



Avoiding double counting between CORSIA and Nationally Determined Contributions

Options for accounting under the Paris Agreement

Editorial information

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Abstract

This discussion paper assesses how robust accounting could be implemented under the Paris Agreement in order to avoid double counting between nationally determined contributions (NDCs) and the Carbon Offsetting and Reduction Scheme for International Aviation (CORSIA) implemented under the International Civil Aviation Organization (ICAO). The paper focuses on how host countries of carbon-offset projects can account for the use of offset credits under CORSIA by reporting “adjustments” in the “structured summaries” of their biennial transparency reports prepared under Article 13 of the Paris Agreement. The paper finds that several accounting approaches considered in the international negotiations on Article 6 of the Paris Agreement for international transfers of mitigation outcomes between countries cannot not be implemented in the specific context of CORSIA where the offset credits are used by airline operators or may not robustly avoid double counting. The paper identifies nine options for how the use of offset credits under CORSIA could be accounted for by host countries and discusses their advantages and disadvantages. The paper also evaluates options to account for single-year targets in the context of CORSIA, as well as options for consistent consideration of Global Warming Potentials used under CORSIA and nationally determined contributions under the Paris Agreement. The findings of the paper are important for the ongoing negotiations under the Paris Agreement on the rules for international transfers of mitigation outcomes under Article 6 and the implementation of “structured summaries” under Article 13.

Kurzbeschreibung

Dieses Diskussionspapier analysiert, wie eine robuste Bilanzierung unter dem Pariser Übereinkommen so umgesetzt werden könnte, dass eine Doppelzählung zwischen Klimazielen von Staaten unter dem Pariser Übereinkommen und dem „Carbon Offsetting and Reduction Scheme for International Aviation“ (CORSIA) der internationalen Zivilluftfahrtorganisation vermieden werden kann. Das Papier richtet sein Augenmerk darauf, wie Gastländer von Klimaschutzprojekten die Nutzung von Klimaschutzzertifikaten unter CORSIA durch sogenannte „adjustments“ in „strukturierten Zusammenfassungen“ ihrer zweijährigen Berichterstattung unter Artikel 13 des Übereinkommens bilanzieren können. Das Papier kommt zu dem Ergebnis, dass einige Bilanzierungsansätze, die in den internationalen Verhandlungen zu Artikel 6 des Übereinkommens für den Transfer von Emissionsminderungen zwischen Ländern diskutiert werden, in dem speziellen Kontext von CORSIA nicht umgesetzt werden können oder eine Doppelzählung nicht zuverlässig vermeiden. Das Papier identifiziert neun Ansätze für die Bilanzierung von Klimaschutzzertifikaten, die unter CORSIA genutzt werden, durch die Gastländer, und diskutiert jeweils ihre Vor- und Nachteile. Zudem wird analysiert, welche Bilanzierungsoptionen für Länder mit einzelnen Zieljahren im Kontext von CORSIA geeignet sind. Schließlich wird noch analysiert, wie Werte für Global Warming Potentials konsistent unter dem Pariser Übereinkommen und CORSIA verwendet werden können. Die Forschungsergebnisse sind sowohl für die laufenden Verhandlungen unter Artikel 6 als auch für die Verhandlungen zu den strukturierten Zusammenfassungen unter Artikel 13 wichtig.

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Abbreviations

CORSIA	Carbon Offsetting and Reduction Scheme for International Aviation
EUCs	Emission Unit Eligibility Criteria
GHG	Greenhouse gas
GWP	Global warming potential
ICAO	International Civil Aviation Organization
IPCC	Intergovernmental Panel on Climate Change
ITMO	Internationally traded mitigation outcome
MPGs	Modalities, Procedures and Guidelines
NDC	Nationally determined contribution
TAB	Technical Advisory Body
tCO₂e	Tonnes of carbon dioxide equivalent
UNFCCC	United Nations Framework Convention on Climate Change

Summary

Greenhouse gas (GHG) emissions from international aviation were not included in climate mitigation targets under the Kyoto Protocol, and most Parties to the Paris Agreement – with the exception of the EU – did not include them in their nationally determined contributions (NDCs). Instead, Article 2.2 of the Kyoto Protocol mandated the International Civil Aviation Organization (ICAO) to address these emissions. In 2016, ICAO adopted the Carbon Offsetting and Reduction Scheme for International Aviation (CORSIA). The scheme requires airline operators to purchase carbon offset credits for any increase of carbon dioxide (CO₂) emissions above 2020 levels.

Avoiding double counting is a key requirement under both the Paris Agreement and ICAO. Double counting means that the same emission reduction is used more than once to achieve climate goals. In the context of CORSIA, a key risk is that a carbon offset credit's emission reduction be claimed by both an airline operator to fulfil its offsetting requirements under CORSIA and by the country hosting the carbon-offset project to achieve its NDC. Avoiding such double counting requires action by, and coordination between, both the Paris Agreement and ICAO. Indeed, how to avoid double counting is being discussed in relevant fora under both regimes.

This paper discusses what provisions could be adopted and implemented under the Paris Agreement to avoid double counting between CORSIA and NDCs. Avoiding double counting requires that the host country accounts for the use of offset credits under CORSIA when tracking progress and accounting for its NDC. In principle, such accounting could be implemented similar to the accounting for internationally transferred mitigation outcomes (ITMOs) under Article 6 of the Paris Agreement, through the application of “corresponding adjustments” in an accounting balance, referred to as “structured summary”. This means that a country authorizing the use of offset credits under CORSIA would make an addition to its reported emissions. This ensures that the country does not use the offset credit's emission reductions to achieve its own NDC.

There are a number of aspects, however, in which CORSIA differs from carbon market cooperation between countries: the offset credits are not used by countries to achieve their NDC but by private sector entities – aeroplane operators – regulated through another international regime; CORSIA establishes continuous multi-year compliance periods whereas many countries have single-year targets; and there is a risk that the offset credits might be issued using different global warming potentials (GWP) values than those used by the host country when accounting for its NDC. The paper identifies that some of the approaches considered for accounting for transfers between countries cannot be applied in the context of CORSIA or may not necessarily be robust.

The paper identifies nine options for how adjustments could be applied in structured summaries. These combine different triggers for the application of adjustments (ex-ante authorization, issuance, ex-post authorization, or cancellation) with different approaches for the calendar years to which adjustments are applied (year of expected or actual emission reductions, year of issuance, year of authorization, year of cancellation, period of CORSIA compliance cycle, year of submitting the surrendering report under CORSIA).

These options involve important trade-offs. Some options could lead to more adjustments being implemented than necessary to avoid double counting, which could make it more difficult for the host country to achieve its NDC; some options implicitly allow “borrowing” of emission reductions from future NDC implementation periods, which might delay climate action and create perverse incentives to set future NDCs less ambitiously; some options better ensure that the application of adjustments is reasonably representative for mitigation action taken over time; and some options require to either update structured summaries well beyond the target year or to set limits by when issued offset credits must be cancelled under CORSIA. Other challenges also exist but might be addressed more easily, such as that carbon-offset programs would need to provide information to host countries on the issuance and use of offset credits under CORSIA and that they may need to determine in which calendar year emission reductions occurred.

Among the options, we recommend using ex-ante or ex-post authorization as the trigger for the application of adjustments and applying adjustments to the calendar years in which the emission reductions or removals occurred. Most importantly, these options avoid implicit borrowing of emission reductions from future NDC implementation periods and ensure that the application of adjustments is representative for the mitigation action taken over time. Ex-ante application of adjustments brings the advantage that project owners have early on certainty that they will be able to use the offset credits under CORSIA. This option also avoids timing issues with preparing the final accounting balance to demonstrate achievement of the NDC. Ex-post authorization provides the advantage that adjustments are only made for emission reductions or removals that have been verified to have actually occurred but may bring about more uncertainty for project owners whether they will ultimately get approval by host countries.

A further important cross-cutting issue is the compatibility between accounting approaches for CORSIA and accounting approaches for international transfers between countries. As long as the offset credits from a project are only used under CORSIA, all the accounting options discussed in this paper could be implemented irrespectively of which accounting approaches are used for international transfers between countries. If offset credits from a project are authorized for all type of purposes, however, compatibility of accounting rules for CORSIA and international transfers between countries becomes an issue. Several challenges would then have to be resolved and accounting would become more complex. Policy-makers thus need to bear in mind that there is trade-off between (a) limiting authorization of projects to either international transfers between countries or use under CORSIA, which allows to keep accounting rules simpler but limits the flexibility of project owners to serve different markets, or (b) authorizing projects for any use other than the implementation of its own NDC, which makes accounting more complex but provides project owners flexibility to serve different markets.

The paper also identifies that not all options to account for single-year targets are robust in the context of CORSIA, which provides for continuous three-year compliance periods. Using multi-year targets, multi-year emission trajectories or multi-year budgets is the most robust approach to account for the use offset credits under CORSIA. These options ensure that all offset credits authorized for use under CORSIA are accounted for by the host country. If these options are politically not palatable, the options “averaging” (i.e. applying an adjustment only in the target year which corresponds to the average of offset credits authorized or used under CORSIA) or “vintage limitation” (i.e. only using offset credits from emission reductions in the target year under CORSIA) could be considered, though they involve some drawbacks. The option of “annual adjustments” (i.e. applying adjustments to all years but only counting those adjustments in the target year) would only be robust if the generation of emission reductions for use under CORSIA is limited to target years. As with the vintage limitation option, this option would therefore restrict the available supply for CORSIA.

To ensure consistent use of GWP values, accounting would be simplest if both host countries and carbon-offsetting programs use the values from the 5th assessment report of the Intergovernmental Panel on Climate Change (IPCC) for the period after 31 December 2020. Under the Paris Agreement, this could be implemented through a decision requiring countries authorizing the use of offset credits under CORSIA to (i) apply the Article 4.13 accounting guidance in Annex II to decision 4/CMA.1 and (ii) to include in their authorization letters a condition that offset credits must be issued using the GWP values from the 5th assessment report. In addition, the ICAO Council could decide that CORSIA eligible programs must use the values from the 5th assessment report.

Two important lessons can be drawn for the negotiations under the Paris Agreement. First, as CORSIA differs from international transfers between countries, specific provisions addressing the particular context of CORSIA are needed in Article 6 guidance on cooperative approaches, or alternatively in a separate decision under the Paris Agreement. And second, some findings of this paper are not only relevant for the context of CORSIA but can also inform the negotiations on accounting rules for international transfers between countries.

We recommend that Parties to the Paris Agreement address the following issues in international rules for Article 6:

- ▶ **Trigger for adjustments for other uses:** Parties may clarify what action should trigger the application of adjustments in the context of mitigation outcomes used for purposes other than towards NDCs. We recommend that the authorization is used as the trigger for applying adjustments in such instances.
- ▶ **Application of adjustments to calendar years:** Parties may clarify to which calendar years adjustments should be applied for both the transfer of ITMOs between countries and the use of mitigation outcomes for other purposes. We recommend that transferring (or host) countries should apply adjustments to the calendar years in which the emission reductions or removals occurred.

- ▶ **Authorization for one or multiple purposes:** Parties may clarify whether an authorization should be conducted for a specific purpose (e. g. use towards other NDCs or use towards CORSIA) or whether countries may also authorize mitigation outcomes to be used for any purposes other than achieving their own NDCs. In the latter case, Parties may address through a future work program how it can be ensured that an adjustment for a mitigation outcome is only applied once by the transferring (or host) country and not twice (e. g. once at authorization and once again at the first transfer).
- ▶ **Compatibility of options to account for single-year targets:** Parties may clarify which options can be used for accounting in the context of single-year targets if a Party authorizes offset credits for use under CORSIA. We recommend that countries authorizing offset credits for CORSIA should preferably have multi-year targets, multi-year budgets or apply the emissions trajectory approach. Alternatively, averaging or vintage restrictions could also be viable, though with some drawbacks.
- ▶ **GWP values and application of accounting guidance under Article 4.13:** Parties may clarify which GWP values should be accepted by host countries when authorizing the use of offset credits under CORSIA. We recommend that countries authorizing the use of offset credits (i) should require in their authorization letters that carbon-offset programs issue respective offset credits using the 100-year GWP values from the 5th IPCC assessment report, consistent with relevant decisions by the CMA, and (ii) apply the Article 4.13 accounting guidance in Annex II to decision 4/CMA.1.

1 Introduction

Greenhouse gas (GHG) emissions from international aviation were not included in climate mitigation targets under the Kyoto Protocol, and most Parties to the Paris Agreement – with the exception of the EU – did not include them in their nationally determined contributions (NDCs). These emissions are reported as memo items in national GHG inventories and not included in national totals. Instead, Article 2.2 of the 1997 Kyoto Protocol mandated the International Civil Aviation Organization (ICAO) to address international aviation emissions.

More than a decade later, ICAO adopted in 2010 an aspirational goal of achieving “carbon neutral growth” from 2020 onwards (ICAO, 2010). In 2016, ICAO adopted a scheme to operationalize this goal: the Carbon Offsetting and Reduction Scheme for International Aviation (CORSIA). The scheme complements measures to reduce emissions through technological and operational improvements or the use of “sustainable aviation fuels” with a mechanism which requires airline operators to purchase carbon offset credits for any remaining increase of carbon dioxide (CO₂) emissions above 2020 levels (ICAO, 2016a). The scheme runs from 2021 and 2035 and includes three phases: a pilot phase from 2021 to 2023, a first phase from 2024 to 2026, and a second phase from 2027 to 2035. The first phase and the pilot phase are voluntary, and the second phase is mandatory for most countries. Over the period 2021 to 2035, the scheme could generate a demand for about 1.6 to 3.7 billion offset credits (Healy, 2017).

In March 2019, the ICAO Council adopted Emission Unit Eligibility Criteria (EUCs) which specify the requirements that must be fulfilled for offset credits to be eligible under CORSIA (ICAO, 2019a). Carbon-offsetting programs need to implement these criteria and be approved by the ICAO Council as eligible programs. A first window for applications was opened in June 2019 and the ICAO Council plans to approve the first programs in early 2020.

In these EUCs, one important criterion is avoiding double counting of emission reductions. Double counting means that the same emission reduction is used more than once to achieve climate goals. It can occur in different ways (Hood, Briner, & Rocha, 2014; Prag, Hood, & Barata, 2013; Schneider et al., 2019; Schneider, Kollmuss, & Lazarus, 2015). The most critical risk is that the same emission reduction be claimed by an airline operator to fulfil its offsetting requirements under CORSIA and by the country hosting the offset project to achieve its NDC under the Paris Agreement. Avoiding such double claiming is critical to achieve CORSIA’s objective of carbon neutral growth and to ensure that the mitigation achieved through CORSIA complements efforts under the Paris Agreement. It requires action by, and coordination between, both regimes. Indeed, how to avoid double counting is being discussed in relevant fora under both the Paris Agreement and ICAO.

Avoiding double claiming between the host country and CORSIA requires that the host country accounts for the use of offset credits under CORSIA when tracking progress and accounting for its NDC (ClimateWorks Foundation, Meridian Institute, & Stockholm Environment Institute, 2019; ICAO, 2019a; Schneider et al., 2019, 2017). In principle, such accounting could be implemented similar to the accounting for internationally transferred mitigation outcomes (ITMOs) under Article 6 of the Paris Agreement. However, there are a number of aspects in which CORSIA differs from carbon market cooperation between countries and which may impact accounting provisions for CORSIA: the offset credits are not used by countries to achieve their NDC but by private sector entities – aeroplane operators – regulated through another international regime; CORSIA establishes continuous multi-year compliance periods whereas many countries have single-year targets; and there is a risk that the offset credits might be issued using different global warming potentials (GWP) values than those used by the host country when accounting for its NDC.

This paper discusses what provisions could be adopted and implemented under the Paris Agreement to avoid double counting between CORSIA and NDCs. It specifically explores how host countries could robustly account for the use of offset credits under CORSIA. The results can inform both the ongoing negotiations on this matter under the Paris Agreement as well as the implementation of CORSIA under ICAO.

The paper first summarizes relevant provisions under CORSIA and the Paris Agreement (Section 2) and then assesses options for accounting provisions to avoid double counting between CORSIA and NDCs (Section 3). Based on this assessment, recommendations are made for adopting accounting provisions under the Paris Agreement (Section 4).

2 Overview of relevant provisions under ICAO and the Paris Agreement

2.1 ICAO

The principle of avoiding double counting has first been established by ICAO in its resolution adopting CORSIA. Carbon offset credits from mechanisms established under the United Nations Framework Convention on Climate Change (UNFCCC) and the Paris Agreement are considered eligible provided that “they align with future decisions, including on avoiding double counting (...)” (ICAO, 2016a).

This principle has been further operationalized in the EUCs adopted by the ICAO Council in 2019 (ICAO, 2019a). The EUCs consists of two types of criteria that both include provisions for avoiding the double counting of emission reductions:

1. Program design elements

- ▶ Paragraph 11 outlines that “programs should provide information on how they address double counting, issuance and claiming in the context of evolving national and international regimes for carbon markets and emissions trading”.
- ▶ Paragraph 4 of the program design does not explicitly refer to avoiding double counting but addresses the tracking of units which is one of the necessary elements for avoiding double counting. The paragraph notes that “programs should have in place procedures that ensure that: (a) units are tracked; (b) units are individually identified through serial numbers; (c) the registry is secure (i. e., robust security provisions are in place); and (d) units have clearly identified owners or holders (e. g., identification requirements of a registry). The program should also stipulate (e) to which, if any, other registries it is linked; and, (f) whether and which international data exchange standards the registry conforms with”.

2. Carbon offset credit integrity assessment criteria

- ▶ Emission Criterion 7 states that programs should deliver credits that represent emission reductions, avoidance or sequestration that “are only counted once towards a mitigation obligation”. Measures must be in place in order to prevent:
 - ▶ “Double issuance (which occurs if more than one unit is issued for the same emissions or emissions reduction)”;
 - ▶ “Double use (which occurs when the same issued unit is used twice, for example, if a unit is duplicated in registries)”;
 - ▶ “Double claiming (which occurs if the same emissions reduction is counted twice by both the buyer and the seller)”.
- ▶ Emission Criterion 7 also requests that “eligible programs should require and demonstrate that host countries of emissions reduction activities agree to account for any offset units issued as a result of those activities such that double claiming does not occur between the airline and the host country of the emissions reduction activity”.

The EUCs thus specify the broad elements that carbon-offsetting programs should have in place to avoid double counting. How this could be implemented has been further elaborated in guidelines for the interpretation of the EUCs, published by ICAO as part of the documentation for the application of carbon-offsetting programs under ICAO (ICAO, 2019b, see Appendix A to this discussion paper). These guidelines go a step further and specify what procedures programs should put in place to meet the EUCs.

Outside the formal ICAO process, a group of stakeholders – including carbon-offsetting programs, non-governmental organizations and the International Emissions Trading Association – developed “Guidelines on Avoiding Double Counting for the CORSIA” (ClimateWorks Foundation et al., 2019). These Guidelines aim to assist carbon-offsetting programs in satisfying the provisions for avoiding double counting under CORSIA. They include concrete steps on how carbon-offsetting programs can revise their procedures and standards to address ICAO's requirements.

Both the relevant ICAO documents and the “Guidelines on Avoiding Double Counting for the CORSIA” envisage a process whereby double claiming between NDCs and CORSIA is avoided through the following basic steps:

1. **Host country attestations:** The carbon-offsetting programs, or project owners, must receive a formal letter from the host country confirming that the country will not claim the offset credit's associated emission reductions or removals towards its own mitigation target(s) and will appropriately account for the use of offset credits under CORSIA. The letter should be made publicly available and be received from a designated focal point.
2. **Qualification of offset credits for use under CORSIA:** Only once the host country attestation has been received, the offset credits may be used to fulfil offsetting requirements under CORSIA. As not all offset credits issued by carbon-offsetting programs may be eligible for use under CORSIA, carbon-offsetting programs should adopt procedures to transparently distinguish eligible from non-eligible offset credits. Carbon-offsetting programs could do this by establishing a dedicated procedure to qualify offset credits for use under CORSIA.
3. **Use of offset credits by aeroplane operators:** Carbon offset credits qualified as eligible may be used by airline operators to comply with their offsetting obligations under CORSIA. This occurs through the “cancellation” of the offset credits in the relevant registry. The necessary registry capabilities must be in place, in particular to ensure that the cancellation purpose is unambiguously defined, such that one cancellation cannot be claimed for more than one purpose.
4. **Host countries account for the use of offset credits under CORSIA:** The host countries have the responsibility to comply with their commitment expressed in the letter, by accounting for the use of offset credits under CORSIA.
5. **Carbon-offsetting programs track accounting by host countries:** The carbon-offsetting programs must implement procedures to track whether the host countries appropriately account for the use of the offset credits under CORSIA. Any issues observed need to be reported to relevant bodies under ICAO.
6. **Compensation for any double-claimed mitigation:** The carbon-offsetting programs should have procedures in place to compensate, replace, or otherwise reconcile double-claimed mitigation.

The ICAO documents and the “Guidelines on Avoiding Double Counting for CORSIA” largely clarify what actions can be taken by carbon-offsetting programs to avoid double counting. However, they leave relatively open what action host countries should take to avoid double counting, in particular how they should account for the use of offset credits under CORSIA. The next section provides an overview of what elements have been agreed in this respect under the Paris Agreement and which gaps are still to be closed.

2.2 Paris Agreement and the Katowice Climate Package

The Paris Agreement, and the Katowice Climate Package – also referred to as Paris Agreement rulebook – adopted in Katowice in 2018, include provisions for avoiding double counting in three broad contexts:

1. **The accounting for NDCs under Article 4:** Article 4.13 requires Parties, in accounting for their NDCs, to “promote environmental integrity, transparency, accuracy, completeness, comparability and consistency, and ensure the avoidance of double counting”. These provisions are recalled and further specific in the Katowice rulebook (decision 4/CMA.1).
2. **The framework for engaging in international carbon markets under Article 6:** Article 6.2 requires Parties engaging in cooperative approaches to “apply robust accounting, to ensure, inter alia, the avoidance of double counting”. The decision adopting the Paris Agreement further specifies that double counting should be avoided on the basis of “corresponding adjustments” applied emissions and removals covered by the NDC (paragraph 36 of decision 1/CP.21). Article 6.5 includes a related provision, requiring that emission reductions resulting from the mechanism established by Article 6.4 “shall not be used to demonstrate achievement of the host Party’s NDC if used by another Party to demonstrate achievement of its NDC”. In Katowice at COP24 and also in Madrid at COP25, international rules on Article 6 could not be agreed, in particular due to competing views on how double counting of emission reductions should be avoided (Schneider et al., 2019).

- 3. The enhanced transparency framework under Article 13:** The modalities, procedures and guidelines (MPGs) for the enhanced transparency framework, adopted in Katowice, include provisions for accounting for the international transfer of mitigation outcomes under Article 6 (decision 18/CMA.1). Paragraph 77(d) of the MPGs requires each country engaging in a cooperative approach under Article 6 to provide an emissions balance, referred to as “structured summary”. In these “structured summaries”, countries make “adjustments” to their reported GHG emissions; additions are made for mitigation outcomes that are transferred to other countries and subtractions are made for mitigation outcomes acquired or used from other countries. The resulting balance is then compared with the target level to determine whether a country has achieved its NDC target. Importantly, countries should also include in this balance information with regard to “mitigation outcomes for international mitigation purposes other than the achievement of its NDC”, which is understood to cover the use of offset credits under CORSIA. The exact information to be included within these structured summaries is yet to be determined and many issues remain unresolved, including with regards to accounting for the use of emission units under CORSIA.

In the ongoing negotiations there is considerable debate what these provisions mean for avoiding double counting with CORSIA. First, at the climate change conference in Bonn in June 2019, there was considerable disagreement about the legal status of the provisions for the structured summary, given that rules for Article 6 have not yet been finalized and future rules on Article 6 could overrule or amend the approach included in the MPGs, as reflected in the Katowice decision on Article 6 which notes that “information provided in a structured summary referred to in decision 18/CMA.1, paragraph 77(d), is without prejudice to the outcomes on these matters” (decision 8/CMA.1, paragraph 4). Second, there was debate on whether Article 6 rules should include provisions for CORSIA or not. Some Parties argued that Article 6 of the Paris Agreement addresses only cooperation between Parties, and that hence transfers to CORSIA should not be addressed under Article 6 rules. Other Parties argued that Article 6 rules are the right place to address the use of offset credits under CORSIA, as a single set of accounting rules to address all types of transfers best ensures robust accounting (Schneider et al., 2019). Practically speaking, avoiding double counting between NDCs and CORSIA would require integrating the use of offset credits for CORSIA into an accounting balance. The structured summary may thus well serve to address both transfers of mitigation outcomes between Parties and the use of offset credits under CORSIA.

At COP25 in Madrid, countries could not finalize the rules for Article 6 but forwarded three different versions of the negotiation text to the next climate change conference in June 2020 in Bonn (UNFCCC, 2019a). All three text versions include specific references to transfers for “international mitigation purposes”, consistent with paragraph 77(d) of the MPGs, and thus cover the use of offset credits under CORSIA. The texts differ, however, in some nuances, also in respect to “international mitigation purposes”.

For the purpose of this paper, we assume that the approach set out in the draft negotiations texts on Article 6 from COP25 in Madrid will be implemented and that the structured summary, as set out in paragraph 77(d) of the MPGs, will cover both mitigation outcomes transferred between Parties and carbon offset credits used under CORSIA. We also assume that accounting is implemented based on adjustments to NDC covered emissions, including for the mechanism established by Article 6.4 of the Paris Agreement. The analysis in the paper focuses on how these approaches could be practically implemented and what the advantages and disadvantages of different accounting options are.

3 Options for accounting by host countries

This section identifies and discusses key issues and options for how host countries could account for the use of offset credits under CORSIA in the structured summary set out in paragraph 77(d) of the MPGs or other forms of accounting balances if agreed upon under Article 6. In principle, accounting for the use of offset credits under CORSIA could be implemented similar to accounting for transfers between Parties. In some respects, however, the context of CORSIA differs from transfers between countries. This paper identifies four issues that require particular consideration in the context of CORSIA:

- 1. Trigger for adjustments:** The draft Article 6 negotiation texts from COP25 in Madrid indicate that adjustments for transfers between countries should be applied when mitigation outcomes are first-transferred and used. Under CORSIA, however, offset credits are not necessarily transferred across international borders. Offset credits are issued in registries operated by eligible programs and may subsequently be transferred within the registry to aeroplane operators (or entities acting on their behalf) which cancel the credits to meet their offsetting requirements under CORSIA. In other words: all transactions take place within a registry and may not involve countries but only private sector entities. This raises the question what action should trigger the application of adjustments in the context of CORSIA.
- 2. Application of adjustments to calendar years:** The draft negotiation texts from COP25 in Madrid require countries to report “annual” information, including on the authorization, transfer, and use of ITMOs. This suggests that structured summaries, as referred in paragraph 77(d) of the MPGs, should include all years of the relevant NDC implementation period. However, it remains yet unclear to which calendar year an adjustment should be applied in the structured summary. This question is particularly relevant for CORSIA.
- 3. Accounting for single-year targets:** A key question in the ongoing negotiations on Article 6 is how international transfers can be robustly accounted for in the context of single-year targets. Several options have been proposed in the negotiations. Some of the options considered in the negotiations may, however, not work robustly in conjunction with CORSIA. This raises the question which accounting options countries should be allowed to pursue if they intend to authorize the use of offset credits under CORSIA.
- 4. Global warming potentials (GWPs):** In their first NDCs, countries use different GWP values to account for their NDCs, including from the 2nd, 4th and 5th assessment reports of the Intergovernmental Panel on Climate Change (IPCC) (Graichen, Cames, & Schneider, 2016). At the same time, ICAO does not specify which GWP values should be used when issuing CORSIA eligible emissions units. This raises the questions whether different carbon-offsetting programs will use the same GWP values, whether these values are consistent with those that countries use to account for their NDCs, and how any differences could be addressed.

Each of these accounting issues, if left unresolved, could undermine the environmental integrity of the Paris Agreement and CORSIA. This section explores how these four issues could be addressed. To illustrate the implications of different options, we introduce here an example scenario for an offset project and the use of the project's offset credits by aeroplane operators (section 3.1). Using this example, we then discuss each of the four issues identified above (sections 3.2 to 3.4).

3.1 Example scenario

To illustrate options for accounting, we introduce here a hypothetical example scenario of a wind power project which is implemented in country A – the host country of the project – and registered under a CORSIA eligible carbon-offsetting program. The offset credits issued to the project are used by aeroplane operators under CORSIA. Table 1 summarizes key information on this example scenario. The implementation of the project and the issuance and use of offset credits is assumed to occur as follows:

- 1. Authorization by the host country:** Provisions under both ICAO and the Paris Agreement require that host countries issue an attestation or authorization letter in which they authorize that the emission reductions may be used by aeroplane operators under CORSIA and declare that they will not claim the associated emission reductions and account for them in relation to their own mitigation targets.¹ It is yet unclear when countries would issue such letters. In principle, this could occur either ex-ante, before the issuance of offset credits, or ex-post, once the offset credits have been issued. It may also be perceivable that countries issue an initial letter that endorses the project and later authorize, in subsequent letters, specific offset credits for use under CORSIA. If countries issue a letter ex-ante, the letter could specify the period over which emission reductions may be generated and establish an upper limit for the emission reductions that may be issued as offset credits and be used under CORSIA. Such restrictions can help countries plan the implementation and achievement of their NDC. They could be used a tool for the country to ensure that only part of the emission reductions achieved by a project can be used by aeroplane operators or other countries and that the remainder can be used by the country to achieve its own NDC. In our example, we assume that the country issues an authorization letter ex-ante in 2020, in which it specifies that emission reductions of up to 10 MtCO₂eq per year, issued over a seven-year crediting period from 1 January 2021 to 31 December 2027, may be used as offset credits under CORSIA.
- 2. Registration of the project and crediting period:** The project is registered in late 2020 under a CORSIA eligible carbon-offsetting program. Its crediting period starts on 1 January 2021 and ends on 31 December 2027. The crediting period is not renewed, due to the limitation specified by the host country in its letter of authorization.
- 3. Implementation and operation of the project:** The wind power project starts operation on 1 June 2021 and continues operation for 15 years, until 31 May 2035. The emission reductions achieved fluctuate slightly from year to year, reflecting changes in electricity generation due to variations in wind availability (see Table 1). Over the seven-year crediting period the project reduces 65 MtCO₂eq.
- 4. Issuance of offset credits:** Carbon-offsetting programs typically issue offset credits ex-post, following the monitoring and verification of the emission reductions by third-party auditors. After successful verification and program approval, offset credits are issued to the program's registry. The frequency of issuance can vary greatly, from a few months to several years. Here we assume that issuance occurs three times: in 2023, 2026 and 2028. The issuance occurs for the emission reductions achieved in the preceding calendar years: the emission reductions achieved from 1 June 2021 to 31 December 2022 are issued in 2023; the emission reductions achieved from 1 January 2023 to 31 December 2025 are issued in 2026; and the emission reduction achieved from 1 January 2026 to 31 December 2027 are issued in 2029. Due to the limit established in the letter of authorization, the total issuance over seven-year period is with 62 MtCO₂eq slightly lower than the 65 MtCO₂eq emission reductions achieved.
- 5. Use of offset credits by aeroplane operators:** Aeroplane operators need to cancel offset credits for each of the three-years compliance periods under CORSIA. For the first compliance period from 2021 to 2023, offset credits must be cancelled at the latest by 31 January 2025, for the second period from 2024 to 2026 by 31 January 2028, and so forth (ICAO, 2018). We assume here that cancellations take place in 2024, 2027 and 2030, prior to the respective cancellation deadlines. The number of offset credits needed by aeroplane operators is expected to grow over time (Healy, 2017; ICAO, 2016b). We assume here that 6 million offset credits from the project are used for the first compliance period from 2021 to 2023; 12 million in the second period from 2024 to 2026; and 24 million in the third period from 2027 to 2029. The remainder of the issued offset credits – 20 million – may be used either in subsequent CORSIA compliance periods or for other compliance or voluntary purposes. In total, thus 42 out of the 62 million offset credits issued to the project are used under in the first three compliance cycles under CORSIA.

¹ The Article 6 negotiation texts and paragraph 77(d) of the MPGs refer to a situation where a Party “authorizes the use of mitigation outcomes for international mitigation purposes other than achievement of its NDC”. This is commonly understood to refer to CORSIA and points to the need for an authorization. Likewise, the documentation published by the TAB for applications by carbon-offsetting programs requires that programs “should obtain (...) written attestation from the host country” and that the attestation “should specify, and describe any steps taken, to prevent mitigation associated with units used by operators under CORSIA from also being claimed toward a host country’s national mitigation target(s) / pledge(s)” (ICAO, 2019b). The Guidelines on Avoiding Double Counting for the CORSIA also include this requirement and provide example “letters of assurance and authorization” (ClimateWorks Foundation et al., 2019).

Table 1: Overview of the assumptions made in the example scenario with respect to emission reductions and the generation and use of offset credits (MtCO₂eq)

	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	Total
Emission reductions authorized for use under CORSIA	10	10	10	10	10	10	10				70
Emission reductions achieved	5	11	8	10	9	12	10				65
Issuance of offset credits			15			27		20			62
Cancellation of offsets credits by aeroplane operators				6			12				42

Source: Own author

Lastly, we assume that the host country has a single-year target for the year 2030 and that the NDC is implemented over the period 2021 to 2030 (also referred to as “NDC implementation period”). The crediting period of the project, the use of the project's offset credits under CORSIA, and the target year of the host country all involve different time periods, as shown in Table 2. For example, the host country of the project has to achieve its single year NDC target in 2030, whereas the aeroplane operators need to comply with continuous three-year compliance cycles. In the next sections, we use this example scenario to discuss the implications of different options for accounting for these varying time periods.

Table 2: Relevant time horizons in the example scenario

	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030
Wind power project										
Emission reductions										
Authorized crediting period										
CORSIA compliance cycles										
Compliance cycle 1										
Compliance cycle 2										
Compliance cycle 3										
Compliance cycle 4										
NDC of the host country										
NDC implementation period										
Target year										

Source: Own author

3.2 What action should cause an adjustment to be applied and to which calendar years should adjustments be applied in structured summaries?

This section explores how the application of adjustments for the use offset credits under CORSIA could be reported in structured summaries. We first explore what action should cause an adjustment to be applied, also referred to as the “trigger” for adjustments (section 3.2.1). We then discuss to which calendar years adjustments should be applied in structured summaries (section 3.2.2). This is followed by an assessment of the implications of different combinations for the trigger and the calendar years to which adjustments are applied, using the example scenario introduced above (section 3.2.3).

3.2.1 Options for the trigger for the application of adjustments

The draft negotiation text on Article 6 foresees that the application of adjustments for international transfers of mitigation outcomes between countries is triggered by the “first transfer” and “use” of ITMOs. For transferring countries, the application of a corresponding adjustment would be triggered by the first transfer of a mitigation outcome. No corresponding adjustments would apply to any subsequent transfers of the same mitigation outcome. For acquiring countries, the application of a corresponding adjustment would be triggered by the use of the mitigation outcome towards the NDC. This means that the application of the two corresponding adjustments for internationally transferred mitigation outcome are not necessarily triggered at the same point in time.

This approach cannot be applied in the same way for CORSIA. Under CORSIA, eligible offset credits are issued to a registry of an eligible carbon-offsetting program, may subsequently be transferred between accounts within that registry, and are then cancelled by an aeroplane operator (or an entity acting on behalf of the aeroplane operator) for the purpose of fulfilling its offsetting requirements. All these steps occur within a single registry operated by the eligible carbon-offsetting program. Countries may not at all be involved in such transfers. This means that there are no transfers between countries and the emission reductions do not necessarily cross international borders.

This raises the question of how the “first transfer” could be defined in the context of CORSIA. At some point the emission reductions “leave” the host country and are used for “international mitigation purposes”. Theoretically, two options could be considered:

- ▶ **Transfer to the country where the aeroplane operator is registered:** Under CORSIA, aeroplane operators must fulfil their offsetting obligations in the country where they are registered. This could suggest that the “transfer” may be defined to occur between the host country of the offset project and the country where the aeroplane operator is registered. However, the country where the aeroplane operator is registered does not fulfil other functions than ensuring that aeroplane operators meet their obligations. The country does not in any way acquire the emission reductions. Moreover, it is possible that an aeroplane operator registered in country X uses offset credits from a project located in the same country. There may thus not be two different countries involved.
- ▶ **Transfer between the entities owning the offset credits:** Another option could be defining “transfer” in the context of CORSIA based on the ownership of offset credits. In practice, however, this option also does not work: In many instances, offset credits are issued to entities that are registered in other countries than the host country. This is because the project developers are often registered in a different country. Offset credits may thus never be owned by the host country or by entities registered in the host country. There could also be situations where no change of ownership takes place: an aeroplane operator could develop its own carbon-offset project, the associated offset credits may be issued to an account of that aeroplane operator, and that aeroplane operator may then cancel the offset credits from that same account, without any change in ownership. Similarly, offset credits from a project could be issued to the account of a third party (e.g. a bank) which is then mandated by an aeroplane operator to cancel the offset credits on behalf of the aeroplane operator.

In conclusion, none of these two options seem suitable to define when a “transfer” occurs in the context of CORSIA. We identify here four alternative actions that could trigger the application of adjustments:

- a) **Ex-ante authorization:** If the host country issues an authorization letter ex-ante and if this letter stipulates a maximum number of emission reductions that may be used for CORSIA, the issuance or publication of such a letter could cause the adjustments to be applied. In this case, the number of adjustments to be applied would correspond to the limit stipulated in the authorization letter. The adjustments could be applied to the calendar years when the project is expected to generate the emission reductions. This means that adjustments would be applied ex-ante to future calendar years.
- b) **Issuance:** In this case, adjustments would be applied directly following the issuance of offset credits into a program registry. Different options are available with regard to the calendar years to which the adjustments would be applied, as discussed further below.
- c) **Ex-post authorization:** If the host country issues an authorization letter ex-post, for a specific number of issued offset credits, then adjustments could be applied following the issuance of the letter. As with the previous option, the adjustments could be applied to different calendar years, as discussed further below.
- d) **Cancellation:** In this case, adjustments would be applied following the cancellation of the offset credits by aeroplane operators for the purpose of fulfilling CORSIA offsetting requirements. As with the previous options, the adjustments could be applied to different calendar years, as discussed further below.

The Article 6 negotiation texts from Madrid appear to reflect some of these options. In all three text versions, paragraph 2 of the “Guidance on cooperative approaches referred to in Article 6.2 of the Paris Agreement” defines what “first transfer” means in the context of “international mitigation purposes”. The texts include basically two options. A “first transfer” is either defined as a mitigation outcome authorized by a participating Party “for use” for international mitigation purposes or as a mitigation outcome authorized by a participating Party “and used” for other international mitigation purposes. The first option – authorization “for use” – could be interpreted such that the “first transfer”, and hence the trigger for applying a corresponding adjustment, is defined as the ex-ante authorization (option A) or ex-post authorization (option C). The second option – authorization “and use” – could be interpreted such that the “first transfer” is defined as the cancellation of the offset credits by aeroplane operators (option D).

The implications and pros and cons of the four identified options are discussed further below.

3.2.2 Options for the calendar years to which adjustments are applied

A related issue to the choice of the trigger for the application of adjustments is the choice of the calendar year to which the adjustments should be applied in structured summaries. This question has so far received little attention in international negotiations on Article 6. Both the MPGs and the draft negotiation texts on Article 6 include options for what should trigger corresponding adjustments but are not entirely clear to which calendar years the adjustments should be applied in structured summaries. For the acquiring country, it seems straight-forward that the adjustments are reported in the year in which the ITMOs are used to implement and achieve the NDC. The choice is, however, less obvious for the transferring country.

Context of transfers between countries

For the context of international transfers of mitigation outcomes between countries, we identify two possible options for the calendar year to which transferring countries could apply adjustments:

- Option 1: the year in which the first transfer took place; or
- Option 2: the year in which the mitigation outcome took place (also referred to as the “vintage” of the mitigation outcome).

Figure 1 illustrates the implications of both approaches for a country that has otherwise constant emissions. The mitigation outcomes occur in 2030, lowering the emissions in that year. In 2031, the mitigation outcomes are issued as offset credits and transferred to another country. Under Option 1, on the left-hand side of the figure, the adjustment is applied to the year of transfer, in 2031, whereas under Option 2, on the right-hand side of the figure, the adjustment is applied to 2030, the year in which the mitigation outcome took place. Respectively, the adjusted emissions balance (red dotted line) differs between the options.

Both options have advantages and disadvantages:

- **Representativeness of reported progress over time:** Option 1 has the disadvantage that it creates a mismatch between when the country observes the emission reductions and when it applies adjustments. This results in an adjusted emissions balance (red dotted line) that is less representative of the actual progress of the country in implementing and achieving its NDC. Under Option 2, the adjusted emissions balance is more representative for progress over time, thus ensuring that reporting on transfers and emissions is aligned, which allows to better track progress towards NDCs.

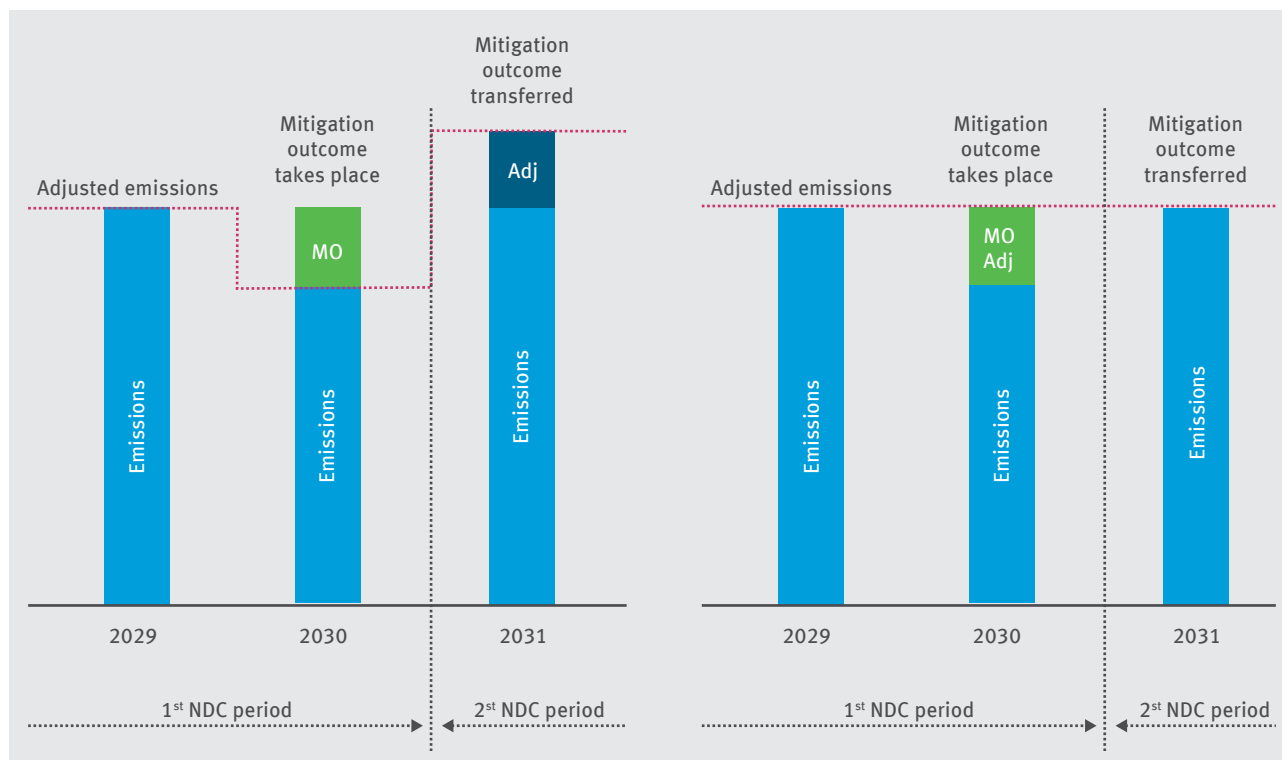


Figure 1: Implications of applying adjustments to the year of transfer (left-hand side) or to the year in which the mitigation outcomes tool place (right-hand side)

- **Implicit “borrowing” from future NDC implementation periods:** Under Option 1, the transferring country could use the mitigation outcomes generated in 2030 in the first NDC implementation period but would only need to account for the transfer in the second NDC implementation period from 2031 onwards. This would allow the country to do less to achieve its first NDC, which it would have to compensate for by doing more to achieve its second NDC. Option 1 thus implicitly allows “borrowing” from future NDC implementation periods. This could delay mitigation action into the future and potentially increase emissions within the first NDC implementation period. It may also create perverse incentives to set future NDCs less ambitiously and enhance the risk of “overselling”, as countries would only need to account for the transfer of emission reductions in the future while they could use them already today to achieve their NDCs. Under Option 2, implicit borrowing is not possible, as the country would need to apply adjustments to the years when the emission reductions occurred.

- **Compatibility with options to account for single-year targets:** Option 1 is not compatible with some of the accounting options considered for single-year targets. One of the options considered requires that “ITMOs are of the same vintage as the Party’s single year NDC” (UNFCCC, 2019b, paragraph 19).² This accounting approach is intended for countries that both have the same single target year (e.g. 2030) and both only account for mitigation outcomes that are transferred for that year. This approach would only preserve environmental integrity and ensure robust accounting if the two countries also both apply corresponding adjustments to the same single target year (i.e. 2030). This is practically difficult to achieve in the case of carbon offset credits, as carbon-offsetting programs issue offset credit only ex-post. By contrast, Option 2 would be compatible with this accounting option: both countries could apply the corresponding adjustment to the year 2030.
- **Timing issue for final accounting balance:** Paragraph 70 of the MPGs envisages that countries demonstrate the achievement of their NDC in their biennial transparency report following the end of the NDC implementation period. For the first NDC implementation period until 2030, this would likely be in 2032 or 2034. Option 2 raises timing issues for demonstrating the achievement of NDCs because offset credits are sometimes issued and transferred several years after the emission reductions occurred. For example, if an emission reduction achieved in 2030 would be issued and transferred in 2035, the country has, by that time, already demonstrated achievement of its 2030 NDC. The country could thus no longer apply an adjustment to the year 2030. To address this issue, countries could adopt decisions that require that ITMOs would need to be used within the same NDC implementation period in which they have been generated. However, this would limit the flexibility of how ITMOs may be used and might therefore be politically controversial. Another option could be that countries would need to update their structured summaries and their demonstration of achievement of their NDCs as long as such transfers still occur. These issues do not arise with Option 1.
- **Need to identify the calendar years in which mitigation outcomes occurred:** Option 2 requires identifying the calendar years in which the mitigation outcomes occurred and tag ITMOs respectively. Approaches to allocate emissions to calendar years have already been developed under the Clean Development Mechanism and are not complicated to implement; however, most carbon-offsetting programs currently do not have them in place yet and would need to adapt their procedures respectively. Similarly, in the context of linking of ETSs, the linking partners would need to develop approaches that estimate when the mitigation outcomes occurred. Different approaches are available and have been investigated, including using the “net transfer of allowances” or “the use of allowances” as proxies for estimating the shift in mitigation outcomes between the jurisdictions (Schneider, Cludius, & La Hoz Theuer, 2018).

Table 3: Advantages and disadvantages of options for applying adjustments to calendar years in the context of transfers between Parties

	Application to year of transfer	Application to year of emission reductions
Adjusted emissions balance representative for action taken over time	No	Yes
Implicit “borrowing” from future NDC implementation periods	Yes	No
Compatible with all options for accounting for single-year targets	No	Yes
Necessary to determine the year in which the emission reductions occurred	No	Yes
Timing issues for demonstrating achievement of NDCs	No	Yes

² This accounting approach was explicitly included in the draft negotiation texts from the 2018 Katowice conference and the 2019 Bonn conference (UNFCCC, 2019b). The draft negotiation texts forwarded from Madrid do no longer include this option in the Guidance on cooperative approaches, but still include the consideration of further options as part of a work programme (UNFCCC, 2019a).

Context of CORSIA

For the context of CORSIA, we identify three possible options for the calendar year to which host countries could apply adjustments:

1. **Emission reductions:** Adjustments could be applied to the calendar years in which the offset credit's associated emission reductions took place (as Option 2 for ITMOs above).
2. **Issuance:** Adjustments could be applied to the calendar year in which the offset credit is issued. This can be the same or a later year than when the emission reductions occurred.
3. **Use:** Adjustments could be applied to the calendar year in which an offset credit is used by aeroplane operators under CORSIA. The use could here be defined through different options:
 - a. **Year of cancellation:** The calendar year in which the offset credit is cancelled in the carbon-offsetting program's registry system (e. g. in 2024 to satisfy the offsetting obligation for the first compliance period from 2021 to 2023);
 - b. **Three-year compliance period:** The three-year compliance period for which the offset credit is used (e. g. 2021–2023), meaning that for three offset credits cancelled for that compliance period, an adjustment of one tCO₂e would be recorded in each of the years 2021, 2022 and 2023.
 - c. **Year of surrendering report:** The calendar year in which the surrendering report is submitted by airlines to national authorities (i. e. in 2025 for the pilot phase of CORSIA).

The implications and pros and cons of these options are discussed in the next section below.

3.2.3 Possible combinations for the trigger and the calendar year to which adjustments are applied

The options discussed above for the trigger and the calendar years for adjustments could be combined in different ways. Table 4 uses the example scenario introduced in section 3.1 to illustrate for all plausible combinations how many adjustments would be applied to which calendar years. In Table 4, we do not yet consider how adjustments are applied in relation to a single-year target, but first illustrate the implications if the adjustments were applied in all years of the NDC implementation period or if the country had a multi-year target over the period 2021 to 2030. In section 3.3 below we then assess these options in the light of different approaches to account for single-year targets.

Table 4 shows that the options result in strongly varying numbers. This holds for the total number of adjustments applied over the NDC implementation period from 2021 to 2030 as well as for the calendar years to which adjustments are applied. The choice of the accounting option has thus considerable implications.

Total number of adjustments

If ex-ante authorization is used as the action that should trigger the application of adjustments (option A0), it is not straight-forward how many adjustments should be applied. Authorization letters may be issued in advance of implementing a project or shortly thereafter. At this point in time it can only be estimated how many emission reductions the project will generate in the future. The actual emission reductions and how many of these will be used as offset credits under CORSIA is not yet known. It is thus unclear how many adjustments are needed to avoid double counting.

One possible option could be that the number of adjustments equals the expected emission reductions as estimated in the project documentation. If the actual emission reductions exceed the expected emission reductions, however, this could result in a too low number of adjustments being applied. Using the expected emission reductions would thus not be robust.

Table 4: Implications of different options for the trigger and application of adjustments

	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	Total
Trigger for CORSIA offset adjustment												
[A] Ex-ante authorization	X											
[B] Issuance				X			X		X			
[C] Ex-post authorization				X			X		X			
[C] Cancellation					X			X			X	
Application of adjustments to calendar years												
[A0] Adjustments triggered by ex-ante authorization and applied over the authorized time period		10	10	10	10	10	10	10				70
[B1] Adjustments triggered by issuance and applied to the year in which the emission reductions occurred, up to the authorized limits		5	10	8	10	9	10	10				62
[B2] Adjustments triggered by issuance and applied to the year of issuance				15			27		20			62
[C1] Adjustments triggered by ex-post authorization and applied to the year in which the emission reductions occurred		2	8	8	8	8	8	8				50
[C2] Adjustments triggered by ex-post authorization and applied to the year of authorization				10			24		16			50
[D1] Adjustments triggered by cancellation and applied to the year in which the emission reductions occurred		3.4	6.8	5.4	6.8	6.1	6.8	6.8				42
[D3a] Adjustments triggered by cancellation and applied to the year of cancellation					6			12			24	42
[D3b] Adjustments triggered by cancellation and applied to the relevant three-year CORSIA compliance period		2	2	2	4	4	4	8	8	8		42
[D3c] Adjustments triggered by cancellation and applied to the year of the surrendering report						6			12			18

Source: Own author

Another possibility is that the host country stipulates in its authorization letter a maximum number of offset credits that may be used under CORSIA, as suggested in the Guidelines on Avoiding Double Counting for CORSIA (ClimateWorks Foundation et al., 2019). In this case, the country could simply apply adjustments equal to this maximum number. This approach would be robust because it ensures that the number of adjustments applied are equal to, or exceed, the number of offset credits used under CORSIA. We therefore assume here that this approach is chosen for option A0 and that adjustments corresponding to the total authorized amount are applied (70 MtCO₂eq over the seven-year period).

If issuance is used to trigger the application of adjustments (options B1 and B2), the number of adjustments applied equals to the number of offset credits issued (62 MtCO₂eq). As with option A0, these options are robust and conservative because the number of the adjustments applied is equal to, or even larger than, the offset credits used under CORSIA. In our example scenario, the number of offset credits issued (62 MtCO₂eq) is lower than the actual emission reductions achieved (65 MtCO₂eq). This is because the actual emission reductions exceed the limit established by the host country in two years (2022 and 2026).

If ex-post authorization is used to trigger the application of adjustments (options C1 and C2), the number of adjustments applied equals to the number of offset credits authorized for use under CORSIA (here assumed to amount to 50 MtCO₂eq). This approach is robust, as the number of adjustments applied is equal to, or even larger than, the offset credits used under CORSIA.

If cancellation is used to trigger the application of adjustments (options D1, D3a, D3b and D3c), the number of adjustments applied equals to the number of offset credits used by aeroplane operators under CORSIA. In our example scenario, we assume that only about two third of issued offset credits are used under CORSIA in the first NDC implementation period (42 MtCO₂eq). Under option D3c, the report for the compliance cycle from 2027 to 2029 is only submitted in 2031, and therefore the total number of adjustments applied to the first NDC implementation period would in our example scenario be lower (18 MtCO₂eq).

Distribution of adjustments over the NDC implementation period

Table 4 also shows that the distribution of adjustments over the NDC implementation period varies considerably among the options. For some options, adjustments are spread over a period (options A0, B1, C1, D1, D3b), for others they are applied to specific years only (options B2, C2, D3a, D3c).

Under option A0, the total number of adjustments could be distributed over the period for which the country authorized the issuance and use of offset credits. In our example scenario, the distribution is proportional, with 10 MtCO₂ allocated to each year of the period 2021 to 2027 (see Table 4). Other distributions might be implemented if the level of emission reductions is expected to change over time. In the case of afforestation activities, for example, the removals typically increase over time, at least in the first period of a project. An ex-ante distribution of the adjustments over the relevant period proportionally to the expected emission reductions or removals may usually ensure a reasonable match in timing between the observed emission reductions and the application of adjustments.

Under options B1, C1 and D1, the adjustments are applied to the calendar years in which the emission reductions occurred. Under option B2, the adjustments are applied to the years in which the offset credits are issued, under option C2 to year of ex-post authorization, under option D3a to when the cancellation occurs, and under option D3c to when the surrendering report for a three-year compliance cycle under CORSIA is submitted. Option D3b uses an approach where the offset credits' associated emission reductions are proportionally allocated to each year of the three-year CORSIA compliance cycle. In our example scenario, 6 million offset credits are cancelled for the first compliance cycle from 2021 to 2023, and respectively 2 million adjustments would be required for each year in this three-year period.

A particular feature of option A0 is that adjustments would be applied to future years. In its first biennial transparency report submitted in 2024, the country would, in our example scenario, report in the structured summary adjustments for the period 2021 to 2027, whereas emissions may only be reported up to 2022. This is not necessarily an issue, as these reports are updated biennially and a complete emissions balance for the NDC implementation period could be provided by 2032 or 2034.

3.2.4 Advantages and disadvantages of options

Table 5 compares key features of the nine accounting options identified in the previous section. Below we assess their implications in more detail.

Table 5: Key features of different options

	A0	B1	B2	C1	C2	D1	D3a	D3b	D3c
Number and timing of adjustments									
Number of adjustments could be higher than necessary, possibly making NDC achievement more difficult	Yes	Yes	Yes	Yes	Yes	No	No	No	No
Implicit “borrowing” from future NDC implementation periods is possible	No	No	Yes	No	Yes	No	Yes	Yes	Yes
Application of adjustments is reasonably representative for mitigation action taken over time	Yes	Yes	No	Yes	No	Yes	No	No	No
Structured summaries need to be updated beyond NDC implementation periods or the use offset credits needs to be limited in time	No	Yes	No	Yes	No	Yes	No	Yes	No
Information flows from carbon-offsetting programs to host countries are necessary	No	Yes	Yes	No	No	Yes	Yes	Yes	Yes
Carbon-offsetting programs must identify the calendar years when the offset credits' emission reductions occurred	No	Yes	No	Yes	No	Yes	No	No	No
Requires that countries stipulate in authorization letters a limit on the maximum number of offset credits that may be used under CORSIA	Yes	No	No	No	No	No	No	No	No
Easy compatibility with accounting rules for international transfers between countries if projects are authorized for both for CORSIA and international transfers	No	No	No	No	No	No	No	No	No

Source: Own author

Number of adjustments could be higher than necessary, possibly making NDC achievement more difficult

Some options may imply that the host country has to apply more adjustments than needed to avoid double counting, which could make achieving the NDC more difficult. This could occur in two different ways:

- 1. Fewer emission reductions occur than have been authorized:** Using ex-ante authorization as the trigger for adjustments (option A0) poses the risk that some of the emission reduction authorized for use under CORSIA (or by other countries) are never achieved. This could occur if the project generates fewer emission reductions than expected or if a project is authorized by a country but subsequently never implemented. In our example scenario it is assumed that over the seven-year period the project generates fewer emission reductions (65 MtCO₂eq) than authorized for use under CORSIA (70 MtCO₂eq). This implies that more adjustments are applied than actual emission reductions are generated and used under CORSIA. Applying more adjustments than necessary could make it more difficult for the host country to achieve its NDC: it would observe only the achieved emission reductions in its GHG inventory (65 MtCO₂eq) but would have to adjust for the full amount of emission reductions authorized (70 MtCO₂eq). In the worst case, the country would have to compensate for the resulting gap, by reducing emissions further. While the difference is not large in our example scenario, there could also be situations where a project is authorized but subsequently never implemented. In this case, the country would have to apply adjustments for emission reductions that never occur and are never used under CORSIA. Using authorization as the trigger for adjustments thus poses some risks for countries. To manage these risks, host countries could, as a conservative approach, set the maximum number of offset credits they authorize at a lower level than the expected emission reductions. If on average, over all projects, the actual emission reductions exceed the number of offset credits authorized for use under CORSIA, host countries would not face a gap but could use some of the emission reductions to achieve their NDC. Overall, this suggests that this risk is manageable as long as countries are cautious in how they limit the number of offset credits that may be used under CORSIA.
- 2. Not all offset credits are used under CORSIA or internationally transferred:** Using ex-ante authorization, issuance or ex-post authorization as the trigger for corresponding adjustments (options A0, B1, B2, C1 and C2) poses a further risk of applying more adjustments than needed, namely if not all of the issued and authorized offset credits are used under CORSIA or are internationally transferred. This could, for example, occur if the host country has established a domestic market for offset credits, e. g. if domestic offset credits are eligible for compliance in ETs or under carbon taxes such as in Colombia and South Africa. In this case, projects could in principle serve offset credits to different markets, including international and domestic markets. If offset credits are used domestically, adjustments would not be needed to avoid double counting. If a significant portion of the offset credits were used domestically but the country nevertheless has to apply adjustments, the country could also face a mitigation gap and may, in the worst case, have to compensate for that mitigation gap. This risk could be managed by host countries by authorizing projects to serve either only international purposes (for CORSIA or transfers to other countries) or only domestic purposes. This may reduce flexibility for project owners to sell their offset credits in the market that gives higher revenues, but – combined with limits in authorization letters – may significantly reduce the risk that host countries have to apply more adjustments than needed.

These risks do not apply if the application of adjustments is triggered by the cancellation of offset credits under CORSIA (options D1, D3a, D3b and D3c). In this case, the host country would only apply adjustments for offset credits that are actually used under CORSIA (or internationally transferred to another country). In conclusion, a risk of applying too many adjustments holds for options A0, B1, B2, C1 and C2, but not for options D1, D3a, D3b and D3c (see Table 5). However, both risks seem to be manageable through cautious approaches when authorizing projects.

Implicit “borrowing” from future NDC implementation periods

Some options implicitly allow the host country to “borrow” emission reductions from future NDC implementation periods. This occurs if the country observes the offset credits' associated emission reductions in its first NDC implementation period, but only has to apply an adjustment in a subsequent NDC implementation period. This can occur with options where adjustments are applied to the year of issuance (B2), to the year of ex-post authorization (C2), to the year of cancellation (D3a), to the three-year CORSIA compliance period (D3a), or to the year in which the surrendering report is submitted (D3c). This risk does not apply to options where adjustments are applied to the authorized period (A0) or to the years in which the emission reductions occurred (B1, C1 and D1), as shown in Table 5.

Application of adjustments is reasonably representative for mitigation action taken over time

When countries have a multi-year emissions target, the distribution of adjustments over the NDC implementation period does, in principle, not matter because the achievement of the NDC is assessed over the full multi-year target period. The distribution of adjustments is more important in the context of single-year targets, as discussed in section 3.3 further below.

Independent of the target type, the distribution may matter in terms of creating transparency on how well countries are on track in implementing their NDCs. Progress towards implementing NDCs could best be tracked if the application of adjustments would match with the timing of the emission reductions. This is best ensured with options that apply adjustments over the authorized period or to the calendar years in which the emission reductions occurred (options A0, B1, C1 and D1).

If adjustments are applied to specific years only, as under options B2, C2, D3a and D3c, there could be stronger variations over time. This holds in particular if a large amount of offset credits would be used under CORSIA and if the specific CORSIA deadlines are used as the calendar year in which adjustments are applied (option D3a and D3b). In this case, the country could observe in its structured summary spikes in its adjusted emissions level for specific years (e. g. 2024, 2027 and 2030 for option D3a). This would not be representative for the mitigation action taken by the country over time.

Under option D3b, the adjustments are applied to the CORSIA compliance cycles and thus distributed over a period of time. However, although such a distribution may be more representative than applying adjustments to specific calendar years only, this approach may also not match well with when the emission reductions were achieved. In our example scenario, the country would observe a high level of adjustments in the period 2027 to 2029, although most of the emission reductions were achieved in the period before. In its adjusted emissions balance in the structured summary, the country could thus be perceived to be not on track towards its NDC in the period 2027 to 2029 and to have been on track in the period up to 2026.

Need to update structured summaries beyond NDC implementation periods or to limit the use of offset credits in time

An important disadvantage of options B1, C1 and D1 is that they require to update structured summaries well beyond the NDC implementation period in order to account for offset credits that are issued, authorized or cancelled after the NDC implementation period but that represent emission reductions that occurred during the NDC implementation period. Alternatively, the use of offset credits could be limited in time (see discussion in section 3.2.2 above). A similar risk, though for a shorter time period, applies to option D3b. In this case, a cancellation in 2036 could trigger a corresponding adjustment to the calendar year 2029. However, by 2036, the NDC implementation period until 2030 could already have been closed.

Information flows from carbon-offsetting programs to host countries are necessary

Options for which the application of adjustments is triggered by authorization (options A0, C1 and C2) have the advantage that the host country does not require any information on whether and when the offset credits have been used but can apply the adjustments immediately upon the issuance of the authorization letter. By contrast, all other options require countries to have information on when and how many offset credits are issued or cancelled. They would thus need to either track the issuance or cancellation of offset credits or be informed by the carbon-offsetting programs about issuance or cancellation events. To facilitate this, countries could request in their authorization letters carbon-offsetting programs to automatically inform them about any issuance or cancellation events (ClimateWorks Foundation et al., 2019). Such information flows could also be automated. However, this makes the information flow needed to apply adjustments more complex as compared to options A0, C1 and C2.

Need for carbon-offsetting programs to identify the calendar years when the emission reductions occurred

Options that apply adjustments to the calendar years in which the emission reductions occurred (options B1, C1 and D1) bring the disadvantage that they require that carbon-offsetting programs identify the calendar years in which the emission reductions occurred and tag offset credits respectively. Approaches to allocate emissions to calendar years have already been developed under the CDM and are not complicated to implement; however, most carbon-offsetting programs currently do not have them in place yet and would need to adapt their procedures respectively. All other options (A0, B2, C2, D3a, D3b and D3c) do not require this.

Need for countries to stipulate in authorization letters a limit on the maximum number of offset credits that may be used under CORSIA

Option A0 is only robust and avoids double counting for all emission reductions if host countries stipulate in their authorization letters a maximum number of offset credits that may be used under CORSIA (and/or for international transfer to another country). All other options do not require this. However, in order to ensure that countries achieve their NDCs, it may be advisable that host countries establish such limits regardless of which accounting options is implemented. In practice, this may therefore not be a major barrier for using option A0. If this option is implemented under the Paris Agreement, a decision could request countries to specify such limits in their authorization letters.

Easy compatibility with accounting rules for international transfers between countries if projects are authorized for both for CORSIA and international transfers

As long as offset credits from a project are only authorized for use under CORSIA, all the accounting options discussed in this paper could be implemented irrespectively of which accounting approaches are used for international transfers between countries. If offset credits from a project are authorized for use under CORSIA or for international transfer to another country, however, then compatibility of accounting rules becomes an issue.

In this case, there is a risk that the host country unintentionally applies two adjustments for one offset credit. This risk applies to all options but could occur in two different ways:

1. If the adjustment is triggered by authorization (options A0, C1 and C2) or by the issuance of offset credits (options B1 and B2), there is a risk that an adjustment could be applied once following the authorization or issuance and once following the first transfer of the offset credit to another country. To address this risk, international rules could, for example, clarify that the (first) transfer would be the latest possible action that should cause the application of an adjustment but that adjustments may also be applied at an earlier point in time (i. e. at authorization or issuance). However, even in this case, it may still be necessary for the country to track how the offset credits have been used, because, in order to enable a reconciliation and review of the application of adjustments, the rules for structured summaries may require countries to report how many adjustments were applied for transfers to other countries and how many adjustments were applied for CORSIA purposes.

2. If the adjustment is triggered by the cancellation of offset credits under CORSIA (options D1, D3a, D3b and D3c), there is a risk that an adjustment could be applied twice if an offset credit is first transferred to another country (e.g. bought by a retailer located in another country) and subsequently sold to an aeroplane operator that cancels the offset credit to satisfy offsetting requirements under CORSIA. In this case, the host country might apply an adjustment once following the first transfer of offset credit to another country, and another adjustment following the cancellation of the offset credit. This risk could, for example, be addressed by exempting countries from the application of adjustments for the cancellation of offset credits under CORSIA if these were previously transferred to another country. However, this would require careful tracking and reconciling the use of offset credits.

3.3 How can countries with single-year targets account for the use of offset credits under CORSIA?

A key question in the ongoing negotiations on Article 6 is how international transfers of mitigation outcomes can be robustly accounted for in the context of single-year targets (Hood et al., 2014; Howard, Chagas, Hoogzaad, & Hoch, 2017; Lazarus, Kollmuss, & Schneider, 2014; Rich, Bhatia, Finnegan, Levin, & Mitra, 2014; Schneider et al., 2019, 2017). If countries with single-year targets engage in international transfers of mitigation outcomes, this could lead in different ways to aggregated GHG emissions being greater than if the countries had achieved their NDC targets individually, and thus undermine environmental integrity. Several approaches to address this challenge have been proposed in the negotiations. This section assesses whether the same concerns apply if host countries have single-year targets and authorize the use of offset credits for CORSIA and whether and how the accounting approaches considered in the negotiations on Article 6 could work in the context of CORSIA.

CORSIA establishes continuous three-year compliance cycles. If host countries also have continuous multi-year targets, this does not give rise to the concern that aggregated GHG emissions could increase, as multi-year targets ensure that all offset credits authorized for use under CORSIA are accounted for by the host country when demonstrating achievement of its NDC. All nine approaches identified in the previous section ensure this, though some options may implicitly allow “borrowing” and could thus give temporary rise to emissions and would only ensure in aggregate, over a long time period, that emissions do not increase (see section 3.2.4). Robust accounting for the use of offset credits under CORSIA is thus relatively easy to ensure if host countries have continuous multi-year targets.

In their first NDC, however, most countries communicated only targets for single years, mostly for 2030 (Graichen et al., 2016). This raises the question of whether and how host countries would account for offset credits for which the emission reductions occurred in years other than the target year. In the negotiations on Article 6, the following options are considered for applying corresponding adjustments for international transfers for countries with single year targets (UNFCCC, 2019b):

- ▶ **Option 1: Multi-year emission trajectory.** Countries account for all years of the NDC implementation period against a multi-year trajectory of emissions set to be consistent with reaching the target level in the single target year. The trajectory sets expected or indicative levels of emissions for each year and countries undertake transfers and acquisitions to bring emissions balances into line with these levels. The comparison of adjusted actual emissions with the trajectory level could be conducted for each year or for the whole NDC implementation period cumulatively.
- ▶ **Option 2: Annual adjustments.** Countries report on the adjustments implied by their transfers and acquisitions (or use) for all years of the NDC implementation period, without first setting an emissions trajectory or other expectation of emissions prior to the single year target. This would provide information during the NDC implementation period to track implementation and provide transparency regarding the use of transfers. However, the achievement of single-year NDCs would still be assessed only in relation to the target year.
- ▶ **Option 3: Multi-year budget.** Countries account for all years of the NDC implementation period against a budget of emissions that is determined over that period consistent with the NDC. The budget must first be calculated, which requires assumptions to be made regarding the trajectory of emissions during the NDC implementation period and prior to the single target year. Adjustments are applied at the end of the NDC period.

- **Option 4: Annual averages.** Countries account only for the single target year, but the accounting adjustments are determined by averaging transfers and acquisitions (or use) over a longer period to make them more “representative” of a typical year. The option recognizes transfers and acquisitions in the years preceding the target year. The relevant period may be defined by the period over which the NDC is implemented (e.g. 2021–2030) or by an ETS compliance period (e.g. 2028–2030).
- **Option 5: Vintage limitation.** Countries account only for the single target year and transfers and acquisitions in the years preceding the target year are ignored. This limits the accounting of transfers from, and acquisitions to, a country with a single-year NDC to mitigation outcomes that occur in that target year. There is no mixing of mitigation outcomes from inside and outside the timeframe of the NDC target.

All five options are reflected in the negotiation text from the 2019 Bonn conference (UNFCCC, 2019b). The draft negotiation texts from COP25 in Madrid include only option 1, 3 and 4 in the guidance on cooperative approaches, but the draft decision envisages that other options will be considered as part of a work program (UNFCCC, 2019a).

The **multi-year emission trajectory** (option 1) effectively translates the single-year NDC into a multi-year emissions target for accounting purposes, without necessarily changing the NDC itself. It is a robust approach to avoid double counting for CORSIA, as it ensures – in the same way as multi-year targets – that all offset credits used under CORSIA are accounted for by the host country, irrespective of the calendar years to which adjustments are applied.

Annual adjustments (option 2) seek to enhance the information on transfers prior to the single target year by applying adjustments for the purpose of tracking the implementation of NDCs. However, unlike option 1, although the reporting of adjustments is extended to multiple years, the period in which the target applies remains a single target year. Achievement of the NDC would only be assessed for the target year, by comparing the target level with the adjusted emissions level. Adjustments reported in prior years provide thus more information but are irrelevant for whether the country achieves its target.

Annual adjustments may not necessarily avoid double counting for CORSIA. In our example scenario, none of the accounting options identified in section 3.2, except for option C3a, would require the country to apply adjustments in its target year in 2030. The country could effectively use the emission reductions from the wind power plant to achieve its 2030 target (as the plant continues operation beyond 2030) and at the same time authorize the plant’s emission reductions achieved prior to its target year to be used under CORSIA. In our example scenario, this would not be possible if the plant had a 10-year crediting period until 31 December 2030. In this case, some of the accounting options (A0, B1, C1 and D1) would effectively avoid double counting, while other accounting options may not necessarily do so, as their ability to avoid double counting in the target year depends on when the offset credits are issued or cancelled. The approach of annual adjustments could thus create a perverse incentive for host countries to only authorize the generation and use of offset credits in non-target years, and to use the projects’ emission reductions in target years to achieve their single-year target. This risk applies if the emission reductions can be expected to continue in non-target years, but not if the project would stop GHG abatement if it does not receive carbon credits. Most project types are, such as wind power projects, are likely to continue GHG abatement until the end of their technical lifetime, as the revenues from continued operation (e.g. electricity sales) exceed their operation costs (Warnecke et al., 2017).

The approach of annual adjustments may also lead to levels of adjustments in the target year that are not representative for the actual mitigation. The adjustments could be way too high or too low. In our example scenario, approach D3a would, for example, require the country to apply 24 million adjustments in 2030, whereas the wind power plant would only generate emission reductions of about 10 MtCO₂eq in that year. The country would thus need to apply more adjustments than needed to avoid double counting, which could make it more difficult to achieve its NDC target. The same risk applies to other accounting options (B2, D3c), as the number of adjustments to be applied in 2030 would depend on how many units are issued, cancelled, or included in airlines’ surrendering reports in that specific year. As this is out of the control of the host country, it could face considerable risks with regard to its ability to achieve its NDC.

These challenges could theoretically be addressed if countries with single-year targets would only be allowed to authorize offset credits for use under CORSIA if the offset credit’s emission reductions occur in the target year and if the adjustment is applied to that year (as is the case for options A0, B1 or C1). In this case, it would be ensured that the host country accounts for all emission reductions used under CORSIA in its single-year target.

However, this would restrict the supply of offset credits to CORSIA to emission reductions generated in target years of the host country, and could thus significantly reduce supply for CORSIA.

The **multi-year budget** (option 3) extends the target to the full NDC implementation period. As with option 1, this option effectively avoids double counting for CORSIA because it ensures that all emission reductions used under CORSIA are accounted for by the host country, irrespective of the calendar years to which adjustments are applied.

Annual averages (option 4) provide a means to reflect the use of offset credits under CORSIA over a longer period and may provide a fairer picture of mitigation action taken over time and progress towards NDCs. In our example scenario, averaging over the ten-year NDC implementation period from 2021 to 2030 would imply that 7 million adjustments be applied in 2030 under option A0; 6.2 million under options B1 and B2; 5 million under options C1 and C2; 4.2 million under options D1, D3a and D3b; and 1.8 million under option C3c. The adjustment in 2030, as opposed to the emission reduction of about 10 MtCO₂eq observed from the wind power plant, would thus reflect that over the ten-year NDC implementation some of the emission reductions were used under CORSIA whereas some were used by the country to implement and achieve its NDC (the emission reductions occurring from 2028 to 2030 and some of the emission reduction occurring in earlier years as not all emission reductions were used under CORSIA). The approach is less accurate than options 1 and 3 but may represent a reasonably fair picture of what happened over the NDC implementation period.

The main disadvantage of averaging is that its effectiveness strongly hinges on the situation in the target year. Unexpected increases in emissions in the target year, e. g. due to weather conditions such as low levels of precipitation or high temperatures, could imply that the country does not achieve its NDC in the target year, even though it may have been on track over the NDC implementation period. Conversely, lower than expected emissions in the target year mean that more offset credits may be used under CORSIA over the entire NDC implementation period. The level of emissions in 2030, however, becomes available only when GHG inventories are completed, after the end of the NDC implementation period. The averaging, therefore, leaves considerable uncertainty for countries regarding how many mitigation outcomes they can authorize for use under CORSIA. This may limit countries' readiness to provide advance authorization for the use of offset credits under CORSIA.

Vintage limitation (option 5) most directly reflects the single year of the NDC by determining that other vintages may not be used towards NDCs or authorized for use under CORSIA due to being outside the scope of NDCs. Under this option, the host country would only be allowed to authorize the use of offset credits under CORSIA if the emission reductions were generated in its target year. This option would only be compatible with accounting option A0, B1, C1 and D1. It would restrict the supply of offset credits to CORSIA, as emission reductions achieved in non-target years could not be used under CORSIA.

In conclusion, multi-year targets, multi-year emission trajectories or multi-year budgets are the most robust approaches to account for the use of offset credits under CORSIA. These options ensure that all offset credits authorized for use under CORSIA are accounted for by the host country, though some of the options may allow for implicit "borrowing" of emission reductions from future NDC implementation periods. If these options are politically not palatable, averaging or vintage limitations could be alternative approaches, which however also bring disadvantages. Annual adjustments would only be robust if the generation of emission reductions for use under CORSIA is limited to target years. As with the vintage limitation option, this option would, therefore, restrict the available supply for CORSIA.

3.4 How can consistency of GWP values be ensured?

Under the Paris Agreement, it is envisaged that countries account for emissions and removals in accordance with “common metrics” assessed by the IPCC (decision 1/CP.21, paragraph 31(a)). The MPGs specify that all Parties shall use in their national inventory reports the 100-year time-horizon GWP values from the 5th IPCC assessment report, or 100-year time-horizon GWP values from a subsequent IPCC assessment report as agreed upon by the CMA, to report aggregate emissions and removals of GHGs, expressed in CO₂eq (paragraph 37 in the Annex to decision 18/CMA.1). While common values should be used for reporting of national GHG inventories, countries can still use different sets of GWP values in their first NDCs, but not any longer in their second NDCs, for which the accounting guidance under Article 4.13 requires to apply the same common metrics as used for national GHG inventories (paragraph 1a of Annex II to decision 4/CMA.1). This leads to a situation where countries use different GWP values in determining their NDC covered emissions and implementing structured summaries for their first NDC implementation period.

ICAO has not established a requirement regarding which GWP values carbon-offsetting programs should use to convert non-CO₂ emissions into CO₂ equivalents. Carbon-offsetting programs currently use mostly values from the 4th IPCC assessment report to quantify emission reductions.

This raises two issues:

1. **Risk of cherry-picking by offset projects:** If different programs use different sets of GWP values under CORSIA, this could create a risk that project owners pick a program which results in higher CO₂ equivalents of emission reductions, depending on which gases are abated. In aggregate, this could lead to more offset credits being issued for the same emission reductions, compared to a situation in which all programs would use the same GWP values.
2. **Inconsistent metrics between countries and carbon-offsetting programs:** If carbon-offsetting programs and host countries use different GWP values, this raises challenges for the application of adjustments. In structured summaries, adjustments should be applied in the same metric as the reported emissions and target levels. If different metrics were used, this could either undermine environmental integrity (if the adjustments applied are lower due to the difference in GWP values) or make it more difficult for the country to achieve its NDC (if the adjustments applied are greater due to the difference in GWP values). For example, a project reducing one tonne of CH₄ may be issued 28 offset credits by a carbon-offsetting program using the 100-year GWP value from the 5th IPCC assessment report. If the host country of the project uses the 100-year GWP of 21 from the 2nd IPCC assessment report to account for its NDC, however, it would observe in its own GWP metric only an emission reduction of 21 tCO₂eq. If the country would apply an adjustment of 28, it would thus face a mitigation gap of 7 tCO₂eq and may have to compensate for that by reducing emissions further.

In this discussion paper, we focus on the second issue.

The simplest option is that all countries authorizing the use of offset credits under CORSIA and all eligible carbon-offsetting programs consistently apply the values from the 5th IPCC assessment report for emission reductions achieved after 31 December 2020. This could be implemented through relevant decisions under the Paris Agreement and ICAO. Under the Paris Agreement, Parties could decide that countries authorizing the use of offset credits under CORSIA shall apply the Article 4.13 accounting guidance already to their first NDC. A similar requirement has been proposed in Article 6 negotiations for countries engaging in international transfers between countries. Alternatively, Parties could adopt a decision that specifically addresses this matter for CORSIA.

Under ICAO, the Council could only approve carbon-offsetting programs that use the GWP values from the 5th IPCC assessment report for offset credits issued for emission reductions occurring after 31 December 2020. The use of GWP values from the 5th assessment report under ICAO could also – indirectly – be enforced through decisions under the Paris Agreement: The Parties to the Paris Agreement could decide that countries shall only authorize the use of offset credits under CORSIA if the relevant carbon-offsetting program uses GWP values from the 5th assessment report. This requirement could also be reflected in authorization letters.

An alternative but more complex option could be allowing the use of different GWP values and reconciling the resulting differences when applying corresponding adjustments. The Guidelines on Avoiding Double Counting for CORSIA specify how this option could work (ClimateWorks Foundation et al., 2019). It would require that carbon-offsetting programs determine the emission reductions in two GWP metrics: in the program's metric, and in the metric used by the host country to account for its NDC. The offset credits would be issued and used under CORSIA in the program's metric. In addition, the program would inform the host country about the equivalent emission reductions in the host country's metric. This would enable the host country to apply adjustments using the same metrics as it uses in its structured summary to report its GHG emissions and to account for its NDC. In the above example, using the GWP value from 5th assessment report, 28 offset credits would be issued for one tonne of CH₄ reduced, whereas the country would only apply a corresponding adjustment of 21 tCO₂e, using the GWP value from the 2nd assessment report.

This second option is robust but brings a number of practical challenges. First, it requires that carbon-offsetting programs quantify emission reductions in two different metrics. This is straight-forward for some project types, such as landfill gas projects, but can be complex for others. Some methodologies to quantify emission reductions use simplified approaches, such as default emission factors, to estimate the aggregated emissions outcome from multiple emission sources and multiple gases. These methodological approaches may need to be modified to estimate emission reductions in different metrics (Schneider, La Hoz Theuer, Howard, Kizzier, & Cames, 2020).

Second, it requires that carbon-offsetting programs inform host countries about the equivalent emission reductions in the metric of the host country and that this information is used correctly by countries when applying adjustments. However, such information flows may be needed anyhow if the application of adjustments is triggered by the issuance or use of offset credits under CORSIA.

Third, the accounting by countries would become more complex because the number of offset credits used under CORSIA would no longer correspond to the number of adjustments applied by countries. This would reduce the transparency of accounting and could make the technical expert review of the application of structured summaries under Article 13 more complex.

Overall, this suggests that a consistent use of GWP values from the 5th assessment report by both countries and carbon-offsetting programs would be the simplest option.

4 Conclusions and recommendations

This discussion paper assesses how robust accounting could be implemented under the Paris Agreement in order to avoid double counting between NDCs and CORSIA. The paper identifies that several approaches for accounting for international transfers between countries cannot be applied in the context of CORSIA.

First, under CORSIA offset credits are issued and cancelled in a carbon-offsetting program's registry and do not necessarily cross international borders. This means that international rules need to clarify what the “first transfer” – which is used as the trigger for applying corresponding adjustments under draft Article 6 rules – means in the context of CORSIA or whether another course of action should trigger the application of corresponding adjustments for CORSIA. Second, the current negotiation text is unclear to which calendar years adjustments should be applied in structured summaries for offset credits used under CORSIA. Third, not all approaches to account for single-year targets may be robust in the context of CORSIA. And lastly, it is unclear which GWP values carbon-offsetting programs will use when issuing CORSIA eligible offset credits and whether these values match the GWP values used by countries in accounting for their NDCs.

The paper identifies nine options for how adjustments could be applied in structured summaries. These combine different triggers for the application of adjustments (ex-ante authorization, issuance, ex-post authorization, or cancellation) with different approaches for the calendar years to which adjustments are applied (year of expected or actual emission reductions, year of issuance, year of authorization, year of cancellation, period of CORSIA compliance cycle, or year of submitting the surrendering report under CORSIA).

These options involve important trade-offs (see Table 5 on page 17). Some options could lead to more adjustments being implemented than necessary to avoid double counting, which could make it more difficult for the host country to achieve its NDC; some options implicitly allow “borrowing” of emission reductions from future NDC implementation periods, which might delay climate action and create perverse incentives to set future NDCs less ambitiously; some options better ensure that the application of adjustments is reasonably representative for mitigation action taken over time; and some options require to either update structured summaries well beyond the target year or to set limits by when issued offset credits must be cancelled under CORSIA. Other challenges also exist but might be addressed more easily, such as that carbon-offset programs would need to provide information to host countries on the issuance and use of offset credits under CORSIA and that they may need to determine in which calendar year emission reductions occurred.

Among the options, we recommend using ex-ante or ex-post authorization as the trigger for the application of adjustments and applying adjustments to the calendar years in which the emission reductions or removals occurred. Most importantly, these options avoid implicit borrowing of emission reductions from future NDC implementation periods and ensure that the application of adjustments is representative for the mitigation action taken over time. Ex-ante application of adjustments brings the advantage that project owners have early on certainty that they will be able to use the offset credits under CORSIA. This option also avoids timing issues with preparing the final accounting balance to demonstrate achievement of the NDC. Ex-post authorization provides the advantage that adjustments are only made for emission reductions or removals that have been verified to have actually occurred but may bring about more uncertainty for project owners whether they will ultimately get approval by host countries.

A further important cross-cutting issue is the compatibility between accounting approaches for CORSIA and accounting approaches for international transfers between countries. As long as the offset credits from a project are only used under CORSIA, all the accounting options discussed in this paper could be implemented irrespectively of which accounting approaches are used for international transfers between countries. If offset credits from a project are authorized for all type of purposes, however, compatibility of accounting rules for CORSIA and international transfers between countries becomes an issue. Several challenges would then have to be resolved and accounting would become more complex. Policy-makers thus need to bear in mind that there is trade-off between (a) limiting authorization of projects to either international transfers between countries or use under CORSIA, which allows to keep accounting rules simpler but limits the flexibility of project owners to serve different markets, or (b) authorizing projects for any use other than the implementation of its own NDC, which makes accounting more complex but provides project owners flexibility to serve different markets.

The paper also identifies that not all options to account for single-year targets are robust in the context of CORSIA, which provides for continuous three-year compliance periods. Using multi-year targets, multi-year emission trajectories or multi-year budgets is the most robust approach to account for the use of offset credits under CORSIA. These options ensure that all offset credits authorized for use under CORSIA are accounted for by the host country. If these options are politically not palatable, the options “averaging” or “vintage limitation” could be considered, though they involve some drawbacks. The option of “annual adjustments” would only be robust if the generation of emission reductions for use under CORSIA is limited to target years. As with the vintage limitation option, this option would therefore restrict the available supply for CORSIA.

To ensure consistent use of GWP values, accounting would be simplest if both host countries and carbon-offsetting programs use the values from the 5th assessment report of the IPCC for the period after 31 December 2020. Under the Paris Agreement, this could be implemented through a decision requiring countries authorizing the use of offset credits under CORSIA to (i) apply the Article 4.13 accounting guidance in Annex II to decision 4/CMA.1 and (ii) to include in their authorization letters a condition that offset credits must be issued using the GWP values from the 5th assessment report. In addition, the ICAO Council could decide that CORSIA eligible programs must use the values from the 5th assessment report.

Recommendations for international negotiations on Article 6

Two important lessons can be drawn from the analysis in this paper for the negotiations under the Paris Agreement. First, as CORSIA differs from international transfers between countries, specific provisions addressing the particular context of CORSIA are needed in Article 6 guidance on cooperative approaches, or alternatively in a separate decision under the Paris Agreement. This is critical for effectively avoiding double counting for CORSIA. And second, some findings of this paper are not only relevant for the context of CORSIA but can also inform the negotiations on accounting rules for international transfers between countries. This includes that some accounting approaches may implicitly allow the “borrowing” of emission reductions from future NDC implementation periods, the timing of when structured summaries are considered final, and the robustness of the options to account for single-year targets.

We recommend that Parties to the Paris Agreement address the following issues in international rules for Article 6:

- ▶ **Trigger for adjustments for other uses:** Parties may clarify what action should trigger the application of adjustments in the context of mitigation outcomes used for purposes other than towards NDCs. We recommend that the authorization is used as the trigger for applying adjustments in such instances.
- ▶ **Application of adjustments to calendar years:** Parties may clarify to which calendar years adjustments should be applied for both the transfer of ITMOs between countries and the use of mitigation outcomes for other purposes. We recommend that transferring (or host) countries should apply adjustments to the calendar years in which the emission reductions or removals occurred.
- ▶ **Authorization for one or multiple purposes:** Parties may clarify whether an authorization should be conducted for a specific purpose (e. g. use towards other NDCs or use towards CORSIA) or whether countries may also authorize mitigation outcomes to be used for any purposes other than achieving their own NDCs. In the latter case, Parties may address through a future work program how it can be ensured that an adjustment for a mitigation outcome is only applied once by the transferring (or host) country and not twice (e. g. once at authorization and once again at the first transfer).
- ▶ **Compatibility of options to account for single-year targets:** Parties may clarify which options can be used for accounting in the context of single-year targets if a Party authorizes offset credits for use under CORSIA. We recommend that countries authorizing offset credits for CORSIA should preferably have multi-year targets, multi-year budgets or apply the emissions trajectory approach. Alternatively, averaging or vintage restrictions could also be viable, though with some drawbacks.
- ▶ **GWP values and application of accounting guidance under Article 4.13:** Parties may clarify which GWP values should be accepted by host countries when authorizing the use of offset credits under CORSIA. We recommend that countries authorizing the use of offset credits (i) should require in their authorization letters that carbon-offset programs issue respective offset credits using the 100-year GWP values from the 5th IPCC assessment report, consistent with relevant decisions by the CMA, and (ii) apply the Article 4.13 accounting guidance in Annex II to decision 4/CMA.1.

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Appendix A: Supplementary Information for Assessment of Emissions Unit Programs

As part of the first application window for carbon-offsetting programs under CORSIA, the Technical Advisory Body (TAB) of the ICAO published an Appendix A to the program application form. This Appendix includes guidelines for interpreting the EUCs. With respect to double counting provisions, the following Guidelines were provided:

- 3.7.4. Guidelines for interpretation of the “Only counted once towards a mitigation obligation” criterion**
- 3.7.5. *Double-issuance:* The program should have procedures in place for program and/or registry administrator monitoring of program registry(ies) to ensure the transparent transfer of units between registries; and that only one unit is issued for one tonne of mitigation.
- 3.7.6. *Double-use:* The program should have procedures in place for program and/or registry administrator monitoring of program registry(ies) to ensure that one unit is issued or transferred to, or owned or cancelled by, only one entity at any given time.
- 3.7.7. *Double-selling:* Programs should have procedures in place to discourage and prohibit the double-selling of units. Double selling occurs when one or more entities sell the same unit more than once.
- 3.7.8. *Host country attestation to the avoidance of double-claiming:* Only emissions units originating in countries that have attested to their intention to properly account for the use of the units toward offsetting obligations under the CORSIA, as specified in paragraph (and sub-paragraphs of) 3.7.9, should be eligible for use in the CORSIA. The program should obtain, or require activity proponents to obtain and provide to the program, written attestation from the host country’s national focal point or focal point’s designee. The attestation should specify, and describe any steps taken, to prevent mitigation associated with units used by operators under CORSIA from also being claimed toward a host country’s national mitigation target(s) / pledge(s). Host country attestations should be obtained and made publicly available prior to the use of units from the host country in the CORSIA.
- 3.7.9. *Double-claiming procedures:* The program should have procedures in place requiring that activities take approach(es) described in these sub-paragraphs to prevent double-claiming, which attestations should confirm:
 - 3.7.9.1. Emissions units are created where mitigation is not also counted toward national target(s) / pledge(s) / mitigation contributions / mitigation commitments.
 - 3.7.9.2. Mitigation from emissions units used by operators under the CORSIA is appropriately accounted for by the host country when claiming achievement of its target(s) / pledges(s) / mitigation contributions / mitigation commitments, in line with the relevant and applicable international provisions.
 - 3.7.9.3. If program procedures provide for the use of method(s) to avoid double-claiming which are not listed above, the GMTE, or other appropriate technical expert body, should evaluate and make a recommendation regarding the sufficiency of the approach prior to any final determination of the program’s eligibility.
- 3.7.10. *Transparent communications:* The program should make publicly available any national government decisions related to accounting for units used in ICAO, including the contents of host country attestations described in paragraph 3.7.8; and update information pertaining to host country attestation as often as necessary to avoid double-claiming.
- 3.7.11. *Comparing unit use against national reporting:* The program should have procedures in place to compare countries’ accounting for emissions units in national emissions reports against the volumes of eligible units issued by the program and used under the CORSIA which the host country’s national reporting focal point or designee otherwise attested to its intention to not double-claim.

- 3.7.12. *Program reporting on performance:* The program should be prepared to report to ICAO's relevant bodies, as requested, performance information related to, inter alia, any material instances of and program responses to country-level double-claiming; the nature of, and any changes to, the number, scale, and/or scope of host country attestations; any relevant changes to related program measures.
- 3.7.13. *Reconciliation of double-claimed mitigation:* The program should have procedures in place for the program, or proponents of the activities it supports, to compensate for, replace, or otherwise reconcile double-claimed mitigation associated with units used under the CORSIA which the host country's national accounting focal point or designee otherwise attested to its intention to not double-claim.

