International Carbon Action Partnership

Offset Use Across Emissions Trading Systems

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Acronyms

ARB	Air Resources Board
ART	Architecture for REDD+ Transactions
ACR	American Carbon Registry
BMWK	Bundesministerium für Wirtschaft und Klimaschutz (German Federal Ministry for Economic Affairs and Climate Action)
CARB	California Air Resources Board
CCER	China Certified Emission Reduction
CDM	Clean Development Mechanism
CER	Certified Emissions Reduction
CH_4	Methane
CO_2	Carbon dioxide
COP	Conference of the Parties
CORSIA	Carbon Offsetting and Reduction Scheme for International Aviation
CTFS	California Tropical Forest Standard
DEBS	Direct Environmental Benefits to the State
EDF	Environmental Defense Fund
ERU	Emission Reduction Unit
ESR	Effort Sharing Regulation
ETS	Emissions trading system
EU ETS	European Union Emissions Trading System
EUA	European Union Allowance
GHG	Greenhouse gas
Gt	Gigatonne
GWP	Global warming potential
HFC-23	Fluoroform
ICAO	International Civil Aviation Organization
ICAP	International Carbon Action Partnership
ICVCM	Integrity Council for the Voluntary Carbon Market
ITMO	Internationally Transferred Mitigation Outcome
JI	Joint Implementation
KCU	Korean Credit Unit
K-ETS	Korea Emissions Trading Scheme
KOC	Korean Offset Credit
LCCDP	Low Carbon City Development Program
LCDS	Low Carbon Development Strategy
LULUCF	Land use, land-use change, and forestry
MEE	Ministry of Ecology and Environment
N_2O	Nitrous oxide
NCP	National crediting program
NDC	Nationally Determined Contribution
NDRC	National Development and Reform Commission
NZ ETS	New Zealand Emissions Trading Scheme

NZU	New Zealand Unit
PMR	Partnership for Market Readiness
PNCTE	Programa Nacional de Cupos Transables
REDD+	Reducing Emissions from Deforestation and Forest Degradation
RGGI	Regional Greenhouse Gas Initiative
RTK	Revenue Tonne Kilometer
t	Tonne
tCO_2e	Tonne carbon dioxide equivalent
UK	United Kingdom
UK ETS	United Kingdom Emissions Trading System
UNFCCC	United Nations Framework Convention on Climate Change
USA	United States of America
VCS	Verified Carbon Standard
WCI	Western Climate Initiative

1 Introduction

As market-based instruments, **emissions trading systems** (ETSs)[1] are inherently flexible, as entities can decide to reduce their own emissions or buy emissions allowances from the market. Carbon offsets[2] (or simply 'offsets') are a tool to further increase flexibility in reaching climate targets under ETSs, as they offer sectoral and geographical flexibility for jurisdictions to reduce greenhouse gas (GHG) emissions outside of the scope of their ETS. This paper gives an overview of offset provisions in several major ETSs around the world and provides an outlook for offsets in the years to come.[3]

Offsets represent emissions reductions and emissions removals resulting from projects undertaken outside the scope of an ETS.[4] Offsets are generated by crediting mechanisms, which ensure adherence to specific requirements and issue the units. In some cases, using offsets can allow emissions from sources covered by the ETS to exceed the ETS cap while ensuring aggregate emissions are kept constant. This is because any excess of emissions covered by the ETS are balanced out by reductions generated by offset projects outside of the ETS scope.

Depending on the provisions of an ETS, offsets can originate from projects either within or outside the geographical boundaries of the ETS jurisdiction, usually termed 'domestic' or 'international' offsets respectively.[5] Domestic offsets have been used in a range of ETS jurisdictions, such as California, the Regional Greenhouse Gas Initiative (RGGI), and China, whilst international offsets have historically played a greater role in Europe, New Zealand, and South Korea. The main international offsets used in ETSs to date have been generated under the Kyoto Protocol's flexibility mechanisms, in particular Certified Emissions Reductions (CERs) of the Clean Development Mechanism (CDM), and Emissions Reduction Units (ERUs) of the Joint Implementation Mechanism (JI). A range of other independently established crediting mechanisms also exist, such as the Verified Carbon Standard (VCS, managed by Verra), Gold Standard, the American Carbon Registry (ACR), and the Climate Action Reserve (CAR). Although ETSs have historically not relied on offsets from independent mechanisms, a few existing and upcoming ETSs are considering doing so.

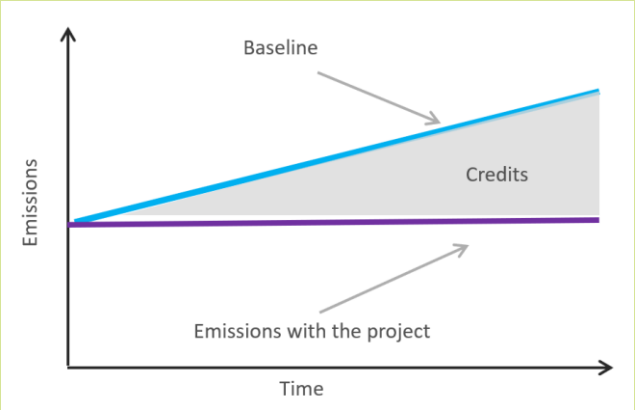
Box 1: Offsets primer

Offsets are typically generated by projects and certified by crediting mechanisms. For example, a landfill owner can install equipment to collect and flare the methane generated by the decomposition of materials. Such a project can generate carbon credits if, among others, the landfill owner follows the requirements of

[1] Mandatory ETSs, also known as cap-and-trade systems, create a compliance obligation for capped emissions allowances, in that covered entities are obliged to acquire and surrender a compliance instrument for each tCO_2e emitted.
[2] Terminology (see Box 1) varies, including 'offsets', 'carbon offsets', 'offset credits', and 'carbon credits'. Though these terms are used interchangeably, this paper uses 'offsets' to align with the terminology used in the ETS Handbook (International Carbon Action Partnership and World Bank 2021).
[3] Other sources of demand for offsets beyond ETSs also exist (see Box 1). These are not covered in this paper.
[4] Most ETSs cover the energy and industrial sectors, so projects undertaken, for example, in the waste or forestry sectors may be eligible to generate offsets.
[5] In subnational jurisdictions with ETSs, national borders can define the geographic limits of offset projects.

the crediting mechanism, is not mandated by regulation to collect and flare the gas, and can demonstrate that the incentive of the crediting program is necessary to enable the project to be implemented.

Unlike allowances, which are created and allocated by ETS administrators to covered entities and serve essentially as permits to emit, offsets are units created for an individual mitigation activity against a baseline that are then certified (see figure below).



Offset **projects** can take place within and/or outside jurisdictional borders. **Crediting mechanisms** can either be set up by an ETS regulator or be externally administered. Externally administered mechanisms can be subject to multilateral oversight (such as the CDM under the Kyoto Protocol and Article 6.4 under the Paris Agreement) or be run independently (such as VCS and Gold Standard).

Mitigation activities that generate offsets can relate to reducing emissions or to removing emissions from the atmosphere. Offsets are generated by comparing monitored project emissions with an emissions baseline. Crediting programs establish detailed rules for eligibility, as well as methodologies for proving additionality (see Box 2), calculating baselines, and monitoring emissions.

To generate offsets, project developers go through a **project cycle** (International Carbon Action Partnership and World Bank 2021), usually consisting of the following steps (steps with an asterisk may be skipped by some creditig mechanisms):

Registration

1. Project design
2. Stakeholder consultation*
3. Validation by third-party auditor*
4. Completeness/consistency check
5. Review*
6. (Preliminary) registration

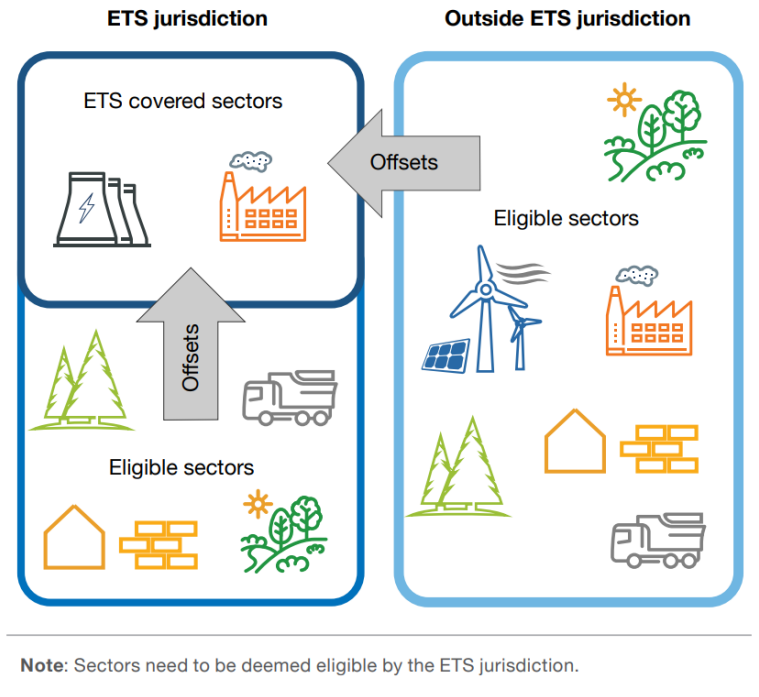
Project implementation and offset issuance

1. Monitoring
2. Verification

3. Review of verification
4. Approval/rejection of offset issuance

Offsets are used in a range of ways, including for **compliance** or **voluntary** purposes, domestically and/or internationally. ETSs and carbon taxes often allow for some use of offsets. Similarly, countries with mitigation targets under the United Nations Framework Convention on Climate Change (UNFCCC) may use international offsets towards the achievement of their Nationally Determined Contributions (NDC). Airlines also have an obligation under the Carbon Offsetting and Reduction Scheme for International Aviation (CORSIA) to offset a portion of their emissions from international flights. Individuals and businesses often choose to voluntarily offset their emissions.

How ETSs can source their offsets



Greenhouse gas **removals** are different from offsets, though these terms are sometimes used interchangeably. Unlike offsetting activities from offset projects, which are designed to reduce CO_2 emissions now and in the future, removals are activities that sequester from the atmosphere CO_2 that has already been emitted.

Source: (International Carbon Action Partnership and World Bank 2021)

ETS jurisdictions that allow offsets tend to have similar objectives. Offsets can reduce compliance costs by providing additional, potentially lower-cost abatement options for covered entities, while at the same time expanding abatement incentives and the benefits of mitigation to other sectors and/or regions. Other benefits commonly attributed to the inclusion of offsets as a compliance option include the potential to facilitate political agreement on a tighter ETS cap, the environmental and social co-benefits of offsetting activities, and the ability to build capacity and incentivize low-carbon investment among actors outside of the ETS.

Experience shows that using offsets can also pose risks. Heavy reliance on offsets may overly disincentivize mitigation and low carbon-investment in covered sectors. Ex-ante assessments of future offset availability and prices are difficult, making it hard to estimate unit flow and future price impacts on the ETS. Jurisdictions must also ensure the environmental integrity of offsets, particularly regarding their additionality, baseline approach, and permanence.

Box 2: Basics of environmental integrity

Environmental integrity is ensured if the use of offsets does not lead to an increase in global GHG emissions as compared to a counterfactual scenario where offsets were not used (Schneider and La Hoz Theuer 2019). For this to be the case, offsets need to meet the following conditions (ibid; UNFCCC 10/2021; Gold Standard 2022). Offsets should:

- be **additional**, meaning that the reduction would not have occurred without the incentive created by offset revenues (ICVCM 2022);
- be **appropriately quantified**, such that emission reductions are not overestimated;
- be **permanent** or come accompanied with a way to mitigate the environmental damage of reversals;

Moreover, the use of offsets should:

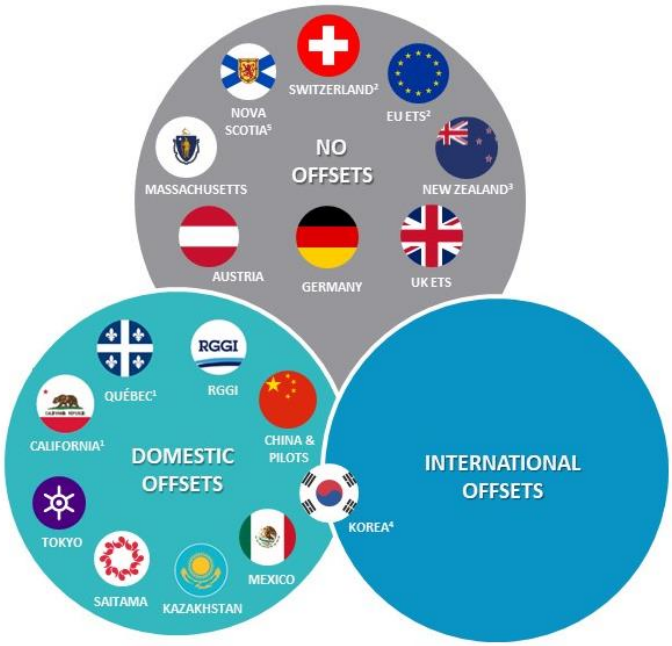
- be **appropriately accounted for** (such that emission reductions have an exclusive claimant and are not double-claimed); and
- **not create disincentives for mitigation** action by the jurisdiction hosting the offset project (e.g., where the host jurisdiction has an incentive to not increase the ambition of future NDCs in order to generate more offsets for sale).[6]

Source: adapted from (Woerdman 2005) and (Schneider and La Hoz Theuer 2019)

[6] At the practical level, this can be ensured by a combination of corresponding adjustments, revised additionality provisions, and broader (not necessarily carbon market specific) rules around raising ambition in NDCs.

Many ETSs worldwide – such as the European Union ETS (EU ETS), the New Zealand ETS (NZ ETS), the cap-and-trade programs of California and Québec, RGGI, the Chinese pilots and the Chinese national ETS, South Korea's K-ETS, and Mexico's pilot ETS – have at some point included offset provisions in their system design. Systems being developed, such as in Colombia and Vietnam, are considering how they could integrate offsets. Over time, systems have tended both towards an increased use of domestically- over internationally sourced offsets and towards the development of self-established rather than independently administered crediting mechanisms. Approaches to offsets differ in other ways, including the geographical and sectoral scope, the level of reliance on offsets, and methodologies (or 'protocols') for offset generation. Several systems have chosen, either from the outset or subsequently, not to include offset provisions – these include Germany, Austria, the UK ETS, Switzerland, the EU ETS, Nova Scotia, and Massachusetts. Figure 1 below provides an overview of offset use in current ETSs. For a cross-system overview, see the tables in the Appendix.

Figure 1: Offset use in ETSs around the world



1 California and Québec mutually allow offsets sourced from linked jurisdictions
2 The Swiss and EU ETS have not accepted offsets since 2021
3 Since 2015, New Zealand has no longer accepted international offsets. However, under the current legislation, the government can decide to readmit international offsets, contingent on access to high integrity sources.
4 Korea allows domestic offsets as well as international CDM credits developed by Korean companies
5 Nova Scotia's cap-and-trade legislation includes the possibility for an offset system; however, as of 2022, it has not yet been introduced. A study was completed in 2020 to explore offset potential in the province's carbon market.

Source: adapted from (International Carbon Action Partnership and World Bank 2021)

1.1. Approaches to offset policy and use in ETSs

When planning for offset use in an ETS, an important decision relates to how and by whom eligible offsets can be generated – in other words, the governance structure for the crediting mechanism. Jurisdictions can make use of offsets sourced from an externally managed crediting mechanism, whether from a multilaterally governed one, such as the CDM, and/or an independently established one, such as VCS or the Gold Standard. Additionally/alternatively, a jurisdiction may choose to set up and administer its own crediting mechanism. This involves creating institutions, developing rules, and approving individual projects. Using an externally managed system is simpler but provides for less control over the development of the program, whereas the latter allows for control and tailoring but incurs much higher administrative costs and requires greater expertise within governments. Intermediate approaches also exist, e.g., by relying on externally managed programs for distinct operational elements, such as accreditation processes and the management of registries ('outsourcing'). Additionally, some externally managed programs cover a wide variety of different mitigation activities with different levels of environmental integrity, so jurisdictions may choose to narrow the use of offsets from these programs by further restricting what types of mitigation activities are eligible ('gatekeeping').

The remainder of this section provides a summary of general approaches to offset policy and use in ETSs. More detailed information can be found in the 'Emissions Trading in Practice: A Handbook on Design and Implementation' (2nd edition) jointly published by the International Carbon Action Partnership and the World Bank's Partnership for Market Readiness (PMR), as well as the PMR's 'Guide to Developing Domestic Carbon Crediting Mechanisms' (World Bank 2021).

All crediting mechanisms share the same basic structure. Programs rely on a similar project cycle (i.e., the various steps a project undergoes, from registration and approval to issuing offsets) and divide tasks among different actors (executive bodies with decision-making authority; program administrators; and advisory boards/external experts) in a similar manner. Moreover, third-party verification through accredited auditors is a process considered essential for quality assurance.

Rules must be established to define offset eligibility within the ETS. Conditions of offset use have frequently been the focus of political contention and public scrutiny in the ETS jurisdictions. Concerns over the risks posed by offsets to the integrity of ETSs have largely revolved around whether they allow polluting sectors an easier way out of their obligations as compared to taking action to decarbonize. These concerns have partially been addressed by setting limits on which and how many offsets may be used for ETS compliance. In addition to decisions related to the governance of the crediting mechanism, there are two additional key considerations in designing rules for the use of offsets in an ETS:

- Qualitative criteria restrict offset projects either by region of origin or by type of activity, sector, GHG, or time period. Through such criteria, systems can limit eligible offsets to those activities considered to have higher environmental integrity. For jurisdictions that set up and administer their own crediting mechanism, these considerations are usually embedded in the design of the mechanism itself. For jurisdictions making use of externally managed crediting mechanisms, restrictions that supplement those of the mechanism can be set within the rules of the ETS in question.

- Quantitative limits define an upper cap on the quantity of offsets, as a percentage share of all compliance instruments that are surrendered that may be used to meet a facility's compliance obligation. The aim of such restrictions is to ensure that a minimum share of abatement occurs inside the ETS and to mitigate potential price shocks caused by an influx of offsets.

In picking/designing crediting mechanisms and establishing eligibility rules for offset use in the ETS, safeguarding environmental integrity of offsets is key: the surrender of offsets for compliance leads to a potential increase of emissions covered under the ETS cap, which must be matched by real emissions reductions by the projects that generate the offsets. See Box 1 above for more details on the environmental integrity of offsets.

The following sections provide an overview of the various approaches to offsets implemented by existing and upcoming ETSs. A full list of offset types, scope, and qualitative criteria and quantitative limits across key ETS jurisdictions is available in the Appendix.

2 International offset use: The European Union and New Zealand

Upon establishing their systems in 2005 and 2008 respectively, the EU and New Zealand sought to harness the potential of the Kyoto Protocol's flexible mechanisms. However, in both systems, the availability of a large volume of low-cost units generated under CDM and JI in the period 2008-2015 led to a substantial surrendering of such offsets for compliance, which, along with declining emissions due to the 2008-2009 global economic downturn, contributed to low allowance prices. Both the EU and New Zealand have since tightened their offset provisions.

2.1. European Union ETS

The EU ETS experience with the use of CDM and JI credits for compliance provides important lessons on quantitative limits and on the importance of market stability instruments. During the first phase (2005-2007), regulated entities were allowed unlimited use of CDM and JI credits, except for those from large hydropower projects and land use, land-use change, and forestry projects. In practice no offsets were used. This was due to the allowance price crash at the end of phase one, which rendered EU allowances (EUAs) cheaper than international offsets. During its second and third phases (2008-2020), the EU ETS was the primary source of demand for CDM and JI credits, as the world's largest carbon market at the time and one of the few that accepted international offsets. In phase two (2008-2012), after the EU ETS cap was tightened, offsets became an attractive option, but concerns circulated about the additionality and environmental integrity of some project types. The EU consequently restricted offsets of certain types by introducing qualitative criteria and banned credits from industrial gas projects.

The EU also introduced quantitative limits: covered entities were allowed to use CDM and JI credits up to a certain percentage, which was determined in the National Allocation Plans of each EU Member State. Aircraft operators were allowed to use offsets for up to 15% of their compliance obligations (Fallmann et al. 2015). Unused phase two offset entitlements were transferred to phase three where stationary installations could use them out to 2020. Alternatively, they could use either an amount corresponding to a maximum of 11% of

their allowance allocation from 2008-2012, or up to 4.5 % of their verified emissions from 2013-2020, whichever was higher (European Commission 8/31/2022). However, the 2008-2009 financial crisis reduced economic output in Europe, thereby creating an EUA oversupply and a corresponding price crash (see Figure 2). In this context, the offset provisions under the EU ETS exacerbated the oversupply problem in the system,[7] further depressing market prices.

In late 2012, following further concerns about the environmental integrity of offsets and their potential impacts on the EU ETS,[8] the European Commission took steps to restrict JI credits from countries not committed to the Kyoto Protocol's second period. For phase 3 (2013-2020), the EU applied further qualitative criteria to eligibility, mandating that newly generated (post-2012) international offsets could only come from projects in Least Developed Countries. Offsets from CDM and JI projects from other countries remained eligible only if registered and implemented prior to 31 December 2012, except for projects involved in the destruction of HFC-23 and N_2O gases, which were excluded regardless of the host country.[9] Furthermore, offsets issued for emissions reductions that occurred in the first commitment period of the Kyoto Protocol were no longer accepted after 31 March 2015. An overarching quantitative limit was also applied: the total quantity of offsets eligible across phases two and three (2008-2020) was set at 1.6 Gt, or 50% of the overall reduction efforts under the EU ETS over the two phases, by limiting each compliance entity's use of offsets. Participants had already used 1.058 billion international offsets to meet their obligations in phase two.

The use of offsets is not allowed in phase four of the EU ETS. However, in the sectors not currently covered by the EU ETS (such as transport, buildings, agriculture, and waste), some flexibilities are allowed. To stimulate additional action in the land use sector, under the Effort Sharing Regulation (ESR) (European Commission 2018a), for example, member states can collectively use up to 262 million offsets over the 2021-2030 period to comply with their national targets. Greater access to this flexibility is given to member states with a larger share of emissions from agriculture, a clause that recognizes the lower mitigation potential for emissions for this sector (ibid). Emissions from land use, land-use change, and forestry (LULUCF) more generally are covered under the LULUCF Regulation (European Commission 2018b), but there is also some flexibility between that (Article 12) and the ESR (Article 7) to allow for the limited transfer of LULUCF removal credits or ESR emissions allocations (Liselotte 2022).

In addition, experts and policy practitioners have recently increased their discussion on the possible use of CO_2 removal units in ETS. Carbon removals are key to achieving the EU's 2050 net zero ambition, but currently no mechanism allows for the use of such units within EU climate policy. An EU carbon removal certification scheme is an initiative that has been proposed in the revised LULUCF Regulation, as part of the

[7] In phase 2 of the EU ETS, offsets made up 10% of the volume of compliance units available in the market (1.058 billion available offsets and 9.112 billion total allowances in the 2008-2012 period, as per data from European Environment Agency 2022).
[8] Kollmuss et al. 2015, for example, estimate that the lack of environmental integrity in JI credits may have undermined the EU ETS emission reduction target by about 400 million tCO_2e.
[9] HFC-23 projects provide a cautionary tale about the importance of proper additionality testing and the usefulness of qualitative criteria by ETS regulators when making use of externally managed crediting mechanisms. Operators of plants that produced HFC made huge windfall profits by destroying industrial gases that would never have been emitted in the first place had it not been for the market signal from offsets.

EU's Fit for 55 Package, which would set "a value on mitigation actions by introducing a carbon removal certification scheme and possibility to trade in certificates" (European Parliament 2021). It is currently under public consultation. However, the discussion is yet to address the use of removal offsets inside the EU ETS itself (see e.g., (European Commission 2022)). The revised EU ETS Directive states that the European Commission should be empowered to adapt legislation "in view of regulatory developments with regard to the certification of carbon removals" (European Commission 2021).

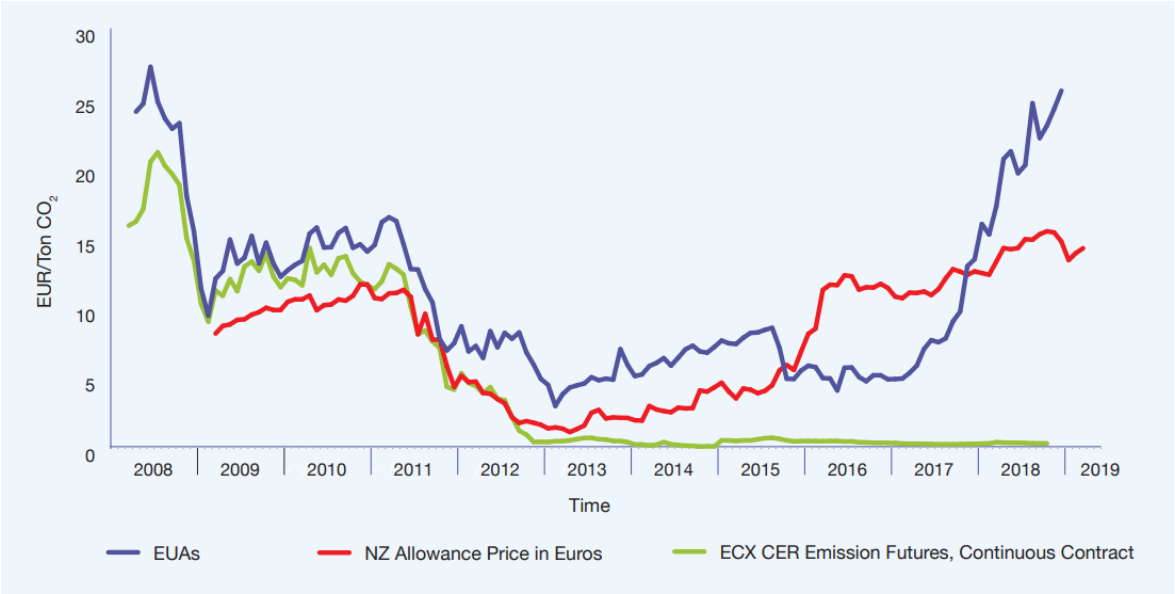
2.2. New Zealand ETS

The **NZ ETS** was initially intended to be fully nested within the Kyoto Protocol regime. As a small country with relatively high abatement costs, the Kyoto mechanisms gave New Zealand an opportunity to meet its international targets at lower cost. Furthermore, forestry was the first sector to be covered by the NZ ETS, and units generated through domestic GHG removal activities have and will continue to play an important role in the NZ ETS market and New Zealand's broader climate strategies.[10]

From its inception in 2008, the NZ ETS operated without a cap on domestic allowances (New Zealand Units, or NZUs), integrating the forestry sector as a source of NZU supply and allowing covered entities unlimited use of some types of Kyoto Protocol international offsets. For the period 2008-2012, this strategy worked well, minimizing the cost of compliance for emitters and meeting its objective of pricing emissions and forest removals. The price for international offsets remained similar to that of domestic NZUs. However, several factors – notably a drop in demand due to the 2008-2009 financial crisis, coupled with higher-than-expected supply volumes of Kyoto Protocol units – caused the market price for international offsets to crash from late 2012 (see Figure 2). With unlimited offsets allowed in the NZ ETS, this led to a rush of international offsets to New Zealand, acquired by regulated entities. This resulted in a NZU price crash, a halt in any domestic abatement activities, impacted the economics of afforestation, and a buildup of NZUs in circulation, as entities used cheaper international units for compliance while banking the slightly more valuable NZUs. In the three years following the price crash, international offsets made up the bulk of compliance instruments used in the NZ ETS for surrenders made from early 2013 to early 2015, covering calendar 2012-2014 compliance years, up until they were disallowed in May 2015, i.e., immediately after the deadline for calendar 2014 surrenders.

[10] NZ ETS participants can earn units for afforestation and forest growth on registered post-1989 forest lands. If the forest is harvested or deforested, units must be surrendered to account for the resulting emissions. Pre-1990 forests are subject to mandatory surrender obligations for deforestation under the NZ ETS.

Figure 2: International offsets and imported risk



Note: EUA = EU Allowance; NZ = New Zealand, ECX CER ECX contracts (EUA and CER futures, options, and spot contracts) are standardized exchange traded CERs.

Source: (Quandl 2019; OM Financial 2019; International Carbon Action Partnership and World Bank 2021)

While there was no quantitative limit on the use of Kyoto Protocol units under the NZ ETS, some qualitative criteria were imposed. CERs derived from forestry and nuclear power projects, CERs and ERUs generated under CDM projects that destroy fluoroform (HFC-23) and nitrous oxide (N_2O), and CERs and ERUs generated from largescale hydropower projects were all excluded. These qualitative criteria were put in place to address concerns about the environmental integrity of these CDM and JI projects. However, ex-post analysis of CERs and ERUs that were allowed for compliance in the NZ ETS, particularly during the period 2012-2015, indicated that a large share of the approximately 96 million offsets used for compliance from the ETS's inception to 2015 lacked in environmental integrity (Kollmuss et al. 2015; Simmons and Young 2016). Of all units surrendered for compliance in the period, more than 70% were offsets (ibid).

While New Zealand's reliance on international offsets created a system that functioned well at cross-border allowance trading, it resulted in negligible domestic abatement (Ministry for the Environment, New Zealand 2016). It also negatively impacted confidence in the NZ ETS market and triggered a wave of land conversion,[11] while the stockpiled NZUs continued to undermine the price signal of the NZ ETS even after international units were disallowed (Leining et al. 2020).

[11] The lower market prices for NZUs, among other factors such as global milk solid markets and prices, and farming and soil improvements, led landowners to harvest timber in NZ ETS covered forests and turn their heads instead to the dairy sector.

Since 2015, the NZ ETS has undergone a fundamental review and reform process, and new overarching climate legislation has been passed, with major reforms implemented in 2021 (New Zealand Government 2019). The focus is now on domestic net abatement under an ETS cap, and international offsets are currently disallowed. International offsets may still play a role in reaching mitigation targets in the future, given the relatively limited domestic emissions reduction potential and high abatement costs in a country with a clean electricity mix and high emissions from land use. International abatement is signaled clearly in New Zealand's updated NDC, and access to international markets is a condition of its 2030 commitment. Its updated NDC states that it intends to use international market mechanisms (or similar) which "…meet reasonable standards and guidelines to ensure the environmental integrity of emissions reductions" (New Zealand Government).

Furthermore, the government has repeatedly stated that any international offsets would need to demonstrate high levels of environmental integrity and any import or use by ETS participants would be subject to strict quantitative limits.[12] Within the rules of the NZ ETS, the government can decide to allow international units for compliance as part of the annual unit supply-setting process, but these must be from government-approved sources, meet environmental integrity standards and be subject to quantitative limits. These conditions would be announced on a five-year rolling basis, alongside other supply settings.

Box 3: Article 6 rulebook

Article 6 of the Paris Agreement establishes a new framework for the trading and use of international offsets for the post-2021 period. Article 6 has three operative paragraphs, two of which relate to how carbon markets may work internationally (UNFCCC 2015). After many years of negotiation, Parties to the Paris Agreement agreed to the operational rules for Article 6 at COP26 in Glasgow in late 2021. A summary of the rules relevant to international offsets is given below.

Article 6.2 provides an accounting and reporting framework for cooperation between Parties, allowing for mitigation measures implemented in one country to be counted towards another country's NDC, or other international mitigation purpose, such as CORSIA or the voluntary carbon market. These mitigation measures could be achieved in different ways, such as through implementing emissions reductions projects or linking ETSs. The Article 6.2 guidance establishes rules for generating, transferring, and using 'internationally transferred mitigation outcomes', or ITMOs. Some key elements of the guidance agreed at COP26 include how countries must account for the use of ITMOs and apply corresponding adjustments to avoid double counting, the information that countries must report, as well as restrictions on ITMO use, such as no banking between NDC periods (UNFCCC 2021a).

Article 6.4 establishes a new centralized crediting mechanism under the UN to generate offsets from emissions reduction and removal activities.[13] The Article 6.4 mechanism is the successor to the CDM. As a

[12] The requirement for quantitative limits is legislated and applies to any ETS linking but not to any possible acquisitions under Article 6 if these are not through the ETS. The commitment on environmental integrity applies, both politically and through legislation, to any Article 6 transfers. Article 6 guidance also applies.
[13] The Supervisory Body for Article 6.4 is also developing the methodologies for activities involving the avoidance of leakage and other negative environmental and social impacts (see e,g., UNFCCC 2021b, p.26)

centralized approach, it differs from 6.2 in that it operates under a supervisory body designated by the Conference of the Parties, and standardized procedures must be observed regarding the design and implementation of reduction activities and the verification of results (BMWK 2022). This mechanism aims to also mobilize the private sector by providing incentives to participate in mitigation activities. Compared to the CDM, the Article 6.4 mechanism also has more stringent baseline and additionality requirements, provides host countries with an enhanced role, and provides more environmental and social safeguards (Kizzier et al. 2019).

Under the Paris Agreement regime, Article 6 is the main international framework for the trading and use of international offsets, including in ETSs. This is similar to what the CDM represented under the Kyoto Protocol, with some significant and fundamental differences.

Under the Kyoto Protocol, only industrialized (also referred to as Annex I) countries had binding mitigation targets, whereas under the Paris Agreement, all Parties have such targets, as outlined in their Nationally Determined Contributions. This implies that, to avoid double counting with domestic mitigation targets, host countries of Article 6 activities must apply corresponding adjustments in respect of ITMOs transferred under Article 6.2 and units generated under Article 6.4 (this requirement does not apply to "mitigation contribution 6.4ERs", which nevertheless cannot be used for compliance purposes). International offsets procured through the Article 6 framework and used for compliance in an ETS therefore must be correspondingly adjusted. Other key differences between the CDM and Article 6 concern environmental integrity, including additionality, sustainable development, the share of proceeds and overall mitigation in global emissions.

Source: adapted from (Kizzier et al. 2019) and (BMWK 2022)

3 Domestication of Kyoto flexibility mechanisms: Bringing CDM credits and methods into the domestic markets in China and Korea

Both China and South Korea were originally involved as CDM host countries, which helped establish the experience and capacity in the development of carbon credit projects, as well as a government-level understanding of the advantages and challenges related to hosting such projects. These jurisdictions' experience with the CDM was key to establishing their own crediting mechanisms.

3.1. China's ETS pilots and the Chinese national ETS

China, a major supplier of international CDM credits in the past, has used the CDM rules and methodologies as a steppingstone towards its own domestic crediting mechanism: the Chinese Certified Emission Reductions (CCER) scheme. One motivation for its establishment was to provide support to projects originally developed for the international carbon market. CCERs are currently eligible for compliance in all

regional Chinese pilot ETSs,[14] subject to different quantitative limits and qualitative criteria (see Appendix) and are also admitted under the Chinese national ETS. Most methodologies eligible under the CCER program are directly derived from the CDM, although some new methodologies were approved by the National Development and Reform Commission (NDRC), China's central planning agency. To generate CCERs, a project must have started implementation after 16 February 2005.

Though the Chinese government began issuing CCERs in 2012, it put project registration and credit issuance on hold in 2017 (World Bank). In the years when CCERs were still being issued, prices were linked to allowance prices, which were low due to small trading volumes and the disparate nature of China's seven regional ETS pilots (see below) (Lushan 2022b). The NDRC approved projects, but the local government of the pilot region controlled allowance supply and demand. The number of CCER projects grew. In the period 2012-2017, the NDRC approved 80 million CCERs, but only 40% of these were sold (Refinitiv Carbon Research 2022). This exacerbated the issue of low carbon prices, causing companies to disengage and the oversupply to increase.

In 2017, the NDRC announced it would be revising the "Interim Measures" that govern the crediting mechanism to promote low-carbon development and streamline administrative and management processes (World Bank). It was after this announcement that national authorities suspended applications for methodologies, projects, CCER issuance, verification bodies, and exchanges, citing limited trading and project irregularities (EDF 2020b). Existing projects were permitted to continue trading (ibid). In 2018, the Ministry of Ecology and Environment (MEE) took over responsibility for climate policy, managing the country's domestic crediting mechanism from the NDRC and revising the "Interim Measures" (EDF 2020b). The government has been signaling since late 2020 that it will revive the crediting mechanism, but the revised Interim Measures are not available publicly as of October 2022. Once the system is operational again, projects will have to also meet several other requirements, such as obtaining approval for their methodologies from the MEE (Lushan 2022b).

However, in late October 2021, the MEE issued a notice allowing covered entities in the national ETS to use CCERs to offset up to 5% of their annual compliance obligation, with no restrictions on project type or vintage (MEE 2021b). This announcement opened the door to the accumulated CCERs and enabled the CCER mechanism to play an important role in the compliance market. The price of CCERs rose sharply after the announcement, rising to near the price of allowances (Qian et al. 2022). Almost 170 million CCER transactions were made in 2021 (Lushan 2022a). However, a small share of covered entities used near to the maximum allowed quantity of CCERs for compliance, banking their allocated allowances for future use (ibid).

[14] The Chinese regional pilot ETSs (Beijing, Chongqing, Fujian, Guangdong, Hubei, Shanghai, Shenzen, and Tianjin) currently operate in parallel with the Chinese national ETS. The power sector has already been transferred to the national carbon market. Over the medium to long term, the pilots are expected to be fully integrated into the national ETS.

The revised measures will likely encourage activities in the renewable energy sectors,[15] forestry carbon sink projects aimed at afforestation/reforestation, and projects aimed at reducing methane releases (MEE 2021; State Council, People's Republic of China 9/13/2021). A process is also currently underway to review and revise the mechanism's methodologies, with a general expectation that they will be more stringent than previously.

All Chinese ETS pilots allow covered entities to use CCERs to fulfil their compliance obligations but set restrictions on the types, origination date, geographic origin, and quantity of offsets that can be used for (see Appendix). These restrictions reflect various concerns, including those related to preventing double counting and ensuring that CCERs do not flood the market. Furthermore, price differentiation for CCERs exists among the Chinese ETS pilots, due to differences in local supply and demand and differing offset regulations; CCERs that are eligible for use in multiple markets cost more than those that are more limited in scope (EDF 2020a). Several pilots have developed, or are in the process of developing, local crediting mechanisms. Shenzhen, for example is setting up its program Tan Pu Hui. Once fully operational, it will generate local offsets that can be used for compliance by the entities under the Shenzhen ETS as well as by enterprises, institutions, and individuals to voluntarily offset their emissions. The Guangdong pilot already uses Tan Pu Hui offsets.

3.2. South Korea ETS

Like China, South Korea has also built on CDM rules and methodologies to establish a domestic crediting mechanism, known as the Korean Credit Units (KCU) scheme. The KCU scheme allows for the domestic certification of projects to generate Korean Offset Credits (KOCs), as well as for the use of (some) CDM CERs in the K-ETS. Both domestic and international offsets are converted to KCUs before being used for compliance under the K-ETS.[16]

In the first phase of the K-ETS (2015-2017), a quantitative limit for offsets was established for up to 10% of each entity's compliance obligation. Qualitative criteria were also set, in that both domestic CDM credits (CERs) and domestically certified KOCs were allowed, but only from projects based within Korea. Eligible activities included those allowed under the CDM as well as carbon capture and storage, and only if implemented after 14 April 2010.

From the second phase (2018-2020), eligibility was extended beyond domestic projects to include CERs from international CDM projects. In the second phase, the quantity allowed remained at 10% of the compliance obligation, but up to half of this amount could be sourced from international projects. Accompanying rules for international offsets ensured that they provided domestic benefits, primarily by mandating that Korean companies participated in the development and/or marketing of the projects and offsets. Projects situated in

[15] Although renewable energy projects are formally eligible under the CCER scheme, the sector is now financially profitable in China, which means that projects in the sector may not comply with additionality requirements. This could significantly reduce future CCER supply from renewable energy projects as compared to previous years (Lushan 2022b).

[16] To generate KCUs from CERs, the CERs must be cancelled in the CDM registry. This is a different approach as compared to e.g., the EU ETS, where CERs/ERUs (while they were allowed) could be used directly, as the registries were integrated through the UNFCCC international transaction log.

Least Developed Countries were also given preference if they were funded by Korean companies. For a project to be eligible, at least one of the following criteria had to apply:

1. at least 20% of the ownership rights, operating rights, or the voting stocks were owned by a Korean company;
2. a Korean company supplied the low-carbon technology worth at least 20% of the total project cost; or
3. the projects were funded by a Korean company with a national or regional government operating in an UN-designated Least Developed Country or a low-income economy as classified by the World Bank.

As of November 2022, approximately international KOCs have been used in the K-ETS (ECOEYE 2022).

In the third phase (2021-2025), offsets can only make up 5% of companies' compliance obligation. No separate limit is set for international offsets, and they may be used under the same qualitative criteria as in phase 2. Since the K-ETS allows for the use of CERs generated under the CDM, it will see itself affected by the gap between the winding down of the CDM (which will not issue CERs for emission reductions generated after January 2021) and the operationalization of the Article 6 mechanisms. Rules and procedures are yet to be established for the transition of CDM projects into Article 6 – after which point such projects would be able to issue offsets for post-2020 emissions reductions. As of September 2022, it is unclear how big the impact of this gap is, and how K-ETS regulations will address this.

In July 2022, South Korea set up an International Reduction Council to deliberate on and coordinate the country's involvement with Article 6, approving and registering projects (Reklev 2022). With the shift away from the CDM, increasingly more companies have indicated interest in international carbon markets, and many are now calling on the government to clarify its Article 6 strategy (ibid).

4 Domestic crediting mechanisms in the Western Climate Initiative and the Regional Greenhouse Gas Initiative

Both the Western Climate Initiative and the Regional Greenhouse Gas Initiative are collaborative programs designed to reduce regional greenhouse gas emissions, including through the permission of offset use. Though administration of offset procedures, project eligibility, and quantitative limits differ across jurisdiction, both initiatives follow broader initiative-wide guidelines such that their offsets may be comparable and/or fungible across borders.

4.1. Western Climate Initiative

The Western Climate Initiative (WCI) was created in 2007. It is a collaboration of independent jurisdictions working together to identify, evaluate, and implement emissions trading[17] as well as other policies to tackle climate change at the regional level.

As part of the comprehensive regional effort to reduce emissions, the WCI has coordinated on a set of cap-and-trade program design recommendations to provide opportunities for low-cost emissions reductions and a degree of uniformity across the partner jurisdictions' systems. These stipulate that members establish a rigorous offset system that may support their ETSs, with specific recommendations regarding how offsets should be used (WCI 2008).[18] The Cap-and-Trade Programs of California and Washington State, and of the provinces of Québec and Nova Scotia are based on the WCI Design.[19]

Under this 2008 framework, the WCI identified the following project types as a priority for investigation and development to participate in the offset system: agriculture (e.g., manure management); forestry (e.g., afforestation/reforestation, forest management, forest preservation/conservation, forest products); and waste management (e.g., landfill gas). It encourages the development of offset projects within WCI jurisdictions to capture some of their health, social, and environmental co-benefits. The recommendations also limit the use of all offsets and allowances from other ETSs recognized by the WCI partner jurisdictions to 49% of total emissions reductions from 2012-2020, though jurisdictions may set a lower limit. Geographical restrictions also apply. Jurisdictions may certify projects located in the USA and Canada, and projects must be subject to comparably rigorous oversight, validation, verification, and enforcement as intra-WCI jurisdictions. Finally, the WCI design recommendations state that protocols should as far as possible be standardized, where eligibility, additionality and baseline emissions can be assessed using standardized criteria, rather than on a project-by-project basis. Such an approach can involve more upfront effort for the regulator, yet arguably enables a more streamlined, objective, and consistent project approval process. Integrity can be safeguarded if the standardized criteria are regularly reviewed, and if necessary, updated to reflect changing circumstances.

Through their agreements under the WCI, California and Québec each employ a self-developed domestic crediting mechanism, in line with the WCI design recommendations. Regulators have taken the lead role in shaping the Compliance Offset Program in California and the Offset Credit Program in Québec by developing

[17] In 2011, British Columbia, California, Québec, and Ontario – four members of the WCI Partnership – created the not-for-profit organization WCI, Inc., which provides cost-effective technical and administrative solutions for supporting implementation of Participating Jurisdictions' GHG emissions trading programs. WCI Inc. can provide services to governments across North, Central, and South America. Four Jurisdictions are currently using WCI Inc. services: the US states of California and Washington, and the Canadian provinces of Québec and Nova Scotia.

[18] Available here: WCI Design Recommendations (section 9)

[19] Nova Scotia is planning to stop the implementation of its cap-and-trade program at the end of 2023.

and approving a limited number of offset protocols.[20] Most of these protocols have been adapted from ones originally developed for the voluntary market to make them suitable for compliance use.[21] California and Québec have also committed to coordinate with each other when identifying and developing new offset protocols to account for regional differences and ensure the WCI design recommendations are consistently applied. Coordination is particularly important as the offsets issued by one jurisdiction are recognized by other partner jurisdictions if their ETSs are linked, as in the case of California and Québec. The geographical scope of offset protocols in California is the United States;[22] for Québec, each offset protocol stipulates whether the offsets can be generated only in Québec or in Canada. California has approved six offset protocols and Québec five. These focus on reducing emissions of GHGs with a high global warming potential (e.g., methane treatment and destruction from landfills, methane from agriculture, and the destruction of ozone-depleting substances) as well as emissions reductions and removals of CO_2 from the forestry sector.

The jurisdictions differ in their approach to the governance of the crediting mechanisms. California develops its own protocols but outsources part of the project cycle work to independent crediting mechanisms (referred to in the California regulation as 'offset project registries') approved by the California Air Resources Board (CARB) – ACR, CAR, and Verra. These mechanisms list the project and issue registry offsets in line with California regulations. Once this has occurred, the offset developer may request the issuance of Air Resource Board (ARB) offsets. CARB then conducts a full review, and issues ARB offsets and transfers them to the project developer only after confirming that the initial registry has retired the corresponding registry offsets (CARB 2022a). Meanwhile in Québec, the administration of offset issuance is conducted entirely by the Ministry of Environment and the Fight Against Climate Change itself (Gouvernement du Québec 2022a).

California's offset use is limited to 4% of an entity's compliance obligation for the current period 2021-2025 (decreasing from 8% during 2013-2020), but this usage limit will rise to 6% for 2026-2030. As of mid-July 2022, nearly 240 million ARB offsets have been issued in California, with almost 50 million still in circulation (Lithgow et al. 2022). About 10% were generated by early action offset projects[23] across the protocols, while the majority have so far come from US forest projects. CARB's forest offset protocol includes reforestation, improved forest management, and avoided conversion project types (CARB 2022c).

In late 2018, CARB approved amendments to its Cap-and-Trade Regulation pursuant to legislation (Assembly Bill 398). The amendments included a provision that no more than half of the offset usage limit (2% of overall compliance in 2021-2025, 3% thereafter) may be sourced from projects that do not provide 'direct environmental benefits to the State' (DEBS) of California. A performance standard per protocol defined in

[20] 'Protocols' in the WCI market are what other systems call 'methodologies'.
[21] This approach differs from the CDM, where methodologies were largely developed by private project developers and subsequently approved by the CDM Executive Board.
[22] The California Cap-and-Trade Regulation has the potential to allow international offsets from approved sector-based programs issued by subnational jurisdictions in developing countries, but this has not been implemented to date.
[23] Early action offset projects are projects that existed using previous versions of protocols adopted by CARB and that were operational before the entry into force of the California Cap-and-Trade Program. They had to be registered with the Early Action Program by 1 January 2014 (Glowaki 2013); source: calculated from ARB's data as of 10 August 2022: approximately 238.5 million offset credits were issued by CARB (CARB 2022c).

section 95989 of the Cap-and-Trade Regulation determines whether specific offset activities result in DEBS, though projects located within California are automatically considered to provide DEBS (CARB 2022d). Offset projects implemented outside of California may be included only if scientific evidence or project data provide evidence of DEBS.

Despite being a lower-cost compliance option than allowances, offsets have not so far been fully exploited by covered entities in California. The limit on offsets that could be used to meet compliance obligations in California's system, for example, was set at 8% for its first three compliance periods. In practice, covered emitters in the state surrendered almost 139 million offsets, or only about 6.3% of their total emissions during this period (Burtraw et al. 2022). The compliance strategies of firms which hold offsets rather than surrender them may be part of the reason that the number of offsets used for compliance in California and Québec to date has been lower than the quantitative limit set by the jurisdictions.

Risk of invalidation (see further below) is often cited as another reason (California Carbon 2021). At about a 20% price discount to allowances for the first three compliance periods in California (2013-2020), offsets provided covered entities with a 1.5% saving on compliance costs. For smaller firms, the administrative costs of acquiring offsets may outweigh the savings, and this is a possible explanation for why companies representing about 45% of Californian emissions have used no offsets. Since 2020, the offset discount has been steadily rising and reached around 35% in September 2022, which results in equivalent compliance cost savings of 1.4% and 2.1%, for the 4% and 6% limits respectively. As allowance prices climb, so too could the incentive for offset use (ibid).

California has also been considering if and how offsets from tropical forest activities (referred to in the regulation as 'programs') might be used in its Cap-and-Trade Program. For several years, CARB staff supported the development of methodologies for tropical forest-based offset projects. In 2019, CARB's Board endorsed the California Tropical Forest Standard (CTFS), a set of criteria intended to serve as a model for assessing jurisdiction-scale crediting mechanisms that reduce emissions from tropical deforestation and degradation (CARB 2022b). CTFS is the first government-enacted international standard that applies to large, sector-based tropical forestry programs at the jurisdictional level. Californian officials have stressed the wide applicability of CTFS by setting minimum requirements for a robust, replicable model to serve GHG mitigation programs, sustainable commodity supply chains, and other initiatives. Tropical forest offsets are not yet allowed into the state's Cap-and-Trade Program.

In Québec, up to 8% of an entity's compliance obligation may currently be met by surrendering offsets. Offset projects are also governed by protocols designed to ensure that projects and offsets meet the overarching WCI requirements for transparency, coherence, comparability, accuracy, verifiability, effectiveness, and validity. Currently, the Québec Cap-and-Trade System lists five offset protocols (Gouvernement du Québec 2022a).[24] Biomethanization of manure and carbon sequestration through afforestation and reforestation activities on private lands are expected to be the subject of ministerial regulations in 2022. A draft regulation for the latter has already been published. Other types of projects under consideration include fuel

[24] These are: covered manure storage facilities (CH_4 destruction), landfill sites (CH_4 reclamation and destruction), destruction of halocarbon, destruction of CH_4 from drainage systems in active coal mines, and destruction of CH_4 from ventilation air in active underground coal mines.

substitution in the marine transport sector, conversion of refrigeration systems, carbon sequestration through afforestation and reforestation activities on public lands, and improvement in the application of agricultural fertilizers. To date, projects falling under two of the five protocols – landfill sites (CH_4 destruction) and destruction of ozone depleting substances (now replaced by destruction of halocarbon) – have been issued offsets, over 1.3 million as of July 2022 (Gouvernement du Québec 2022b). For the first three compliance periods (2013-2014, 2015-2017, 2018-2020), offsets comprised 0.8 %, 3.5 % and 7.6 %, respectively, of the total amount of compliance instruments surrendered by Québec entities for compliance (Gouvernement du Québec 2015, 2018, 2021).

California and Québec have addressed environmental integrity concerns with provisions that differ somewhat across the two systems, though offset protocols in both ensure that all offsets issued are real, permanent, quantifiable, verifiable, enforceable,[25] and additional. Québec has established an environmental integrity account, fed by an automatic and mandatory withholding of 3% of all offsets generated by offset projects (Gouvernement du Québec 2022a). Offsets in this account can be used to replace any offsets deemed illegitimate after issuance (if replacement offsets cannot be recovered from the project developer). California's crediting mechanism has incorporated the principle of buyer liability. Here, the state can invalidate an offset that is later determined not to meet the requirements of an offset protocol due to double counting, over-issuance, or regulatory non-conformance. In this instance, the entity that surrendered that offset for compliance must substitute it with another, valid compliance instrument. Offsets can be invalidated up to eight years after the offsets' reporting period end date.

In addition, California operates a Forest Buffer Account as an insurance mechanism for unintentional reversals in forest offset projects as a result of natural disturbances, such as fires, pest infestations, or disease outbreaks (CARB 2021). As of May 2022, about 31.7 million offsets have been contributed to the Forest Buffer Account, accounting for about 16% of offsets issued under the state's forest offset protocol.[26] So far, offsets have been drawn from the buffer account on four occasions, including twice for wildfires, with a total of 1.2 million offsets deducted (94% for the two wildfires). At least four more projects have been significantly affected by wildfires, but the number of credits to be withdrawn from the buffer account are still under verification (Badgley et al. 2022). Wildfires are intensifying as a result of climate change, and the number of tree-based pathogens is also increasing. CARB staff are thus working to evaluate the latest science and whether the crediting mechanism and forestry protocols require adjustment (Badgley et al. 2022; Wang et al. 2022).

4.2. Regional Greenhouse Gas Initiative

The Regional Greenhouse Gas Initiative (RGGI) has implemented its own crediting mechanism. The RGGI states cooperatively developed prescriptive regulatory requirements for the generation of offsets, aimed to ensure that they represent emissions reductions or removals that are real, additional, verifiable, enforceable, and permanent, and that offset projects are located within one or more of the RGGI states that award offsets

[25] This means that the regulator has the authority to hold a particular party liable and to take appropriate action if any of the provisions of this article are violated.
[26] Calculated from CARB data as of 10 August 2022 (CARB 2022a).

(RGGI 2022b). Projects should also meet category-specific benchmarks and performance standards[27] that are outlined in the 2017 Model Rule (ibid). In terms of quantitative limits, an entity may fulfil up to 3.3 % of its compliance obligations using offsets; this share will remain the same until 2030 (RGGI 2022a).

The RGGI program covers the power sector, therefore an offset is equivalent to a (short) ton of CO_2 emitted by a regulated power plant. For RGGI offset projects to uphold environmental integrity, sponsors must provide assurance that they are achieving emissions reductions that would not have occurred in the absence of said offset provisions. State regulations employ both general and category-specific provisions on additionality (RGGI 2022d). If the regulatory agency finds that a project sponsor[28] has not complied with the requirements, it may revoke and retire all CO_2 offset allowances in the sponsor's account (RGGI 2015). For forestry projects, a 'reversal risk adjustment' is applied at offset issuance, determined by a project-specific reversal risk rating (RGGI 2013).

When states originally developed the RGGI offset protocols, offset types were restricted to five project categories: landfill methane capture, sulfur hexafluoride, forestry or afforestation, end-use efficiency, and avoided agricultural methane. After the most recent RGGI program review process, three protocols (sulfur hexafluoride, end-use efficiency, and afforestation) were removed from the 2017 Model Rule (RGGI 2022a),[29] due to high maintenance costs for project protocols and much of the potential reductions in these areas was already being achieved through other programs or markets (RGGI 2022a). States are moving to implement state-specific regulations based on this Model Rule according to their own specific timelines. Some states have discontinued all offset protocols, but all accept offsets issued by any participating state. As of September 2022, only one project (landfill methane capture) has been approved (RGGI 2022c). This may be due in part to low allowance prices, alongside the fact that since most of the protocols have not been updated since the program began, there may not be any other projects that would meet the additionality criteria. For forestry offsets, the protocols are the same as California's. CARB also qualifies projects outside the state, so the RGGI allowance price would need to exceed that in California to be economically worthwhile.

5 In the works: New offset regulations in existing ETSs and upcoming ETSs with offset provisions

A few ETS jurisdictions are currently designing new offset rules. This includes both existing ETS jurisdictions that are developing new offset regulations, as well as jurisdictions currently developing their ETSs alongside offset provisions. Mechanisms other than domestic ETSs can also be a source of demand for offsets.

[27] In addition to the general additionality provisions addressed in section XX10.3 of the Model Rule, Model Rule section XX-10.5 contains benchmarks and performance standards designed to address project additionality for each category of project activities (RGGI 2015).
[28] The CO_2 authorized account representative (natural person not corporate entity) for the general account of the offset project or CO_2 emissions credit retirement.
[29] The Model Rule is the set of proposed regulations that forms the basis for each RGGI state's emissions trading program.

Mexico's Pilot ETS Program started operating in 2020. It ran from 2020 to 2021 in a pilot phase, followed by a transition phase in 2022, which will then give way to a fully operational ETS, scheduled to begin in 2023. Rules for the operational phase are expected to be published in the first half of 2023. Chapter IV of the regulations for the pilot ETS (Diario Oficial de la Federación 2019) provides two flexibility mechanisms to the pilot program, both of which will generate offsets that can be used by ETS participants to cover up to 10% of their obligations in the pilot phase. The first mechanism is a domestic program established by SEMARNART (Mexico's Ministry of Environment and Natural Resources) for mitigation activities. SEMARNAT is to announce which sectors may generate units as well as which national or international crediting programs can be used to generate offsets. The second mechanism is a recognition of the early action of national mitigation activities that received offsets (or 'external credits', as per the regulation) before the pilot entered into force. These activities may receive offsets if they were implemented under one of the crediting programs to be deemed approved to supply offsets into the system and if a certificate of cancellation is provided. Emission reductions related to all GHGs are eligible, except for those related to direct CO_2 emissions. As of August 2022, the flexibility provisions have not yet been operationalized.

In 2018, Colombia adopted a law for climate change management outlining provisions for the establishment of a 'National Program of Greenhouse Gas Tradable Emission Quotas' (Programa Nacional de Cupos Transables de Emisión de Gases de Efecto Invernadero – PNCTE) (Gobierno de Colombia 2018). The legislation also includes crediting provisions: voluntary actions of non-regulated entities that generate GHG emissions reductions or removals may receive allowances if these reductions are verified, certified, and registered in the National Emission Reductions Registry (Registro nacional de reducción de emisiones de GEI – Renare) and are deemed eligible for the program. This follows the successful experience in Colombia of using offsets under the carbon tax (Impuesto Nacional al Carbono) launched in 2017.[30] By 2021, the carbon tax and the offset system had led to the cancellation of 72.1 million tCO_2e of offsets, the collection of COP 1.85 billion (USD 419,000) in tax revenues, and the registration of 154 mitigation projects. Forestry projects make up most of the offsets (Asocarbono 2022). Under the carbon tax, companies can meet up to 100% of their obligations using domestic offsets and become certified carbon neutral (World Bank 2022). Eligible offsets are those certified under the CDM, 'Low Carbon Development Projects' (Proyectos de Desarrollo Bajo en Carbono – PDBCs),[31] and REDD+ projects (Ministerio de Ambiente y Desarrollo Sostenible 2022). They must be verified by accredited auditors. Offsets generated by projects approved by independent standards such as

[30] The national carbon tax was established by law 1819 of 2016 (Tax Reform), which required the Colombian Environment and Sustainable Ministry (MADS) to establish a procedure to encourage implementing mitigation initiatives that reduce or remove GHG emissions in exchange for tax exemptions. The response to this mandate is enshrined in 2017's Decree 926. All taxpayers who are required to pay the carbon tax and who wish to demonstrate GHG emission reductions or removals per procedural guidelines established in Decree 926 of 2017 (see Article 1.5.5.4 onwards) and its amending Decree 446 of 2020 are eligible for a total or partial carbon tax exemption.
Renare originated from Law 1753 of 2015 and was regulated by Resolution 1447 of 2018. The platform is also integrated into the recent Climate Action Law (Ley de Acción Climática - Law 2169 of 2021), consolidating Colombia's NDC obligations.

[31] PDBCs relate to a Colombian methodology developed for monitoring and reporting (differing from CDM and REDD+). Regulated by Resolution 1447 of 2018, PDBC is based on the World Bank's Low Carbon City Development Program (LCCDP) methodology and was included in the Low Carbon Development Strategy (Ministerio de Ambiente y Desarrollo Sostenible 2019).

VCS and Gold Standard are eligible under the Colombian carbon tax exemption mechanism (Asocarbono 2022; Gobierno de Colombia 2022). Colombia's ETS is currently under regulatory development and is expected to enter a pilot phase in 2024 and full operation in 2025 (Rodriguez 2/16/2022). Its design elements, including offsets, are yet to be defined.

Progress on Vietnam's ETS is also underway, alongside the development of a national crediting program (NCP), under the mandate of the 'Law on Environmental Protection' which was revised most recently in 2021. The framework legislation also allows for the inclusion of domestic offsets in the ETS. The roadmap for the NCP laid out in 'Decree 06/2022/ND-CP' issued in January 2022 foresees a pilot NCP to be in place between 2023 and 2024, focusing on the solid waste and transport sectors. From 2026, the NCP and crediting mechanisms under Article 6 of the Paris Agreement should be fully implemented in the country (ICAP 2022).

Separately, mechanisms other than domestic ETSs can also be a source of demand for offsets. These include notably the Carbon Offsetting and Reduction Scheme for International Aviation (CORSIA)[32] established under the International Civil Aviation Organization (ICAO). Under CORSIA, airlines are obliged to purchase offsets to compensate for part of their emissions. The 'CORSIA Emissions Unit Eligibility Criteria' establish the minimum requirements for offsets to be eligible (ICAO 2019). These include program-level requirements such as having clear methodologies; having offset issuance and retirement procedures; having validation and verification procedures; and avoiding double counting. Criteria also apply at offset-level. Offsets are required, among others, to be additional, based on a credible baseline, have a transparent chain of custody, and represent permanent emission reductions. ICAO launched a regular process whereby crediting mechanisms can apply to become eligible to supply offsets to the scheme. Several have been approved. As of August 2022, the 'CORSIA Eligible Emissions Units' list includes: the ACR; Architecture for REDD+ Transactions (ART); China GHG Voluntary Emission Reduction Program; CDM; CAR; Global Carbon Council (GCC); Gold Standard; and VCS (ICAO 2022a).

6 Conclusions

As existing systems mature and new ETSs are implemented, the focus seems to be increasingly turning to offsets within domestic borders. This seems to be a general trend, although it is especially clear among developing countries. Though many systems in developed regions, such as in Europe and some in the US, have moved (or stayed) away from international offsetting provisions – or offsetting entirely – some ETSs may continue to use international offsets to leverage mitigation opportunities outside their borders. At the same time, jurisdictions must find a balance between the benefits of using offsets and the need to ensure domestic and intra-ETS abatement.

The major criticism of offset use in ETSs circle around environmental integrity and whether they allow polluting sectors a way out of their obligations rather than taking concrete action to decarbonize themselves.

[32] In the pilot (2021-2023) and first phases (2024-2026), offsetting requirements will only apply to flights between states that have volunteered to participate (115 states have agreed to voluntarily participate for 2023, as of September 2022). The second phase (2027-2035) will apply to flights between two ICAO Member States. In all cases, Member States will need to implement national legislation to comply with CORSIA provisions (ICAO 2022b).

But by broadening the carbon price signal to uncovered sectors, offset provisions in ETSs can generate more abatement incentives than might exist under the cap, thus stimulating learning outside the system, increasing mitigation opportunities, and lowering compliance costs. Despite the potential risks that offset use can pose to an ETS, the benefits have led many ETS jurisdictions to include some offset provisions, but to do so cautiously. The hope is that the efforts required to answer these many challenging questions on the role of offsets in the coming years will – in good time – support significant progress towards a climate neutral future.

Looking ahead at long-term decarbonization strategies, there is increasing appetite for the role of GHG removals, both in ETS and in climate policies more broadly. Offsetting provisions may be an avenue to integrate ETS and GHG removals. The dynamics and mechanics of how this might work are explored in a recent ICAP publication entitled "Emissions Trading Systems and Net Zero: Trading Removals".

International cooperation is also set to become increasingly important. This holds especially once we see higher abatement costs and strive towards net zero emissions by mid-century. The world of offsets may be one sphere where this may take place, though jurisdictions should ensure to only use offsets, if any, that meet robust international standards.

Furthermore, offsets traditionally used in voluntary markets – such as those stemming from independent standards like Gold Standard and VCS – are increasingly being considered to fulfil obligations in compliance carbon pricing instruments worldwide. Though not yet the case in any operational ETS, it seems likely in the near future. While the use of units from independent standards reduces administrative burden, it highlights the need for standardization and ensuring environmental integrity. In the gap left by the suspension of the CDM, the imminent operationalization of the mechanisms under the Paris Agreement's Article 6 brings about further opportunities for international offsetting.

7 Appendix - Offset types, scope, and qualitative/quantitative criteria across key ETS jurisdictions, as of August 2022

System	Type of offsets admitted	Regional scope	Approved offset methodologies and qualitative criteria	Quantitative limits and share of surrendered offsets
Austria	No offsets	N/A	N/A	N/A
Beijing Pilot	Chinese Certified Emissions Reductions (CCERs) Offset credits from Beijing certified energy conservation projects. Offsets credits from Beijing local forestry carbon sink projects. Offsets credits from citizen low carbon transportation incentive projects.	China for CCER projects Beijing for local energy conservation, forestry carbon sink and low carbon transportation projects.	Beijing Municipal DRC and Ecology and Environment Bureau developed methodologies to calculate offsets from local energy conservation projects, carbon sink projects and citizen low carbon transportation incentive projects. No CCER credits from hydropower, HFCs, PFCs, N_20, and SF6 projects. Projects must have begun operation after the beginning of 2013 (except for Beijing local forestry carbon sink projects, for which the date is February 2005). Among non-Beijing CCERs, priority is given to those with regional climate or pollution control cooperation agreements (e.g., Hebei and Tianjin).	The use of CCERs is limited to 5% of the annual allocation. The use of CCERs generated by projects outside Beijing is limited to 2.5% of the annual allocation.
California (WCI)	Offset credits issued under the California Compliance Offset Program. Offsets issued by Québec are also accepted.	United States	Currently six domestic offset project types ('protocols') covering agriculture, forestry, mine methane capture and avoidance of ozone depleting substances.	2021-2025: up to 4% per year of each entity's compliance obligation, increasing to 6% for 2026-2030. No more than half of the quantitative usage limit may be sourced from projects that do not provide DEBS.
China national ETS	CCERs	China	~200 methodologies, the largest share of which originate from CDM. CCERs must not come from emission reduction projects included in the national carbon market (covered entities may not generate CCERs for their own use).	Covered entities can use CCERs for up to 5% of the annual compliance obligation.

System	Type of offsets admitted	Regional scope	Approved offset methodologies and qualitative criteria	Quantitative limits and share of surrendered offsets
			CCER methodologies may cover project types from six GHGs: CO_2, CH_4, N_2O, HFCs, PFCs, and SF6.	
Chongqing Pilot	CCERs and Chongqing Certified Emissions Reduction (CQCER) credits since September 2021	China	CCERs, largely originating from CDM and approved by the NDRC. No credits from hydro projects. For CCERs, reductions must be achieved after 2010, except for carbon sink projects. For CQCERs, no specific project types yet defined in regulation; likely to cover wide range of small-scale reduction activities.	The use of CCERs is limited to 8% of the compliance obligation.
EU ETS	From Phase 4 (2021-2030), no offsets are admitted.	N/A	N/A	N/A
Fujian Pilot	CCERs and Fujian Forestry Certified Emission Reduction credits (FFCERs)	China for CCER projects. Fujian Province for FFCER projects.	CCER CO_2 or CH_4 projects, largely originating from CDM and approved by the NDRC. FFCER projects, with three project types (afforestation, forest management, and bamboo management). No credits from hydropower-related projects. Must start implementation after 16 February 2005 and the project developers must have independent legal personality.	The use of CCERs is limited to 5% of the annual compliance obligation, which is increased to 10% for companies that use both FFCER and CCER credits.
Germany	No offsets	N/A	N/A	N/A
Guangdong Pilot	CCERs and Tan Pu Hui Certified Emission Reductions (PHCERs)	China for CCER projects. Guangdong Province for PFCER projects. At least 70% of offsets must come from within Guangdong Province.	CCERs, largely originating from the CDM and approved by the NDRC. Of the annual compliance obligation met by offsets, at least half must be from CO_2 or CH_4 reduction projects. No credits from hydro and most fossil fuel projects. No pre-CDM credits. No credits generated in other Chinese ETS pilots.	The use of CCERs and PHCERs is limited to 10% of the annual compliance obligation.

System	Type of offsets admitted	Regional scope	Approved offset methodologies and qualitative criteria	Quantitative limits and share of surrendered offsets
			Tan Pu Hui projects, with 5 project types (forest sink, distributed PV, high efficiency air conditioner, air source heat pump, re-use of waste cloth).	
Hubei Pilot	CCERs	CCERs must come from key counties under the national or provincial poverty alleviation plan in urban agglomeration areas of the middle reaches of the Yangtze River (within Hubei).	CCERs, largely originating from CDM and approved by the NDRC. CCERs must come from rural biogas or forestry projects. CCERs must have been generated between 1 January 2013 and 31 December 2015.	The use of CCERs is limited to 10% of the annual initial allocation for each entity.
Kazakhstan ETS	Domestic offsets	Kazakhstan	GHG reduction or absorption activities in all economic sectors; IPCC methodologies and rules developed by the Ministry of Ecology, Geology and Natural Resources	None
Korea ETS	Phase 3 (2021-25): Domestic and international (including CDM credits)	South Korea and international	Up to 50% of offsets in the ETS can be international, but only from projects minimum 20% owned/funded by Korean firms.	In Phase 3, limited to 5% of each entity's compliance obligation. No separate limit for international offsets applies.
Massachusetts	No offsets	N/A	N/A	N/A
Mexico	Domestic program of mitigation activities and early action mitigation activities	Domestic	Not yet published. For offsets: domestic projects that have been validated and verified under internationally or domestically recognized protocols (still to be specified). Emission reductions related to all GHGs will be eligible, except for those related to direct CO_2 emissions. Early action: National mitigation activities that received credits before the start of the Pilot from programs recognized by SEMARNAT. SEMARNAT is currently working on the regulations to operationalize the offset and early action provisions in the Pilot ETS.	Quantitative limit: Up to 10% of the compliance obligation. Share of surrendered offsets: N/A

System	Type of offsets admitted	Regional scope	Approved offset methodologies and qualitative criteria	Quantitative limits and share of surrendered offsets
New Zealand	As of 1 June 2015, international units are not eligible for surrender in the NZ ETS. International offsets may be allowed as part of the government's 2030 strategy.	N/A	N/A	Currently no offsets are allowed.
Nova Scotia	Legislation includes the possibility for an offset system. A study was completed in 2020 to explore offset potential in the province's carbon market	N/A	N/A	N/A
Oregon	Community Climate Investment (CCI) offsets	Oregon	Eligible projects in Oregon that reduce anthropogenic GHG emissions. A CCI entity can only use funds to implement eligible projects in Oregon that reduce anthropogenic GHG emissions. Priorities include reducing emissions by at least 1 tCO_2e on average per CCI credit; reducing non-GHG emissions; promoting benefits for environmental justice communities; and accelerating the transition from fossil fuels to low-carbon energy sources.	First Compliance Period (2022 – 2024): 10% of compliance obligation may be covered with CCI offsets Second Compliance Period (2025 – 2027): 15% of compliance obligation may be covered with CCI offsets From 2028 onwards: 20% of compliance obligation may be covered with CCI offsets
Québec (WCI)	Offset credits issued under the Québec Offsets program. Offsets issued by California are also accepted.	Generally, Quebec. Canada for some protocols e.g., destruction of halocarbons	Currently five domestic project types ('protocols'), all relating to high GWP gases (CH_4 and HFC).	Up to 8% of each entity's compliance obligation.
RGGI	Offset credits issued under the RGGI program	RGGI states	Three project types: landfill methane capture and destruction, forestry projects, and avoidance of methane emissions from agricultural manure management operations.	Up to 3.3% of entities' compliance obligation. This quantitative limit is to remain at least until 2030.
Saitama	Small and mid-size facility credits; Outside Saitama credits; Renewable energy credits; Tokyo credits (via link); Forest absorption credits	Saitama and Japan	Emissions reductions from small and mid-sized facilities; large facilities; renewable energy; forest absorption.	Quantitative limits apply only to Outside Saitama credits (up to one third of offices' reduction

System	Type of offsets admitted	Regional scope	Approved offset methodologies and qualitative criteria	Quantitative limits and share of surrendered offsets
			Emissions reductions from non-covered small and medium-sized facilities in Saitama; large facilities have energy consumption of 1,500 kL of crude oil equivalent or more in a base year, and with base-year emissions of 150,000 tonnes or less. Offsets from solar, wind, geothermal, or hydro (under 1,000 kW) electricity production for use under the Saitama ETS are converted on a 1:1 basis (same for biomass at a rate of 95% or more, black liquor excluded). Emissions reductions from facilities in Tokyo with base-year emissions of 150,000 tonnes or less. Offsets from forest absorption (from inside Saitama, credits are counted at 1.5 times the value of regular credits).	obligations; factories may us up to 50%).
Shanghai Pilot	CCERs	China	CCERs, largely originating from the CDM and approved by the NDRC. No credits from hydro projects. Credits for reductions that were realized before January 2013 cannot be used for compliance.	The use of CCERs is limited to 3% of the annual verified emissions.
Shenzhen Pilot	CCERs and local crediting mechanism Tan Pu Hui.	Some geographic restrictions apply to the use of certain CCERs.	CCERs, largely originating from the CDM and approved by the NDRC. No credits from hydro projects. Tan Pu Hui: Two developed methodologies focus on public transportation and electricity-saving in citizen's daily life; others under development.	The use of CCERs is limited to 20% of the gap between the free allowance and the verified emissions, at least for the 2021 compliance year. Unclear whether this will continue to apply in the future.
Swiss ETS	No offsets	N/A	N/A	N/A
Tianjin Pilot	CCERs and Tianjin regional forestry offsets	At least 50% must originate from Beijing, Tianjin, or Hebei.	CCERs, largely originating from the CDM and approved by the NDRC. Credits must stem from CO_2 reduction projects. No credits from hydro projects.	The use of CCER credits is limited to 10% of the annual compliance obligation. For the 2021 compliance year, at least 50% of the CCER credits must have

System	Type of offsets admitted	Regional scope	Approved offset methodologies and qualitative criteria	Quantitative limits and share of surrendered offsets
			No credits for reductions that were realized before 2013.	originated from Beijing, Tianjin, or Hebei.
Tokyo	Small and mid-size facility credits; Outside Tokyo credits; Renewable energy credits (Environmental Value Equivalent, Renewable Energy Certificates, and New Energy Electricity, generated under the Renewable Portfolio Standard Law); Saitama credits (via link)	Tokyo and Japan	Reductions achieved through measures based on certification criteria for small and medium-sized facilities in Tokyo. Large facilities have energy consumption equivalent to at least 1,500kL of crude oil in a base year and with base year emissions of 150,000 tonnes or less; offsets from solar, wind, geothermal, or hydro (under 1,000kW) electricity production for use under the Tokyo ETS are converted on a 1:1 basis (same for biomass, rate of 95 % or more, black liquor excluded); emissions reductions from facilities in Saitama with base-year emissions of 150,000 tonnes or less.	Quantitative limits apply only to Outside Tokyo credits (up to one third of facilities' reduction obligations).
UK ETS	No offsets	N/A	N/A	N/A

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