCMs. Prices vary considerably according to the project type, the vintage of the credits (the year that the credits were issued or certified), the size of the transaction and the standard to which it is accredited (e.g. Verra, Gold Standard, CAR or ACR).[119] Price differentiation is inevitable as different project types require different levels of carbon finance to make them viable. Standardized pricing across the market does not facilitate this. The challenge therefore is not to achieve price standardization but to improve price discovery, for example through the entry of more participants.[120]

In addition to the variability in CCMs and VCMs respectively, carbon pricing is also not aligned across all aspects of the carbon environment. The complexity of carbon pricing contributes to the perception that carbon markets are not as effective as they could be. External factors such as policy developments, shifting climate targets, crises like the COVID-19 pandemic and geopolitical tensions which impact oil and gas prices, add to this volatility. Some analysts argue that prices in the global VCM environment are unsustainably low and need to increase significantly if integrity of the emission reductions is to be sustained.[121] Further, an increasing number of organizations are using internal carbon pricing to guide decision-making processes.[122] This adds to the complexity given the lack of transparency and consistency of pricing methodologies and price levels.

In its comments to the IOSCO Compliance Markets Consultation Paper, the UN Principles for Responsible Investment (PRI) acknowledge the necessity of greater market transparency, however note that to grow and scale CCMs, appropriate and effective design of carbon pricing policy instruments is essential.[123] The PRI and the UN-convened Net Zero Asset Owner Alliance (NZAOA) recommend five key market design principles for scaling carbon pricing (**Box B.3**).

Box B.3: Recommended market design principles for carbon pricing instruments

In 2022, the United Nations Environment Programme Finance Initiative (UNEP FI) and the PRI published a position paper[124] on governmental carbon pricing for the NZAOA, setting out five recommended guiding principles for governments when designing carbon pricing policy instruments to ensure efficacy. These principles can also be relevant to the design of the relevant policy and pricing approach for the ETSs implemented by CCMs, and encapsulate the following:

- Ensuring appropriate coverage and ambition. The global coverage of carbon pricing instruments should be expanded across more countries and more sectors, entities, and GHG emissions where feasible.
- Delivering a just transition. Carbon pricing should take into consideration the potential impacts on a wide range of sectors, markets, and businesses, particularly where shifts in economic activities may be concentrated in disadvantaged communities.
- Providing a predictable price signal. Carbon prices could allow for a planned and orderly transition to a low-carbon world. ETSs can include market stability measures to avoid excessive price volatility and provide a predictable increase in price signal over time.

[119] Trove Research (June 2021) Future Demand, Supply and Prices for Voluntary Carbon Credits – Keeping the Balance
[120] Initiatives such as Xpansiv CBL's spot-traded platform, CME (Chicago Mercantile Exchange) and ICE's (Intercontinental Exchange) new futures contracts, as well as Price Reporting Agencies (PRAs) like Platts and OPIS have increased their presence in the VCM.
[121] Trove Research (June 2021) Future Demand, Supply and Prices for Voluntary Carbon Credits – Keeping the Balance
[122] World Bank Group What is Carbon Pricing?
[123] IOSCO (27 March 2023) Public Comment Letters - IOSCO Consultation Reports - CR07/2022 Compliance Carbon Markets: Comments Received: UNPRI
[124] UNEP FI, PRI (2022) Position Paper on Governmental Carbon Pricing

- Minimizing competitive distortions. While carbon pricing policies should be designed to avoid leakage, the measures should still have emissions abatement as primary incentive.
- Promoting international cooperation. International cooperation on carbon pricing can contribute to efficiency, including through linking of ETSs and knowledge transfers.

Source: PRI

Carbon price uncertainty and volatility are contributing factors restricting lower-income developing countries from accessing the opportunities of carbon markets. Many of these countries lack the financial resources to operationalise projects as well as the skills and technologies needed to monetize their climate mitigation efforts. For example, despite their emissions levels being lower than more developed countries, many African countries have both a distinct reliance on fossil fuels and expected growth in energy consumption. Coupled with the untapped capacity of the continent's ecosystems (Africa's highest mountain forests can store more carbon per hectare than the Amazon),[125] African countries should be able to both contribute to and benefit from carbon market mechanisms. However, low and unpredictable carbon prices mean that participants cannot accumulate sufficient funding to cover the cost of building or acquiring the necessary capacity.

Quality and Integrity Considerations

The integrity of the instruments used in voluntary carbon markets is often exposed to questions, both at issuance as well as at retirement. The value of a carbon credit is directly linked to the degree to which it can be relied upon to make a credible, demonstrable contribution to combating the climate crisis. This may be influenced by aspects such as the project's characteristics and the verification standard applied. The success of a VCM is ultimately reliant on the credits complying with a range of quality criteria and project implementation achieving the anticipated outcome in emissions abatement.

Quality characteristics of carbon credits

When it comes to discussing what makes a quality carbon credit, the following key characteristics relating to environmental integrity have emerged across the market:

- **Additionality**
  The requirement of additionality holds that the emissions avoidance or reductions achieved by a project need to be 'additional' to what would have happened under a business-as-usual scenario.[126] To ensure that the offset being claimed contributes to the intended climate outcome, carbon credits should not be subjected to perceptions that they are unjustified because the underlying projects or activities would have taken place anyway.[127]
- **Permanence**
  The emission reductions or removals foreseen by carbon credits effectively need to be permanent, with little risk that the carbon is re-emitted into the atmosphere (known as reversal), as it would result in the project losing its value as a function to offset emissions.[128] An assessment of permanence considers the degree of confidence that a particular project will keep carbon out of the atmosphere for at least a given period of time, with 100 years considered as a benchmark. While some reversals can be avoided, others are beyond human control (such as natural disasters and unavoidable climate change impacts).[129]

[125] UNDP Climate Promise (16 June 2022) Africa needs carbon markets | Climate Promise
[126] Gold Standard (17 November 2020) What does "additionality" mean and why is it important?
[127] One debate in this regard also relates to the vintage of the project, noting that credits issued from long-standing projects may no longer meet additionality since the project's operations have become business as usual.
[128] Institute for Global Environmental Studies (IGES) (November 2021) Elements related to carbon credit credibility - A brief guide for offset credit buyers
[129] Sylvera (16 December 2022) Permanence in carbon credits: why it matters, and how to evaluate it

In project types where the risk of reversal is considered to be higher (such as those in the land use and forestry sector), a portion of the issued carbon credits may be set aside and placed in a "buffer pool" or "buffer reserve" instead of being sold.[130] As long as the buffer remains solvent, the project remains able to deliver on the claims targeted by the offset. However, should the project continue to be compromised by reversal even after the buffer has been depleted, the environmental integrity of the credits is affected. For example, research into California's forest carbon offsets program demonstrated that estimated carbon losses from wildfires have depleted as much as 95 percent of the contributions to the buffer reserve, with the buffer being at risk of being depleted.[131]

- **Leakage**

  Credits should be generated from projects that do not cause emissions to increase elsewhere, by ensuring that activities that generate emissions are not simply displaced.[132] In the case of VCMs, leakage occurs when the project may have effects beyond its carbon accounting boundary, for example by causing emission increases elsewhere. Leakage risk is also relevant in CCMs, often as a result of asymmetrical carbon policies, for example where businesses transfer production to other countries with more lenient emission constraints. Authorities may therefore decide to issue allowances at a lower price to avoid leakage from occurring.

- **Quantification / measurability**

  The emissions reductions or removals projected by a project has to be capable of being measured credibly. By applying a robust and established protocol or methodology which is science-based and conservative, a consistent approach is applied both to estimating baseline emissions and determining the project's actual emissions.[133] It should be noted, however, that it is possible that different results may be produced using different protocols under different programs, even for the same project. It is therefore important for buyers to understand which protocol or methodology is being used, to ensure comfort as to the credibility of the credit amount.

- **Verifiability**

  It is essential that the accreditation standards that are applied when certifying emission reductions or avoidance are rigorous and above reproach. The project or program should have clear requirements for robust independent third-party validation and verification of emission reduction activities.

- **Unicity**

  Unicity requires that a credit from a particular project must be unique in that it may only be issued once from a single registry or claimed once.[134] This aspect aims to reduce double counting, whereby credits are at risk of being double-counted by being issued in multiple registries, or claimed by more than one party, for example both the credit seller and buyer.[135]

[130] Sylvera (2022) Guide to Carbon Credit Buffer Pools
[131] Frontiers in Forests and Global Change (5 August 2022) California's forest carbon offsets buffer pool is severely undercapitalized
[132] Institute for Global Environmental Studies (IGES) (November 2021) Elements related to carbon credit credibility - A brief guide for offset credit buyers
[133] Carbon Offset Guide website Quantification
[134] ICAO (January 2023) Application form for Emissions Unit Programs seeking eligibility to supply units to the CORSIA first phase
[135] Riverse Standard website Core principles

Claims and disclosure of use

Registry systems track carbon instruments from issuance to surrender or retirement. These registries aim to avoid double counting, by ensuring that allowances that have been surrendered are recorded or that each carbon credit is issued and retired only once. When companies use carbon allowances or credits to make a climate claim — such as achieving carbon neutrality or net zero emissions — they are asserting ownership over the climate benefits generated by allowances or carbon offset projects.

Companies can obtain and hold the allowances and credits that have been issued, but to claim the underlying climate benefits the allowance has to be surrendered or the credits must be retired and taken out of circulation. However, while compliance markets mostly require full disclosure to ensure compliance, registries or standards in voluntary markets don't regulate claims or the related disclosure. It may therefore not always be possible to obtain a complete picture of who ultimately claims the climate benefits. An investor seeking to assess a company's net zero transition plan — or any corporate claim based on carbon offsets — has no consistent way of knowing which allowances have been surrendered or which credits have been retired by a particular company, unless this is disclosed by the claimant. Company-level disclosures of carbon credit use would close the information gap, and help to address the existing challenges in data availability and opaqueness in the disclosure about the use of carbon credits.[136] Carbon credits can strengthen interim claims and address gaps, provided that the necessary guardrails are in place to prevent delayed action on emission reductions (such as requirements on transparency and limitations on credit usage as a percentage of required reductions).

A further factor constraining the VCM market is the lack of access for buyers to comprehensive, easily searchable data on projects and credit attributes to enable efficient due diligence and enhance credibility.[137] The efficacy of the registry system used by a VCM, its integration with trading and related transparency is a key element of credibility. Standard setting bodies continue to pursue greater disclosure, for example, Gold Standard provides Claims Guidelines in relation to their credits and Puro. earth has implemented a system of standardized disclosures based on the scientific characteristics associated with voluntary carbon removal credits. Registries track the lifecycle of their units from issuance to retirement, to ensure traceability and transparency and to avoid double counting, and have strict controls such as "Know-Your-Customer" background checks on new account applicants. Verra Registry requires account holders to obtain their written permission for transacting in related instruments such as carbon credit derivatives. The information in the Puro Registry allows any member of the public to review the claims made regarding each carbon credit. This includes such information as the form of carbon sequestration and its duration.

However, fragmentation remains an issue in voluntary markets especially since different registries and standards use different methodologies to certify, issue, and retire offsets, leaving the market without a single authoritative source for retirements.[138-139] In addition, credits cannot be transferred from one registry to another. While there is a range of standards and various ways in which credits can be traded, credits are typically issued under the standard of a particular accreditation organization and stored in a registry managed or retained by this standard. Since VCMs typically work with a preferred standard and registry, the range of credits available within the market can be limited.

---

[136] CarbonPlan (2022) Why carbon offset disclosure matters – CarbonPlan

[137] International Emissions Trading Association (IETA) (March 2023) The Evolving Voluntary Carbon Market Page 14

[138] CarbonBetter (13 July 2022) Carbon Offset Registries: An Overview

[139] A World Bank initiative, Climate Data Warehouse, is an ongoing project aiming to develop an end-to-end digital solution to connect and aggregate registry information, monitoring, reporting and verification (MRV) systems, national carbon registries, tokenization instruments, etc. See World Bank Climate Warehouse. In the interim, various private sector companies produce datasets across different registries, which are used by market participants.

Project realization

Closely related to the quality characteristics of the credits and ensuring credible claims, is the risk that project realization is compromised. VCMs have a high level of reliance on monitoring, reporting and verification (MRV) to ensure the environmental integrity of the offset instrument. However, a key challenge in ensuring realization of carbon reductions or avoidance is the lack of agreed upon standards for carbon accounting at project level. This includes for example the assessment of baselines for the purposes of additionality, as well as the difficulty of monitoring actual carbon performance.

There is also a risk that substandard projects receive investment and the reductions that are claimed are not reliable. These factors have left the VCM with a reputation of being risky and highlights that not all carbon credits are created equal.[140]

Developments in addressing integrity and credibility of VCMs

Several new initiatives have emerged to address the challenges around integrity and credibility of VCMs. While IOSCO is exploring the role of policymaking for carbon markets (**Box B.1**), the Integrity Council for the Voluntary Carbon Market (ICVCM) and the Voluntary Carbon Markets Integrity Initiative (VCMI) have been developing targeted guidance for VCMs. Their work is related but addresses different points of the carbon credit value chain, with the quality of the underlying carbon offset credits that are being supplied (sell-side) being the subject of the work of the ICVCM, while the VCMI focuses on claims made by carbon market participants who generate the demand for credits (buy-side). Their work represents a concerted push for greater transparency, standardization and improvement in the quality of credits issued in the VCM environment in order to accelerate stakeholder engagement with the VCM and, in turn, mobilize investment in climate mitigation projects that will contribute to achieving the Paris Agreement goals.

In June 2023, the ICVCM and VCMI announced a joint commitment to define best practice and credibility with regards to both the use and sourcing of high-integrity credits. Through coordinating their expertise, resources, and influence, they aim to work towards setting an integrated market integrity framework.[141]

The Integrity Council for the Voluntary Carbon Market (ICVCM)[142]

The ICVCM is a multi-stakeholder organization that positions itself as an independent governance body for the voluntary carbon market. It was established as an outcome of the private-sector led Taskforce on Scaling Voluntary Carbon Markets. The ICVCM's purpose is to ensure the voluntary carbon market plays a legitimate role within, and accelerates, a just transition to 1.5 degrees Celsius. The Council has released a draft set of Core Carbon Principles (CCPs), along with an accompanying Assessment Framework and Assessment Procedure (Assessment Framework).[143]

The Core Carbon Principles are intended to set a global benchmark for carbon credit integrity, with rigorous thresholds on disclosure and sustainable development. They were developed with input from hundreds of organizations throughout the VCM ecosystem. The principles are operationalised through the Assessment Framework which provides criteria and decision tools for each principle. Carbon credits

[140] Sylvera (2022) The Sustainability Leader's Guide to Voluntary Carbon Markets (VCMs)
[141] VCMI (21 June 2023) Leading voluntary carbon market initiatives join forces to operationalize a high-integrity market to accelerate global climate action
[142] ICVCM (2022) The Core Carbon Principles - ICVCM
[143] Norton Rose Fulbright (August 2022) Draft Core Carbon Principles for the Voluntary Carbon Market released

will receive a label indicating compliance with the principles only if both the carbon-crediting program that issued them and the credit category are assessed by the Integrity Council and meet the criteria set out in the principles. The ten principles are set out across three thematic areas (**Table B.1**).

Table B.1: The ICVCM Core Carbon Principles for high-integrity carbon credits

Emissions impact	1.	Additionality
	2.	Permanence
	3.	Robust quantification of emission reductions and removals
	4.	No double counting
Governance	5.	Effective governance
	6.	Tracking
	7.	Transparency
	8.	Robust independent third-party validation and verification
Sustainable development	9.	Sustainable development benefits and safeguards
	10.	Contribution to net zero transition

Source: ICVCM

The Voluntary Carbon Market Integrity Initiative (VCMI)[144]

The VCMI is a multi-stakeholder platform targeting the promotion of integrity in the VCM environment. It aims to connect with, align, and amplify initiatives that share the vision for high integrity voluntary carbon markets. The VCMI has released a Claims Code of Practice setting out the actions that organizations must take in order to make credible claims about their voluntary use of carbon credits.[145]

While the ICVCM's Core Carbon Principles outline what constitutes a high-quality carbon credit, the VCMI's Claims Code aims to provide guidance for the credible use of voluntary carbon credits. The Claims Code of Practice comprises four components or steps to which companies must adhere to in order to make credible claims about their voluntary use of carbon credits. VCMI's Claims Code of Practice requires companies to:[146]

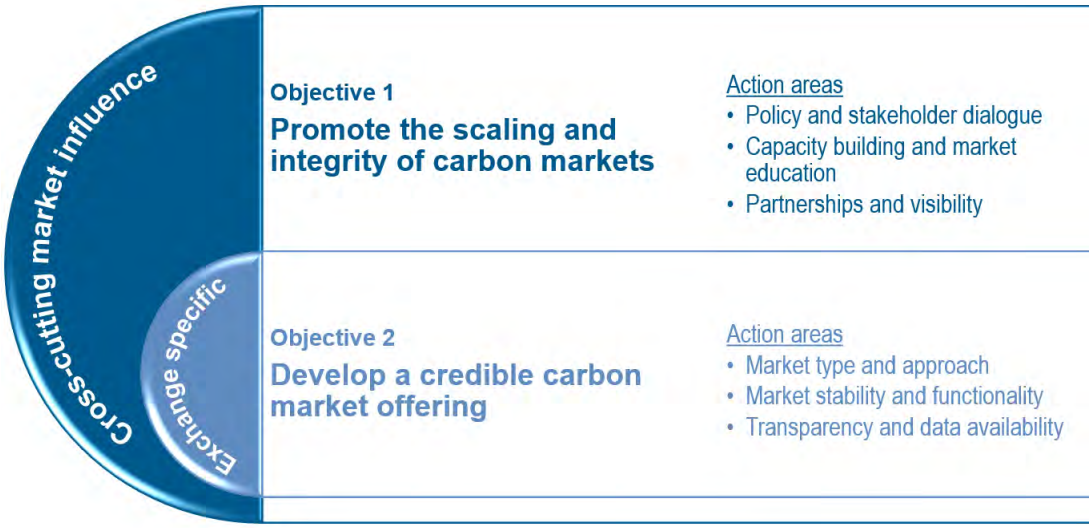
- Meet a set of foundational criteria designed to ensure that carbon credits supplement direct actions to achieve net zero. These include maintaining and disclosing a GHG inventory, setting science-based targets to reach net zero by 2050, reporting on progress and supporting the Paris Agreement goals;
- Select which of the three tiers of VCMI Claims will be used, as appropriate to the amount of emissions that the company wishes to offset through application of carbon credits;
- Ensure that the credits used meet the highest quality - defined by the VCMI as those that meet the ICVCM Core Carbon Principles;
- Report and obtain third party assurance.

144 Voluntary Carbon Markets Integrity (VCMI) website
145 VCMI (2023) VCMI Claims Code of Practice
146 VCMI (2023) VCMI Claims Code of Practice Fact sheet

SECTION C: ACTION FRAMEWORK FOR MAXIMIZING OPPORTUNITIES OF CARBON MARKETS

Having set the context of the carbon market environment, opportunities arise that exchanges may wish to explore. This guidance offers an action framework for maximizing the opportunities of carbon markets to assist exchanges, regulators and other market stakeholders. The framework has two main objectives, each with three action areas that contain a range of suggested actions or 'action menus' that exchanges can consider for application (**figure C.1**).

Figure C.1: SSE action framework for maximizing opportunities of carbon markets



Source: UN SSE

The two main objectives are:

- **Objective 1: Promote the scaling and integrity of carbon markets.** The first objective encapsulates cross-cutting market influence, with three interlinked action areas through which exchanges can promote the scaling and integrity of carbon markets. Taking action in these areas can strengthen the exchange's own initiative or enable the exchange to influence the broader market, whether or not it has implemented or intends to develop a carbon market offering of its own.
- **Objective 2: Develop a credible carbon market offering.** The second objective applies where an exchange is pursuing its own carbon market initiative. This objective is associated with three action areas that could be considered key to support a credible carbon market offering by an exchange.

To assist exchanges in progressing each of the action areas, a range of potential actions, or an "action menu" is detailed below for exchanges to consider for implementation, as appropriate. Given that the business models and operating environments of exchanges vary, certain strategies may be more appropriate in some markets than in others, but it would be important for an exchange to consider all relevant aspects to help inform decision making around its carbon market strategy. This framework and the action menus that it contains can assist exchanges whether they are just beginning to explore involvement in carbon markets, or seeking opportunities to expand or optimize existing involvement.

Objective 1: Promote the Scaling and Integrity of Carbon Markets

Action area 1a: Policy and stakeholder dialogue

Market stability and policy clarity are inextricably linked in capital markets. As far as carbon markets are concerned, a range of policy aspects are in play and can influence the effectiveness and operation of the marketplace across the value chain, whether it be in driving the integrity of the issuance, stability and transparency of trading or the credibility of the offset that is being claimed. Clarity of policy (or lack thereof) affects market stability and credibility, particularly of primary market activity, which further informs which mechanisms may be required to ensure secondary market stability and avoid dangerous volatility.

In the CCM environment, the direct involvement of government authorities establishes a more absolute reliance on clear policies than may be the case in a VCM environment which currently has little to no regulation. CCM and VCM approaches appear to increasingly be positioned alongside one another in various markets. As a result of growing calls for regulatory intervention and standardization, the reliance on policy clarity is bound to increase regardless of the approach taken by the exchange. More research needs to be conducted to explore the potential benefits of a single operator for both types of market.

Exchanges vary in their jurisdictional authority and business models and may not be in a position to set standards, drive policy or influence it directly. However, most exchanges do actively promote the implementation of national or international standards, guidelines or best practices in their markets. They are also often able to support or participate in policy dialogue either directly with relevant regulatory authorities at local, regional or global levels or through relevant representative bodies.

In addition, as market infrastructure operators positioned between issuers and investors, exchanges often facilitate dialogue between key capital market stakeholders in relation to developments in their markets. These activities already extend to environmental, social and governance (ESG) aspects in many markets. Bringing the topic of carbon markets into these discussions will broaden the range of stakeholders engaged and enable the exchange to develop informed views on the state of play as well as the supply and demand in its market, which may help identify risks and opportunities and subsequent policy deficits or needs.

Action menu

- Ensure that the exchange develops an understanding of the applicable policy landscape by:
  - Establishing the extent and nature of relevant laws, regulations and policy instruments (whether national, regional, or international).
  - Assessing whether there are legal, regulatory or policy-related gaps or barriers that may hinder the establishment or scaling of a carbon market initiative by the exchange.
- Identify the relevant policymakers, regulators and other key stakeholders with specific reference to carbon markets. These may come from within the exchange's existing regulatory and stakeholder environment as well as beyond. Review the extent of their involvement in the carbon markets and identify to what extent international practices are already in use.
- Support and enable policy dialogue and stakeholder engagement by:
  - Pursuing opportunities to participate in direct dialogue with policymakers and regulators.

- Actively participating in market-wide policy discussions and consultations.
- Facilitating dialogue between policymakers and market participants.
- Hosting stakeholder dialogue events.
- Conducting regular engagements with key stakeholders.

- Consider whether and how the exchange can develop, promote or accredit standards, guidelines or best practices that help to further the integrity and credibility of the carbon markets.

Action area 1b: Capacity building and market education

A clear need exists for greater information exchange and knowledge building in the carbon market environment, to improve capacity and technical understanding. Exchanges can contribute to capacity building efforts through their own initiatives as well as through supporting efforts of third parties. In addition to focused training, other means of education can also be pursued. For example, sharing data and trends with stakeholders on topics such as carbon pricing trends, the performance of the carbon markets and the relationship to climate impact, or the introduction of new markets, products or services can also help to educate the market on this topic.

Exchanges may also consider supporting the development of national registries of carbon projects. Not only would this facilitate oversight of the market, but it would also support development of jurisdictional scale projects.

In addition to educational efforts, exchanges can build capacity beyond carbon, such as renewable energy certificates or biodiversity credits. This will enhance the scaling of nature markets and expand the knowledge and capacity needed to meet broader environmental objectives.

Action menu

- Strengthen the exchange's internal capacity and knowledge as regards carbon markets, for example by ensuring access to relevant information sources, joining consultation groups and networks.
- Contribute to building market capacity by:
  - Hosting information sessions for market participants to share knowledge and updates about developments in the carbon markets generally and with regard to the exchange's own approach.
  - Developing education and training initiatives, with particular focus on the areas of involvement by the exchange (covering e.g. the rules that apply to the relevant market).
  - Developing written guidance for market participants on key aspects of the market such as terminology and disclosure.
  - Exploring opportunities to partner, promote and/or facilitate training or capacity building initiatives by third parties (especially in cases where exchanges lack the resources to implement their own training).
- Regularly assess the performance and impact of the exchange's carbon market offering. Monitor market dynamics, policy changes, and stakeholder feedback to identify areas for improvement and adapt accordingly.

Action area 1c: Partnerships and visibility

As has been the case in other environmental markets (such as the green bond environment), exchanges working together may contribute to the scaling of markets. Exchange efforts may also benefit from collaboration with other stakeholders in the market. Collaborative efforts can further advance policy dialogue as well as expand education and capacity building efforts. For example, developing guidance on best practices is often done in collaboration with multiple stakeholders. Such collaborations may be subject to agreement among exchanges and participants on aspects such as reporting and verification, and therefore also often benefit from stakeholder engagement activities.

Exchanges can further play an important role in the growth of carbon markets by supporting enhanced visibility of available carbon market offerings, whether via the exchange or others. As noted in the previous action area, pursuing education and capacity building initiatives for the market and its stakeholders will go a long way to spread the message, as will the publication and distribution of information. Stakeholders should also be able to easily find information about the exchange's carbon markets offering.

Action menu

- Join or align with existing initiatives that are working towards scaling carbon markets (see **Box C.1** for an example).
- Ensure that access to information regarding the exchange's carbon market initiative is easily accessible, for example by the following means:
  - A clear section on the exchange website, or a dedicated segment of the trading platform (where applicable and appropriate).
  - Including information on carbon market developments and offerings in newsletters or other frequent communications with market participants and other stakeholders.

Box C.1: Africa Carbon Markets Initiative aims to supplement and reinforce African VCMs

The Africa Carbon Markets Initiative (ACMI)[147] was launched at COP27 by a group of sponsors that includes the Global Energy Alliance for People and Planet, Sustainable Energy for All, The Rockefeller Foundation, and UN Economic Commission for Africa, with support from the UN Climate Change High-Level Champions. The Steering Committee comprises government representatives, global experts, suppliers, financiers, intermediaries and buyers.

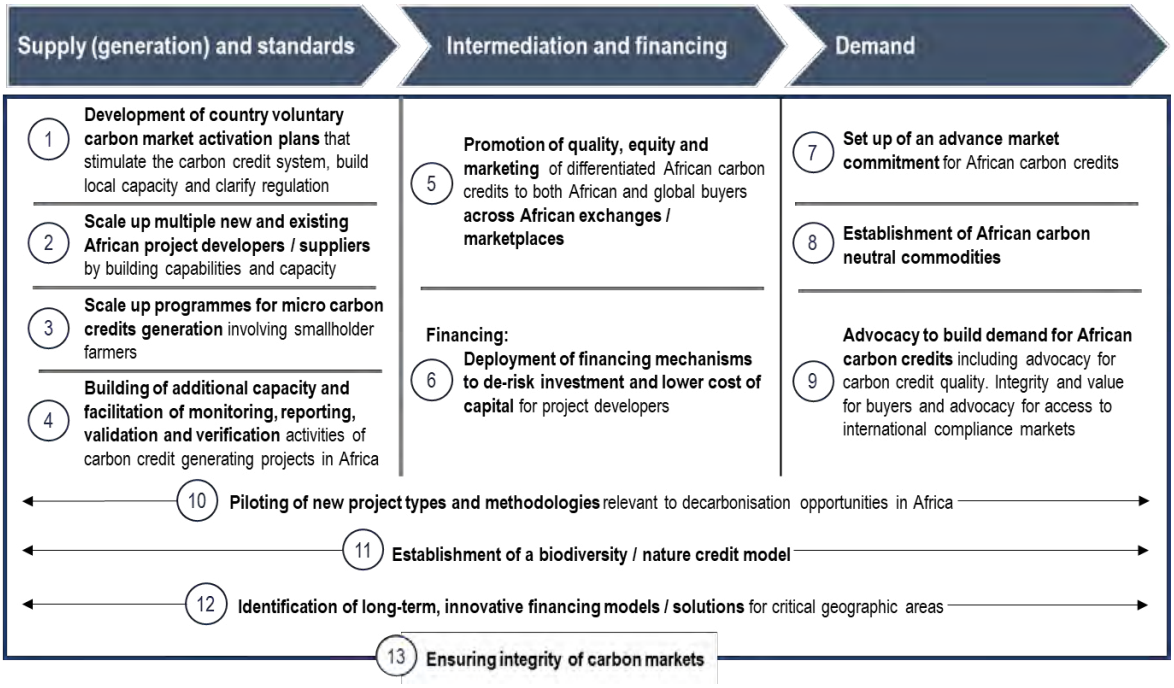
The ACMI aims to dramatically expand Africa's participation in the voluntary carbon market and is committed to supporting high-integrity credits where an equitable and transparent distribution of revenue goes to communities. To stimulate the production of high-integrity credits, the ACMI is collaborating with global integrity initiatives like the ICVCM and the VCMI, as well as other regional carbon market platforms. The initiative published a roadmap report in November 2022[148] in which 13 action programmes are set out across the VCM value chain:

- In supply, ACMI will assist in scaling of project developers, developing national enabling ecosystems and building validation and verification capacity on the continent.
- In intermediation, ACMI proposes to support efforts to create a more integrated African carbon market and reduce costs including cost of capital. This is an area where ACMI would specifically aim to support and grow exchanges and carbon marketplaces across Africa

[147] Climate Champions (8 November 2022) Africa Carbon Markets Initiative launched to dramatically expand Africa's participation in voluntary carbon market

[148] Sustainable Energy for All (16 November 2022) Africa Carbon Markets Initiative (ACMI): Roadmap Report

- ACMI aims to stimulate demand for African credits, including through piloting new project types and methodologies and exploring diversified financing models for nature assets.
- Focus on supporting efforts to ensure integrity across the market.



Source: Sustainable Energy for All: Africa Carbon Markets Initiative

Objective 2: Develop a Credible Carbon Market Offering

Action area 2a: Market type and approach

Selecting which carbon market type to pursue (compliance / voluntary) and what the offering will entail (e.g., primary or secondary market, spot trading or derivatives etc.) requires careful consideration before pursuing implementation. It is important that the appropriate conditions are in place before initiating an approach. Exchanges should have a clear understanding of the broad carbon market landscape as well as those parts of the carbon market chain that are most relevant to the exchange. This will assist exchanges to identify optimal opportunities to promote alignment between exchange and market activities with public policy goals on climate.

The exchange's motivations for entering such markets, and the needs and concerns of stakeholders related to carbon trading are also key in helping the exchange identify an approach that best leverages an exchange's abilities.

As the business models and operating environments of exchanges vary, particular approaches and products are more appropriate in some markets than in others. For example, in some markets governments may prefer the use of a carbon tax or other tax strategies rather than carbon trading.[149] Strategies should therefore be discussed with policy makers and regulators to understand what may be feasible and what level of mandate or support may be forthcoming.

[149] UN SSE (2017) How Stock Exchanges can Grow Green Finance

Action menu

- Assess the landscape to establish what approach will be most appropriate. A landscape assessment can cover the following:
  - Climate policy aspects that could influence exchange's decisions; this includes considering the policy and stakeholder landscape assessment conducted under Action Area 1a.
  - The nature and context of carbon markets that already exist or are being planned, e.g. through compiling an inventory of ongoing or planned activities, sectors that are involved, methodologies and certification standards that are applied. Exchanges should consider the interplay between compliance mechanisms (such as CCMs or carbon taxes) and voluntary market opportunities within its jurisdiction, for example benefits of involvement in one or both and the interaction between compliance mechanisms and the VCM. In South Africa for example, interoperability between the compliance obligations (carbon tax) and VCM exists in the sense that carbon credits / offsets may be sourced in the VCM to satisfy compliance obligations. Thus the mandatory carbon tax scheme is a big driver of the VCM market and pricing of VCM carbon credits.
  - Existing or potential projects and programs along with the relevant project developers, standard setters, investors and other key stakeholders.
- Identify the motivations for the exchange to pursue a carbon market offering. This is an important governance mechanism to justify the time and expense that may be required to pursue action. Relevant factors to consider include the following:
  - Existing or emerging regulations driving exchange involvement.
  - A mandate from government.
  - The business case for the exchange (e.g. through listing securities or derivatives on existing carbon instruments), and opportunity to progress its own sustainability strategy.
  - Opportunities to meet market needs such as scaling up supply, improving accessibility and lowering transaction costs for validation, verification and issuance of carbon credits. Exchange involvement may also enable maximized facilitation of capital flow across jurisdictions (e.g. enabling access to a global central order book for carbon markets).
  - Supporting the achievement of broader benefits such as capacity building.
  - Pursuing a unique value proposition that the exchange can offer.
- Engage key stakeholders. Also an action area of the cross-cutting elements (objective 1 above), stakeholder engagement has particular relevance in the context of determining which approach to take. The mapping of relevant stakeholders in the landscaping exercise will aid in ensuring that the relevant parties are engaged throughout the process. Focused engagements may be necessary with stakeholders that are crucial to the exchange's ability to pursue carbon market involvement. For example, discussions with the relevant regulator regarding the legal classification of the carbon product are crucial.
- Evaluate the various options to assess which offerings align best with the exchange's capabilities, market demand, and policy priorities to maximize opportunities.
  - The exchange's business model, jurisdiction and regulatory authority are relevant in informing what the exchange may be able to do, and at which juncture of the carbon market value chain the exchange feels it can best contribute (see **Box C.2** for an example).
  - In some emerging carbon markets the opportunity can be created to provide suggestions and to participate in the formulation of the initial market rules. Market simulations can be helpful in exploring what may be possible at exchange level together with regulators (see **Box C.3** for an example).

Box C.2: Nasdaq's varied involvement in the VCM environment

Nasdaq, Inc. (Nasdaq) is engaged with the VCM ecosystem at multiple points of the value chain. Since 2021, Nasdaq is the majority owner of Puro.earth Oy ("Puro"), a standard setting body for engineered carbon removal methods in VCMs. Puro is an integrated standard setter and registry focusing on high quality carbon removals with long durability (minimum one hundred years) and low risk of reversal. Through the Puro Standard, Carbon Removal Credits ("CORCs") are issued, each representing one metric ton of carbon removed from the atmosphere. CORCs are only issued once the carbon removal process has been completed, they are not based on a projected removal that is expected to take place at some point in the future. CORCs are issued in the Puro Registry where their complete lifecycle is recorded, from issuance to retirement.

In 2022, Nasdaq launched commodity reference price indices based on the trading of Puro's CORCs. These indices aim to bring price transparency to the market and help corporations understand the true cost of removing their carbon emissions. Additionally, Nasdaq Marketplace Services Platform provides carbon credit exchanges with trading technology designed to match buyers and sellers with carbon credits based on their specific requirements. In 2022, Nasdaq and Climate Impact X (CIX) entered into a partnership, leveraging Nasdaq's cloud-based trading technology to power CIX's new spot exchange platform.

Source: Nasdaq

Box C.3: Japan Exchange Group (JPX) supports carbon market developments in Japan

The introduction of Japan's emission trading system, known as GX-ETS, will initially invite voluntary compliance and operate on a baseline-and-credit system. In the second phase compliance obligations will be introduced. The initiative was established by Japan's Ministry of Economy, Trade and Industry and involves major companies who are participants of the so-called GX League.

In the VCM environment, there are J-credits (carbon credit instruments created under Japan's J-credit scheme) and joint crediting mechanisms (JCMs),[150] but supply is insufficient and the use of credits by companies is not advanced enough. In 2022, the Ministry of Economy, Trade and Industry commissioned the Tokyo Stock Exchange under the Japan Exchange Group, to conduct demonstration trading of J-credits . The market design took into account the following factors:

- Being tailored to the liquidity of J-credits (through two daily sectional auctions).
- Grouping and standardization of trading categories according to methodologies and offsetting needs by J-credits.
- Criteria for market participants to enable participation of credit issuers and SME consumers, including national and local government.

Following the successful execution of the demonstration project, the Tokyo Stock Exchange plans to launch a carbon credit market in late 2023. It is expected that J-credits and JCMs will be able to be used in part as offsets by GX League participants to meet compliance commitments.

Source: Japan Exchange Group and Asia Society[151]

Action area 2b: Market stability and functionality

Once it is clear what the most appropriate and feasible entry point into carbon markets is for an exchange, the exchange should define the details of how the market will function. To the extent that an exchange wishes to focus its involvement in the primary and secondary market aspects of the value chain, it should leverage the necessary market integrity and stability mechanisms to ensure that the market is capable of functioning without being subject to fraud, manipulation, conflict of interest

[150] The joint crediting mechanism (JCM) is a bilateral mechanism initiated by Japan in which the country aims to meet its NDC by transferring Japan's technologies to partner countries in exchange for carbon credits. It is seen as a leading pilot mechanism of cooperative approaches under Article 6.2 of the Paris Agreement.

[151] Asia Society website (2023) ETS Status: Japan GX-ETS (National Voluntary ETS)

or disruption.[152] The integrity of the carbon credit itself is likely the most critical success factor for the credibility and functioning of a carbon market. It is essential for market participants and the public at large to see evidence of the benefits that are targeted by such credits, whether related to the climate or other co-benefits such as community benefits, biodiversity, gender equality, water, etc.

In the VCM environment in particular, the lack of standardization of what constitutes a "high quality carbon credit" is a major challenge in establishing the integrity of these markets.[153] While there is consensus on certain common elements such as additionality, verification, permanency and transparency (among others), establishing the credibility of these elements currently happens in a fragmented manner. As discussed earlier, initiatives driven by the ICVCM, VCMI and others are working to achieve greater alignment on what constitutes a quality carbon credit. In addition to alignment with ongoing initiatives, exchange-traded derivatives products based on carbon credits can further support integrity through standard contract specifications that are clear and balanced, providing confidence in the quality of the underlying credit.

Exchanges should ensure that they have a good understanding of the standards that are employed in verifying or certifying the carbon instruments that may be issued on the market that the exchange is involved in or looking to establish. When considering reliance on a verification or certification standard and the organization performing such services, all options should be thoroughly vetted for suitability and credibility.

Action menu

- Support and/or host dialogues for market participants around market conduct policy (whether established by the exchange or a relevant market regulator).
- Perform appropriate due diligence on standards used for validation, verification, and issuance of carbon credits to promote credibility, build trust among market participants, and facilitate the flow of capital across jurisdictions. This may include considering, where appropriate, alignment with and incorporation of existing regulatory frameworks for credible environmental markets and or private sector efforts such as the ICVCM and VCMI.
- Develop clear rules on relevant aspects of issuance, trading and post-trade infrastructure, depending on the model implemented. Aspects that would need to be clarified include:
  - The type of market design and instruments that will be issued / listed and traded, and clarity on the legal nature of the instruments.
  - Infrastructure design in compliance or alignment with relevant national and or regional regulations, standards and registry operators.
  - Clarity about which participants are allowed into the market (such as market makers to stimulate liquidity).
  - Governance of the market at exchange level and as it relates to key stakeholders, for example the governance frameworks required of market participants.
  - Which certification or verification methodologies and standards are accepted or applied.
  - The trading mechanism(s) used (auction, continuous auction, single price), and clarity about the mechanism(s) for surrender and/or retirement.
  - To the extent possible, ensuring that processes for retiring credits achieve credible offsets, for example by requiring (to the extent possible or appropriate) or promoting that claims be made in line with relevant regulation or global standards.

[152] Also see the recommendations of IOSCO's carbon market papers (November 2022) Compliance Carbon Markets Consultation Report and Voluntary Carbon Markets Discussion paper

[153] IOSCO (November 2022) Voluntary Carbon Markets Discussion paper

- Price formation mechanisms.
- Rules around market surveillance and general market conduct principles.
- Provisions of general trading terms such as dispute resolution, and settlement and delivery. These are particularly important in the VCM context, given the permanence principle (the risk of reversal, and the mechanisms to deal with it such as through buffer pools).
- Provisions around monitoring and reporting. Exchanges can also consider the role of external assurance of data and the use of reporting standards, frameworks or guidance. Developments in the regulatory environment may further support exchange efforts to develop or enhance its own disclosure requirements or guidance.

- Identify ways to improve accessibility and encourage market entry, such as reduced transaction costs and/or broker fees. Streamlining procedures and leveraging technology can enhance market efficiency and attract broader participation.
- Regularly assess the performance and impact of the carbon market offering. Monitor market dynamics, policy changes, and stakeholder feedback to identify areas for improvement and adapt the strategies accordingly.

Action area 2c: Transparency and data availability

One of the core mandates of exchanges is promoting the availability of decision-useful information for investors and other market users. Much progress has been made in sustainability-related / ESG disclosures, in many cases directly attributed to the efforts of exchanges to provide disclosure guidance, mandate disclosure in their markets and or provide training and capacity-building in relation to disclosure. Now that these disclosures are increasingly established as part of mainstream reporting practices both in terms of what reporters provide and what investors demand, exchanges can build on this to expand knowledge of disclosure in carbon markets. Exchanges are well positioned to promote the quality of available data and reduce information asymmetry by promoting better disclosure practices around carbon markets.

In some carbon markets there is a lack of access to fundamental market data relating for example to the balance between supply of carbon instruments (such as the available credits in the market) and the amount that has been claimed or applied through surrender or retirement. In addition, there is a lack of alignment between market-level data and disclosures by individual firms about the source of an offset that has been applied.

In VCMs particularly, the lack of access to project-level detail (as also noted in section B) and the scarcity of pricing data, limits the ability of buyers to perform due diligence for effective price discovery. Likewise, suppliers encounter challenges in managing the risks associated with financing carbon-reduction projects, as they lack information about the eventual payment they will receive for carbon credits. An infrastructure that promotes access to comprehensive and timely data from multiple sources will improve the transparency of reference and market data.[154]

By promoting standardized disclosures on carbon market activity, exchanges can afford stakeholders a better view of the use of carbon market instruments. Enhanced disclosure can enable clearer alignment between actual emissions and the intended avoidance / reduction and removal / sequestration by means of carbon market instruments. Equally, inadequate disclosure about carbon market activity relative to actual emission reductions undermines the credibility of reduction claims by companies and poses reputational risk to the carbon market in question.

[154] McKinsey Sustainability (29 January 2021) A blueprint for scaling voluntary carbon markets to meet the climate challenge

Action menu

- Review disclosure requirements and practices that may already exist in the market to identify whether there are gaps that may offer opportunities for the exchange to contribute, for example through development of disclosure guidance for carbon markets (see **Box C.4** for examples of disclosure elements).
- In addition to training efforts discussed in action area 1b, provide training programmes on disclosure to ensure market participants are able to adopt and implement best practices.
- Work with carbon market participants and relevant data providers to feature key carbon market information on the exchange's website.
- Consider ways to develop a robust data infrastructure to increase data availability and transparency.

Box C.4: IOSCO Discussion Paper on the VCM environment calls for feedback on disclosure

With the publication of a Discussion Paper on VCMs in November 2022, IOSCO called on market participants to provide feedback on the 14 key considerations for enhancing the resilience and integrity of VCMs. With respect to key considerations on disclosure, the discussion paper on VCMs states that:

"If relevant authorities or sustainability reporting standard setters are considering issues related to recognition, measurement, and disclosures by participants of their use of carbon credits, disclosures could address:

a. Whether and to what extent a participant will rely on credits to achieve climate pledges.

b. Whether and to what extent a participant will rely on credits that have been issued under the certification of a body authorized to do so under Article 6 of the Paris Agreement.

c. Whether and to what extent participants will rely on credits that have been issued under certification by an industry body, which body, and whether that body claims to comply with prevailing standard for high-integrity carbon offsets (e.g., the Core Carbon Principles from the Integrity Council for the Voluntary Carbon Market (ICVCM) for the supply side, any other private-sector carbon offset standards body for the demand side of the VCM, and or intergovernmental bodies).

d. How the market participant assesses the carbon credit(s) to operate having regard to: impact; additionality; permanence; and risk of leakage.

e. Whether the market participant has used the credit faithfully to offset residual emissions only but not to abuse the use of credits to maintain business as usual.

f. How participants accounted for existing carbon credits purchased, including standards and assumptions used."

Source: IOSCO[155]

[155] IOSCO (November 2022) Voluntary Carbon Markets Discussion paper

CLOSING THOUGHTS

Carbon markets have long been considered key to supporting efforts to combat the climate crisis. With the realization that climate action needs to escalate significantly, various markets for carbon trading have gained significant traction, particularly in recent years. Approximately 23 percent of global emissions are now covered by a direct carbon pricing mechanism,[156] with the value of traded carbon dioxide permits increasing by 164 percent in 2021.[157]

While carbon reduction initiatives continue to grow, they are not scaling up fast enough to meet the ambitions agreed to under the Paris Agreement. In addition, the combination of real and perceived challenges within the markets creates difficulties in scaling them. Carbon markets remain highly fragmented and face ongoing criticism regarding the quality of the instruments and integrity of verification processes.[158]

However, as the World Bank observes,[159] the development of these markets is at a crossroads. Growth driven by strong demand and expanding market diversity is causing higher scrutiny of the role of carbon markets in meeting emissions goals. To sustain the growth, deepen liquidity and achieve scale, all stakeholders involved will need to collaborate to support the development and implementation of high standards for integrity and credibility. Exchanges have a central role to play in this context. Exchanges are well-positioned to participate in the dialogue to optimize the opportunities that CCMs and VCMs offer, while promoting more alignment and supporting processes to maintain integrity and credibility. This guidance has been developed to assist exchanges, regulators and policy makers in that effort.

[156] Systems Change Lab website Price greenhouse gas emissions and other environmental externalities
[157] UNDP Climate Promise (16 June 2022) Africa needs carbon markets | Climate Promise
[158] Taskforce on Scaling Voluntary Carbon Markets (TSVCM) (21 May 2021) Public Consultation Report
[159] World Bank Group (2022) State and Trends of Carbon Pricing 2022 p. 22

ANNEX 1: GLOSSARY AND LIST OF ABBREVIATIONS

Additionality	According to Gold Standard: "To qualify as a genuine carbon offset, the reductions achieved by a project need to be 'additional' to what would have happened if the project had not been carried out (e.g. continued as business-as-usual). Only carbon credits from projects that are 'additional to' the business-as-usual scenario represent a net environmental benefit. Without the additionality requirement, there is no guarantee that the emissions reduction activities will lead to a reduction of greenhouse gases into the atmosphere."[160]
Carbon offset	GHG emission reductions or removals that compensate for CO2 emissions[161]
CCM	Compliance Carbon Market
CDM	Clean Development Mechanism, a United Nations-run carbon offset scheme allowing countries to fund greenhouse gas emissions-reducing projects and claim the saved emissions as part of their own reduction targets.
CER	Certified Emission Reduction, a type of emissions unit issued by the CDM for emission reductions achieved by CDM projects under the rules of the Kyoto Protocol.
COP	Conference of the Parties, representing the formal meeting of the UNFCCC Parties
CORSIA	Carbon Offsetting and Reduction Scheme for International Aviation
ERU	An ERU or emission reduction unit was an emissions unit issued under a Joint Implementation project in terms of the Kyoto Protocol. An ERU represented a reduction of greenhouse gasses under the Joint Implementation mechanism, where it represented one tonne of CO2 equivalent reduced.
ESG	Environment, Society and Governance
ETS	Emissions Trading System
GHG	Greenhouse Gas
ICVCM	Integrity Council for the Voluntary Carbon Market
IOSCO	International Organization of Securities Commissions
JI	Joint Implementation was a mechanism under the Kyoto Protocol which allowed a country with an emission reduction or limitation commitment under the Kyoto Protocol to earn emission reduction units (ERUs) from an emission-reduction or emission removal project, which can be counted towards meeting the commitment or target set under the Kyoto Protocol.
NDCs	Nationally Determined Contributions, which are the commitments of individual States to reduce greenhouse gas emissions and adapt to climate change, as agreed to in the Paris Agreement.
Paris Agreement	The legally binding international treaty on climate change adopted by 196 Parties at COP 21 in Paris, on 12 December 2015, which entered into force on 4 November 2016.

[160] Gold Standard (17 November 2020) What does "additionality" mean and why is it important?
[161] Broekhoff, D., Gillenwater, M., Colbert-Sangree, T., and Cage, P. (2019) Stockholm Environment Institute & Greenhouse Gas Management Institute, Securing Climate Benefit: A Guide to Using Carbon Offsets

REDD and REDD+	REDD is the abbreviation for "reducing emissions from deforestation and forest degradation", amplified by REDD+ (or REDD-plus) which also includes the role of conservation, sustainable management of forests and enhancement of forest carbon stocks in developing countries.[162] REDD+ is a climate change mitigation solution developed by Parties to the UNFCCC. The framework is commonly referred to as the Warsaw Framework for REDD+ (WFR) adopted at COP19 in Warsaw, December 2013 and provides the complete methodological and financing guidance for the implementation of REDD+ activities. REDD+ is also recognized in Article 5 of the Paris Agreement.[163]
RIN	Renewable Identification Numbers or RINs are credits generated to track and enforce compliance with the U.S. federal Renewable Fuel Standard (RFS) program, which requires U.S. transportation fuel to include renewable fuels.[164]
RMU	A Removal Unit (RMU) was a tradable carbon unit representing an allowance to emit one tonne of greenhouse gases absorbed by a removal or carbon sink activity in an Annex I country. Removal Units were generated and issued by Kyoto Protocol parties for carbon absorption by land use, land-use change, and forestry activities such as reforestation.
TSVCM	The Taskforce on Scaling of Voluntary Carbon Markets, a private sector-led initiative initiated by Mark Carney, sponsored by the Institute of International Finance (IIF), which works to scale an effective and efficient voluntary carbon market to help meet the goals of the Paris Agreement.
UN SSE	United Nations Sustainable Stock Exchanges initiative
UNFCCC	United Nations Framework Convention on Climate Change
VCM	Voluntary Carbon Market
VCMI	Voluntary Carbon Markets Integrity Initiative
VCU	Verified Carbon Unit

[162] UN Economic and Social Commission for Asia and the Pacific (ESCAP) REDD and REDD+ Fact Sheet
[163] UN-REDD website About REDD+ | UNREDD Programme
[164] ICE (19 May 2023) ICE Reports Strong Demand in U.S. Renewable Fuels Futures with Record Trading in Renewable Identification Numbers (RINs)

ANNEX 2: EXCHANGE CARBON MARKET INVENTORY

Note: This inventory was compiled by desktop research and presents the involvement of SSE member exchanges in carbon markets as at the date of publication of this guidance (October 2023). Several more countries have carbon markets initiatives in place or under development which may not be reflected here as the exchange is not involved. Refer to the SSE website for a database that will be updated with more developments over time.

Key: ● Exchange actively involved in CCM / VCM
○ Exchange involvement under development / discussion

Country	Exchange	Exchange involved in:		Notes
		VCM	CCM	
Argentina	Bolsas y Mercados Argentinos (BYMA) and Bolsa de Comercio de Buenos Aires (BCBA)		●	BCBA assists companies active in CDM-based projects, through education programs, corporate carbon trading simulations and building relationships between project developers and international investors.
Australia	Sydney Stock Exchange (SSX)	○		SSX is part of a consortium that has been shortlisted by the Australian Government's Clean Energy Regulator (CER) to participate in the next phase for the delivery of the Australian Carbon Exchange.

Country	Exchange	Exchange involved in:		Notes
		VCM	CCM	
Australia	Australian Securities Exchange (ASX)	●		ASX lists an ETF tracking ICE Carbon Futures Index and is also exploring more carbon derivative products.
Brazil	B3	○	●	Offers an electronic interface platform for the trading of Brazilian carbon credits (CBIOs). Decarbonization Credits (CBIOs) are instruments adopted by the Brazilian National Biofuels Policy (RenovaBio) as a tool to reach annual decarbonization targets for the Brazilian fuel sector. B3 provides the registration environment for CBIO issuance, trading and retirement requests. Voluntary use of the market is not yet mainstream but expected to grow.
Canada	NEO Exchange (now operating as Cboe Canada)	●		The exchange lists a number of companies that are focused on the creation, management and financing of carbon credit projects.
Canada	TMX Group Inc.	●		The energy trading solutions provider Trayport which provides the primary trading network, back-office and data platform for The Voluntary Climate Marketplace (TVCM), is a wholly-owned subsidiary of TMX Group Limited.

Country	Exchange	Exchange involved in: VCM	CCM	Notes
China	Hong Kong Exchanges and Clearing Limited (HKEX)	●		Hong Kong Exchanges & Clearing (HKEX) launched their International Carbon Market Council in July 2022, as a forum for collaboration with leading local corporates and financial institutions on new climate projects, technologies and businesses relating to emissions reduction. The HKEX Core Climate platform offers an international carbon marketplace to source, hold, trade, settle and retire voluntary carbon credits verified against international standards. HKEX has also signed a Memorandum of Understanding (MOU) with the China Emissions Exchange (CEEX) to jointly explore the development of a regional voluntary carbon emission reduction programme. An MOU with the Guangzhou Futures Exchange (GFEX) will explore the feasibility of cooperation on product development in both onshore and offshore markets.
China	Shanghai Stock Exchange		○	The Shanghai Environment and Energy Exchange which operates the trading platform for China's Emissions Trading Scheme is collaborating with the Shanghai Stock Exchange to develop a price benchmark index.
Costa Rica	Bolsa Nacional de Valores (BNV)	●		A domestic voluntary carbon market exists to support national commitments to achieve carbon neutrality. Carbon credits established by a national standard, Costa Rican Compensation Units ("UCCs"), are issued and traded at the national stock exchange or through bilateral agreements.

Country	Exchange	Exchange involved in: VCM	CCM	Notes
Egypt	The Egyptian Exchange (EGX)	○		EGX is working on developing the ecosystem for a VCM by investing in a local project developer through its holding company, public and private stakeholder engagement to stimulate supply and demand, and providing a trading platform for investors to be able to trade and retire the credits.
Germany	Deutsche Börse	●		Deutsche Börse owns the European Energy Exchange (EEX) and has bought a stake in ACX (previously AirCarbon Exchange). It has also entered into an MOU with Guangzhou Futures Exchange (GFEX) in 2022 to facilitate carbon markets across China and Europe.
Greece	Athens Exchange (Athex)	○		ACX (AirCarbon Exchange) and the Athens Stock Exchange (ATHEX) have established a partnership to explore the development of a Voluntary Carbon Market in Greece.
Indonesia	Indonesia Stock Exchange (IDX)	●	●	IDX has been issued with a carbon trading license by the Indonesian Financial Services Authority (OJK) with carbon trading launching in September 2023. The market will trade carbon credit certificates issued for activities or projects that remove carbon from the atmosphere or companies that emit pollution below a limit set by the government.
Japan	Japan Exchange Group (JPX)	●		The Tokyo Stock Exchange performed trade simulations for the Japanese government supporting the launch of a voluntary ETS.

Country	Exchange	Exchange involved in:		Notes
		VCM	CCM	
Korea, Republic of	Korea Exchange (KRX)		●	Facilitates trading of allowances for the Korea ETS.
Malaysia	Bursa Malaysia Berhad - Bursa Carbon Exchange	●		Facilitates the trading of physical credits.
Mexico	Bolsa Mexicana de Valores (BMV)	●	●	MÉXICO2 (The Mexican Carbon Platform), which forms part of the Mexican Stock Exchange Group and Environmental Defense Fund (EDF) with funding from the World Bank, was established to trade carbon credits for voluntary purposes and for compliance with Mexico's national carbon tax.
Panama	Latin American Stock Exchange (Latinex)	○		Latinex has been working with the Ministry of Environment on the development of a voluntary carbon market in Panama. Verra and Panama have signed MOU to support development of a national carbon market.
Russian Federation	Moscow Exchange (MOEX)	●		In late 2022, the Russian National Commodity Exchange, part of the Moscow Exchange Group, started trading of carbon credits. Carbon units were generated from voluntary climate projects or certified emission reduction units, rather than carbon credits or allowances.
Saudi Arabia	Saudi Exchange (Tadawul)	●		The exchange's parent company, Saudi Tadawul Group, owns 20% of the Saudi Voluntary Carbon Market Company.

Country	Exchange	Exchange involved in: VCM	CCM	Notes
Singapore	Singapore Exchange (SGX)	●		Singapore's Climate Impact X, or CIX, launched in 2021 acts as a global marketplace and exchange for carbon credits (VCM), jointly developed by DBS Bank, Singapore Exchange Group, Standard Chartered, and the Singapore sovereign wealth fund Temasek.
Spain	Bolsas y Mercados Españoles (BME)	●	●	BME, through Iberclear, and ClimateTrade, have developed a Voluntary Registry for carbon and biodiversity inventories that allows companies to offset their carbon footprint through green credits. Trading takes place through ClimateTrade's Marketplace, Iberclear maintains the registry and certifies the transfer and cancellation of carbon credits. Iberclear also maintains the National Registry for Greenhouse Gas Emission Allowances (RENADE).
Switzerland	SIX Swiss Exchange	●		The Spanish BME exchange, which is active in the VCM environment, forms part of the SIX Group. SIX has also carried out its own research on the state of VCMs and the role of financial market infrastructure (FMI) providers.
Türkiye	Borsa İstanbul		○	Borsa Istanbul has been working with the Ministry of Environment Urbanisation and Climate Change on the development of a national ETS. Establishing an Emission Trading System (ETS) in Türkiye is one of the targets defined in the Medium Term Programme (2023-2025) and Türkiye's Green Deal Action Plan.

Country	Exchange	Exchange involved in: VCM	CCM	Notes
United Kingdom	London Stock Exchange (LSE)	●		The London Stock Exchange Voluntary Carbon Market enables funds and operating companies to raise capital for projects that are expected to generate carbon credits. The Voluntary Carbon Market designation will be applied to funds or operating companies that are admitted to Main Market or AIM and which invest in climate change mitigation projects that are expected to yield carbon credits.
United States	CME Group	●	●	CME offers futures and options on EU ETS Allowances, Regional Greenhouse Gas Initiative (RGGI) allowances , California low-carbon fuel standard futures. Its GEO and N-GEO products also offer a broad range of physically settled derivatives contracts based on voluntary carbon offset credits.
United States	ICE – Intercontinental Exchange	●	●	Facilitates trading in a broad range of futures and options contracts on EU ETS Allowances, UK allowances, California carbon allowances (CCAs), California carbon offsets and Regional Greenhouse Gas Initiative (RGGI) allowances. Also offers trading in voluntary carbon products through its Nature Based Solutions carbon credit futures.
United States	Nasdaq	●		Provides carbon credit exchanges with trading technology - e.g. Climate Impact X (CIX)'s spot exchange platform. Nasdaq is also a majority owner of Puro.earth which is an integrated standard setter and registry. The exchange launched commodity reference price indices on the trading of Puro CORCs in 2022

Country	Exchange	Exchange involved in: VCM	CCM	Notes
United States	Cboe Global Markets, Inc.	●		Owns the NEO exchange which is active in the VCM market. Buys credits to offset operational emissions.
United States	New York Stock Exchange (NYSE)		●	KRBN (KraneShares Global Carbon Strategy ETF) trades on the New York Exchange (NYSE) and is the most accessible ETF for investing in carbon markets. This ETF tracks the top traded carbon credit futures contracts and covers a wide range of cap-and-trade carbon allowances. Carbon Fund Advisors also introduced the Carbon Strategy ETF with NYSE Ticker KARB to provide exposure to global compliance carbon markets.
Zimbabwe	Zimbabwe Stock Exchange		○	The Zimbabwean government has released a national carbon credit framework outlining guidance on the carbon markets in the country. Investors will be allowed to list carbon credits on the exchange on the Victoria Falls Stock Exchange (VFEX), which is a subsidiary of the Zimbabwe Stock Exchange ("ZSE"), after approval from the Environment Ministry and admission into the Zimbabwe Carbon Credit Registry.

ANNEX 3: ADVISORY GROUP MEMBERS

The Sustainable Stock Exchanges initiative gratefully acknowledges the valuable inputs to this guidance made by the experts listed here. Note: Advisory Group experts participated in their personal capacity; their professional affiliations are provided for information only. The views expressed in this guidance do not necessarily represent the views of each member of the Advisory Group or the official views of their organizations.

The SSE expresses appreciation to The Egyptian Exchange and Bursa Malaysia for co-chairing the Advisory Group.

Co-Chairs

- Mr Ahmed Abdel Rahman El Sheikh, Executive Chairman, The Egyptian Exchange
- Mr Datuk Muhamad Umar Swift, CEO, Bursa Malaysia

Organization		Name	Job title
AIMS	Mr	Gus Goh	Compliance Manager
Amman Stock Exchange	Ms	Rasha Dayyat	Director of Planning and Institutional Development
Argentina Clearing y Registro S.A.	Mr	Federico Cavestri	Risk & Compliance Intelligence
Athens Exchange Group	Mr	Andreas Daskalakis	Director, New Markets & International Business Development Division
Athens Exchange Group	Mr	Georgios Flemetakis	Business Analyst
Athens Exchange Group	Mr	Nikolaos Porfyris	Chief Post-Trading & International Business Development Officer
B3 - The Brazilian Stock Exchange	Mr	Gabriel Santana do Nascimento	Sustainability Analyst
B3 - The Brazilian Stock Exchange	Mr	Cesar Tarabay Sanches	Head of Sustainability
Bolsa Institucional de Valores (BIVA)	Mr	Alvaro Martinez del Campo	Analyst
Bolsa Institucional de Valores (BIVA)	Mr	Miguel Angel Davalos	Sr. Financial Institutions Business & Relationship Manager
Bolsa Mexicana de Valores (BMV)	Ms	Nalleli Barajas	Deputy Director of Sustainability
Borsa Istanbul	Mr	Abdullah Akgun	Director, Business and Product Development
Borsa Istanbul	Mr	Guzhan Gulay	Executive Vice President
Borsa Istanbul	Mr	Onur Sar	Senior Expert
Borsa Istanbul	Ms	Busra Ozbakir	Assistant Specialist
Borsa Istanbul	Mr	Recep Mutlu	Business Developer
Botswana Stock Exchange (BSE)	Ms	Otsile Pilane	Product Development Specialist
Bourse de Tunis	Mr	Lotfi Khezami	Head Communication
Brazil Securities Commission	Mr	Claudio Maes	Assistant Director
Bulgarian Stock Exchange	Ms	Miglena Dimitrova	Investor Relations Director
Bursa Malaysia Berhad	Mr	Datuk Muhamad Umar Swift	CEO
Bursa Malaysia Berhad	Ms	Wei-nee Chen	Head, Carbon Market
Bursa Malaysia Berhad	Ms	Emilia Tee Yoke Hoong	Director, Group Sustainability

Organization		Name	Job title
Cape Town Stock Exchange	Ms	Tersia Lister	Executive
Capital Markets Board of Türkiye	Ms	Secil Sayin Kutluca	Deputy Head, Strategy Development Department
Cboe Global Markets	Ms	Megan Wadin	ESG Specialist
CDP	Mr	Amir Sokolowski	Global Director, Climate Change
Chittagong Stock Exchange PLC	Mr	Mohammad Shahidullah	Manager
CME Group	Mr	Owain Johnson	Managing Director, Global Head of Research and Product Development
The Egyptian Exchange (EGX)	Mr	Ahmed Salman	Strategic Planning & Sustainability Specialist
The Egyptian Exchange (EGX)	Mr	Ahmed Abdel Rahman El Sheikh	Executive Chairman
EnelSPA	Mr	Gustavo Sanchez	Stakeholder Engagement, Head Sustainability Intelligence
EnelSPA	Mr	Marco Favarato	Innovability Manager
EnelSPA	Ms	Valeria Checchi	Innovability
Gold Standard	Mr	Hugh Salway	Senior Director, Market Development and Partnerships
Greenomy	Mr	Alex Stevens	CEO
Hong Kong Securities and Futures Commission	Ms	Christine Kung	Senior Director, Head of International Affairs & Sustainable Finance
Hong Kong Securities and Futures Commission	Ms	Elaine Ng	Associate Director
Hong Kong Securities and Futures Commission	Ms	Veronica Liu	Senior Secretary
Hong Kong Securities and Futures Commission	Ms	Grace Wong	Manager
Intercontinental Exchange (ICE)	Ms	Brookly McLaughlin	Vice President, ICE Corporate Affairs and Sustainability
Impax Asset Management PLC	Ms	Julie Gorte	SVP for Sustainable Investing
Indonesia Stock Exchange (IDX)	Mr	Ignatius Denny Wicaksono	Head of Business Development Division
Indonesia Stock Exchange (IDX)	Ms	Puspita Pratiwi	Business Development
Indonesia Stock Exchange (IDX)	Mr	Kautsar Primadi Nurahmad	AVP of Product Development
International Organization of Securities Commissions (IOSCO)	Ms	Kris Nathanail	Senior Policy Advisor
International Organization of Securities Commissions (IOSCO)	Ms	Ana Goytia	Policy Advisor
Japan Exchange Group (JPX)	Mr	Yuki Mori	Senior Manager
Johannesburg Stock Exchange (JSE)	Ms	Anelisa Matutu	Head: Commodities / Capital Markets
Korea Exchange (KRX)	Mr	Hwun Choi	Vice President
Latinex	Mr	Angel Blanco	Deputy Manager Strategic Innovation
Latinex	Ms	Lydia Caballero Cadastre	Sustainability & CSR Manager
Luxembourg Stock Exchange (LuxSE)	Ms	Claire Dorrian	Head of Sustainable Finance
London Stock Exchange Group (LSEG)	Mr	Adrian Rimmer	Director, Sustainable Finance
Luxembourg Stock Exchange (LuxSE)	Mr	Carlo Houblie	Commercial Director
Luxembourg Stock Exchange (LuxSE)	Ms	Laetitia Hamon	Head of Sustainable Finance
Luxembourg Stock Exchange (LuxSE)	Ms	Paula Pereira	Head of Listing and Regulatory Affairs
MAP CAPITAL PARTNERS	Mr	Mpho Lechesa	Managing Director
MÉXICO2 at Bolsa Mexicana de Valores (BMV)	Mr	Eduardo Piquero	CEO

Organization		Name	Job title
Mongolian Stock Exchange	Ms	Javkhlan Ivanov	Chief Operating Officer
Muscat Stock Exchange (MSX)	Ms	Majeda Almamari	Senior Head of Sustainable Investment
Nairobi Securities Exchange (NSE)	Ms	Wendy Boit	Senior Corporate Affairs and IR Officer
Nairobi Securities Exchange (NSE)	Ms	Mbithe Muema	Chief Business Officer
Nasdaq	Mr	Fredrik Ekström	Senior VP, Head of European FICC
Nasdaq	Mr	Gerard Smith	Head of Product - Digital Assets & Carbon
Nasdaq	Ms	Nina Eisenman	Vice President Head of Corporate ESG Strategy and Reporting
New Zealand Stock Exchange (NZX)	Mr	Nick Morris	GM, Strategic Delivery
Philippine Stock Exchange (PSE)	Mr	Resurreccion Velarde	Sustainability Specialist
Philippine Stock Exchange (PSE)	Mr	Roel Refran	Chief Operating Officer
Philippine Stock Exchange (PSE)	Ms	Eunice Ostaco	Sustainability Associate
Prague Stock Exchange	Mr	Luboš Mazanec	Regulatory Specialist
RepRisk AG	Ms	Jenny Mathilde Nordby	Head of Strategic Partnerships
Saudi Stock Exchange	Mr	Bandar Al Blehed	Head - Clients Relations Development
Singapore Exchange (SGX)	Ms	Chandni Khosla	SVP - Sustainability and Sustainable Finance
SIX Swiss Exchange	Mr	Maneesh Wadhwa	Senior Business Development Manager Exchanges
SIX Swiss Exchange	Mr	Tobias Lehmann	Senior Product Manager
Sydney Stock Exchange	Mr	George Wang	Executive Director
Sydney Stock Exchange	Mr	Steven Larkins	General Manager
Trove Research	Mr	Ben St. Laurent	Senior Policy Analyst
Trove Research	Mr	Jamie Saunders	Chief Operating Officer
Toronto Stock Exchange	Ms	Valérie Douville	Senior Governance and Compliance Advisor
Ulaanbaatar Securities Exchange	Ms	Davaajargal Magsarjav	Head of Business Development
UNCTAD	Mr	Marco Fugazza	Economic Affairs Officer, DITC
UNECA	Mr	Jean-Marc Kilolo	Economist
UNECA	Mr	Sheng Zhao	Economist
UNECA	Ms	Sonia Essobmadje	Chief: Innovative Finance and Capital Markets Section
UNFCCC	Mr	Carlos Ruiz-Garvia	Project Manager, UN Climate Change Global Innovation Hub
Verra	Mr	Robin Rix	Chief Legal, Policy and Markets Officer
World Federation of Exchanges	Ms	Christine Brentani	Senior Manager and Sustainability Lead
World Federation of Exchanges	Ms	Simrita Lota	ESG Regulatory Affairs Manager

www.sseinitiative.org