COMPLIANCE CARBON MARKETS

July 2024

G2Z

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We strive to simplify the intricacies of decarbonization within a business. Whether clients are struggling to understand the complexities of measuring, communicating and reducing their greenhouse gas emissions, G2Z is well equip to guide them to the right path. By providing all encompassing bespoke solutions we help please stakeholders, gain new customers, access bank financing, and much more.

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About This Report

This report, titled "Compliance Carbon Markets," provides a comprehensive analysis of the key compliance carbon markets operating across the globe. By detailing the structures and outcomes of various systems such as the EU ETS, UK ETS, California Cap-and-Trade, and China's National Carbon Market, the report aims to highlight the effectiveness of these markets in mitigating climate change through regulated carbon emissions.

Designed to offer insights into how these systems reduce greenhouse gas emissions, manage market operations, and contribute to national and international climate goals, this report underscores the importance of strategic carbon management and pricing. It also explores the challenges and opportunities faced by these markets, providing a pathway for future improvements and increased global integration.

Executive Summary

This report provides an in-depth analysis of the major compliance carbon markets operating globally, highlighting their mechanisms, impacts, and future directions. These markets are crucial components of global strategies to mitigate climate change by regulating and pricing carbon emissions.

European Union Emissions Trading System (EU ETS): Established in 2005, the EU ETS is the largest and most significant carbon trading system globally. It operates on a cap-and-trade principle where a cap is set on the total greenhouse gasses that can be emitted by the installations covered, and this cap is reduced over time to ensure total emissions fall. The EU ETS has been successful in reducing emissions within the covered sectors by 41% from 2005 levels by 2020, significantly surpassing its targets.

EU Emissions Trading System 2 (ETS2): Introduced in 2023, ETS2 complements the existing EU ETS by covering additional sectors such as buildings and road transport, which are not extensively covered under the original EU ETS. ETS2 aims to become fully operational by 2027 and is designed to support the EU's broader decarbonization efforts, particularly under the European Green Deal.

UK Emissions Trading Scheme (UK ETS): Launched in 2021 post-Brexit, the UK ETS mirrors the EU ETS structure but functions independently, covering the UK's power generation, heavy industries, and aviation sectors. It aims to contribute significantly to the UK's target of reaching net-zero emissions by 2050.

California Cap-and-Trade Program: This program forms a key part of California's broader strategy to reduce greenhouse gas emissions, covering approximately 85% of the state's emissions. It has proven effective in promoting substantial reductions in GHG emissions while generating significant revenue for reinvestment in green projects.

Quebec Cap-and-Trade System: Linked with California's cap-and-trade system, Quebec's program covers significant sectors like transportation, industry, and buildings. It has effectively helped reduce GHG emissions, aligning with Quebec's ambitious targets for reducing carbon emissions.

Japan Cap-and-Trade System: Japan's system, particularly the Tokyo Cap-and-Trade Program, focuses on large-scale facilities and covers sectors such as industrial and commercial. It has successfully reduced emissions and surpassed its initial targets.

Canada's Carbon Pricing Framework: This comprehensive system includes a minimum national price on carbon pollution, encouraging businesses and individuals to reduce their carbon footprint. The framework aims to ensure all Canadian provinces have a pricing system in place that meets or exceeds the federal standard.

Regional Greenhouse Gas Initiative (RGGI): As the first mandatory market-based GHG reduction program in the U.S., RGGI involves Northeast and Mid-Atlantic states. It focuses on the power sector, setting a regional cap on CO2 emissions that decreases annually.

China's National Carbon Market: Launched in 2021, this market is currently the world's largest carbon market by volume, covering over 40% of China's CO2 emissions. It primarily focuses on the power sector but plans to expand to include more industries.

New Zealand Emissions Trading Scheme (NZ ETS): The New Zealand Emissions Trading Scheme is a cornerstone of New Zealand's strategy to meet its climate change targets. Established in 2008, the NZ ETS covers all sectors of the economy including forestry, energy, industrial processes, and waste. It operates on a cap-and-trade mechanism, allowing businesses to buy and sell emission units in response to caps set by the government.

Korea Emissions Trading Scheme (KETS): South Korea launched its national emissions trading scheme in 2015, making it the first Asian country to implement a nationwide cap-and-trade program. The KETS covers approximately 68% of national greenhouse gas emissions, encompassing over 600 of the country's largest emitters, including power generation, manufacturing industries, and aviation. The scheme has contributed to promoting energy efficiency and technological innovation among covered entities.

Each of these systems plays a pivotal role in their respective jurisdictions but also collectively influences global carbon market dynamics. The report discusses the integration of market-based approaches to foster global cooperation in carbon reduction. Future directions suggest a trend towards expanding these markets and integrating more sectors and greenhouse gasses, aligning with global climate goals and technological advancements.

Introduction

Compliance Carbon Markets (CCMs), also known as Emissions Trading Systems (ETS), are a crucial part of global climate change mitigation efforts. They are regulated markets established by mandatory national, regional, or international carbon reduction regimes, where carbon emitters buy or sell carbon credits based on emissions generated in relation to their allowance limits. These markets play a significant role in achieving the goals set out in international accords like the Kyoto Protocol and the Paris Agreement, which aim to limit global warming and reduce greenhouse gas emissions.

The compliance carbon market is a mandatory market that operates under the principle of "cap-and-trade," where a cap or limit is set on the total amount of specific greenhouse gasses that can be emitted by the installations covered by the system. The cap is reduced over time so that total emissions fall. Compliance markets are designed to establish a carbon price by laws or regulations, which control the supply of allowances that are then distributed to energy-intensive emitters such as iron and steel producers, oil refineries, power generators, airlines, and processing companies.

Compliance carbon markets have experienced significant growth, with a current worth of around $850 billion and forecasts projecting them to exceed $2.5 trillion by 2028. The three major Emissions Trading Systems (ETS) around the world are the European Union's Emissions Trading System (EU), the California Global Warming Solutions Act (USA), and the Chinese National Emission Trading System (China). These systems have been instrumental in shaping compliance markets and reducing greenhouse gas emissions.

CCMs are regulated markets established by governments to achieve specific carbon reduction targets. Participation in these markets is mandatory for companies, governments, and organizations that emit greenhouse gasses above a specified threshold.

On the other hand, Voluntary Carbon Markets (VCMs) are not regulated by governments and participation is entirely optional. VCMs allow businesses, governments, and organizations to voluntarily offset their carbon emissions through various projects or initiatives that reduce or remove greenhouse gasses from the atmosphere. These

markets provide flexibility for participants to choose projects and initiatives that align with their sustainability values and goals.

In this report, we will focus on compliance carbon markets and their role in global climate change mitigation efforts. The following report will cover voluntary carbon markets in detail. By understanding the differences between compliance and voluntary carbon markets, organizations can make informed decisions about which market aligns best with their sustainability strategy and regulatory context.

Historical Context of The Compliance Carbon Markets

The carbon markets under the Kyoto Protocol were established in 1997 with the signing of the Kyoto Protocol, which marked the first international piece of law that articulated an idea of carbon rights and created a market for carbon. The protocol committed certain nations to meet greenhouse gas emissions reduction targets and established a framework for allowance trading across international borders. The protocol entered into force in February 2005, with 37 industrialized signatories, known as Annex-I nations, responsible for reducing emissions by specified targets. If a nation could not meet its target, it could purchase allowances (Assigned Amount Units, or AAUs) from a fellow Annex-I nation or purchase emissions offsets from projects that decrease emissions in other parts of the world.

The Kyoto Protocol established two major mechanisms to offset emissions: the Clean Development Mechanism (CDM) and Joint Implementation (JI). CDM projects, which reduce emissions in developing nations, earn one Certified Emissions Reduction credit (CER) per metric ton of GHG emissions reduction, which may be purchased by nations or firms to meet their obligations under the protocol. JI projects also earn one credit per metric ton of emissions reduction (called Earned Reduction Units, or ERUs) and come primarily from projects in the former Soviet Union. Both project types seek to encourage clean energy investment and learning while allowing Annex-I nations flexibility in meeting their emissions targets.

However, the widespread trading of AAUs has generally not been effective, and the Kyoto Protocol did not lead to a very large number of trades directly among countries. The European Union and a variety of other jurisdictions have established their own emissions trading systems, which have contributed to the growth and expansion of carbon markets. The Kyoto Protocol's international architecture of carbon markets has evolved to feature separate emissions trading systems serving distinct jurisdictions, complemented by a variety of other types of policies alongside the carbon markets

Beginning of Emissions Trading.

The concept of emissions trading, also known as cap and trade or allowance trading, is an innovative approach to reducing pollution that has been successfully used to protect human health and the environment. Emissions trading programs are structured around two key components: a limit or cap on pollution and tradable allowances that correspond to this limit, authorizing holders to emit a specific quantity of the pollutant, typically measured in tons. This system ensures that the environmental objectives are met while providing flexibility for individual emissions sources to determine their compliance strategies within the set limits.

Effectively designed emissions trading programs offer several benefits, including environmental certainty through the established pollution limit, flexibility for emissions sources to customize their compliance approaches, incentives for efficiency and innovation that reduce implementation costs, and the ability to bank surplus allowances, encouraging early pollution reductions. These programs are often referred to as market-based because allowances can be bought and sold in an allowance market, fostering a dynamic and efficient system for emissions reduction.

Emissions trading programs are most effective when environmental or public health concerns span a large geographic area, numerous sources contribute to the pollution issue, and emissions can be accurately measured and monitored. Under the right conditions, emissions trading programs have demonstrated their effectiveness in achieving significant reductions in pollution levels while ensuring accountability, transparency, and low administrative costs.

Types of Emissions Trading Systems

There are three main types of emissions trading systems: baseline-and-credit, rate-based, and cap-and-trade. Baseline-and-credit systems allow companies to earn credits for reducing emissions below a predetermined baseline, rate-based systems set a rate of emissions per unit of output, and cap-and-trade systems set an overall cap on emissions and allow companies to trade emission allowances within that limit.

Auctioning of Allowances vs. Free Allocation

In cap-and-trade systems, allowances can be auctioned to the highest bidder or freely allocated to companies based on certain criteria. Auctioning allows for market-driven price discovery and generates revenue for governments, while free allocation can help protect industries from carbon leakage and maintain international competitiveness.

Cap-and-Trade Systems and Carbon Taxes

Cap-and-trade systems and carbon taxes are two primary mechanisms used to address carbon emissions. Cap-and-trade systems set a limit on emissions and allow companies to trade emission allowances within that limit, while carbon taxes directly set a price on carbon emissions, allowing the market to determine the quantity of emission reductions. Both mechanisms have advantages and disadvantages, with cap-and-trade providing a clear, market-driven cost for a stipulated quantity of emissions reductions, while carbon taxes are easier to administer and more politically palatable for certain sectors.

Key Compliance Carbon Markets Around The World

EU Emissions Trading System

The European Union Emissions Trading System (EU ETS) is a pioneering international emissions trading system that was established in 2005, making it the world's first of its kind. The EU ETS has evolved through different phases, with the current phase being Phase IV (2021-2030). The system is designed to help the EU meet its climate targets by setting emission limits and allowing the trading of emission allowances.

Structure of the EU ETS

- Phase 1 (2005-2007): This initial phase was a pilot period aimed at preparing for Phase 2. It covered CO2 emissions from power generators and energy-intensive industries, with most allowances allocated for free. The penalty for non-compliance was set at €40 per tonne.
- Phase 2 (2008-2012): During this phase, the EU ETS expanded to include new countries and sectors. The cap on allowances was reduced based on actual emissions data, but the economic crisis led to a surplus of allowances and a decrease in carbon prices.
- Phase 3 (2013-2020): Significant changes were made in this phase, including a single EU-wide cap on emissions, auctioning as the default allocation method, and the inclusion of more sectors and gasses. The New Entrants Reserve was also established to fund innovative energy technologies.
- Phase 4 (2021-2030): The cap on emissions continues to decrease annually at an increased annual linear reduction factor of 2.2%. The Union-wide cap for 2021 from stationary installations is fixed at 1,571,583,007 allowances .

Acheivements of the EU ETS

- The EU ETS has successfully reduced emissions covered by the system by 41% compared to 2005 by 2020, surpassing the 2020 target of a 21% reduction.
- Emissions reductions of 24.2% were achieved in the ETS sector in 2015 compared to 2005, showcasing the effectiveness of the system in driving emission reductions.

Challenges of the EU ETS

- Oversupply: The EU ETS has faced challenges related to an accumulated surplus of approximately 1.7 billion allowances in 2016, leading to a decline in CO2 allowance prices. This oversupply has been attributed to factors like the financial and economic crisis and credits from project-based mechanisms.
- Structural Reforms: To address challenges like oversupply, the EU ETS has undergone structural reforms, including the establishment of a Market Stability Reserve (MSR) and cap reductions to restore scarcity and incentivize long-term investments.

Participation

- The industries required to participate in the EU Emissions Trading System (EU ETS) include the following sectors:
- Electricity and heat generation
- Energy-intensive industry sectors such as oil refineries, steel works, and production of iron, aluminum, metals, cement, lime, glass, ceramics, pulp, paper, cardboard, acids, and bulk organic chemicals
- Aviation within the European Economic Area and departing flights to Switzerland and the United Kingdom
- Maritime transport, covering 50% of emissions from voyages starting or ending outside of the EU and 100% of emissions from voyages between two EU ports and when ships are within EU ports
- Production of nitric, adipic, and glyoxylic acids, and glyoxal for nitrous oxide (N2O) emissions
- Production of aluminum for perfluorocarbons (PFCs) emissions

Participation in the EU ETS is mandatory for companies in these sectors, with certain operators above a certain size included, while small installations may be excluded if governments implement alternative measures to reduce their emissions. Additionally, from 2024, installations for the incineration of municipal waste above a certain threshold are also required to monitor and report their emissions in the EU ETS.

ETS 2

The EU Emissions Trading System 2 (ETS2) is a new, separate emissions trading system created in 2023, designed to complement other policies of the European Green Deal in the covered sectors, including buildings, road transport, and additional sectors mainly consisting of small industries not covered by the existing EU ETS. The ETS2 is a 'cap and trade' system that will become fully operational in 2027, with fuel suppliers being required to monitor and report their emissions and surrender sufficient allowances to cover them. The system will cover emissions upstream, with all emission allowances auctioned, and a share of the revenues used to support vulnerable households and micro-enterprises through a dedicated Social Climate Fund (SCF).

The ETS2 is designed to start in an orderly, smooth, and efficient manner, with the implementation timeline shown in Figure 2 of the reference. The system will cover emissions from fuel combustion in buildings, road transport, and additional sectors, bringing about 75% of the bloc's emissions under a pricing scheme. The ETS2 is expected to provide a common ground for pricing emissions in other sectors in the EU and contribute to the bloc's decarbonization efforts. The system will include emissions from the building sector, road transport, and as of now not defined, sectors from 2027 onwards.

The ETS2 is less ambitious compared to the existing EU ETS, with a price cap of 45 EUR/ton, and is not expected to drive decarbonization in the sectors under the system. However, it will provide a common ground for pricing emissions in other sectors in the EU and bring about 75% of the bloc's emissions under a pricing scheme. The system is designed to start in an orderly, smooth, and efficient manner, with the implementation timeline shown in Figure 2 of the reference. The ETS2 is expected to provide a common ground for pricing emissions in other sectors in the EU and contribute to the bloc's decarbonization efforts. The system will include emissions from the building sector, road transport, and as of now not defined, sectors from 2027 onwards.

The ETS2 will complement other policies of the European Green Deal in the covered sectors, helping Member States achieve their emission reduction targets under the Effort Sharing Regulation (ESR). The carbon price set by the ETS2 will provide a market incentive for investments in building renovations and low-emissions mobility. The ETS2 will become fully operational in 2027, with fuel suppliers being required to monitor and report their emissions and surrender sufficient allowances to cover them. The system will cover emissions upstream, with all emission allowances auctioned, and a share of the revenues used to support vulnerable households and micro-enterprises through a dedicated Social Climate Fund (SCF).

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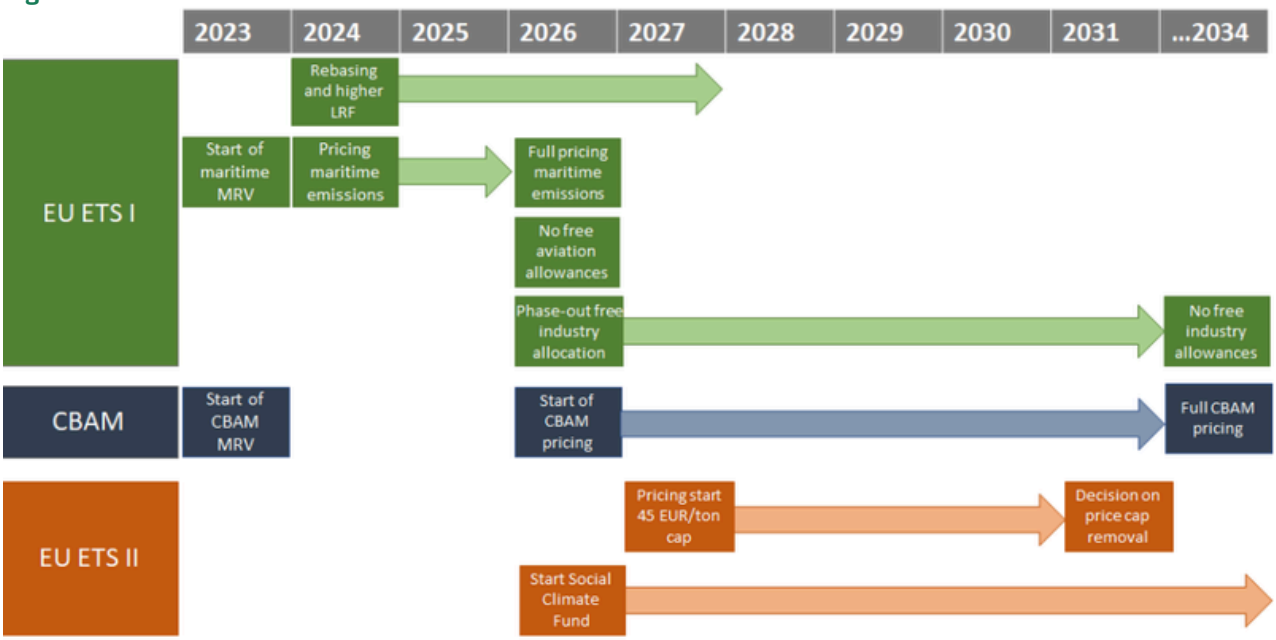
Figure 1: Overview of EU ETS 1 & 2



Source: energypost.eu

UK Emissions Trading Scheme

The UK Emissions Trading Scheme (UK ETS) is a carbon emission trading scheme that came into operation on 1 January 2021 following the UK's departure from the European Union. It is a cap-and-trade system that seeks to reduce greenhouse gas emissions in energy-intensive sectors. The UK ETS has replaced the UK's participation in the EU ETS and covers energy-intensive industries, the power generation sector, and aviation.

The UK ETS operates on the 'cap and trade' principle, where a cap is set on the total amount of certain greenhouse gasses that can be emitted by sectors covered by the scheme. This limits the total amount of carbon that can be emitted and decreases over time, making a significant contribution to meeting the Net Zero 2050 target and other legally binding carbon reduction targets.

The UK ETS applies to energy-intensive industries, the power generation sector, and aviation, covering regulated activities that result in greenhouse gas emissions, including the combustion of fuels in installations with a total rated thermal input exceeding 20MW. The scheme covers UK domestic flights, flights between the UK and Gibraltar, the UK and Switzerland, and flights departing the UK to European Economic Area states conducted by all included aircraft, regardless of nationality.

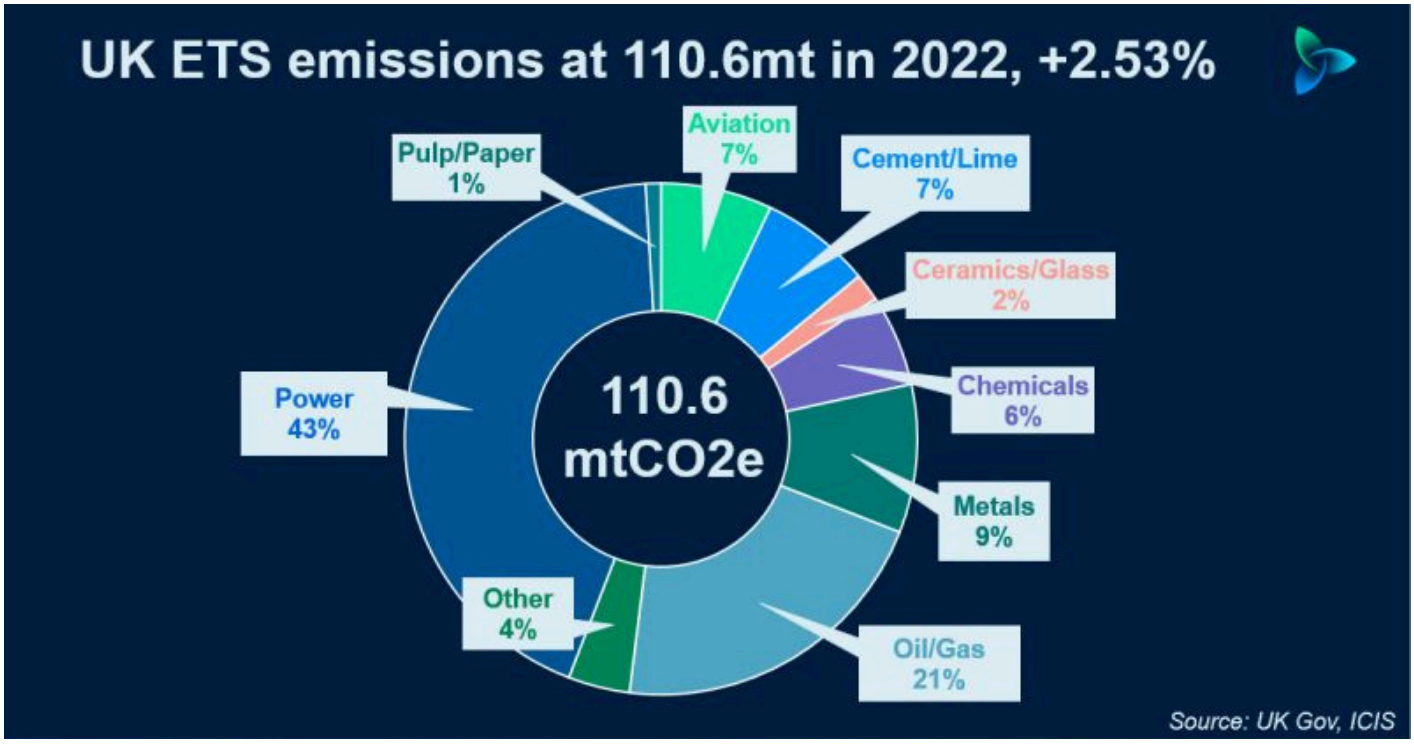
Participants in the UK ETS receive free allowances and/or buy emission allowances at auction or on the secondary market, which they can use to cover their reportable emissions. Each year, installations and aircraft operators covered by the scheme must surrender allowances to cover their reportable emissions, and the cap is reduced over time, leading to a decrease in total emissions.

The UK ETS is managed by the UK ETS Authority, which consists of the UK Government, Scottish Government, Welsh Government, and Department of Agriculture, Environment and Rural Affairs for Northern Ireland. The fine for exceeding allowances is £100 per tonne.

The UK ETS is designed to increase the climate ambition of the UK's carbon pricing policy, and many of its features and processes will be familiar to operators. It is expected to play a crucial role in achieving the UK's net-zero emissions goals by providing economic incentives for emission reductions and fostering innovation in sustainable technologies

Participation

The industries that are required to participate in the UK Emissions Trading Scheme (UK ETS) include energy-intensive industries, the power generation sector, and aviation. These sectors are covered by the scheme, which sets a cap on the total amount of certain greenhouse gasses that can be emitted, aiming to limit carbon emissions and contribute to meeting the UK's Net Zero 2050 target and other legally binding carbon reduction goals. Additionally, the UK ETS applies to regulated activities that result in greenhouse gas emissions, such as the combustion of fuels in installations with a total rated thermal input exceeding 20MW



Source: UK Gov

California Cap-and-Trade Program

The California Cap and Trade Program is a key element of California's strategy to reduce greenhouse gas (GHG) emissions, covering approximately 80 percent of the state's GHG emissions. The program establishes a declining limit on major sources of GHG emissions throughout California and creates a powerful economic incentive for significant investment in cleaner, more efficient technologies.

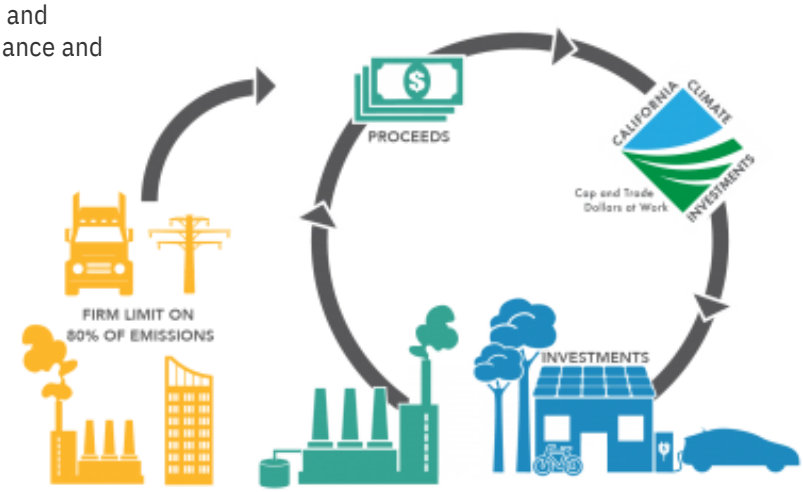
The California Cap and Trade Program operates in 10 steps:

- Decide the scope: The program initially covered industrial and electricity sectors, then expanded to transportation fuels and natural gas, bringing about 85% of state emissions under the cap.
- Set the cap: The California Legislature set the first climate target of 1990 emissions levels by 2020.
- Distribute allowances: CARB creates allowances equal to the total amount of permissible emissions, with one allowance equaling one metric ton of carbon dioxide equivalent emissions.
- Consider the use of offsets: Offsets can be used to meet up to 8 percent of a covered entity's compliance obligation in certain years.
- Decide on temporal flexibility: California allows entities to bank or borrow allowances within certain limits, providing flexibility to manage compliance obligations over time.
- Address price predictability and cost containment: An increasing annual auction reserve (or floor) price for allowances and the reduction in annual allowances creates a steady and sustained carbon price signal.
- Ensure compliance and oversight: Covered entities are subject to existing air quality permit limits for criteria and toxic air pollutants, and CARB conducts audits and investigations to ensure compliance.
- Engage stakeholders, communicate and build capacities: CARB holds stakeholder workshops and provides guidance and forms to support compliance and understanding of the program.
- Consider linking: The California Cap and Trade Program is linked with the Canadian province of Quebec's cap-and-trade system through the Western Climate Initiative.
- Implement, evaluate and improve: Regular evaluations and adjustments are made to ensure the program effectively meets its goals, such as the extension of the program to 2030 with design changes like a price ceiling, price containment points, and additional limits to offset credits.

Since the program commenced, it has generated over $5 billion in total revenue, with 35 percent of the revenues required by law to be directed to environmentally disadvantaged and low-income communities. Statewide greenhouse gas emissions decreased 5.3 percent from the start of the program in 2013 to 2017, with at least some of this reduction likely attributed to California's cap-and-trade program

Participation

The California cap-and-trade program covers industries that have one or more of the following processes or operations: large industrial facilities (including cement, glass, hydrogen, iron and steel, lead, lime manufacturing, nitric acid, petroleum and natural gas systems, petroleum refining, and pulp and paper manufacturing, including cogeneration facilities co-owned/operated at any of these facilities); electricity generation; electricity imports; other stationary combustion; and CO2 suppliers. The program covers about 450 entities that emit at least 25,000 metric tons of CO2 equivalent annually, accounting for approximately 85% of the California economy.



Source: California Globe

Quebec Cap-and-Trade System

Québec

The Quebec Cap and Trade System for Greenhouse Gas Emissions Allowances is a key component of Quebec's climate action plan, spanning the years 2013 to 2020. The system was established in 2009 to limit emissions and encourage energy savings, as well as growing shares of renewables in the consumption of the highest emitting sectors: transportation, industry, and buildings. The system covers businesses that emit 25,000 metric tons or more of CO2 equivalent per year, initially applying to the industrial and electricity sectors in the first compliance period (2013-2014) and expanding to include fossil fuel distributors in the second compliance period (2015-2017) and beyond. The system is open to individuals and other entities that wish to participate in the carbon market, even if there is no regulatory obligation for them to do so.

The Quebec Cap and Trade System is linked with California's, improving market liquidity. The system covers fuel combustion emissions in the power, buildings, transport, and industrial sectors, as well as industrial process emissions, with covered entities required to surrender allowances for all their covered emissions. Most emission units are auctioned, with a portion freely allocated to emissions-intensive, trade-exposed (EITE) sectors and to electricity producers with fixed-price sales contracts concluded before the announcement of the system. Covered entities can also cover a part of their GHG emissions by using offset credits.

The system has been effective in reducing GHG emissions, with Quebec achieving a 10.9% reduction in emissions from 1990 levels by 2016, despite a 19.5% increase in economic activity over the same period. The system is a central tool in reaching Quebec's GHG reduction targets: a 20% reduction from 1990 levels by 2020, a 37.5% reduction by 2030, and an 80-95% reduction by 2050. The system provides flexibility to emitters with respect to the means of complying, thereby reducing overall mitigation costs.

Participation

In Quebec's cap-and-trade system, the industries required to participate are those that emit 25,000 metric tons or more of CO2 equivalent per year. This includes sectors such as transportation, industry, and building, with specific sectors like aluminum, lime, cement, chemical and petro-chemical industry, metallurgy, mining and pelletizing, pulp and paper, and petroleum refining. The system covers fuel combustion emissions in the power, buildings, transport, and industrial sectors, as well as industrial process emissions. Covered entities must surrender allowances for all their covered emissions, with most emission units auctioned and a portion freely allocated to emissions-intensive, trade-exposed (EITE) sectors and to electricity producers with fixed-price sales contracts concluded before the announcement of the system.

Tokyo Cap-and-Trade Program

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Japan's cap-and-trade system is primarily represented by the Tokyo Cap-and-Trade Program, which is Japan's first mandatory emissions trading scheme. The program was launched in April 2010 as part of Tokyo's climate change strategy, with the aim of reducing greenhouse gas emissions in the city. The program covers large-scale facilities in Tokyo that emit 25,000 metric tons or more of CO2 equivalent per year, including those in the industrial and commercial sectors. The system is designed to cover about 20% of Japan's total emissions.

The Tokyo Cap-and-Trade Program operates on a mandatory basis for covered facilities, with a compliance period of three years. The first compliance period was from 2010 to 2014, the second from 2015 to 2017, and the third from 2018 to 2020. The program uses a cap-and-trade system, where a cap is set on the total amount of CO2 emissions allowed, and facilities are required to hold enough allowances to cover their emissions. Allowances are allocated for free to facilities based on a combination of grandparenting and benchmarking methods. Offsets and credits from domestic sources are also accepted.

The system has been successful in reducing emissions, with facilities achieving a 24% reduction in emissions compared to base year emissions during the four years from 2010 to 2014, as seen in figure 2 below. By February 2015, over 90% of covered facilities had surpassed their reduction targets for the first compliance period, and 69% of facilities had exceeded their targets. The program has also received recognition from international organizations, such as the City Climate Leadership Awards and the Most Groundbreaking Policy Award from the World Green Building Council.

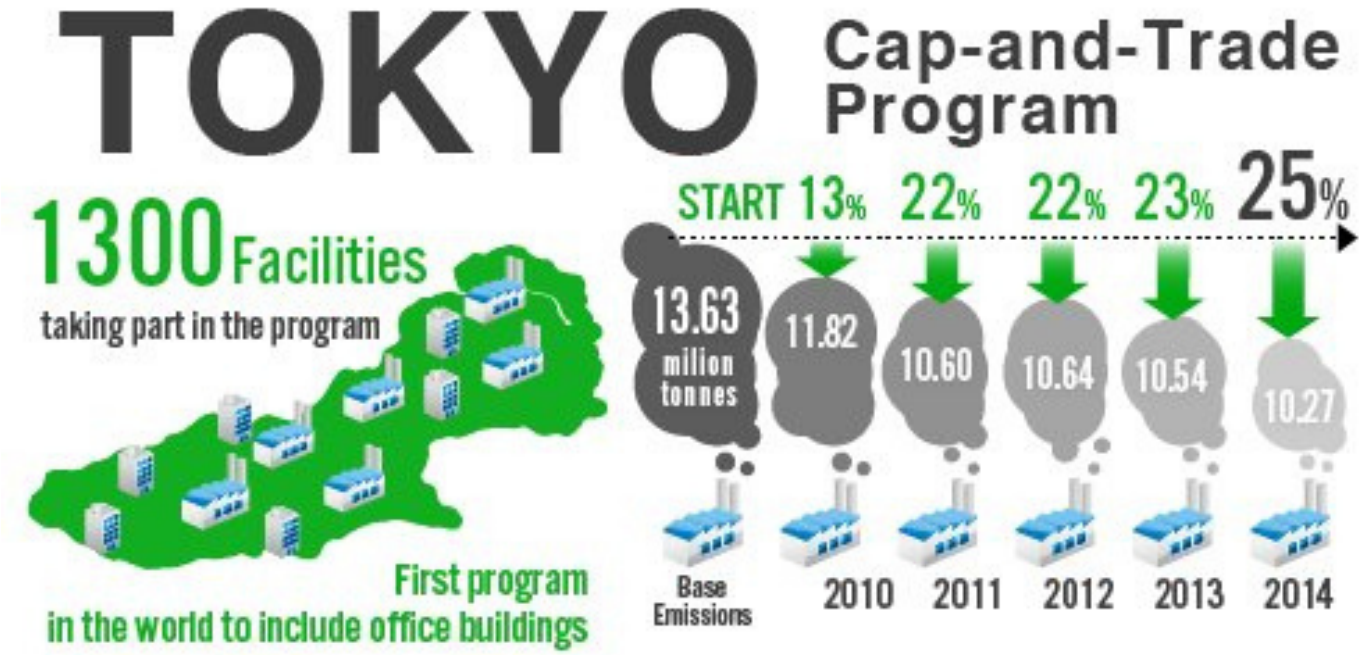
Stakeholder engagement has been a crucial factor in the success of the Tokyo Cap-and-Trade Program. The Tokyo Metropolitan Government (TMG) has actively engaged with stakeholders, including financial institutions, the Tokyo Stock Exchange, and the business community, to tailor the ETS to individual companies' needs and build confidence among ETS participants. The TMG remains committed to executing the ETS and reducing emissions, although efforts to implement a national ETS in Japan have been postponed.

In addition to the Tokyo Cap-and-Trade Program, Japan was set to launch a nationwide emissions trading system (ETS) in April 2023, involving voluntary participation from companies for an initial three-year period. This system will cover Scope 1 greenhouse gas emissions in Japan and will allow companies to trade their GHG reductions that are in excess of the country's Nationally Determined Contribution (NDC). The J-Credit Scheme is expected to be a key source of carbon credits traded in the ETS.

Participation

The Japan cap and trade system, specifically the Tokyo Cap-and-Trade Program, covers large commercial and industrial buildings that consume more than 1,500kL (crude oil equivalent) of energy per year. These facilities account for 20% of Tokyo's total emissions and are required to reduce their emissions by 6-8% in the first compliance period (2010-2014), 15-17% in the second period (2015-2019), and a target for the third period (2020-2022) is yet to be defined. The program applies to about 1,300 facilities, including 1,000 office buildings, public buildings, and commercial facilities in the commercial sector, and about 300 factories and other facilities in the industrial sector

Figure 2: Overview of THe Tokyo Cap-and-Trade Program



Source: Tokyo Gov

Canada’s Carbon Pricing Framework

Government of Canada

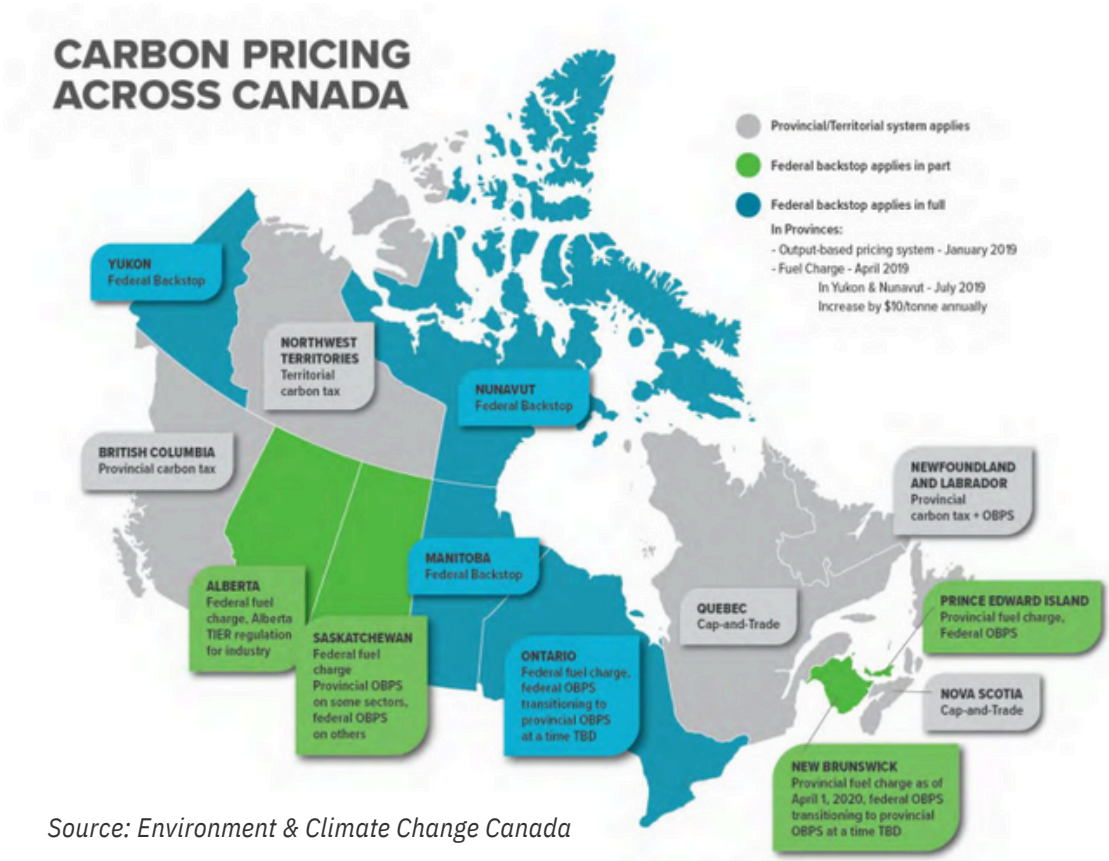
Canada's Carbon Pricing Framework is a significant component of the country's climate policy, aiming to reduce greenhouse gas emissions and incentivize the transition to a low-carbon economy. The framework consists of a set of provincial carbon pricing systems under the pan-Canadian framework, with a minimum national price on carbon pollution set at $65 per tonne of GHG emissions in 2023. This pricing structure is designed to internalize the cost of pollution along the entire value chain of goods and services production, encouraging individuals and businesses to shift towards cleaner practices.

Canada's Carbon Pricing Framework is compared internationally to other jurisdictions with carbon pricing mechanisms. According to the World Bank, 45 national jurisdictions, including Canada, have implemented carbon pricing or emissions trading systems (ETS). Canada is noted to have one of the highest posted carbon prices globally, comparable to countries like Sweden, Switzerland, Finland, and Norway. However, the effectiveness and stringency of carbon pricing frameworks vary due to differences in economic structures, fuel consumption patterns, and revenue utilization strategies among jurisdictions.

The framework also includes considerations for clean electricity regulations, aiming to achieve a net-zero electricity system and reduce GHG emissions from electricity production. It encourages the adoption of clean technologies, energy efficiency measures, and non-emitting generating technologies like solar, wind, hydro, and nuclear power, among others. The regulations are part of a suite of federal measures to transition Canada's electricity sector towards cleaner energy sources and support the country's climate targets

Participation

In Canada, the carbon pricing framework applies to industries that emit greenhouse gasses. The framework is implemented either as a regulatory fee or tax on the carbon content of fuels at the territorial or federal level. Provinces and territories are allowed to create their own system of carbon pricing as long as they comply with the minimum requirements set by the federal government. The federal minimum tax is set at CA$65 per tonne of CO2 equivalent, set to increase to CA$170 in 2030. In the absence of a provincial system, or in provinces and territories whose carbon pricing system does not meet federal requirements, a regulatory fee is implemented by the federal Greenhouse Gas Pollution Pricing Act (GHGPPA). In provinces where the fee is levied, 90% of the revenues are returned to tax-payers. The carbon tax is levied because of a need to combat climate change, which resulted in Federal commitments to the Paris Agreement. The introduction of the tax was met with political resistance, mainly by the Conservative Party of Canada, but legal challenges to the law failed in March 2021 when the Supreme Court of Canada ruled in favor of the GHGPPA.



Source: Environment & Climate Change Canada

Regional Greenhouse Gas Initiative

RGGI Inc.

The Regional Greenhouse Gas Initiative (RGGI) is a cooperative effort by ten Northeast and Mid-Atlantic states to limit greenhouse gas emissions, specifically carbon dioxide (CO2) emissions from the power sector. Established in 2005, RGGI is the first mandatory, market-based CO2 emissions reduction program in the United States. The participating states are Connecticut, Delaware, Maine, Maryland, Massachusetts, New Hampshire, New York, Rhode Island, and Vermont.

RGGI operates under a cap-and-trade system, where a multi-state CO2 emissions budget (cap) is established and gradually decreases over time, leading to a 10% reduction in the cap by 2018 compared to 2009 levels. CO2 emissions allowances are sold and traded, with the proceeds from auctions supporting low-carbon-intensity solutions, including energy efficiency and clean renewable energy projects.

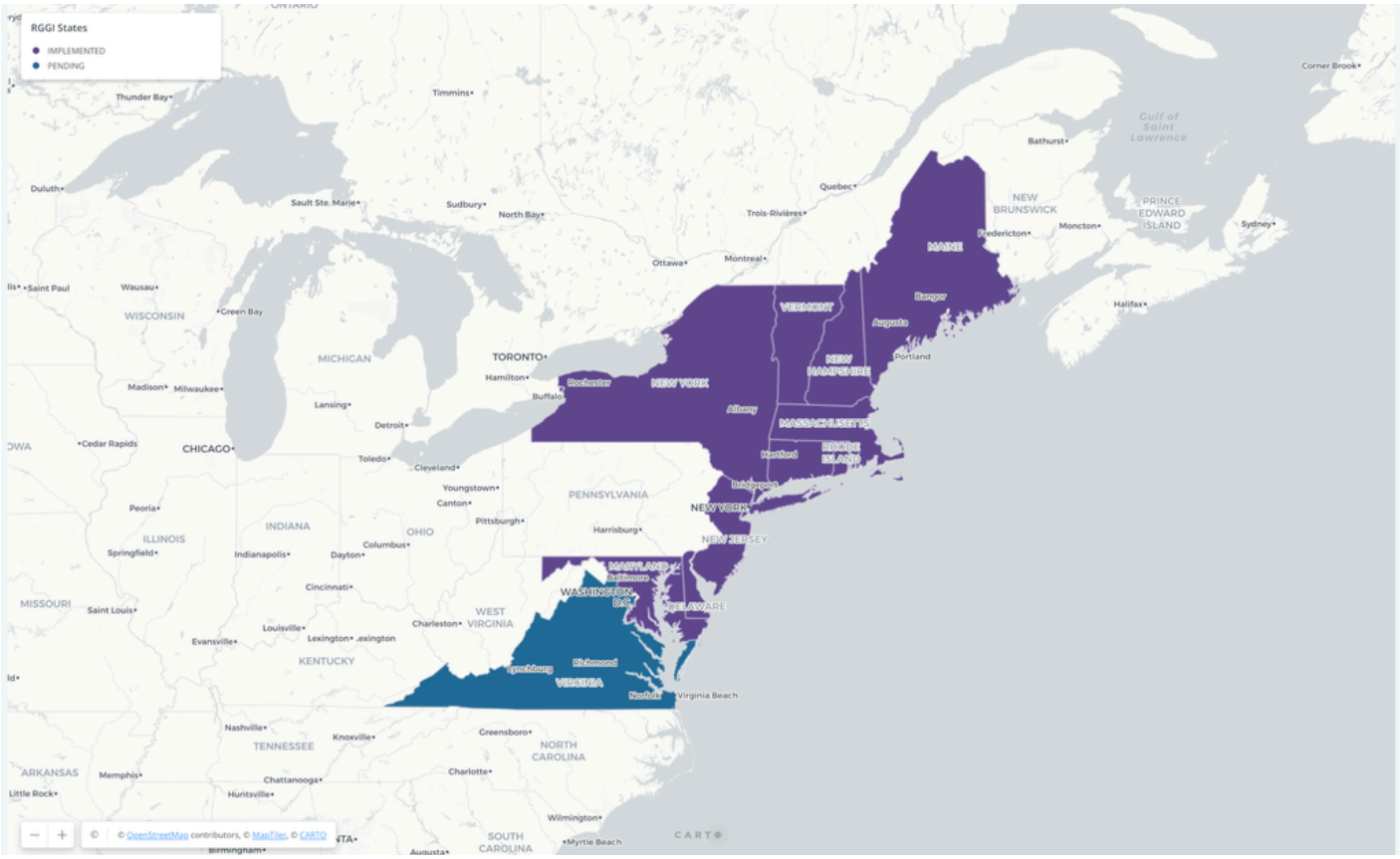
RGGI has been successful in reducing CO2 emissions from the power sector, with a 47% reduction in emissions from 2005 to 2017 in the participating states. The program has also provided a training ground for personnel from multiple states and various professions to develop expertise in emissions trading, which could be useful if a federal system were developed.

In addition to its direct impact on CO2 emissions, RGGI has indirectly influenced the development of a Regional Low Carbon Fuel Standard (LCFS) and other alternative fuel initiatives, such as the establishment of an electric vehicle (EV) corridor demonstration project.

Challenges facing RGGI include the development of a governance structure involving states not participating in RGGI's cap-and-trade program, such as Pennsylvania, and engaging transportation agency heads currently not serving on the RGGI Board of Directors. External communication of the intent for affiliation with RGGI is also a challenge

Participation

The Regional Greenhouse Gas Initiative (RGGI) is a cooperative effort among ten Northeast and Mid-Atlantic states in the U.S. to cap and reduce carbon dioxide emissions from the power sector. The industries required to participate in the RGGI are power plants that generate 25 megawatts or more of electricity. These power plants are mandated to hold allowances for each ton of CO2 they emit, with the overall goal of reducing greenhouse gas emissions from the power sector.



Source: Center for Climate & Energy Solutions

New Zealand Emissions Trading Scheme

Ministry for the Environment
Manatū Mō Te Taiao

The New Zealand Emissions Trading Scheme (NZ ETS) is the country's primary tool for reducing greenhouse gas emissions. Established in 2008, the NZ ETS covers emissions from energy, industrial processes, waste, and agriculture sectors, making it one of the most comprehensive emissions trading schemes in the world.

The NZ ETS operates on a cap-and-trade system, where a cap is set on the total amount of greenhouse gasses that can be emitted, and participants can trade emission units to meet their obligations. The scheme covers around 50% of New Zealand's total greenhouse gas emissions, with the power, industrial, and transport sectors being the largest contributors.

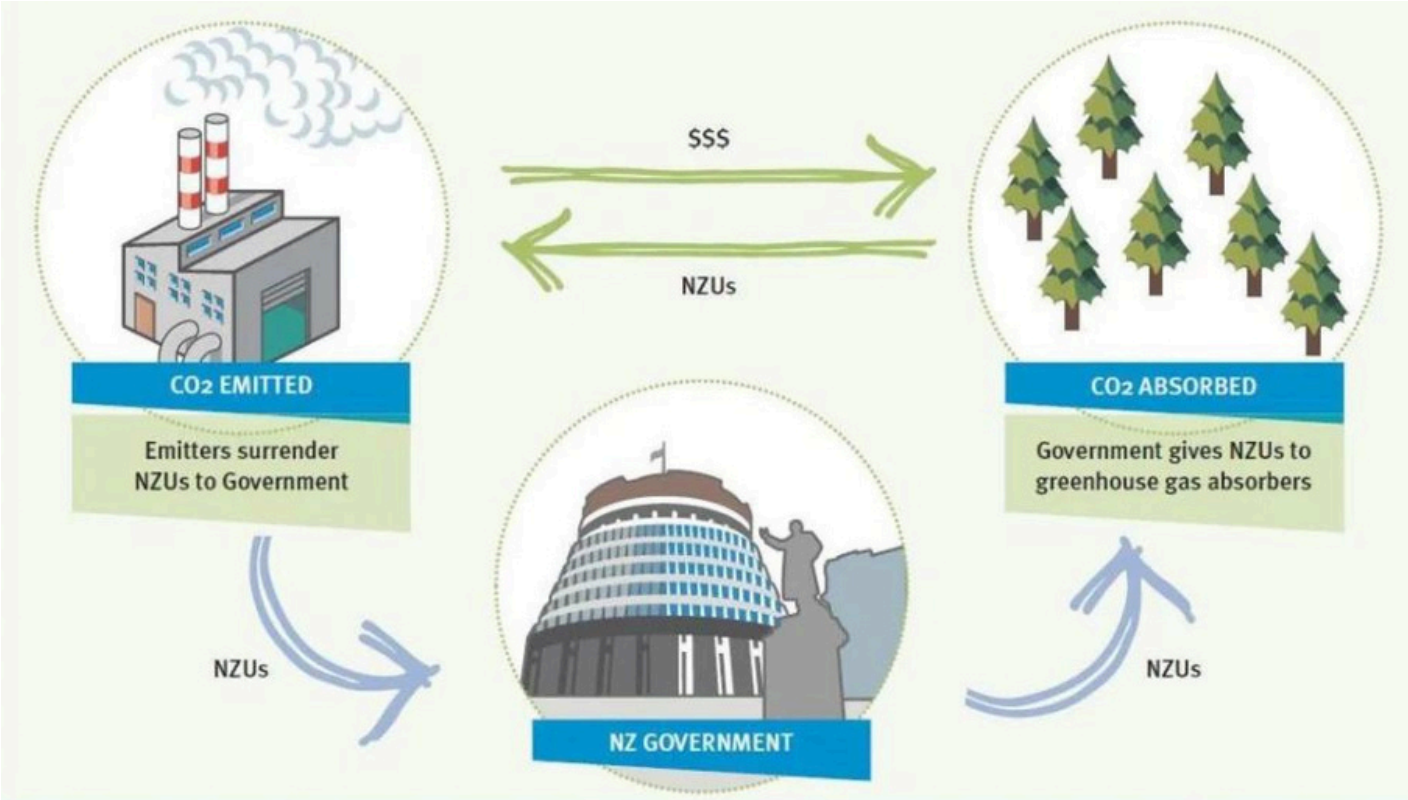
The NZ ETS has undergone several reforms since its inception, with the most recent one in 2020 introducing a split-gas approach, where separate caps are set for different greenhouse gasses. The government has also announced its intention to phase out free allocation of emission units to certain sectors, including agriculture, by 2025.

The NZ ETS is administered by the Ministry for the Environment, which sets the caps, allocates emission units, and enforces regulations. Participants in the scheme are required to surrender emission units equivalent to their emissions, with the option to purchase additional units from other participants or the government.

The NZ ETS has faced criticism for its limited impact on reducing emissions, with some stakeholders calling for more stringent caps and the phasing out of free allocation of emission units. However, the scheme has also been praised for its comprehensive coverage of emissions sources and its potential to drive innovation and investment in low-carbon technologies.

Participation

The New Zealand Emissions Trading Scheme (NZ ETS) is an all-gasses, partial-coverage, uncapped domestic emissions trading scheme that features price floors and free allocation of emission units. Participants in the NZ ETS include emitters from sectors such as energy, industrial processes, waste, and agriculture, with free allocation of units varying between sectors. The commercial fishery sector, which is not a participant, received a one-off free allocation of units on a historic basis. Owners of pre-1990 forests received a fixed free allocation of units, and free allocation to emissions-intensive industry is provided on an output-intensity basis. The NZ ETS was first legislated in the Climate Change Response (Emissions Trading) Amendment Act 2008 and became operational in 2008, with auctions of units commencing in 2020. The NZ ETS has undergone several reviews and amendments since its inception, with the most recent one in 2020 introducing rules for emissions budgets and auctions of units within price caps.



Source: RNZ

Korea Emissions Trading Scheme

환경부

The Korea Emissions Trading Scheme (K-ETS) was launched in 2015 as East Asia's first nationwide, mandatory emissions trading system, covering around 89% of South Korea's national greenhouse gas emissions. The K-ETS plays a crucial role in helping South Korea achieve its emission reduction targets, including a 40% reduction by 2030 and the goal of carbon neutrality by 2050.

The K-ETS was established by the "Framework Act on Low Carbon, Green Growth" in 2010, preceded by a mandatory Target Management System (TMS) launched in 2012 after a two-year pilot phase. The TMS facilitated the collection of verified emissions data and training in the Measurement, Reporting, and Verification (MRV) process, still applying to smaller entities not covered by the K-ETS.

In September 2023, the South Korean government introduced new rules to increase liquidity in the K-ETS, focusing on facilitating market participation, banking, and reducing price volatility. These reforms include measures to increase incentives for emissions reduction, mitigate price volatility, revise guidelines for verifying offset credits, and introduce market stabilization measures.

The K-ETS allows for offset credits for up to 5% of compliance obligations, along with mechanisms like banking and borrowing to enhance flexibility for covered entities. The scheme aims to stabilize the market, provide incentives for low-carbon investments, and promote emissions reductions across sectors.

The K-ETS is set to introduce new measures to stimulate market participation, diversify financial products, and strengthen trading foundations. These initiatives include the introduction of consignment transactions, the opening of a derivatives market, and the relaxation of carry-over standards to enhance market stability and encourage low-carbon investments.

Participation

Participants in the Korean Emissions Trading Scheme (K-ETS) include a wide range of entities from various sectors, covering around 89% of South Korea's national greenhouse gas emissions. The scheme encompasses 804 of the country's largest emitters in sectors such as power, industrial processes, buildings, waste, transport, domestic aviation, and domestic maritime transportation. Covered entities in the K-ETS are required to surrender allowances for all their covered emissions, with allocation done through auctions or free distribution. At least 10% of allowances must be auctioned, and free allocation is provided for emissions-intensive, trade-exposed (EITE) sectors based on production cost and trade intensity benchmarks. Additionally, since 2021, domestic financial intermediaries and other third parties have been able to participate in the exchange within the K-ETS.

Source: Center for Climate & Energy Solutions

China’s National Carbon Market

中华人民共和国
环境保护部
Ministry of Environmental Protection
The People’s Republic of China

China's national carbon market, launched in July 2021, is a significant policy instrument to achieve the country's climate ambition. It covers more than four billion tonnes of CO2 from the power sector, which accounts for approximately 40% of national emissions. The market is expected to be further developed over time, potentially expanding to include other industry sectors and introducing additional trading instruments such as carbon derivatives.

The market has been designed to raise companies' awareness of reducing emissions and lower their emissions intensity, with the power sector being the first to face direct costs for their CO2 emissions. The carbon market has begun to weigh on companies' investment decisions, with over 70% of survey respondents expecting at least a moderate impact by 2025.

In its first year of operation, the market traded a total of 412.05 million tonnes of allowances, including those on regional pilot schemes and domestic offsets known as CCERs. The carbon emissions allowances closed the year at 54.22 yuan (US$8.52) per tonne, up 13% on the opening price of 16 July.

In 2022, the market is expected to expand in scope, with sectors like cement and non-ferrous metals likely to be brought in, possibly including their 2022 emissions. The Interim Regulations for the Management of Carbon Emissions Trading are also expected to be introduced, providing a legal framework for the operation of China's carbon emissions trading market.

China aims to peak carbon dioxide emissions by 2030 and achieve carbon neutrality by 2060, with the national carbon market playing a crucial role in achieving these targets. The market is expected to systematize and institutionalize carbon reduction, further advancing the work on carbon peaking and carbon neutrality.

Participation

The China National Carbon Market covers the electricity sector and its 2,200-plus large firms that account for 40 percent of China's total carbon emissions. Once fully implemented, the market will also cover large firms in seven additional sectors: petroleum refining, chemicals, non-ferrous metal processing, building materials, iron and steel, pulp and paper, and aviation. The market is designed to cap and reduce carbon dioxide emissions from these sectors.

Source: Caixin Global

Challenges & Future Direction

Market Volatility

Compliance carbon markets face challenges related to market volatility, influenced by factors like regulatory changes, political decisions, and market conjectures. Price uncertainties can impact the stability and effectiveness of these markets, requiring mechanisms to manage fluctuations and ensure a predictable pricing environment.

Potential Expansion

The future of compliance carbon markets involves the potential expansion of existing markets and the development of new ones. As more countries commit to net-zero emissions targets, there is a growing need to scale up carbon markets globally, creating opportunities for market growth and collaboration across regions.

Regulatory Challenges

Regulatory challenges pose a significant hurdle for compliance carbon markets, as changes in emission targets, market mechanisms, and policies can impact market dynamics. Additionally, the risk of carbon leakage, where industries relocate to regions with less stringent regulations, poses a threat to global emission reduction efforts and necessitates robust regulatory frameworks.

Integration of Technology

Innovations in market mechanisms and the integration of technology, such as blockchain for transparency, are essential for enhancing the efficiency and credibility of compliance carbon markets. Leveraging technological advancements can improve data accuracy, streamline trading processes, and increase market transparency.

Addressing Criticisms

Critics often raise concerns about the equity and effectiveness of compliance carbon markets. Ensuring fairness in the distribution of emission allowances and addressing disparities in compliance costs among industries are crucial aspects that need to be addressed to enhance the credibility and impact of these markets.

Role in Achieving Net-Zero

Compliance carbon markets play a crucial role in supporting the transition to a low-carbon economy and achieving net-zero emissions goals. By providing economic incentives for emission reductions, fostering innovation in sustainable technologies, and offering flexibility in compliance options, these markets contribute to the global effort to combat climate change. Collaborative efforts among stakeholders, enhanced regulatory frameworks, and continuous innovation will be key to ensuring the effectiveness and sustainability of compliance carbon markets in the journey towards a decarbonized future.

Conclusion

The analysis presented in this report underscores the critical role that compliance carbon markets play in the global effort to mitigate climate change. As demonstrated through diverse examples from the European Union to China, these systems are pivotal in setting a price on carbon and reducing greenhouse gas emissions in a structured and effective manner.

The success of systems like the EU ETS, UK ETS, and California's Cap-and-Trade program illustrates the potential of cap-and-trade mechanisms to drive significant reductions in carbon emissions while fostering economic incentives for innovations in green technology. Additionally, the expansion of these systems into new sectors and the introduction of newer programs like China's National Carbon Market show the evolving nature of carbon markets and their increasing relevance in addressing the complexities of global warming.

Despite these successes, the report also highlights the challenges faced by these markets, such as ensuring comprehensive coverage across all significant sources of emissions, maintaining market integrity, and managing the socio-economic impacts of transitioning to a low-carbon economy. Moreover, the integration of global markets through initiatives like the linkage between California and Quebec's systems points towards a future where global carbon pricing mechanisms might become more unified, providing a more coherent and impactful approach to climate governance.

As the world continues to seek effective solutions to climate change, the role of compliance carbon markets is likely to expand and become more integrated into national and international policy frameworks. Their ability to adapt and scale will be crucial in meeting the ambitious climate targets set by governments worldwide.

Sources

1. Alexander, A. (n.d.). Strategies for Linking Carbon Markets: Lessons from International Cooperation. Retrieved from https://www.cepal.org/sites/default/files/presentations/alexander_handke.pdf
2. Analysis Group. (2018, April). The Regional Greenhouse Gas Initiative: Performance, Potential, and Design Recommendations. Retrieved from https://www.analysisgroup.com/globalassets/uploadedfiles/content/insights/publishing/analysis_group_rggi_report_april_2018.pdf
3. Arbonics. (n.d.). A Little History of the Voluntary Carbon Market. Retrieved from https://www.arbonics.com/knowledge-hub/a-little-history-of-the-voluntary-carbon-market
4. California Air Resources Board. (n.d.). About Cap-and-Trade. Retrieved from https://ww2.arb.ca.gov/our-work/programs/cap-and-trade-program/about
5. California Air Resources Board. (n.d.). Program Linkage. Retrieved from https://ww2.arb.ca.gov/our-work/programs/cap-and-trade-program/program-linkage
6. Canada.ca. (n.d.). Proposed frame for clean electricity regulations. Retrieved from https://www.canada.ca/en/environment-climate-change/services/canadian-environmental-protection-act-registry/publications/proposed-frame-clean-electricity-regulations.html
7. Carbon Clean. (n.d.). Canada. Retrieved from https://www.carbonclean.com/policies/canada
8. CarbonCredits.com. (n.d.). A Guide to Compliance Carbon Credit Markets. Retrieved from https://carboncredits.com/a-guide-to-compliance-carbon-credit-markets/
9. Center for Climate and Energy Solutions. (n.d.). California Cap and Trade. Retrieved from https://www.c2es.org/content/california-cap-and-trade/
10. Center for Climate and Energy Solutions. (n.d.). Summary of California's Extension of its Cap-and-Trade Program. Retrieved from https://www.c2es.org/document/summary-of-californias-extension-of-its-cap-and-trade-program/
11. Centre for Public Impact. (n.d.). Cap and Trade System. Retrieved from https://www.centreforpublicimpact.org/case-study/cap-and-trade-system
12. Centre for Public Impact. (n.d.). Cap and Trade: Mandatory Emissions Trading in Tokyo. Retrieved from https://www.centreforpublicimpact.org/case-study/cap-and-trade-mandatory-emissions-trading-in-tokyo
13. CEPR. (n.d.). Collapse of the Clean Development Mechanism Scheme Under the Kyoto Protocol and Its Spillover. Retrieved from https://cepr.org/voxeu/columns/collapse-clean-development-mechanism-scheme-under-kyoto-protocol-and-its-spillover
14. China Dialogue. (n.d.). The first year of China’s national carbon market reviewed. Retrieved from https://chinadialogue.net/en/climate/the-first-year-of-chinas-national-carbon-market-reviewed/
15. Choosy Technology AS. (n.d.). Compliance Carbon Markets vs. Voluntary Carbon Markets. Retrieved from https://www.chooose.today/insights/compliance-carbon-markets-vs-voluntary-carbon-markets
16. Concur. (n.d.). Compliance vs. Voluntary Carbon Markets: Which One Is Right for Your Business? Retrieved from https://www.concur.co.uk/blog/article/compliance-vs-voluntary-carbon-markets-which-one-is-right-for-your-business
17. Congressional Research Service. (n.d.). Carbon Markets: A Primer. Retrieved from https://sgp.fas.org/crs/misc/R41836.pdf
18. Corporate Finance Institute. (n.d.). Carbon Markets: An Overview. Retrieved from https://corporatefinanceinstitute.com/resources/esg/carbon-markets/
19. Darcy Partners. (n.d.). Voluntary vs. Compliance Carbon Markets. Retrieved from https://darcypartners.com/research/voluntary-vs-compliance-carbon-markets
20. Decode6. (n.d.). Differences Between Voluntary and Compliance Markets. Retrieved from https://decode6.org/articles/differences-between-voluntary-and-compliance-markets/
21. Deloitte. (n.d.). Understanding the Compliance and Voluntary Carbon Trading Markets. Retrieved from https://www2.deloitte.com/uk/en/blog/net-zero/2023/understanding-the-compliance-and-voluntary-carbon-trading-markets.html
22. Dentons. (2023, October 2). Understanding Quebec's Cap-and-Trade System for Carbon. Retrieved from https://www.dentons.com/en/insights/articles/2023/october/2/understanding-quebecs-cap-and-trade-system-for-carbon
23. E.ON SE. (n.d.). Compliance vs. Voluntary Carbon Markets Explained. Retrieved from https://www.eon.com/en/innovation/future-of-energy/energy-and-beyond/compliance-vs-voluntary-carbon-markets-explained.html
24. Eco Eye. (n.d.). M21 - Emissions Trading Scheme in New Zealand. Retrieved from http://ecoeye-int.com/m21.php
25. Energy Post. (n.d.). Understanding the New EU ETS, Part 2: Buildings, Road Transport Fuels and How the Revenues Will Be Spent. Retrieved from https://energypost.eu/understanding-the-new-eu-ets-part-2-buildings-road-transport-fuels-and-how-the-revenues-will-be-spent/
26. Environment New Zealand. (n.d.). Emissions trading scheme. Retrieved from https://environment.govt.nz/what-government-is-doing/areas-of-work/climate-change/ets/
27. Environmental and Energy Study Institute. (n.d.). Overview of RGGI. Retrieved from https://www.georgetownclimate.org/files/report/TCI-Overview%20of%20RGGI%281%29.PDF

Sources

28. Environmental Defense Fund. (n.d.). California's Cap-and-Trade Program: Step by Step. Retrieved from https://www.edf.org/sites/default/files/californias-cap-and-trade-program-step-by-step.pdf
29. Environmental Protection Agency. (n.d.). Participating in the ETS. Retrieved from https://www.epa.govt.nz/industry-areas/emissions-trading-scheme/participating-in-the-ets/
30. Environmental Protection Agency. (n.d.). What Is Emissions Trading? Retrieved from https://www.epa.gov/emissions-trading-resources/what-emissions-trading
31. Eurex. (n.d.). China Carbon. Retrieved from https://www.eex.com/en/markets/environmental-markets/china-carbon
32. European Commission. (n.d.). ETS2: Buildings, Road Transport, and Additional Sectors. Retrieved from https://climate.ec.europa.eu/eu-action/eu-emissions-trading-system-eu-ets/ets2-buildings-road-transport-and-additional-sectors_en
33. European Commission. (n.d.). The Development of the EU Emissions Trading System (2005-2020). Retrieved from https://climate.ec.europa.eu/eu-action/eu-emissions-trading-system-eu-ets/development-eu-ets-2005-2020_en
34. European Parliament. (n.d.). EU Emissions Trading System: Recent Developments and Future Challenges. Retrieved from https://www.europarl.europa.eu/RegData/etudes/BRIE/2022/698890/EPRS_BRI%282022%29698890_EN.pdf
35. Frontiers in Marine Science. (n.d.). Carbon Pricing and Markets in the Ocean Economy: Recent Advances and Future Opportunities. Retrieved from https://www.frontiersin.org/articles/10.3389/fmars.2024.1393047/full
36. Government of the People's Republic of China. (2024, February 4). A circular on issuing the plan for the development of a national carbon market (2021-2025). Retrieved from https://english.www.gov.cn/policies/latestreleases/202402/04/content_WS65bf7f70c6d0868f4e8e3c94.html
37. Homaio. (n.d.). A 2024 Guide to the EU ETS 2: Navigating New Carbon Markets and Their Impact. Retrieved from https://www.homaio.com/post/a-2024-guide-to-the-eu-ets-2-navigating-new-carbon-markets-and-their-impact
38. ICAP. (n.d.). Canada: Quebec Cap-and-Trade System. Retrieved from https://icapcarbonaction.com/en/ets/canada-quebec-cap-and-trade-system
39. ICAP. (n.d.). Japan: Tokyo Cap-and-Trade Program. Retrieved from https://icapcarbonaction.com/en/ets/japan-tokyo-cap-and-trade-program
40. ICAP. (n.d.). Korea Emissions Trading Scheme. Retrieved from https://icapcarbonaction.com/en/ets/korea-emissions-trading-scheme
41. IETA. (n.d.). From Kyoto to Paris: The Evolution of International Carbon Markets. Retrieved from https://www.ieta.org/resources/from-kyoto-to-paris/
42. International Energy Agency. (n.d.). Quebec Cap-and-Trade System for Greenhouse Gas Emissions Allowances. Retrieved from https://www.iea.org/policies/6362-quebec-cap-trade-system-for-greenhouse-gas-emissions-allowances
43. International Institute for Sustainable Development. (n.d.). Carbon Pricing and Markets Update: Initiatives Promote Carbon Pricing Approaches in Southern and Eastern Africa. Retrieved from https://sdg.iisd.org/news/carbon-pricing-and-markets-update-initiatives-promote-carbon-pricing-approaches-in-southern-and-eastern-africa/
44. IOSCO. (n.d.). The Role of Carbon Credit Markets in Achieving Environmental Objectives: IOSCO's Objectives and Principles of Securities Regulation. Retrieved from https://www.iosco.org/library/pubdocs/pdf/IOSCOPD740.pdf
45. Journals of the University of Chicago. (n.d.). The Evolution of Emissions Trading in the European Union: EU Emissions Trading System (EU ETS) from the Perspective of New Member States. Retrieved from https://www.journals.uchicago.edu/doi/full/10.1093/reep/rew017
46. Kim & Chang. (n.d.). The Emission Trading Scheme of Korea. Retrieved from https://www.kimchang.com/en/insights/detail.kc?idx=28418&sch_section=4
47. LinkedIn. (n.d.). Regulatory Compliance in Carbon Markets: Growth, Share, Future Trends. Retrieved from https://www.linkedin.com/pulse/regulatory-compliance-market-growth-share-future-trends-s5thf/
48. Massachusetts Institute of Technology. (n.d.). The EU Emissions Trading System in Perspective: Issues and Prospects. Retrieved from https://economics.mit.edu/sites/default/files/2022-09/EU%20Emissions%20Trading%20System%20in%20Perspective.pdf
49. Metro Tokyo. (2016, November 16). "Tokyo's Cap-and-Trade Program." Retrieved from https://www.metro.tokyo.lg.jp/english/topics/2016/161116_01.html
50. National Observer. (2024, March 26). Trudeau fires back at premiers over carbon price. Retrieved from https://www.nationalobserver.com/2024/03/26/news/trudeau-fires-back-premiers-over-carbon-price
51. NeutralX. (n.d.). Convergence of Voluntary and Compliance Carbon Markets. Retrieved from https://www.neutralx.com/blog/convergence-of-voluntary-and-compliance-carbon-markets
52. Offset Guide. (n.d.). Clean Development Mechanism (CDM). Retrieved from https://www.offsetguide.org/understanding-carbon-offsets/carbon-offset-programs/united-nations-offset-mechanisms/clean-development-mechanism-cdm/
53. Resources for the Future. (n.d.). California's Cap-and-Trade Program Explained. Retrieved from https://www.resources.org/common-resources/california-cap-and-trade-explained/

Sources (Cont.)

54. Richels, R. G., & Blanford, G. J. (2012). The value of technological advance in decarbonizing the power sector. Resources for the Future. Retrieved from https://media.rff.org/documents/RFF-DP-12-51.pdf
55. S&P Global. (2023, February 14). Japan set to launch emissions trading system in April. Retrieved from https://www.spglobal.com/commodityinsights/en/market-insights/latest-news/energy-transition/021423-japan-set-to-launch-emissions-trading-system-in-april
56. S&P Global. (n.d.). China's national voluntary carbon market starts trading Jan 22. Retrieved from https://www.spglobal.com/commodityinsights/en/market-insights/latest-news/energy-transition/012224-chinas-national-voluntary-carbon-market-starts-trading-jan-22
57. TD Economics. (n.d.). ESG Carbon Report. Retrieved from https://economics.td.com/esg-carbon-report
58. The Conversation. (n.d.). Are freeloading premiers undermining Canada's climate strategy? Retrieved from https://theconversation.com/are-freeloading-premiers-undermining-canadas-climate-strategy-217638
59. The Times of India. (n.d.). The Carbon Credits Market: The Past, Present, and Future. Retrieved from https://timesofindia.indiatimes.com/blogs/voices/the-carbon-credits-market-the-past-present-and-future/
60. The United Nations Framework Convention on Climate Change. (n.d.). Introduction to the Clean Development Mechanism. Retrieved from https://unfccc.int/files/cooperation_and_support/capacity_building/application/pdf/unepcdmintro.pdf
61. The World Bank. (n.d.). Carbon Markets Under the Kyoto Protocol and Paris Agreement. Retrieved from https://documents1.worldbank.org/curated/en/650081545377054720/pdf/133140-19-12-2018-17-11-20-CarbonMarketsUnderKPWeb.pdf
62. Tokyo Metropolitan Government. (n.d.). Cap and Trade. Retrieved from https://www.kankyo.metro.tokyo.lg.jp/english/climate/cap_and_trade
63. Verra. (n.d.). VCS in Compliance Markets. Retrieved from https://verra.org/programs/verified-carbon-standard/vcs-in-compliance-markets/
64. Wikipedia contributors. (n.d.). New Zealand Emissions Trading Scheme. In Wikipedia. Retrieved from https://en.wikipedia.org/wiki/New_Zealand_Emissions_Trading_Scheme
65. Wikipedia. (n.d.). Carbon Emission Trading. Retrieved from https://en.wikipedia.org/wiki/Carbon_emission_trading
66. Wu, B. (n.d.). China's carbon market turns two: how has it performed? Retrieved from https://chinadialogue.net/en/climate/china-carbon-market-turns-two-how-has-it-performed/

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