International Carbon Action Partnership

APPLYING RULES UNDER ARTICLE 6 OF THE PARIS AGREEMENT TO LINKED EMISSIONS TRADING SYSTEMS

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EXECUTIVE SUMMARY

The rules adopted on Article 6 at the 26th Conference of the Parties (COP26) provide a new framework for international cooperation under the Paris Agreement. After six years of negotiations, countries agreed to an initial set of guidance at Glasgow in 2021. Since then, efforts to implement Article 6 have accelerated with a further set of rules adopted at COP27 in Sharm El Sheikh. Moreover, a significant milestone was reached with the launch of the first activities to generate authorized mitigation outcomes. Independent assessments suggest that utilizing Article 6 could lower the cost of meeting current nationally determined contribution (NDC) targets (Edmonds, George, Yu, Forrister, & Bonzanni, 2023).

International linking of emissions trading systems (ETS) is an important form of cooperation. Most cooperative approaches under Article 6.2 are expected to involve trading carbon credits from baseline-and-crediting activities. Linking ETSs between countries can be another type of cooperation. Several international ETS links already exist at different levels, including one – between the ETSs of the European Union and Switzerland – that will use Article 6 to account for the flows of allowances between the systems. Norway and the EU will also use Article 6 to account for Norway's participation in the EU ETS and in the EU's Effort Sharing Regulation that covers sectors not included in the EU ETS. The growth of ETS implementation in different parts of the world may mean that international linking could once again become a relevant factor in the coming years, with more countries seeking to account for their ETS links under Article 6.2.

There are different approaches to estimate the mitigation caused by an ETS link. The 2018 ICAP paper, *Accounting for the Linking of Emissions Trading Systems under Article 6.2 of the Paris Agreement*, identified four different approaches to estimate annually the emission reductions – or the "shift" in emissions – caused by an ETS link. Each of the four approaches was found to have benefits and drawbacks and each produced different estimates of the shift in emissions. In 2022, California and Québec published their methodology for calculating the shift in emissions between their linked cap-and-trade programs.

All of the four approaches can be applied under Article 6.2. The previous ICAP paper was published three years before the agreement reached at COP26. During this period, the Article 6.2 guidance continued to evolve, with new concepts introduced and adopted that were not considered in the previous ICAP paper. The purpose of this paper is to explore whether and how the four approaches proposed in the previous paper can be applied to the Article 6.2 guidance and to identify any new challenges. In general, this paper finds that all four approaches can be applied consistently with the Article 6.2 guidance.

Not all accounting options allowed under Article 6.2 work equally well for ETS links. The options available to countries vary depending on whether they have a multi-year NDC target (i.e., a budget or series of annual targets) or a single-year NDC target (i.e., meeting a target in the final year of the NDC period). Multi-year NDC targets can facilitate robust accounting and are more closely aligned with the design of an ETS. However, almost all countries have adopted single-year NDC targets. For these countries, the two available accounting options – either adopting an

indicative trajectory or budget, or accounting for the average of the shift over the NDC period – have different implications for ETS links. In general, the paper finds that adopting an indicative trajectory or budget is better suited to an ETS link.

Determining when mitigation caused by an ETS link occurs is challenging. One of the requirements of the Article 6.2 guidance is the notion of "vintage-based" accounting. This means that accounting under Article 6.2 should reflect not only the size of mitigation, but also when the mitigation occurred. While this is simple to implement for baseline-and-credit approaches, determining the timing of mitigation caused by an ETS link is not so straightforward. In the case of ETS linking, both the size and the timing of the shifts in emission reductions between jurisdictions due to linking cannot be empirically observed. These impacts can only be estimated. The four approaches identified in the previous ICAP paper each make assumptions about when mitigation occurs. This has practical implications, including whether the restriction on banking of mitigation between NDC periods can be implemented for ETS links. Further research could explore different options to identify the timing of mitigation.

Participation in Article 6.2 involves significant reporting obligations. The quantitative information needed to account for an ETS link should be readily available to administrators from ETS registries. The treatment of confidential information in Article 6.2 reporting is yet to be determined. If information must be reported which is not currently publicly disclosed by regulators, countries will have the option to label such information as confidential. In addition to quantitative data, participating countries must report qualitative information on their cooperation. Some of these reporting provisions require interpretation for the case of a linked ETS, given that the Article 6.2 guidance has been informed primarily by experiences with baseline-and-credit activities.

Linked ETSs have several ways of raising financial resources to support adaptation action. Countries cooperating under Article 6.2 are strongly encouraged to raise adaptation finance to support developing countries particularly vulnerable to the adverse effects of climate change. How they do so is not prescribed. In the context of ETS linking, a straight-forward option is allocating some of the revenue raised through auctioning allowances to support adaptation action. This could be implemented in different ways. Countries can tie the level of adaptation finance contributions to the size of the shift in emissions caused by the ETS link in a mechanical fashion. This most closely resembles the approach adopted under Article 6.4, which Article 6.2 is meant to consider. Alternatively, countries could make fixed contributions to the Adaptation Fund or provide adaptation-focused climate finance from ETS auctioning revenue, without a direct link between the size of the shift in emissions and the amount of resources provided. Examples of this latter approach already exist in implementing ETS jurisdictions.

Achieving an "overall mitigation in global emissions" in the context of ETS linking could be done through buying and cancelling Article 6 authorized carbon credits. Countries participating in Article 6.2 are also strongly encouraged to achieve an "overall mitigation in global emissions" (OMGE). This is a portion of emissions reductions achieved as a result of the cooperation but claimed by neither the transferring nor using country when accounting for their NDC targets. Implementing this directly for an ETS link poses several challenges, both to the functioning of the linked ETSs and for NDC accounting. Instead, countries with an ETS link could consider purchasing and cancelling Article 6 authorized carbon credits from a third country, which is a simpler way of meeting the encouragement of delivering an OMGE.

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Acronyms

COP	Conference of the Parties
ETS	Emissions trading system
EU	European Union
GHG	Greenhouse gas
ITMO	Internationally transferred mitigation outcome
NDC	Nationally determined contribution
OMGE	Overall mitigation in global emissions
UNFCCC	United Nations Framework Convention on Climate Change

INTRODUCTION

Recent years have seen the continued expansion in the use of explicit carbon pricing as a policy tool to reduce greenhouse gas (GHG) emissions. In 2022 around 23% of GHG emissions were covered by a carbon pricing instrument (World Bank, 2023). Within this, the coverage of emissions trading systems (ETSs) has also grown, reaching around 17% of global GHG emissions in 2022 (ICAP, 2023). This is set to increase in the coming years as systems currently under development enter operation. By capping overall emissions, ETSs give jurisdictions greater certainty over meeting emissions reductions targets, while doing so in a least-cost manner.

One of the advantages of implementing carbon pricing through an ETS is the possibility to link with other systems. Linking two or more ETSs offers several potential benefits. By expanding the emissions covered through a combined carbon market, more – and potentially cheaper – mitigation options are available to regulated entities, enabling the combined emissions reduction targets to be met more cost-effectively. A larger market with more participants can improve liquidity and address concerns around competitiveness, as all covered firms face the same carbon price (Santikarn, Li, La Hoz Theuer, & Haug, 2018). Different types of ETS links already exist: at the international level between countries and/or regional blocs, the ETSs of the European Union (EU) and Switzerland have been linked since 2020; at the international level between sub-national jurisdictions, the ETSs of California and Québec have been linked since 2014; at the domestic level, the Regional Greenhouse Gas Initiative is a regional ETS covering 11 Northeastern and Mid-Atlantic U.S. states which has been in operation since 2009, and in Japan, the ETSs of Saitama and Tokyo have been linked since 2011.

The concept of international carbon trading has been present since the early days of the multilateral climate regime. Industrialized country Parties to the Kyoto Protocol of the United Nations Framework Convention on Climate Change (UNFCCC) had the flexibility to meet their budget-based targets either through trading their emission allowances or by buying carbon credits, which could be generated in developing countries or in other industrialized nations. Under the Paris Agreement, Article 6 establishes a broad framework for governing both market- and non-market-based cooperation between countries working jointly to meet their nationally determined contribution (NDC) targets. The international linking of ETSs between two or more jurisdictions could be one such form of cooperation. For instance, the linking agreement between the EU and Switzerland confirms that net flows of allowances between the two systems will be accounted for under Article 6.

One of the main functions of Article 6 – and specifically the guidance under Article 6.2 – is to determine how countries should track, report on, and account for the trade in "internationally transferred mitigation outcomes" (ITMOs). Linking two ETSs could impact the emissions of the participating jurisdictions, as emissions are reduced further in the system with lower abatement costs, with a possible corresponding increase in emissions in the higher cost system. While participation in Article 6 is voluntary, countries with linked ETSs may choose to account for the impact of the link on their emissions. Accounting for the impact is especially relevant for importing jurisdictions. By importing allowances, a jurisdiction's regulated entities can emit more than they would otherwise be able to. In this scenario, emissions from the ETS sectors may be higher than

the jurisdiction's ETS cap, which in turn could negatively impact whether the country can achieve its NDC target. Accounting for these imported allowances – i.e., being able to claim the emissions associated with them when assessing progress towards and achievement of the country's NDC target – may therefore be in the interest of importing jurisdictions.

In theory, the amount that should be accounted for under Article 6.2 is the change in emissions that occurs in each jurisdiction *as a direct result* of linking the ETSs. This change is hereafter referred to as the "shift" in emissions. In practice, it is not possible to determine this precisely. This is because, once the link is established, the emissions that would have occurred in each jurisdiction in the absence of the link cannot be observed. The shift must therefore be estimated. The 2018 ICAP paper *Accounting for the Linking of Emissions Trading Systems under Article 6.2 of the Paris Agreement* (hereafter, "2018 ICAP paper") explored four different approaches to estimate this shift in emissions (hereafter, "the four approaches"). Each of the four approaches was found to have benefits and drawbacks and, importantly, produced different estimates of the shift. The main features of the approaches are summarized in Chapter 1.

At the 26th Conference of the Parties (COP26) in Glasgow in 2021, Parties to the UNFCCC reached agreement on an initial set of guidance for Article 6. The decision adopted on Article 6.2 provides a comprehensive set of rules for tracking, reporting on, and accounting for the transfer and use of ITMOs. Further guidance was subsequently agreed at COP27 in Sharm El Sheikh in 2022. With many of the basic rules now established, this paper explores how key provisions of the Article 6.2 decisions might be applied in the case of an ETS link. The paper has two objectives: to further examine the application of the four approaches in the context of the agreed Article 6.2 accounting rules; and to explore elements beyond the scope of the 2018 ICAP paper, such as accounting for temporal shifts in mitigation, reporting requirements for linked ETSs, and options to implement measures to generate finance to support adaptation action and deliver an "overall mitigation in global emissions" (OMGE). The paper is structured as follows:

- **Chapter 1** explores how countries can account for an ETS link under Article 6.2. The guidance adopted at COP26 provides different options for accounting, depending on the NDC type. It also requires that countries reflect the timing of mitigation when accounting. By applying the four approaches to a simplified example of an ETS link, this chapter assesses their suitability to meet the requirements of the guidance and identifies challenges and options to address them.

- **Chapter 2** addresses other issues in the Article 6.2 guidance relevant for linked ETSs. The chapter highlights certain reporting provisions that require interpretation in the context of an ETS link. It also explores options to raise resources to support adaptation action and to deliver an OMGE through an ETS link, both of which are strongly encouraged for countries participating in Article 6.2

This paper is not intended as a comprehensive guide for how countries can participate in a cooperative approach under Article 6.2 through an ETS link. While the Article 6.2 guidance covers a broad range of possible cooperation, in practice it has been influenced by the UNFCCC's experience with baseline-and-crediting. As a result, it is less immediately apparent how some elements of the guidance may be applied to other forms of Article 6 cooperation, such as ETS linking. This paper focuses on those elements where further exploration and interpretation is required. Many other provisions of the Article 6.2 guidance – for instance, the need to submit a

GHG inventory – apply equally well to different forms of cooperation and are therefore not discussed. This paper also does not address the case of an ETS using internationally sourced carbon credits for compliance purposes, which could constitute another type cooperative approach under Article 6.2.

A note on terminology

The purpose of this paper is to explore how ETS links could be accounted for in a manner consistent with the Article 6.2 guidance. As such, the paper adopts the terminology used in Article 6.2 decisions. A summary of the main terminology with a brief explanation is given in **Box 1** below.

Box 1 Summary of main Article 6.2 terminology

Nationally Determined Contribution (NDC): National commitments under the Paris Agreement to reduce emissions and enhance removals, and to adapt to the impacts of climate change.

Cooperative approaches: Cooperation between two countries under Article 6.2 of the Paris Agreement to meet target(s) in their NDCs.

Internationally transferred mitigation outcome (ITMO): Mitigation (i.e., a reduction of emissions or enhancement of removals) that has been achieved and can be transferred internationally to be used to meet another country's NDC target. For example, the mitigation could be represented by a carbon credit or the shift in emissions between two linked ETSs.

Corresponding adjustments: The mechanism by which double counting of the same mitigation between two NDC targets is avoided. The country transferring the ITMOs (i.e., the seller) must make an addition to its actual emissions equivalent to the size of mitigation transferred; the country acquiring and using the ITMOs (i.e., the buyer) must make a subtraction equivalent to the size of mitigation used. Not all mitigation that is acquired may be used, as it can be banked for later years. This means the addition and subtraction may not be the same for each year.

Emissions balance: The level of emissions after corresponding adjustments have been applied, i.e., reflecting the additions for ITMOs transferred and subtractions for ITMOs used.

Authorization: Mitigation outcomes must have been authorized by the transferring country in order to be used to meet NDCs. Authorization therefore serves as a confirmation that the transferring country will apply corresponding adjustments for the transferred ITMOs.

Two further points should be noted. Firstly, the paper only considers NDC targets expressed as GHG emissions in tCO_2e. It is therefore also assumed that countries will track progress and achievement of the NDC targets based on their emissions balance and not on other indicators. Finally, while ETS links can be implemented at different levels (e.g., between regions or cities), only

countries can be party to the Paris Agreement and participate in Article 6.2. As such, this paper refers to countries as opposed to jurisdictions. However, the findings are still applicable for ETS links at other governance levels which choose to apply the Article 6.2 guidance as an accounting framework.

A note on referencing

Where specific provisions of the decision on Article 6.2 are addressed, these are referenced in brackets at the end of the relevant sentence. For example, (*Annex, Paragraph 1*) refers to first paragraph of the annex to the Article 6.2 decision adopted at COP26. The decision can be accessed **here** (UNFCCC, 2021).

1 ACCOUNTING FOR AN ETS LINK

1.1 Understanding ITMOs in the context of ETS linking

The guidance under Article 6.2 is primarily concerned with how countries should track, report on, and account for the transfer and use of ITMOs. The guidance defines what an ITMO is, with the following attributes most relevant to the case of linked ETSs (*Annex, Paragraph 1*):

- That it is real, verified, and additional
- That it is measured in tonnes of carbon dioxide equivalent (tCO_2e)
- That it is from an Article 6.2 cooperative approach and is internationally transferred
- That it is authorized to be used against an NDC target
- That it represents mitigation generated from 2021 onwards

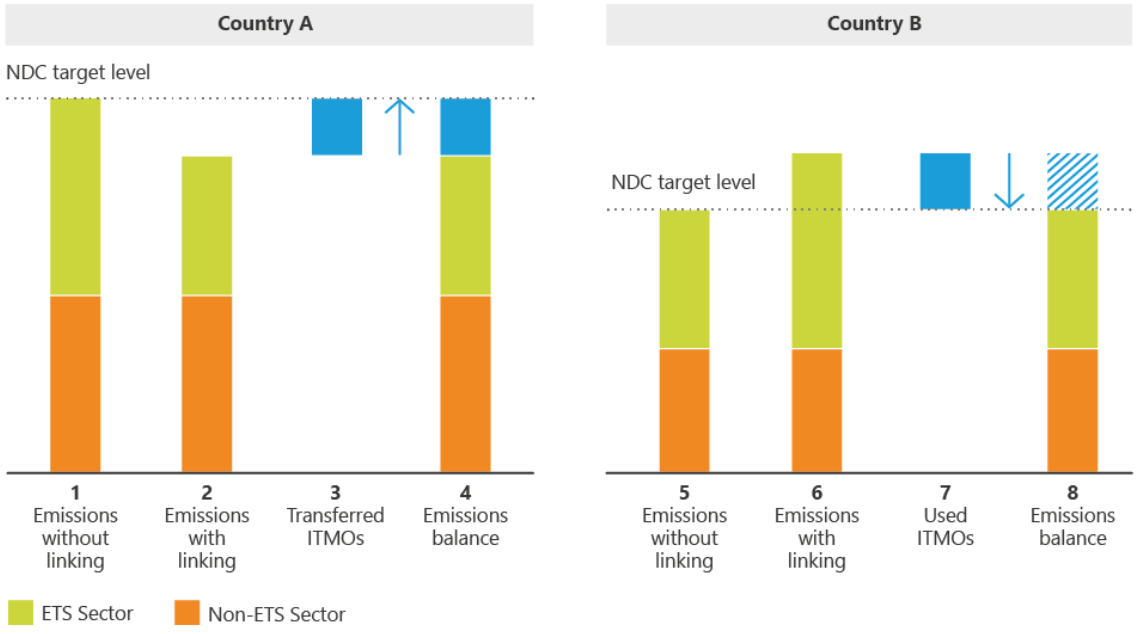
The core characteristic of an ITMO is that it must reflect mitigation, i.e., a reduction in emissions or enhancement of removals. This idea can be most easily understood in the context of carbon credits generated from baseline-and-credit emissions reduction activities. In this instance, each carbon credit – assuming it is additional – represents one tonne of mitigation that has been achieved below the level that would have occurred had the activity not been implemented.

For linked ETSs, the analogous concept of mitigation can be understood as the change in emissions that occurs within the two systems due to the link. Linking two ETSs can affect both where and when emissions are reduced. Through linking ETSs, allowances can be used interchangeably in both systems. It would therefore be expected that GHG abatement would shift from the system with higher abatement costs to the one with lower abatement costs, with a resulting net flow of allowances to the higher cost system. Through its impact on allowance prices, linking can also impact the timing of abatement, as entities face different incentives for when to make investments in GHG reductions. This difference – between emissions with the link established and emissions that would have occurred in both systems in the absence of the link – is here referred to as the "shift" in emissions. It is this shift that should be accounted for as an ITMO under Article 6.2.

1.2 How the shift in emissions between linked ETSs can be accounted for

Article 6.2 establishes that accounting for ITMOs is to be implemented through applying "corresponding adjustments" (*Annex, Chapter III*). **Figure 1** shows a simplified example of how a corresponding adjustment would be applied by countries with linked ETSs. In the absence of the ETS link, both Country A and Country B would achieve their NDC targets exactly. Linking the two systems induces a shift in emissions – equal to the blue bar – from Country A to Country B. This blue bar can then be accounted for by the countries as an ITMO under Article 6.2. If this shift were not accounted for, Country A would overachieve its NDC target while Country B would miss its NDC target.

Figure 1 Accounting for the shift in emissions between linked ETSs under Article 6.2



It is through corresponding adjustments that both countries can reflect the shift in emissions when demonstrating NDC achievement. The emissions of Country A's (Column 2) – the exporting country – are lower than the NDC target level and it must add to its reported emissions an amount equal to the shift (Column 3). This produces an "emissions balance" for Country A (Column 4), which is exactly equal to the NDC target level. Conversely, the emissions of Country B (Column 6) – the importing country – are above the NDC target level, and it can subtract the shift in emissions when reporting on its NDC achievement (Column 7). This produces an emissions balance for Country B (Column 8), exactly equal to its NDC target level. By applying corresponding adjustments (additions for "transferred" ITMOs and subtractions for "used" ITMOs, represented here by the blue arrows) both countries can account for the shift in emissions and meet their respective NDC targets.

The challenge is that, in practice, it is not possible to observe empirically the shift in emissions. Doing so would require knowing what emissions in each of the ETSs would have been without the link, and then comparing this with the emissions in both systems with the link established. Given that the first is a counterfactual scenario that cannot be observed once the link is in place, it is instead necessary to estimate or approximate the real – but unknown – shift in emissions.

1.3 Estimating the shift in emissions caused by the ETS link

The 2018 ICAP paper explored four different approaches to estimate the shift based on allowance transfers and surrenders. The paper found that there is no single best solution. Each of the options have benefits and drawbacks, and each produces different estimates of the shift in emissions. A

summary and assessment of the approaches is given in **Table 1** below. A full exploration of each of the options, with worked examples, can be found in the 2018 ICAP paper.

Table 1 Summary and assessment of the four approaches

Approach	Summary and Assessment
Approach A: Comparing emissions with caps	This approach compares the emissions from regulated entities in each jurisdiction with the size of the cap of that jurisdiction. A shift in emissions is only accounted for if emissions in one of the jurisdictions exceed the jurisdictional ETS cap. If that is the case, the shift is estimated as the allowance shortfall in that jurisdiction, which is made up by allowances from the other jurisdiction. While simple to calculate, this approach always determines the lowest possible outcome regarding the actual shift in emissions. It is therefore likely to underestimate the actual shift, disadvantaging the importing jurisdiction.
Approach B: Net transfers of allowances	This approach estimates the shift in emissions as the net amount of allowances transferred between the jurisdictions. Under this approach, transferred volumes are aggregated to yield a net flow in one direction, which is assumed to represent the shift in emissions. This approach is also simple to calculate. Particularly for ETSs with large numbers of allowance holdings, however, the transfer of allowances may simply reflect trading activity and not necessarily imply any changes in abatement.
Approach C: Surrender of allowances	This approach estimates the shift in emissions based on the volumes of "foreign" allowances surrendered in each jurisdiction. The shift in emissions is calculated as the difference of foreign allowances used in Jurisdiction A and foreign allowances used in Jurisdiction B. The calculation could either be based on the actual origin of the allowances (Approach C1) or the origin could be approximated in proportion to the size of each jurisdiction's cap (Approach C2). Since the surrender of allowances reflects emissions from regulated entities, this approach may be better suited to reflect the actual shift in emissions compared to using information on the transfer of allowances (Approach B).
Approach D: Combining information on transfer and surrender of allowances	This approach combines information on the transfer and surrender of allowances to estimate the shift in emissions. The shift in emissions is calculated as the difference between own allowances transferred to another jurisdiction and "foreign" allowances surrendered. Combining information on transfer and surrender of allowances could be a way to reflect the actual availability and surrender of allowances but can also lead to different values for the shifts in the two jurisdictions. Cumulatively over time, however, the differences in values between the two jurisdictions would even out.

As well as producing an estimate of the size of the shift between two ETSs, each of the four approaches also gives an implicit estimate of when the shift occurs. Approaches A, B and C each assume that there is no temporal shift in overall emissions from the jurisdiction as a result of linking. This means that the decrease in emissions in one jurisdiction occurs in the same year as the increase in emissions in the other jurisdiction. Conversely, Approach D assumes that the link may also cause a temporal shift in emissions. It is for this reason that corresponding adjustments applied using Approach D may not be the same between the two countries in a particular year, which is not the case under Approaches A, B and C. An assessment of the ability of each of the four approaches to approximate the temporal shift of emissions is made in section 1.7.

Since the publication of the 2018 ICAP paper there has been limited progress in exploring how the four approaches – or alternative options – might be applied in practice under Article 6.2. The agreement to link the EU and Switzerland ETSs was concluded in 2017, and following ratification in 2019, entered into force from January 2020. Article 4.5 of the agreement states that the "*Parties shall account for net flows of allowances in accordance with UNFCCC approved principles and rules for accounting following their entry into force*". The mechanism to determine the calculation will be established by a Joint Committee, which is comprised of representatives from both the EU and Switzerland and has responsibility for administering the linking agreement. As of November 2023 this mechanism had not yet been established.

A major development occurred in 2022 with the presentation of a mechanism to account for the flows of allowances and carbon credits between the linked ETSs of California and Québec. A summary of this mechanism is provided in **Box 2**.

Box 2 Accounting for the linked cap-and-trade systems of California and Québec

In June 2022 California and Québec presented a mechanism to determine the annual number of surrendered compliance instruments – allowances and offset credits – attributable to each jurisdiction. The mechanism was developed pursuant to Article 8 of the 2017 linkage agreement, which requires a "transparent and data-driven calculation that attributes to each Party its portion of the total GHG emission reduction achieved jointly by the Parties' linked cap-and-trade programs".

The annual net flow is calculated by comparing the amount of compliance instruments surrendered by entities in both California and Québec that are attributable to the other jurisdiction. So, for example, if Québec were to retire more compliance instruments attributable to California than vice versa, then the jurisdictions assume that a shift of emissions from California to Québec has occurred, equal to the difference in the net flow of instruments that have been transferred and surrendered. The attribution of compliance instruments to either jurisdiction differs between allowances and offset credits. For allowances, it will be done based on the proportion of each jurisdiction's allowances as a share of the total market supply. For instance, if one jurisdiction's allowances represent 10% of the market supply, 10% of the allowances retired in both systems will be considered as

originating from that jurisdiction. This approach – which is a variation of Approach C2 – was chosen instead of using the actual origin of surrendered allowances (Approach C1), information on which is available to the regulators.

One reason for this is that, when transferring units, the registry system chooses allowances in a way that optimizes computer processing efficiency. The actual origin of transferred allowances may therefore have no relation to underlying shifts in emissions between the systems. In contrast, calculating the net flow of retired offset credits is based on the actual origin of the credits, which is known to both regulators and participants.

In December 2022 California and Québec simultaneously published their first report on the net flow of compliance instruments for the years 2013 to 2020. More information on the California and Québec accounting mechanism for compliance instruments traded among the WCI partners may be found **here** (California) and **here** (Québec).

1.4 Choosing the method to apply corresponding adjustments

The four approaches presented in **Table 1** are different ways of estimating the shift in emissions. These estimates can then be accounted for as ITMOs under Article 6.2, through the application of corresponding adjustments to the reported emissions of each country. The Article 6.2 guidance allows countries to choose different methods for applying corresponding adjustments, which vary depending on whether the country has a single-year or multi-year NDC target:

- **Single-year NDC target:** This represents one or more targets to be achieved in a particular year, usually 2030. Whether the NDC has been achieved or not will be based on a comparison of the adjusted emissions balance with the target level, in the target year. Progress in other years of the NDC, while reported on, is not necessarily captured in the final accounting. Examples include the EU's target to reduce emissions by 55% from 1990 levels by 2030, or the Canadian commitment to reduce emissions 40-45% from 2005 levels by 2030. Countries with single-year targets may implement multi-year instruments – such as ETSs – as policies at the domestic level.

- **Multi-year NDC target:** This represents a target for a multi-year period, such as between the years 2021 and 2030. It can take the form of either a multi-year trajectory – which effectively acts a series of annual emissions budgets – or a total budget of allowable emissions covering the whole NDC period. Accounting requires comparing the adjusted emissions balance with the trajectory or budget throughout the multi-year period. An example of a country with a multi-year NDC target is New Zealand. New Zealand's NDC sets a target of reducing emissions to 50% below gross 2005 levels by 2030, which equates to a budget of around 571 Mt CO_2e over the period 2021 to 2030.

The different methods to apply corresponding adjustments provided for by the Article 6.2 guidance are summarized below. While also allowing for the possible inclusion of additional methods in the future, the guidance sets out the intention that a single method of corresponding adjustment should be applied in all cases from 2031 (*Decision, Paragraph 15(b)*).

1.5 Corresponding adjustments for single-year NDC targets

Accounting for carbon market activity, such as through linked ETSs, poses a particular problem in the context of single-year targets. Carbon market approaches, such as ETSs and carbon crediting activities, are established for multi-year compliance or crediting periods. With a single-year target, however, only the activity occurring in the target year is captured when accounting for NDC achievement. The fact that activity in other years is not automatically accounted for leaves open the possibility of gaming the system. In the worst case, this could lead to a scenario where aggregate emissions from the two cooperating countries are higher than they would have been in the absence of their participation in Article 6. Further exploration on how this might occur can be found in Schneider et al. (2017) and Siemons & Schneider (2022).

A fundamental challenge is therefore to ensure that the amount of ITMOs accounted for in the target year is representative of activity occurring throughout the NDC period. To address this, the Article 6.2 guidance provides two options for countries with single-year NDC targets to pick from and apply consistently throughout their NDC period.

1.5.1 Option 1: Indicative trajectory, trajectories or budget with annual adjustment

The first option to apply corresponding adjustments for single-year NDC targets is the following (*Annex, Paragraph 7ai*):

> *Providing an indicative multi-year emissions trajectory, trajectories or budget for the NDC implementation period that is consistent with implementation and achievement of the NDC, and annually applying corresponding adjustments for the total amount of ITMOs first transferred and used for each year in the NDC implementation period.*

Under this option, countries would need to define an "indicative" emissions trajectory, trajectories or budget. The indicative trajectory or budget would then provide a reference, covering the whole NDC period, against which actual emissions could be compared. The guidance does not explicitly set out the relationship between this comparison and the corresponding adjustments that countries must apply annually. For instance, if emissions are above the indicative trajectory value in a particular year, it is not stated whether the country should then use an amount of ITMOs equal to the excess emissions. Similarly, when a country accounts for its NDC target, it is not explicitly stated whether only emissions in the target year will be considered, or if the assessment should consider performance through the whole NDC period, including with reference to the indicative trajectory or budget. A future COP is due to agree further guidance on how the indicative trajectories and budgets should be calculated, at which point more clarity may be provided (*Decision, Paragraph 3bi*).

Having established the indicative trajectory or budget, countries must then apply corresponding adjustments annually for the ITMOs they transfer and use. While any of the four approaches could be followed, they produce different results for the shift in emissions. This is shown through a simplified example of two linked ETSs over a five-year NDC period, summarized in **Table 2**. The example has the following features:

- The emissions covered by the ETSs represent all emissions covered by the countries' NDCs.

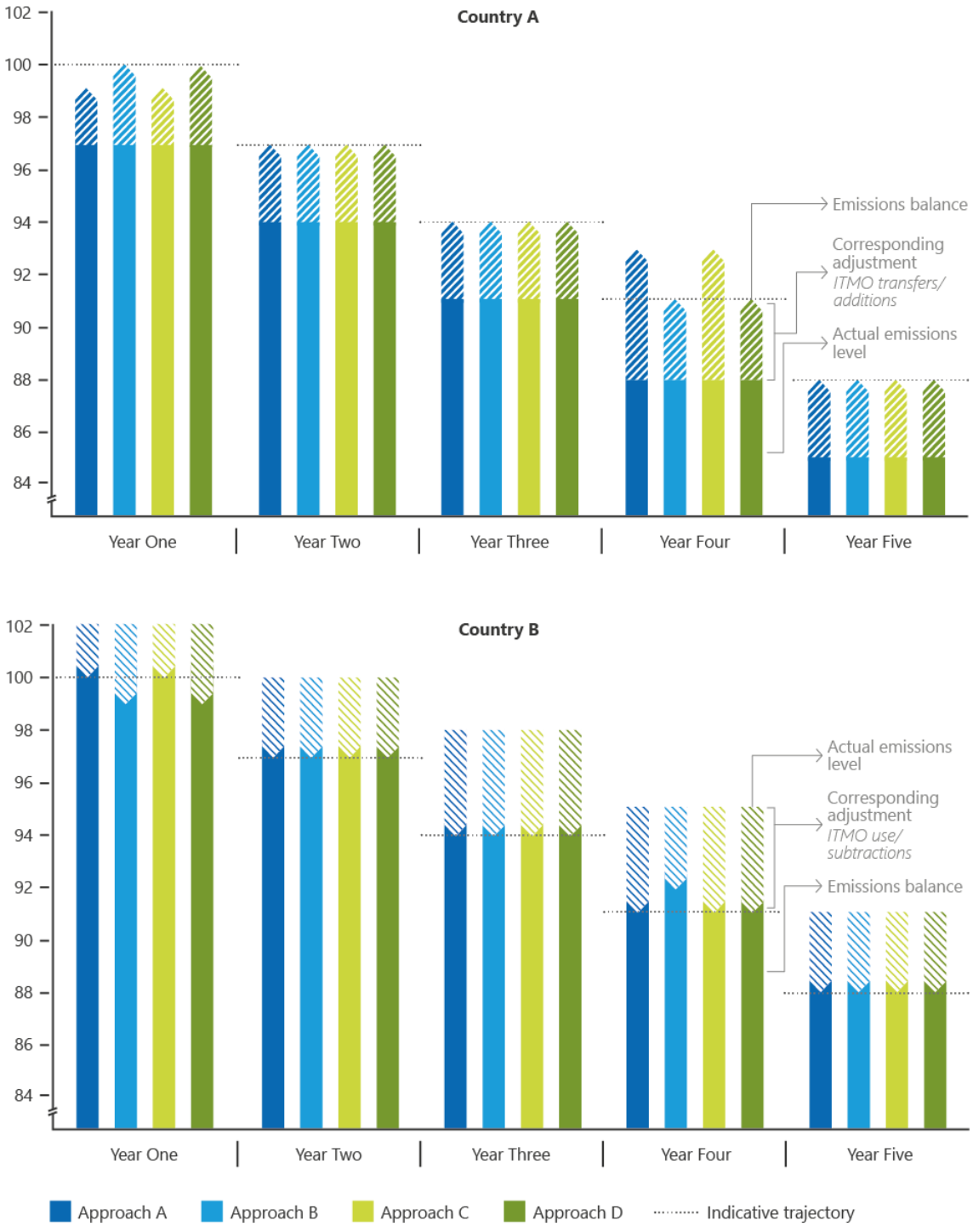
- Both ETSs have the same cap with a common target to reach an absolute emissions level of 88 tCO_2e in year five.
- Given that there are caps in place for each year of the NDC period, the indicative trajectory for both countries is the same as the annual ETS caps.
- Emissions in Country A are below the cap in every year of the NDC period, while Country B's emissions exceed the cap. Country A is therefore a net transferrer of allowances, while Country B is a net importer and user.
- Surplus allowances from Country A are transferred to Country B in the same year in which the surplus occurs. These allowances can then be banked for surrender by entities in Country B in later years.

Table 2 Example of two linked ETSs over a five-year NDC period, tCO2e

	Country A				Country B		
Year	ETS cap	Emissions	Surplus (+) / deficit (-)	Allowance transfer	ETS cap	Emissions	Surplus (+) / deficit (-)
1	100	97	+3	3 →	100	102	-2
2	97	94	+3	3 →	97	100	-3
3	94	90	+4	4 →	94	98	-4
4	91	88	+3	3 →	91	95	-4
5	88	85	+3	3 →	88	91	-3

Figure 2 shows the countries' actual emissions and emissions balances – i.e., emissions after corresponding adjustments have been applied – for each of the four approaches, together with the indicative trajectory, which in this example is the same as annual ETS caps. Note that, for simplification, in this and the following examples approach C refers only to approach C1, which is based on the actual origin of surrendered allowances.

Figure 2 Emissions balances for both countries under each of the four approaches, tCO2e



In this example, both countries meet their NDC targets exactly, with their emissions balances equal to 88 in year five. The emissions balances in the non-target years one to four vary between the approaches. This is due to the different ways in which they capture the additional allowance transferred from Country A to Country B in year one, but not used in Country B until year four. The following results can be highlighted:

- For Country A, approaches A and C produce the same result, with an emissions balance below the trajectory in year one and above it in year four. With respect to the allowance banked from year one to year four, the shift in emissions is assumed to have occurred in year four (when the allowance is surrendered), and not in year one (when it is transferred). Country B meets its trajectory exactly each year with these approaches, whereas country A overachieves its trajectory in year one and exceeds it in year four.

- For Country B, approach B produces an emissions balance below the trajectory in year one and above it in year four. Under this approach, the shift in emissions associated with the banked allowance is assumed to have occurred in year one (when the allowance is transferred), and not in year four (when the allowance is surrendered). Country A meets its trajectory exactly under this approach.

- Approach D is the only one under which both countries meet their indicative trajectory every year. This is because approach D encompasses information on both transfers and surrenders. As a result, the corresponding adjustments do not match each year, as the year in which emissions are reduced (i.e., the mitigation outcomes are generated) can differ from the year in which emissions increase. In this example, Country A can account for the transfer of the banked allowance in year one, when it is transferred, while Country B can account for its use in year four, when it is surrendered.

Adopting a single-year target involves a degree of risk. Even if over the course of a whole NDC period emissions have been reduced in line with the trajectory, a deviation from the trend in the final year can lead to emissions levels above the target level. Such fluctuations can and do occur, for instance because of increased energy demand due to unexpectedly cold or hot weather. A small change to the example above illustrates this risk. Assume that emissions in Country B are 94 tCO_2e in year four and 92 tCO_2e in year five (as opposed to 95 tCO_2e and 91 tCO_2e, respectively, in the original example). Aggregate emissions across the period from the two countries are unchanged; however, in three of the four approaches, the emissions balances in the target year are now different. The results are shown in **Table 3** below, with solid cells representing emissions balances equal to or below the target level (i.e., where the NDC target is met) and striped cells representing emissions balances above the target level (i.e., where the NDC target is missed).

Table 3 Emissions balance in final target year, tCO2e

	Target	Approach A	Approach B	Approach C	Approach D
Country A	88	**89**	88	**89**	88
Country B	88	88	**89**	88	88

As these results show, a small change in emissions in one country in the final year can impact the achievement of both countries' targets, depending on which approach is applied. This occurs even though aggregate emissions over the five-year period are the same as in the original example, where both countries meet their targets in the final year. As in the original example, the exception is approach D, where both countries still achieve their targets.

1.5.2 Option 2: Averaging ITMO transfer and use over the NDC period

The second option to apply corresponding adjustments for single-year targets is the following (*Annex, Paragraph 7aii*):

> *Calculating the average annual amount of ITMOs first transferred and used over the NDC implementation period, by taking the cumulative amount of ITMOs and dividing by the number of elapsed years in the NDC implementation period and annually applying indicative corresponding adjustments equal to this average amount for each year in the NDC implementation period and applying corresponding adjustments equal to this average amount in the NDC year.*

This accounting option requires that, in the target year, countries account for the average number of ITMOs they have transferred or used over the whole NDC period. If a country with a five-year NDC period uses 10 ITMOs in its target year, it would only be able to apply a corresponding adjustment of two (i.e., 10 ITMOs/5 years = 2). In non-target years, "indicative" corresponding adjustments equal to the rolling average of ITMOs transferred and used up until that point must be applied. It should be noted that a future COP is due to agree further guidance on assessing the representativeness of averaging by quantifying how much the yearly transaction volume differs from the average for the period (*Decision, Paragraph 3bii*).

Averaging is simple to implement but amplifies the importance of a country's emissions in the NDC target year relative to its target. An underachievement in the target year would need to be compensated by purchasing an amount five or ten times the size of the shortfall, depending on whether the country has a five- or ten-year NDC period. Conversely, five or ten times the amount of any overachievement in the NDC target year could be sold to other countries to use.

Averaging also has different impacts depending on whether countries' transfer and use of ITMOs is increasing or decreasing over the course of an NDC period. For importing countries, if the use of ITMOs is increasing over time, then the average amount for which they can account will be smaller than the amount of ITMOs used in the final year. For exporting countries, if the transfer is decreasing over time, then the average amount for which they must account will be greater than the amount of ITMOs transferred in the final year. In both instances, this could make achieving the NDC target harder (Siemons & Schneider, 2022). This circumstance could occur in an ETS link if there is an increasing or decreasing shift in emissions from one system to the other, perhaps as the result of a big differential in abatement costs. Which of the systems would have the greater risk would depend on whether the shift is increasing or decreasing over time. The more constant the shift between systems over the NDC period, the lower the risk, as the average calculated in the final year will more closely match the shift that has occurred consistently throughout the NDC period. For a fuller exploration of the challenges of applying averaging, see Siemons & Schneider (2022).

As with the first option of indicative trajectories or budgets, each of the four approaches can be used in combination with averaging. Considering the same two-system example (**Table 3**) as in the first option, with the same assumptions, the approaches produce different results for the indicative corresponding adjustments. For approaches A, B and C, the indicative corresponding adjustments applied by both countries are the same in each year. For approach D, they differ

between the two countries in years one to three, which reflects the allowance that is banked from year one in Country B but not used until year four. The results are shown in **Table 4**.

Table 4 Indicative and final averaged corresponding adjustment values under the four approaches, tCO_2e

		Approach A	Approach B	Approach C	Approach D	
	Year	Countries A & B	Countries A & B	Countries A & B	Country A	Country B
Indicative	1	2	3	2	3	2
	2	2.5	3	2.5	3	2.5
	3	3	3.33	3	3.33	3
	4	3.25	3.25	3.25	3.25	3.25
Final	5	3.2	3.2	3.2	3.2	3.2

Unlike the first option of indicative trajectories or budgets, in years one to four there is no reference level against which to compare the emissions balance. The indicative corresponding adjustments in these years therefore serve mainly to increase transparency and illustrate a country's transfer and use of ITMOs on an ongoing basis as it progresses through its NDC period. In this example, each of the four approaches produces a final corresponding adjustment value of 3.2 tCO_2. This might not always be the case. For instance, if allowances are banked between NDC periods, then under approach D the value for the final corresponding adjustment can differ between the two countries, as it does in years two and three above. **Table 5** shows the emissions balance in the target year for both countries, i.e., after the corresponding adjustment of 3.2 tCO_2 has been applied to their emissions in year five.

Table 5 Final year emissions balances after applying the average corresponding adjustment value, tCO_2e

	Country A			Country B		
ETS cap	Emissions	Corresponding adjustment	Emissions balance	Emissions	Corresponding adjustment	Emissions balance
88	85	+3.2	88.2	91	-3.2	87.8

In this example, Country A misses its target by 0.2 tCO_2 while Country B overachieves its target by the same amount. This occurs even though, in aggregate, emissions have not exceeded the caps of either system over the five-year NDC period. Country A's transfers are fairly consistent throughout the period, at 3 tCO_2e in four of the five years. However, the transfer of 4 tCO_2e in year three increases the final average from 3 tCO_2e – where both countries would meet their

targets exactly – to 3.2 tCO_2e, where Country A narrowly misses its target. This illustrates the impact that any deviations, even if only slight, from an otherwise constant flow of allowances can have on the final accounting.

Averaging is also subject to the risk of emissions deviating from a trend in the final year, as explored in the first option of indicative trajectories and budgets. Assume the same change in Country B's emissions: 94 tCO_2e in year four and 92 tCO_2e in year five (as opposed to 95 tCO_2e and 91 tCO_2e, respectively, in the original example). Unlike in the first option, where one of the two countries missed their targets under approaches A, B and C (see **Table 3**), with averaging, both countries would miss their targets in the final year, under all four approaches. This occurs even though aggregate emissions have not exceeded the caps over the five-year NDC period. This illustrates that a deviation from an emissions trend in the final year has a larger impact under averaging than under multi-year trajectories or budgets (Siemons & Schneider, 2022).

Averaging poses additional challenges compared to the first option with indicative trajectories and budgets. Under both options, a country that is at risk of missing its NDC target due to its accounting method could pursue efforts to make up the difference by purchasing carbon credits through Article 6. However, the number of carbon credits that the country would need to purchase differs substantially between the two options. Whereas under the first option, a shortfall of 100,000 tCO_2 could be compensated through the purchase of 100,000 carbon credits, under the second option, the country would need to purchase 500,000 or 1,000,000 carbon credits, depending on whether it has a five- or ten-year NDC. This is because it can only account for the average amount of ITMOs in the target year and therefore needs to purchase a multiple of the shortfall. This could have implications for ETS jurisdictions, as it would turn a private liability (i.e., the need for regulated ETS entities to meet compliance obligations under the ETS) into a public liability (i.e., the need for the country to meet its NDC target).

In addition, the following points should be noted:

- When applying averaging, Country A narrowly misses its NDC target, while Country B narrowly overachieves it. This outcome applies regardless of the four approaches. However, under the first option of indicative trajectories and budgets, with the same flows of allowances, both countries achieve their targets under all four approaches. This demonstrates that which of the two options for applying corresponding adjustments is chosen can have an impact on NDC achievement independent of the actual flows of allowances between the two ETSs.

- When applying averaging, both the indicative and final corresponding adjustments do not represent the shift in emissions for the relevant year. The four approaches approximate the shift for each year. Conversely, when applying averaging, the corresponding adjustment values are determined based on the cumulative activity that has happened since the first year. This means that the calculation of the shift in emissions in a particular year partly depends on the values of the shifts in the years preceding it. This is demonstrated by the fact that, applying the first option, all four approaches estimate a shift of 3 tCO_2e in the final year, whereas when applying averaging, the estimated shift is 3.2 tCO_2e.

- While all four approaches produce the same final average corresponding adjustment value of 3.2 tCO_2e in the example above, this might not always be the case. If allowances are transferred and then banked by regulated entities beyond the target year, then the corresponding adjustments in the target year will not align. This is also relevant for restrictions on banking ITMOs between NDC periods, which is discussed further in section 1.7 below.

Another situation ETS jurisdictions should consider is the implication of averaging when establishing a link mid-way through an NDC period. In this case, allowances would only be transferred and used in later years of the NDC period, whereas the final amount to be correspondingly adjusted would be calculated as an average over *all* years in the NDC period, including those before the link was in place. This will result in smaller corresponding adjustments for both systems and would disadvantage the importing country.

1.5.3 Further considerations when accounting for ETS links with single-year NDC targets

There are two further points that countries with single-year NDC targets should consider when following either of the two accounting options explored above.

- **ETS and non-ETS covered emissions:** For simplicity, the example in this paper (**Table 2**) assumes that emissions covered by the ETS exactly match the scope of emissions covered by the NDC. This means that if emissions exceed the ETS cap in the final year, the country also misses its NDC target. In practice, the situation is more complex. Countries' NDCs include emissions covered by an ETS and those outside of the system's scope. As a result, if the emissions balance exceeding actual emissions in the target year is caused by the application of one of the four approaches, this could be compensated for through additional emissions reductions in non-ETS covered sectors. In general, the larger the portion of ETS-covered emissions as a share of total NDC coverage, the fewer the options to compensate in other areas of the NDC. Alternatively, the country could buy international carbon credits to cover the shortfall and achieve its target.

- **Multi-year compliance periods:** Both accounting options require corresponding adjustments to be applied annually. To calculate the annual shift in emissions, the four approaches use information on allowance transfers, surrenders, or both. However, not all ETSs have annual compliance cycles. In the California ETS, for instance, full compliance takes place at the end of a three-year compliance period. For the first two years of the period, regulated entities must only surrender allowances equal to 30% of the previous year's verified emissions. The approach of the Regional Greenhouse Gas Initiative is similar. This would not impact approaches A and B, which only rely on information on verified emissions and allowance transfer. However, approaches C and D require information on surrendered allowances. For systems with multi-year compliance, where entities do not need to surrender allowances equal to verified emissions each year, there may therefore be challenges in calculating annual shifts under these two approaches.

1.6 Corresponding adjustments for multi-year NDC targets

If a country adopts a multi-year NDC target, corresponding adjustments must be applied as follows (*Annex, Paragraph 7b*):

> *Where the participating Party has a multi-year NDC, calculating a multi-year emissions trajectory, trajectories or budget for its NDC implementation period that is consistent with the NDC, and annually applying corresponding adjustments for the total amount of ITMOs first transferred and used each year in the NDC implementation period and cumulatively at the end of the NDC implementation period.*

The application of the four approaches for multi-year NDC targets is similar to the option of establishing a trajectory or budget for a single-year NDC target. The difference is that, whereas for single-year NDC targets the trajectory or budget is "indicative", for multi-year targets the target levels are not. This implies that countries' emissions balances should not exceed these target levels, and if they do, ITMOs should be used to compensate for the excess emissions.

As demonstrated above in section 1.5.1 (**Figure 2**), approaches A, B and C each lead, in some years, to emissions balances above the trajectory level for both countries. From the Article 6.2 guidance it is not clear whether, when using a trajectory, overachievement earlier in the NDC period can be used to compensate for underachievement later. As such, countries should carefully consider any accounting approaches that may risk emissions balances above the trajectory at any point in the NDC period.

Alternatively, countries with an ETS may choose to adopt a budget instead of a trajectory. While a trajectory could be interpreted as establishing a target emissions level for each year of the NDC period, a budget would set a total amount of allowable emissions. This approach more closely resembles the design of an ETS, where the objective is to set an upper limit on emissions over a multi-year period, and not to achieve a particular emissions level in each year. However, it should be noted that choosing a budget approach could require establishing an emissions budget for the whole NDC, including the emissions not covered by the ETS.

1.7 Accounting for the shift in emissions through time

Accounting under Article 6.2 requires not only quantifying the size of mitigation that is internationally transferred but also when the mitigation was achieved. The guidance refers to this as the "vintage" of the ITMO, which is defined as "the calendar year in which the underlying mitigation occurred".

Determining the timing of the underlying mitigation is necessary as three accounting provisions are linked to it. These provisions are given below, together with a short explanation:

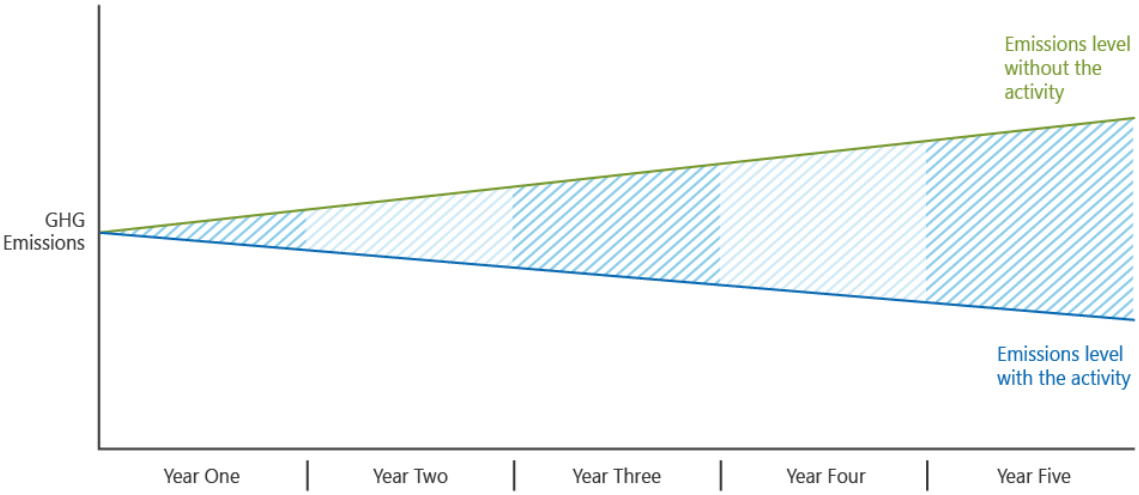
- **"ITMOs from a cooperative approach are…generated in respect of or representing mitigation from 2021 onward"** (*Annex, Paragraph 1f*). To be eligible to be used to meet an NDC target, the mitigation must have occurred after 2021. Mitigation from before this date is not eligible to be used to meet NDC targets under Article 6.

- **"Each participating Party…shall apply corresponding adjustments…[by] adding the quantity of ITMOs authorized and first transferred, for the calendar year in which the mitigation outcomes occurred"** (*Annex, Paragraph 8a*). For the country that transfers ITMOs, when it is making corresponding adjustments, it must make the addition to the emissions of the calendar year in which the mitigation occurred, and not the year in which the ITMO was transferred. For example, if mitigation of 10 tCO_2e occurs in the first year of an NDC, and the ITMOs are subsequently transferred in the third year, then the corresponding adjustment (i.e., the addition) of 10 tCO_2e must be made to year one's emissions, not year three's.

- **"Each participating Party…shall apply corresponding adjustments…ensuring that the mitigation outcomes are used within the same NDC implementation period as when they occurred"** (*Annex, Paragraph 8b*). For countries using ITMOs to meet their NDC targets, they must use them in the same period in which the mitigation occurred. This in effect means that mitigation cannot be banked between periods and used to meet later NDC targets.

Determining the vintage of mitigation is easier with carbon credits from emission reductions activities. This is shown in **Figure 3**. In this case, a comparison of actual emissions (the blue line) against the baseline (the green line) shows how much mitigation occurs in each year (the striped, blue areas between the two lines). By comparing the two it is simple to determine when the mitigation associated with an emissions reduction activity occurs. This information can then be electronically recorded for each carbon credit.

Figure 3 Timing and quantity of emission reductions achieved through an emissions reduction activity



Linking ETSs can affect the timing of mitigation, as it can influence regulated entities' decisions on when and how much to abate. This may lead to greater or fewer emissions reductions earlier on or later than would otherwise have been the case. However, unlike with baseline-and-credit activities, determining the vintage of the shift in emissions due to an ETS link is not so straightforward.

Alongside estimating the size of the shift, each of the four approaches also makes an implicit assumption about when mitigation occurs. Approaches A, B and C all assume that the decrease in emissions in one jurisdiction occurs in the same year as the increase in emissions in the other jurisdiction. Approach D, by combining information on both transfers and surrenders of allowances, considers a potential difference in timing: the decrease in emissions in the jurisdiction from which an allowance is transferred is assumed to occur in the year of transfer, whereas the increase in emissions in the jurisdiction where the allowance is used is assumed to occur in the year of use. Practically, this means that corresponding adjustments may not be the same between the two countries in each year of the NDC period. This raises the question of how well the four approaches are likely to approximate the actual – but unknown – timing, and whether they could be supplemented with additional information to produce better approximations.

There are two options that countries could pursue. The first is to use the assumptions on the timing of mitigation which are already implicit in each of the four approaches. The second is to use information on the vintages of ETS allowances as a proxy for the timing of the increase and decrease in emissions and to combine this with one of the four approaches. These two options are explored below.

1.7.1 Option 1: Using one of the four approaches to determine the timing of emission changes

This option would be to apply one of the four approaches to estimate the timing of the increases and decreases in emissions and using the assumptions on the timing of mitigation implicit in each. The benefit of this option is that it is easy for countries to implement, requiring only the aggregate information on allowance transfers and/or surrenders.

To explore how this option can be applied to approximate the timing of mitigation, some changes have been made to the two-system example previously used, reproduced here in **Table 6**. In this variation of the example, one assumption is modified: instead of assuming that all surplus allowances are transferred in the year in which the surplus occurs, we here assume that they are transferred in the year in which they are surrendered. For this example, it means that the surplus allowance generated in Country A in year one is banked and transferred to Country B in year four, the same year in which it is surrendered in Country B. Furthermore, we also assume that in the absence of the ETS link, both countries' emissions would decline in line with their ETS caps. The features of this example are summarized below:

- The emissions covered by the ETSs represent all emissions within the countries' NDCs.
- Both ETSs have the same cap with a common target to reach an absolute emissions level of 88 tCO_2e in year five.
- In the absence of the ETS link, both countries' emissions would decline in line with their ETS caps.
- With the ETS link, emissions in Country A are below the cap in every year of the NDC period, while Country B's emissions exceed the cap. Country A is therefore a net transferrer of allowances, while Country B is a net user.
- Surplus allowances from Country A are transferred to Country B in the year in which they are surrendered and used.

Based on these assumptions, the increase and decrease in emissions due to the ETS link is exactly equal to surplus/deficit values in each country, as shown in **Table 6**. In year one, emissions in Country A decrease by 3 tCO_2e due to the ETS link, while they increase in Country B by 2 tCO_2e. This means that mitigation across the two countries increases by 1 tCO_2e due to the ETS link in year one. This additional mitigation is then surrendered and used in year four in Country B, where the increase in emissions (4 tCO_2e) exceeds the decrease in Country A (3 tCO_2e). The linking thus leads to mitigation occurring earlier in time than without the linking.

Table 6 Example of two linked ETSs over a five-year NDC period, tCO2e

	Country A				Country B		
Year	ETS cap	Emissions	Surplus (+) / deficit (-)	Allowance transfer	ETS cap	Emissions	Surplus (+) / deficit (-)
1	100	97	+3	2 →	100	102	-2
2	97	94	+3	3 →	97	100	-3
3	94	90	+4	4 →	94	98	-4
4	91	88	+3	4 →	91	95	-4
5	88	85	+3	3 →	88	91	-3

The Article 6.2 guidance requires the transferring country to apply corresponding adjustments to the emissions of the year in which the mitigation occurred. In this case, that is year one. However, all four of the approaches would instead lead to the addition being made to Country A's year four emissions. This is because all four approaches use information on allowance transfer and/or surrender to estimate the shift, both of which happen in year four. In this specific example, none of the approaches attribute the mitigation to the year in which it has occurred.

1.7.2 Option 2: Use allowance vintages as a proxy to determine the timing of the shift

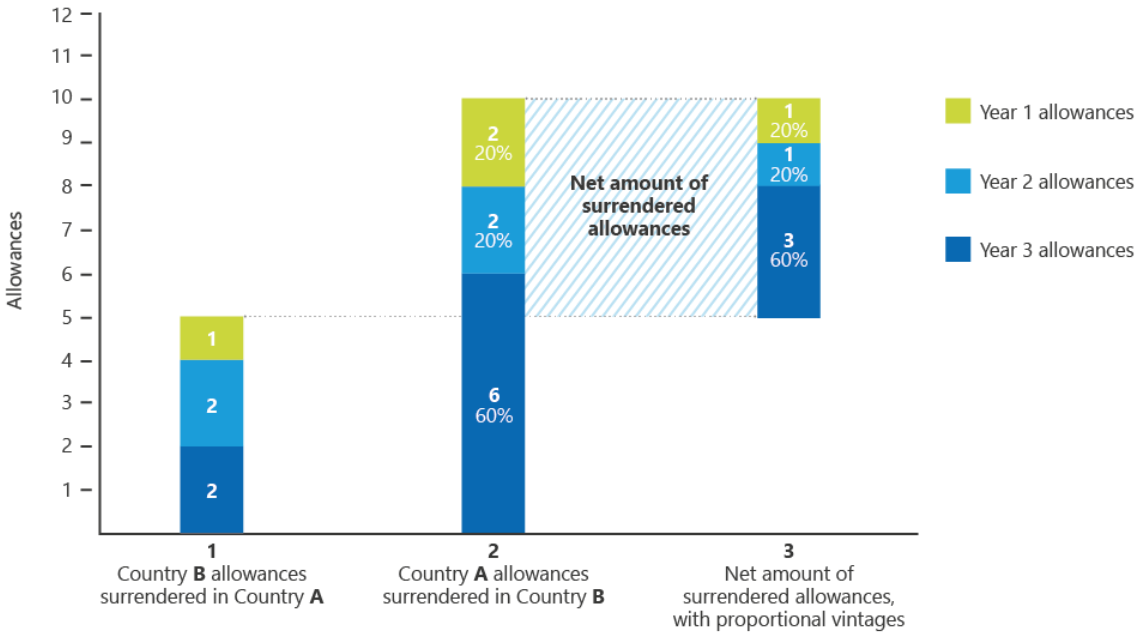
This option uses the year of allowance issuance, either through auctioning or free allocation, as a proxy for the year in which the mitigation occurred. This option assumes that if emissions levels are below the cap in a particular year, then mitigation has been achieved. This mitigation is represented by some or all of the non-surrendered allowances issued that year, which can then be banked for later use. Information on the issuance year of allowances could therefore be considered to estimate when emissions increase or decrease in the respective countries due to an ETS link.

Using the same example above (**Table 6**), the ETS link leads to mitigation of 3 tCO_2e in Country A in year one, but only two allowances are transferred to Country B and used for compliance in the same year. When the third allowance from year one is transferred to Country B and surrendered in year four, the regulators would be able to identify that the allowance had been issued in year

one. With this information, Country A would be able to make the respective corresponding adjustment to year one emissions, which is when the mitigation occurred, as opposed to year four, which is when the allowance was transferred and surrendered. This would be in line with the Article 6.2 requirement that additions are made for the calendar year in which the mitigation outcomes occurred. It is important to note that this would not affect the accounting of Country B, which would remain unchanged.

This option could be implemented using information on actual allowances surrendered. How this could be implemented is illustrated through a separate example, shown in **Figure 4**. In this example, we consider allowances surrendered in the final year of a three-year period. Entities in both countries surrender allowances from the other, with allowances originating from one of the three years. In this example, entities in Country A surrender five allowances from Country B (Column 1), and entities from Country B surrender 10 allowances from Country A (Column 2). Using approach C1, which is based on actual allowance surrenders, this gives an estimate of the shift in emissions equal to 5 tCO2e from Country A to Country B. When applying corresponding adjustments, Country A must therefore make an addition of 5 tCO2e and Country B a subtraction of 5 tCO2e. To estimate when the 5 tCO2e of mitigation occurred, Country B would look at the issuance years of all the surrendered Country A allowances and attribute the timing of mitigation in proportion to the issuance years of the surrendered allowances (Column 3). This would then enable Country A to make additions to the appropriate years: of 1 tCO2e to the emissions of year one and two, and of 3 tCO2e to year three's emissions. Country B would subtract the total amount of 5 tCO2e from year three's emissions. A worked example is shown in **Figure 4** below.

Figure 4 Determining the timing of mitigation in proportion to vintages of surrendered allowances



If regulators can identify the issuance year of surrendered allowances, this option should be relatively simple to implement. Using allowance vintage years in this way would allow countries to attribute mitigation to particular years, which is a requirement of the Article 6.2 guidance. However, this attribution may not reflect the true timing of the mitigation, a limitation which is

discussed further below. Finally, this option could only be applied if both countries adopted approach C1 to estimate the shift in emissions, as it requires data on actual allowance surrenders to attribute the timing.

1.7.3 Discussion

The fundamental challenge with implementing this requirement of the Article 6.2 guidance is that, unlike with baseline-and-crediting activities, the timing of mitigation from an ETS link cannot be observed. In both options, an essential assumption is that emissions would decline in line with the cap without the ETS link – and hence that surplus allowances represent mitigation due to the ETS link. In practice, this assumption does not hold. Allowance surpluses in one or both systems could occur entirely, partly, or not at all due to the ETS link. In newly established ETSs, policy makers may choose to deliberately create more allowances early on to limit price impacts and improve market liquidity. Market stability measures may introduce additional allowances in response to price spikes. Allowance surpluses may also be caused by increased use of carbon credits for compliance. Exogenous factors, such as an economic downturn, may reduce emissions and therefore demand for allowances. In none of these circumstances would the surplus necessarily represent mitigation achieved within the ETS, and only a portion of the surplus in a jurisdiction may be caused by the ETS link.

Given that the true timing of the shift cannot be observed, it is not possible to conclude that one of the four approaches in general provides a better approximation than the others. In the example from Option 1, approach D is the only approach that correctly attributes the mitigation to year one. However, this does not mean that approach D is necessarily always better than the other approaches: the only circumstance in which approach D accurately attributes the timing of mitigation is when the mitigation is transferred in the same year in which it occurs. In practice, this will not be the case, as at least some mitigation is likely to be banked within the system and transferred in later years. In other scenarios with different sizes and timings of mitigation, the other approaches may provide a better approximation. The same is true for Option 2, which faces two main challenges. The first is the extent to which surplus allowances in a particular year can be considered a reasonable proxy for the additional mitigation caused by an ETS link in the relevant jurisdiction. The second is whether the issuance year of the allowance is representative of when that additional mitigation occurred. While Option 2 attributes the shift in mitigation to different years for the two Countries A and B, it may not necessarily result in corresponding adjustments that are more representative of the true timing of mitigation caused by the ETS link.

The rationale for vintage-based accounting in Article 6.2 is to implement the guidance's no-banking provisions, both of pre-2020 mitigation, as well as of ITMOs between NDC periods. One question for ETS administrators is therefore how the different approaches and options may or may not align with this requirement. Under Option 1, the no-banking provisions of ITMOs under Article 6.2 are automatically implemented when applying approaches A, B, and C, even though mitigation may in fact be banked between NDC periods. This is because these three approaches assume that the increase and decrease in emissions between the two countries always happen in the same year. By definition, corresponding adjustments would always be applied within the same NDC implementation period as when the mitigation occurs, even if in reality the mitigation has occurred in a previous NDC period. Under this option, no additional restrictions would therefore be applied at the multilateral level on what mitigation caused by an ETS link is eligible to be used

to meet successive NDC targets. This outcome is aligned with the operation of ETSs, which typically allow unrestricted banking between years and trading periods.

Under Option 1, following approach D could result in corresponding adjustments being applied in different years for the two countries. As explained above, approach D does not necessarily provide a better approximation of the timing of mitigation caused by an ETS link. Nevertheless, by combining information on both allowance transfers and surrenders to estimate the shift, approach D allows for the timing of mitigation and its subsequent use to be separated, as it reflects that mitigation can be banked for use for later years. Without any further accounting provisions, this would enable banking mitigation between NDC periods. The simplest way to implement the no-banking provision for approach D is to ensure that the corresponding adjustment values for the country with the net-surrendering ETS (i.e., the subtractions) are equal to or less than the values for the country with the net-transferring ETS (i.e., the additions), for each NDC period. Implementing the no-banking requirements is simpler under Option 2, as the year of mitigation is identifiable from the issuance date of the surrendered allowance. Countries would therefore know for each ETS compliance period which surrendered allowances had been issued in the previous NDC period and therefore could not be accounted for under Article 6.

However, this raises practical challenges for countries operating ETS links. At the national level, between the two systems, entities would be able to bank, trade and surrender allowances between years and trading periods without restrictions. However, at the multilateral level, allowances that are surrendered for compliance across different NDC periods would not be eligible to be counted towards NDC achievement. This could leave countries in a similar position to the situation explored with the averaging approach for single-year targets: despite the caps of the two ETSs being met, the importing country could find itself with a shortfall when accounting for its NDC, as some of the allowances surrendered were auctioned or issued by its partner country in the previous NDC period. This shortfall would then need to be covered by additional emissions reductions in non-ETS covered sectors or compensated for through purchasing carbon credits.

For these reasons, policymakers may consider that approaches A, B or C under Option 1 are more consistent with the functioning of ETSs as a policy tool to achieve NDCs. Countries could argue that it is a reasonable simplification to assume that mitigation is generated in the same year as when it is used, given that the true timing of mitigation due to the ETS link is unknown, counter-factual, and thus hypothetical under any of the four approaches and options. Countries may also conclude that, as caps decline towards zero and all allowances are surrendered, any inconsistencies will eventually even out. Therefore, in the long run any errors in the approximation of the timing may not be significant. When deciding between approaches and options, countries will need to consider which provide a sufficiently good approximation of the timing while not hindering the operation of the ETS link, as well as being implementable (e.g., that the necessary data is available).

2 OTHER ISSUES RELATED TO ETS LINKING

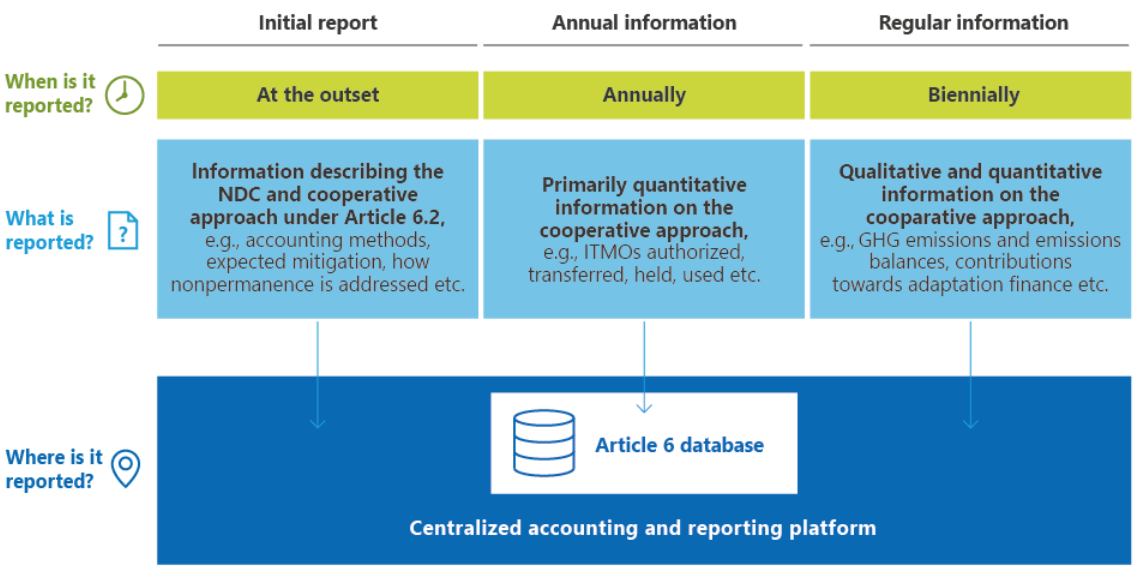
The application of corresponding adjustments is a central component of the Article 6.2 guidance. It aims to avoid double counting mitigation outcomes against multiple NDC targets while ensuring that accounting reflects when mitigation actually occurred. Aside from these accounting rules, the guidance contains other provisions which countries participating in Article 6.2 must follow. These can be grouped into two categories: information that countries must report related to their participation in Article 6.2; and measures to ensure that the countries' cooperation leads to contributing financial resources to support adaptation action and leads to an "overall mitigation in global emissions".

This chapter addresses these two categories, focusing on interpreting particular provisions for the case of linked ETSs.

2.1 Reporting and review

There are three types of reports that countries must provide, summarized in **Figure 5**. An "initial report" provides information on the country's NDC and on the cooperative approach (*Annex, Paragraph 18*). Once the cooperative approach has begun, each participating country must submit quantitative information ("annual information") related to ITMOs in an electronic format to be agreed by Parties at COP28 (*Annex, Paragraph 20*). Every other year, countries must provide a fuller report ("regular information"), which together with the key quantitative information on ITMO transfer and use, will contain qualitative information on the cooperative approach (*Annex, Paragraphs 21-23*). These reports will form part of countries' wider reporting on NDC progress submitted biennially under the Paris Agreement's Enhanced Transparency Framework. All information will then undergo a review, which will provide recommendations for improving the consistency of the reporting with the guidance, as well as addressing any errors in quantified information (*Annex, Paragraphs 25-28*). Information from all three of these reports and the review will be stored in a publicly accessible "central accounting and reporting platform", where all non-confidential information can be accessed.

Figure 5 System of reporting and recording established by Article 6.2



Countries will need to report on many elements of their cooperative approaches. Some of these are not specific to the cooperation itself (e.g., providing a biennial transparency report, quantifying the NDC target) nor do they necessarily vary between ETSs links and other forms of cooperation (e.g., how negative environmental and social impacts are avoided or how the activities are consistent with the country's sustainable development objectives). Other provisions may require interpretation for the case of linked ETSs, noting that they have originally been informed primarily by experiences with baseline-and-credit activities. Several of these provisions are explored below.

2.1.1 Initial report

Some information must be provided at the outset as part of the initial report and then reported on at regular intervals as part of countries' biennial reporting (see section 2.1.2 below). This includes the following three elements:

- **"Describe how each cooperative approach ensures…that there is no net increase in global emissions within and between NDC implementation periods"** (*Annex, Paragraph 18gi & 22bi*). One of the main risks with carbon markets is that their use leads to higher aggregate emissions than would otherwise have occurred. This can, for example, happen when non-additional carbon credits or surplus allowances deriving from a cap set above business-as-usual emissions (so-called "hot air"), displace genuine emissions reductions in systems with targets below their projected emissions. This risk is commonly deemed lower for an ETS link than for baseline-and-credit approaches. ETS caps should be set below business-as-usual emissions and decline over time. If this is the case, surrendering allowances from another system and banking them for later use does not lead to a net increase in emissions, either within or between NDC periods. Countries may also need to demonstrate that linking has not led to higher caps and less ambitious NDC targets in either jurisdiction, in order to increase the amount of exported allowances – and hence revenue – in one of the jurisdictions. For more

on the perverse incentives of ETS linking see section 2.7.2 of the ICAP's *A Guide to Linking Emissions Trading Systems* (Santikarn, Li, La Hoz Theuer, & Haug, 2018). Lastly, the choice of the accounting approach in the case of single-year targets can, under certain circumstances, lead to an increase in emissions across jurisdictions (Siemons & Schneider, 2022). This also holds for ETS linking, although in this case the emissions would not increase across the linked ETSs but could enable one of the countries to increase its emissions in non-ETS covered sectors of the NDC.

- **"Describe how each cooperative approach ensures environmental integrity…through conservative reference levels, baselines set in a conservative way and below 'business as usual' emission projections (including by taking into account all existing policies and addressing uncertainties in quantification and potential leakage)"** (*Annex, Paragraph 18gii & 22bii*). Establishing the baseline is a fundamental part of a baseline-and-credit activity. For absolute ETSs, which do not have a baseline, it must be shown that the cap levels in both linked systems are consistently set below business-as-usual emissions. Relative ETSs will need to show that the emissions intensity or benchmark values are set at levels below those that would have prevailed in the absence of the ETS. ETS links could also lead to emissions leakage. If an ETS with allowance prices links to a lower cost system, thereby raising prices in the latter, entities could be incentivized to move production to a third country.

- **"Describe how each cooperative approach…[minimizes] the risk of non-permanence of mitigation across several NDC periods and how, when reversals of emission reductions or removals occur, the cooperative approach will ensure that these are addressed in full"** (*Annex, Paragraph 18giii & 22biii*). The risk of reversals is mainly a concern associated with mitigation activities in the land sector, such as afforestation and reforestation activities, and with activities involving storage of carbon in geological reservoirs, products, or other reservoirs. This risk is only applicable in cases where ETS cover emissions from the land-use sector, such as in New Zealand, or allow regulated entities to reduce and account for emission reductions from storage in reservoirs, such as carbon capture and storage at power or cement plants in the EU. One way of addressing the reversal risk is to ensure that relevant activities continue to be covered by the ETS in future. In this case, responsible operators of the stored carbon would need to compensate for the reversal through purchasing allowances.

2.1.2 Annual information

The information that countries must provide annually in a standardized format primarily consists of quantitative information related to ITMOs.

- Annual information on authorization of ITMOs for use towards achievement of NDCs
- Authorization of ITMOs for use towards other international mitigation purposes (for example, the carbon crediting scheme for international aviation, CORSIA)
- First transfer, transfer, acquisition, holdings, cancellation, voluntary cancellation, and use of ITMOs towards NDC
- Voluntary cancellation of mitigation outcomes or ITMOs towards overall mitigation in global emissions

Additionally, the country must report on the year the mitigation occurred, the sector and activity from which it originated, and its unique identifier number (*Annex, Paragraph 20*).

Only some of these categories will apply in the case of an ETS link. For instance, with approaches A, B and C, all ITMOs are used in the same year in which they are first transferred. As such, countries applying these approaches may not have ITMO holdings.

All necessary information should be readily available to ETS administrators through their system registries. It is currently not clear what level of detail will need to be reported. While approach A, B and C2 are based on aggregated information (on emissions, allowance transfers, and cap sizes respectively), approaches C1 and D are based on allowances surrendered. Should countries use information on allowance vintage dates to estimate the timing of mitigation, more detailed information on the allowances surrendered may need to be reported. This information is not currently disclosed by ETS administrators, either due to confidentiality or because there is at present no reason to do so. If this level of detail is required for the Article 6.2 review process, then countries with linked ETSs may have the option to classify the relevant information as confidential. In this case it would not be made publicly available on the centralized accounting and reporting platform.

2.1.3 Regular information

In addition to the information which is reported in both the initial and annual reporting, countries will need to provide details and explanations on other elements as part of the regular reporting under the enhanced transparency framework.

- **"How corresponding adjustments undertaken in the latest reporting period…are representative of progress towards implementation and achievement of its NDC"** (*Annex, Paragraph 21d*). When accounting for single-year NDC targets it is important that the amount of ITMOs transferred and used in the final year is representative of the emissions trends. Adopting an indicative trajectory or budget is one way of providing a reference value against which progress can be measured throughout the NDC period. As explored in Chapter 1, after corresponding adjustments have been applied to account for the shift, a country's emissions balance may exceed the trajectory for that year. For instance, in the example from section 1.5.1, this occurs for Country A's emissions under approaches A and C in year four (**Figure 2**). When reporting under this provision, the country would need to explain how, despite the cooperation under Article 6.2 leading to emissions above its trajectory level, the corresponding adjustments it had applied were still consistent with meeting its NDC target. In this case, the country may reference overachievement from earlier in the NDC period. It will be important for countries to describe their approach to calculating the shift in emissions in the initial report. In doing so, they can explain at the outset how the approach chosen might lead to emissions balances above or below the trajectory in non-target NDC years and why this would still be consistent with progress to meet their targets over the whole NDC period.

- **"Provides for the measurement of mitigation outcomes in accordance with the methodologies and metrics assessed by the Intergovernmental Panel on Climate Change and adopted by the CMA"** (*Annex, Paragraph 22c*). At COP24, Parties to the UNFCCC agreed that they would report their emissions using the 100-year time-horizon global warming potential (GWP) values from the Intergovernmental Panel on Climate Change's Fifth Assessment Report (AR5). Countries still have the option to use different GWP values for their first NDC (UNFCCC, 2018). In some cases, countries might also use different GWP values in the implementation of domestic policy instruments such as ETSs. For an ETS link, at a minimum it is important that the two jurisdictions use the same GWP values for their ETS as well as for NDC accounting, as using different GWP values can lead to an increase or decrease in aggregated emissions (Schneider, Cludius, & La Hoz Theuer, 2018). Ideally countries would apply AR5 GWPs to their ETSs and their NDCs, as this would make ETS accounting, NDC accounting, and inventory reporting consistent. Parties have also agreed that in future different IPCC GWP values could be applied.

2.2 Ambition in adaptation and mitigation actions

Article 6.1 of the Paris Agreement, which frames all activity taking place under Article 6, states that participation should "allow for higher ambition in [Parties'] mitigation and adaptation actions". How to implement this principle was among the most controversial aspects of the negotiations. There were several proposals, some of which originated from approaches applied under the Kyoto Protocol while others were new. This section discusses two specific outcomes on these matters in the context of linked ETSs.

2.2.1 Actions to raise ambition in adaptation actions

From the beginning of international carbon markets under the Kyoto Protocol there has been an understanding that participation in the market should support adaptation action. This could in theory happen in different ways. While emissions reduction activities typically have mitigation-focused outcomes, some activities may have considerable adaptation co-benefits. In practice discussions have instead focused on how participation in the market can generate financial resources to support projects that enhance climate resilience.

The Kyoto Protocol provided an innovative model to achieve this. Under the Clean Development Mechanism (CDM), a "share of proceeds" (SOP) for adaptation was levied. This meant that two percent of all carbon credits issued from CDM projects were diverted into a separate account. These carbon credits would then be sold, with the proceeds flowing directly to the UNFCCC's Adaptation Fund, which supports adaptation projects in developing countries. Since it started, the sale of CDM carbon credits has raised around USD 210 million for the Adaptation Fund. The effectiveness of this method to generate finance is directly tied to the prevailing market price. Following the steep decline in demand for CDM carbon credits and resulting price crash after 2012, the SOP has proved a significantly less reliable source of adaptation funding: between July 2022 and June 2023, just USD 3.12 million was raised (UNFCCC, 2023).

At COP26, Parties to the UNFCCC agreed on mechanisms to generate adaptation finance under Article 6.4. The first is a SOP, similar to that of the CDM, but set at five percent. The second is a

monetary contribution related either to the scale of the emissions reduction activity or number of credits issued. The third is a periodic reallocation of surplus resources from administrative charges under the Article 6.4 mechanism to the Adaptation Fund. While the mechanisms to generate adaptation finance under Article 6.4 are clear, how resources should be raised under Article 6.2 was among the most contested issues in the negotiations. The argument ran along two lines. The first was whether it should be mandatory for participants in Article 6.2 to contribute financing for adaptation, just as it was obligatory for participants in Article 6.4. The second was whether adaptation finance in Article 6.2 should be generated through the application of a mechanical method, such as a SOP, or whether the size of the contribution should be left to countries' discretion. Within the second issue there was also a challenge regarding how a mechanical approach could be applied to a potentially diverse range of cooperation taking place under Article 6.2.

Parties eventually agreed to the following compromise:

> *Participating Parties and stakeholders using cooperative approaches are strongly encouraged to commit to contribute resources for adaptation, in particular through contributions to the Adaptation Fund, and to take into account the delivery of resources under Article 6, paragraph 4, to assist developing country Parties that are particularly vulnerable to the adverse effects of climate change to meet the costs of adaptation (Annex, Paragraph 37).*

While contributions will not be mandatory, they are strongly encouraged, with an invitation for them to be directed to the Adaptation Fund. The size of the contribution is not defined, although it should take into account the approach under the Article 6.4 mechanism.

From the guidance there is a clear expectation that countries participating in Article 6.2 through an ETS link should provide financial resources for adaptation. There are different ways in which this could be achieved.

- **Apply a SOP to the shift of emissions.** Countries could apply a SOP to the ETS link, similar to the approach under the Article 6.4 mechanism. Countries would first estimate the shift of emissions. They would then make a financial contribution equal to five percent of this shift – to be consistent with the percentage levied under Article 6.4 – multiplied by the average price for allowances in that year (e.g., a weighted average of auction prices). So, for an ETS link which leads to a shift of 1,000,000 tCO_2e with an average price of USD 50/tCO_2e, a five percent levy from the two countries would generate USD 2,500,000 (1,000,000 x 50 x 0.05). To align fully with the Article 6.4 approach, the countries could also provide a monetary contribution consistent with the rate used under the Article 6.4 mechanism. Its Supervisory Body established a maximum issuance fee of USD 0.20/tCO_2e and agreed that three percent of that fee to be transferred to the Adaptation Fund. This effectively corresponds to a maximum fee of 0.006 USD/tCO_2e. In the above example, this would entail an additional USD 6,000. This latter contribution would thus likely be much smaller than the contribution from the SOP. Both contributions could be financed through revenue raised via auctioning allowances. Overall, this option would align closely with Article 6.4, as the contribution would be linked directly both to the number of ITMO transferred and to the price of the allowances, and possibly include a monetary fee.

- **Create an adaptation action allowance fund.** Countries could endow a dedicated fund with allowances, the auctioning proceeds from which would be directed towards the Adaptation Fund or financing other adaptation projects. This could function in a similar way to the EU ETS's Innovation Fund, which raises revenue to support cutting-edge clean technology projects, and would be similar in design to the original SOP under the CDM, where carbon credits were auctioned out of a dedicated fund. To maintain the link of the adaptation contribution to the size of the ITMO, the fund could be endowed with allowances equal to five percent of the size of the previous year's shift in emissions. Countries could additionally make a further monetary contribution, as outlined in the option above. It is not clear whether this option would offer material benefits compared with the first. Both options could provide a financial contribution. However, creating a dedicated fund of allowances for adaptation would likely be more complex to implement and administer and could require changes to underpinning ETS legislation.

- **Make discretionary contributions to support adaptation action.** Whereas the two options above represent ways to link the adaptation finance contribution mechanically to the shift in emissions, countries also have the option to fulfill this commitment in a discretionary manner. In this case, countries' contribution would not be directly linked to either the size of the shift nor the price of ITMOs. For instance, countries could commit to donate a certain percentage of auction revenue each year to the Adaptation Fund, or a fixed amount over a multi-year period. Some countries already pursue a similar approach: the revenue from EU ETS allowances auctioned in Germany goes towards international climate finance, a portion of which supports adaptation action. This is likely the easiest option for countries to implement and offers the most flexibility. Subnational governments such as Québec have also financially contributed directly to the Adaptation Fund.

Regardless of the method chosen to generate resources for adaptation action, countries pursuing an ETS link under Article 6.2 must decide early on how they will implement this requirement. They are required to explain in their initial report how their cooperation through the ETS link will contribute resources for adaptation (*Annex, Paragraph 18iv*). This will also need to be reported on an ongoing basis as part of their regular reporting (*Annex, Paragraph 22j*).

2.2.2 Implementing an "overall mitigation in global emissions"

Alongside generating resources for adaptation, Article 6 should also enable higher ambition in mitigation action. Unlike adaptation finance, for which there was an established precedent under the Kyoto Protocol, implementation of this principle was new. The idea stems from a long-standing criticism of carbon crediting. Through carbon crediting, an emission reduction in one place compensates for an increased emission elsewhere. In aggregate, emissions levels remain the same. As a result, carbon crediting has been criticized as a "zero-sum" game. The intention of the proponents for increased mitigation action was for carbon crediting to make a "net-positive" contribution, where participation in carbon markets would directly result in reduced global emissions. Under the Article 6 rules, several measures aim to enhance ambition, such as the use of ambitious baselines below business-as-usual emissions and the requirement that part of the mitigation outcomes can be used by the host country of mitigation activities to achieve its own NDC. One further element is referred to as an "overall mitigation in global emissions" (OMGE).

The latter would be achieved through a mandatory cancellation or discounting of mitigation achieved through Article 6. It would work in the following way. Country A finances a project in Country B which will reduce emissions by 100,000 tCO_2e. At the point of issuance, two percent – i.e., 2,000 – of the carbon credits will be automatically cancelled in the registry. This means they cannot be used and claimed by any country. The remaining 98,000 credits would be transferred to Country A and used to meet its NDC. Applying corresponding adjustments, Country B would make an addition of 100,000 tCO_2e to its emissions level, while Country A would subtract 98,000. The 2,000 cancelled credits represent emissions reductions that are not claimed against any NDC target. In this way, a net emissions reduction – or an OMGE – of 2,000 tCO_2e has been achieved at the aggregate level.

At COP26, Parties agreed to apply a mandatory cancellation rate of two percent of all credits generated under the Article 6.4 mechanism. As with adaptation finance, Parties were divided on how this principle could also be applied to cooperation under Article 6.2. The arguments were similar: whether achieving an OMGE should be mandatory or not; and whether it should be done in a mechanical way, as under Article 6.4, or should be left to participating countries to decide. The diversity of potential cooperation under Article 6.2 once again posed challenges to the application of a mechanism approach.

Parties eventually agreed to the following compromise:

> *Participating Parties and stakeholders are strongly encouraged to cancel ITMOs that are not counted towards any Party's NDC or for other international mitigation purposes, to deliver an overall mitigation in global emissions, and to take into account the delivery of overall mitigation in global emissions under the mechanism established by Article 6, paragraph 4 (Annex, Paragraph 39).*

The formulation of the provision closely resembles that of adaptation finance, with a strong encouragement to cancel ITMOs without their being used towards NDC targets or other compliance schemes such as CORSIA. The size of the cancellation should take into account the approach applied under Article 6.4, although how explicitly this is to be implemented is not elaborated.

There are several ways that countries implementing a linked ETS under Article 6.2 could implement an OMGE.

- **Reflect the OMGE when applying corresponding adjustments.** Countries could apply a mechanism based on the Article 6.4 OMGE to the ETS link. They would first estimate the shift of emissions. To be consistent with the OMGE cancellation rate under Article 6.4, neither country should be able to account for two percent of the shift towards achieving its NDC. So, for an ETS link which leads to a shift of 1,000,000 tCO_2e, the OMGE would be equal to 20,000 tCO_2e. If implemented in line with the approach under Article 6.4, the net-transferring country would apply corresponding adjustments by making an addition of 1,000,000 tCO_2e, whereas the net-importing country would apply corresponding adjustments by making a subtraction of 980,000 tCO_2e. The net-importing country would then need to make up for the shortfall of 20,000 tCO_2e. The simplest way of doing so would be to reduce the supply of issued allowances in its ETS by 20,000 for the following year. Alternatively, the OMGE may be divided between

the two countries: for instance, if it were to be split equally, the net-exporting country would make an addition of 1,010,000 tCO_2e while the net-importing country would make a subtraction of 990,000 tCO_2e.

In practice, there are several challenges associated with implementing this option. ETS caps are typically set years in advance, to give market participants certainty over the supply of allowances and hence the carbon price. In this option, additional reductions in the supply of allowances would need to be confirmed each year, based on the annual calculation of the OMGE amount. ETSs already operate with measures to change the supply of allowances: price stability mechanisms can increase or reduce the number of allowances available to regulated entities within compliance periods. However, this option would introduce an additional measure to reduce allowance supply that is not related to either the carbon price or the total amount of available allowances, the two indicators on which price stability mechanisms are based. ETS jurisdictions may not want to introduce uncertainty into allowance supply. On the other hand, the changes in allowance supply to account for OMGE may be relatively small. If the shift were equal to 5% of ETS emissions, a 2% OMGE rate would reduce total supply by 0.1%. Moreover, this value may not fluctuate considerably over time, so that regulated entities could better anticipate this effect. Overall, other factors, such as international fuel prices or economic development, create much larger uncertainty over the scarcity of allowances.

A further consideration is that the shortening of supply of allowances may not necessarily create exactly the same amount of mitigation as a 2% cancellation of ITMOs. Fewer allowances mean that, in the long term, ETS-covered emissions will be lower than they would otherwise have been. However, issuing 20,000 fewer allowances for the following year does not mean that emissions will be 20,000 tCO_2e lower in that specific year. ETS emissions may be the same, with regulated entities instead choosing to surrender allowances banked from previous years. This introduces a risk that, while in the long run emissions will be lower, the effects may not be observed in the same years. This may create some uncertainty for NDC achievement, as the effect of reducing allowance supply may not be reflected in the following year's emissions.

- **Purchase authorized credits through Article 6.** A second option would be to purchase authorized carbon credits. Taking the same example as above, the countries would need to deliver an OMGE equal to 20,000 tCO_2e. They could do this by purchasing 20,000 carbon credits authorized to be used against NDC targets. The seller country from which carbon credits originate would make a corresponding adjustment of 20,000 tCO_2e while the purchaser – in this case, the two ETS countries – would not use the credits to meet their NDC targets, but instead voluntarily cancel them in the registry. This would have a similar overall impact to the first option, leading to a net reduction of 20,000 tCO_2e. The carbon credit purchases would be financed from auction revenues. An advantage of this option is that it does not require annual changes in the supply of allowances. Moreover, it would not create uncertainty when the additional net-reduction in emission occurs. On the other hand, this option requires establishing an ITMO purchase program, which is associated with further transaction costs.

As with adaptation finance, implementing countries must consider if and how they will achieve an OMGE early in the process. They are required to explain their approach in the initial report (*Annex, Paragraph i(vi)*), and then regularly report on it as part of their biennial reporting (*Annex, Paragraph 22k*).

3 CONCLUSION

Since the publication of the previous ICAP paper in 2018, the adoption of ETSs has continued to grow. In 2023, there are 28 systems in operation, up from 20 systems five years previously. Another eight jurisdictions are preparing to implement ETSs, while a further 12 are considering introducing the instrument (ICAP, 2023). This period has also seen the first international link between national ETSs, between the EU ETS and Swiss ETS in 2020. In 2022, the methodology for calculating the shift in emissions between two linked ETSs was established for the joint California and Québec cap-and-trade programs. As the uptake of ETSs increases around the world, more jurisdictions may look at the possibility of linking with other systems. Where this is the case, countries will need to consider whether – and if so, how – to account for a link under Article 6.2.

The 2018 ICAP paper identified four approaches to estimate the shift in emissions caused by an ETS link. The purpose of this paper has been to re-examine the topic in light of the Article 6 guidance agreed at COP26 in 2021 and, where relevant, the subsequent decisions taken at COP27 in Sharm El-Sheik in 2022. This paper has focused on two questions: whether the four approaches can be used to estimate the shift in emissions and apply corresponding adjustments in a way that is consistent with the Article 6.2 guidance; and how other provisions related to reporting, generating adaptation finance, and delivering an OMGE, could be implemented for an ETS link.

The paper identified two main challenges that were not addressed in the 2018 ICAP paper. Firstly, the difficulties associated with averaging as an accounting methodology for single-year NDC targets. Even in a scenario where ETS emissions do not exceed the cap in either system over the NDC period, it may be the case that in one – or even both – countries, the final corresponding adjustment value will result in an emissions balance above their target level. This has implications for governments, which would need to compensate with extra emission reductions in non-ETS sectors or through purchasing international carbon credits. The paper finds that, in general, adopting indicative trajectories or budgets would be a more suitable accounting method for ETS links.

Secondly, the difficulty of implementing "vintage-based" accounting for ETS links. How the ETS link impacts the timing of mitigation cannot be observed and must be estimated. As such, it is not possible to know how well the estimation of the shift in mitigation due to the ETS link approximates the true timing, which is unknown. There are different options available to policymakers, two of which are explored in the paper. However, the paper concludes one option or approach cannot be recommended as providing a better approximation than the others. How the options and approaches perform will vary according to the scenario. The limitations on estimating the timing of mitigation from an ETS link have implications for the ability of countries to adhere to the Article 6.2 guidance. Three accounting approaches (A, B and C in the 2018 ICAP paper) meet the requirements established by the guidance, even though in reality mitigation may be banked between NDC periods. Approach D would require a further adjustment to implement the requirement prohibiting banking of ITMOs. In the absence of a general recommendation, implementing countries will need to assess the different options and decide which option may be most suitable in the context of the specific ETS link. Further research on this topic could explore additional measures that may be applied to appropriately account for the timing of mitigation.

Two important elements of the Article 6.2 guidance are how cooperative approaches will generate finance for adaptation, and how they will lead to an OMGE. Both concepts are closely tied with baseline-and-crediting activities. Nevertheless, the paper finds that policymakers have several options to meet these requirements in the case of an ETS link. In practice, some options may be easier to implement, especially those that avoid making regular changes to core ETS design elements such as cap levels and auctioning of allowances.

Finally, future research could further explore the conclusions reached in this paper under different scenarios, with more complicated flows of allowances over a whole NDC period. The four approaches, together with the options for generating adaptation finance and delivering an OMGE, could also be applied to actual allowance flow and surrender data from linked ETSs. This could allow for a better understanding of the limitations of the four approaches, including to identify the timing of mitigation in different circumstances, as well as how the conclusions of this and the previous ICAP paper may vary when applied with actual ETS allowance data.

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