

Averaging or multi-year accounting?

Implications for environmental integrity of carbon markets under Article 6 of the Paris Agreement

Berlin, 11.01.2021

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On behalf of:



of the Federal Republic of Germany

Implemented by



Impressum

Publisher:	Öko-Institut e.V.
Editors and Project Management:	Anne Gläser (GIZ), Enrico Rubertus (GIZ), Dennis Tänzler (adelphi), Denis Machnik (adelphi)
Authors:	Dr. Lambert Schneider, Anne Siemons
Author support:	Not applicable
Photo credits:	Not applicable
Date:	11.01.2021

This paper has been commissioned by the Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ) GmbH on behalf of the German Federal Ministry for the Environment, Nature Conservation and Nuclear Safety (BMU).

Disclaimer

The analysis, results and recommendations in this paper, funded by the Federal Ministry of the Environment, Nature Conservation and Nuclear Safety (BMU), represent the opinion of the authors and are neither necessarily representative of the position of the funder nor of the Gesellschaft für Internationale Zusammenarbeit (GIZ GmbH).

Acknowledgements

The authors wish to thank Sandra Greiner from Climate Focus and Thomas Forth from the German Federal Ministry for the Environment, Nature Conservation and Nuclear Safety (BMU) for very helpful comments to a draft version of this paper, Andrew Howard for important inputs as part of earlier research for the European Commission, and the German Federal Ministry for the Environment, Nature Conservation and Nuclear Safety (BMU) and the Gesellschaft für Internationale Zusammenarbeit (GIZ) for funding this research. Needless to say, this does not imply that they endorse the analysis or recommendations included in the publication.

Summary

Under the Paris Agreement, most countries have communicated nationally determined contributions (NDCs) with mitigation targets for a single year. Single-year targets present considerable challenges if countries use international carbon markets to achieve their NDCs. This paper assesses the environmental integrity implications of the two main options considered by countries for accounting for internationally transferred mitigation outcomes (ITMOs) under Article 6 of the Paris Agreement. These options are:

1. **Averaging**, whereby the average number of ITMOs transferred or used over the NDC implementation period (e.g. 2026 to 2030) is counted in the target year (e.g. 2030); or
2. **Multi-year approaches**, defining a multi-year trajectory or budget for the NDC implementation period, whereby all ITMOs transferred or used are counted over the entire NDC implementation period.

This paper summarises the current state of negotiations under the Paris Agreement and analyses the circumstances under which these two accounting options may lead to higher, lower or constant aggregated emissions.

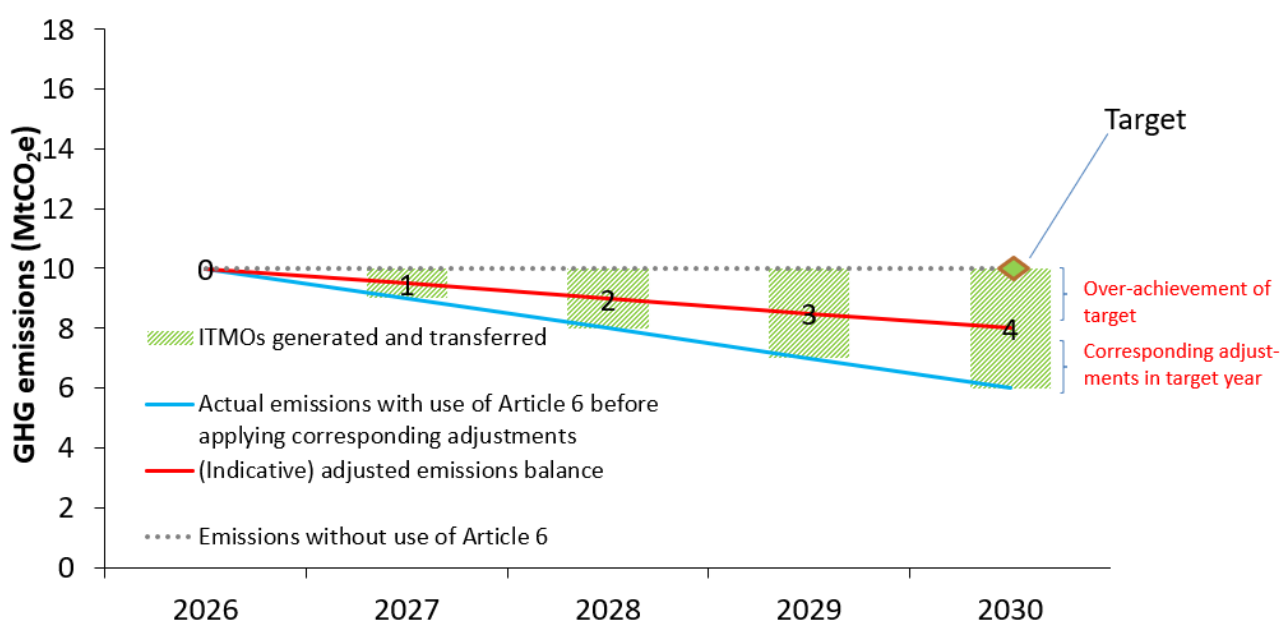
The paper identifies that aggregated emissions depend on three factors: (1) the accounting approach chosen by the transferring and the acquiring country; (2) whether the generation or use of ITMOs decreases, increases, or keeps constant over time; (3) whether the countries' emissions in the target year are above or below the countries' emissions trend and (4) what course of action countries take in the light of a possible over- or under-achievement of their NDC targets. To assess the implications of these factors, the paper defines a variety of scenarios for how countries might engage in Article 6 and assesses their implications on aggregated emissions.

Several findings result from our analysis:

1. **The choice of the accounting approach affects the mitigation effort needed by countries to achieve a given NDC target.** This study shows that, keeping all other parameters constant, averaging can lead to over- or under-achievement of mitigation targets, depending on whether the country is transferring or acquiring ITMOs and whether it is increasing or decreasing its ITMO engagement over time, or keeping it constant. This is because the emission reductions achieved in the target year through the engagement in ITMOs might be lower or higher than the corresponding adjustments applied in that year. Figure ES-1 illustrates this for a transferring country with an increasing engagement in ITMOs over time. In this case, the engagement in a cooperative approach under Article 6 results in mitigation outcomes of 4 MtCO₂e in 2030 which are all internationally transferred as ITMOs. The country would, however, only apply corresponding adjustments of 2 MtCO₂e in that year (10 million ITMOs transferred over the 5-year NDC implementation period divided by 5 years), resulting in an over-achievement of the NDC target by 2 MtCO₂e. The use of Article 6 in the target year may thus be higher or lower than the average engagement in ITMOs over the whole NDC implementation period, which may lead to an over- or under-achievement of the target.
2. **As averaging can lead to an over- or under-achievement of mitigation targets, it can also lead to higher or lower aggregated emissions from both countries over the NDC implementation period,** compared to a situation in which the countries achieved their targets without the use of Article 6. In the example provided in Figure ES-1, the over-achievement would enable the transferring country to undertake less domestic mitigation action or to transfer

additional ITMOs which are not backed by actual emission reductions, while still being able to achieve its NDC target. Among 27 scenarios analysed for combinations of countries using averaging and/or multi-year approaches, aggregated emissions increase in one third of the scenarios, decrease in another third, and remain constant in another third. By contrast, if both the transferring and the acquiring country account based on multi-year approaches, aggregated emissions are not affected, as long as multi-year trajectories are robustly defined.

Figure ES-1: Example for over-achievement of a single-year target by a transferring country as a result of accounting based on averaging



- A free choice between averaging and multi-year approaches can undermine environmental integrity and robust accounting.** If each country strategically picks for each NDC implementation period the accounting approach which requires less effort to achieve its NDC, then aggregate emissions from all countries may increase beyond levels that would occur if all countries used only multi-year approaches or no international transfers took place.
- The use of averaging may be particularly problematic for countries that authorise ITMOs for use under the Carbon Offsetting and Reduction Scheme for International Aviation (CORSA),** as adopted by the International Civil Aviation Organization (ICAO). CORSIA requires airline operators to offset any increase in their CO₂ emissions from international flights beyond 2019 levels. CORSIA establishes continuous multi-year obligations from 2021 to 2035, whereas most countries that may generate carbon credits for use under CORSIA have single-year targets. Demand for carbon credits under CORSIA is expected to increase considerably over time, and so may the generation of ITMOs for use under CORSIA. As shown in Figure ES-1, an increasing generation of ITMOs in combination with averaging enables transferring countries to pursue less mitigation action while still achieving their NDC targets. This would undermine mitigation efforts achieved through CORSIA.
- Year-on-year fluctuations in emissions, as commonly observed by countries, have very different impacts depending on whether a multi-year approach or averaging is used.** With multi-year approaches, such fluctuations do not affect aggregated emissions from both countries

and have minor impacts on the total number of ITMOs that countries can transfer or need to acquire to achieve their NDC target. This is because a deviation from the budget or trajectory in any year of the NDC implementation period will only affect that particular year and may even out over time. Acquiring countries would only need to purchase ITMOs to close the *net* gap over the NDC implementation period. By contrast, with averaging, the emissions level in the target year is decisive for the total number of ITMOs that countries can transfer or need to acquire over the entire NDC implementation period. Any deviations between the emissions and the target in the target year magnify the number of ITMOs needed, or available for transfer, by a factor of 5 or 10 (depending on the length of the NDC implementation period). As this study shows, this can lead to higher or lower emissions than if countries had not engaged in Article 6 or used multi-year approaches.

6. **The magnifying effects of year-to-year fluctuations in emissions when averaging is used involve considerable uncertainty for countries in terms of the number of ITMOs needed or available for transfer.** The precise number of ITMOs needed, or available for transfer, will only become apparent after the target year when GHG inventories for the target year are available. This might have negative repercussions on market dynamics. On the one hand, it may discourage countries from engaging in Article 6 at all. It could also encourage countries to sell fewer ITMOs, or purchase more ITMOs than likely needed, in order to ensure that they achieve their targets despite the uncertainty about the exact emissions level in the target year. In principle, this could lead to countries over-achieving their targets to a larger degree, thereby implicitly promoting more ambition. On the other hand, some countries might engage in late ITMO trades for activities that started in the past, once they realize that they will over-achieve their NDC in the target year. In this case, using Article 6 would not lead to additional mitigation action. The implications for ambition and environmental integrity will thus also depend on the behaviour of countries in practice.

Altogether, we conclude that **averaging is a problematic accounting approach in the context of single-year targets**. While it has certain advantages – it is simple to implement and does not require countries to establish multi-year trajectories or budgets – the identified risks seem notable, particularly as environmental integrity can be undermined in several ways.

Accounting based on multi-year approaches is, in principle, a more robust accounting approach than averaging. Multi-year approaches come with essential advantages. Firstly, they provide certainty regarding the cumulative emissions over the NDC implementation period. Most importantly, once trajectories or budgets are defined, the accounting for ITMOs cannot lead to an increase in the aggregated emissions from both countries, regardless of whether countries increase or decrease their engagement in ITMOs over time. Furthermore, accounting based on multi-year approaches enables continuous accounting over different NDC implementation periods. However, multi-year approaches also come with several disadvantages. A key challenge is implied in establishing robust multi-year trajectories or budgets. An increase in aggregated emissions is only avoided if trajectories or budgets are defined in robust ways. However, countries may have incentives to define loose multi-year trajectories when fixing them at the beginning of an NDC implementation period in order to ensure that they will meet their future targets. Additionally, a budget might create the expectation that unused emissions surpluses can be sold. This might work as an incentive to inflate the budget in order to be able to sell ITMOs without generating additional mitigation outcomes.

Based on these considerations, we recommend that countries engaging in Article 6 move over time towards robustly defined multi-year targets or trajectories and that the risks associated with inflating

multi-year trajectories be addressed through international guidance on the establishment of trajectories. In the ongoing negotiations on Article 6 guidance, countries could consider either removing the option of averaging or limiting its application in time (e.g. up to 2030). From 2031 onwards, when countries are required to set common time frames for their NDCs, countries could consider defining NDC targets as multi-year targets, excluding the option to set single-year targets. To address the risk associated with emission budgets, countries could also consider removing the option of using “budgets”. Countries may also address the risks arising from the possibility to pick and choose between accounting approaches. The negotiation text considered at COP24 in Katowice included a provision that both countries involved in the cooperative approach need to implement the same accounting approach. This provision would not fully address environmental integrity risks but could reduce them. Overall, the implications of multi-year approaches and averaging will only become fully apparent after the rules for accounting under Article 6 have been applied for the first time.

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List of Abbreviations

COP	Conference of the Parties
CORSIA	Carbon Offsetting and Reduction Scheme for International Aviation
ETS	Emission Trading System
ICAO	International Civil Aviation Organization
ITMOs	Internationally Transferred Mitigation Outcomes
MtCO ₂ e	Million tonnes CO ₂ equivalents
NDC	Nationally Determined Contribution

1 Introduction

Under the Paris Agreement, most countries have communicated nationally determined contributions (NDCs) with mitigation targets for a single year (e.g. 2030). Single-year targets present challenges for robust accounting, particularly if countries engage in international carbon market mechanisms under Article 6 of the Paris Agreement. If accounting rules are not robust, using internationally transferred mitigation outcomes (ITMOs) to achieve NDC targets may undermine environmental integrity. Ultimately, this could lead to higher cumulative emissions than would have occurred if no transfers had taken place or if both countries involved had defined their NDCs as multi-year targets (see chapter 2.1).

Countries are currently negotiating international guidance on accounting for ITMOs under Article 6.2 of the Paris Agreement. A critical unresolved issue is how ITMOs should be accounted for in the context of countries with NDC targets for single years (e.g. 2030). At COP24 in Katowice, countries considered five different options to account for ITMOs under single-year targets. At COP25 in Madrid, these were narrowed down to two options for countries to choose from:¹

1. **Averaging**, whereby the average number of ITMOs transferred or used over the NDC implementation period (e.g. 2026 to 2030) is counted in the target year (e.g. 2030); or
2. Defining a **multi-year trajectory or budget** over the NDC implementation period, whereby all ITMOs transferred or used are counted over the entire NDC implementation period.

This paper assesses the implications of these two options for ensuring robust accounting and environmental integrity. A specific focus of the paper is the flexibility of countries to freely choose between these two accounting approaches.

To assess the implications of the two accounting options, the paper defines a variety of scenarios for how countries might engage in Article 6 and assesses their implications on aggregated emissions. For simplicity, the paper focuses on NDC targets and ITMOs expressed in tons of carbon dioxide equivalent (tCO_{2e}), acknowledging that countries may also express ITMOs in non-GHG metrics according to the draft negotiation text from Madrid.

The paper is organised as follows: it first summarises the main challenges for robust accounting for single-year targets and the current state of Article 6 negotiations on this matter (section 2). It then analyses the circumstances under which the engagement in ITMOs by countries with single-year targets will lead to higher, lower or constant aggregated emissions (section 3). Three important factors are taken into account in this analysis: (1) the accounting approach chosen by the transferring and acquiring country (averaging or multi-year approaches), (2) whether a country's transfer or use of ITMOs increases or decreases over the NDC implementation period and (3) whether the emissions level in the target year is representative for the emissions trend over the NDC implementation period. Finally, section 4 summarises the findings and derives recommendations for the ongoing negotiations on Article 6 guidance.

¹ In the negotiations at COP24 in Katowice in 2018, the following options for accounting of ITMOs in the context of single-year targets were discussed: (1) multi-year emission trajectories; (2) multi-year budgets; (3) annual adjustments; (4) averaging; and (5) vintage limitations, see <https://unfccc.int/documents/197877>. This list was reduced to two options at COP 25, see <https://unfccc.int/documents/204687> (third iteration of the draft negotiating text of 15 December 2019).

2 Context of single-year targets

2.1 Challenges for robust accounting of ITMOs in the context of single-year targets

Single-year targets set a mitigation goal for a specific target year. They are achieved if the reported emissions (or other relevant indicators) do not exceed the target level for that year. However, they do not set any requirements for cumulative emissions over an NDC implementation period. Countries could pursue varying emission pathways to reach these targets. Therefore, single-year targets imply uncertainty about the cumulative emissions implied by the NDC (Schneider et al. 2017; Lazarus et al. 2014; Howard et al. 2017).

Single-year targets pose particular challenges if countries engage in the international transfer of mitigation outcomes under Article 6 of the Paris Agreement. Without robust accounting rules, there is a risk that the transfer of ITMOs between countries with single-year targets could result in aggregated cumulative emissions from both countries being higher than if the transfer had not taken place or if both countries had defined their NDCs as multi-year targets (see Howard et al. 2017; Howard 2018; Lazarus et al. 2014; Prag et al. 2013; Schneider et al. 2017; Schneider et al. 2019). There are mainly two reasons for this:

- ITMOs may be generated and transferred not only in the single target year of an NDC but over several years. As a result, the time period in which emission reductions occurred and the period in which they are used might not match.
- The achievement of targets may be assessed only in the target year for single-year targets. Without robust accounting rules, this can entail incentives to increase emissions in pre-target years while still achieving the target in the single-year target through the acquisition of ITMOs.

An increase in emissions could occur in different ways in the absence of robust accounting rules. A simple example is if a transferring country was to generate and transfer ITMOs over the entire NDC implementation period, but the acquiring country only accounted for the use of ITMOs in the single target year. In this case, the transferring country could, for instance, generate and transfer ITMOs in pre-target years only (e.g. from 2021 to 2029) but would not need to account for these transfers, as the mitigation outcomes did not occur in the target year. The acquiring country could use all acquired ITMOs in the target year only (e.g. in 2030). This would allow the country to engage in a higher emissions pathway in pre-target years, resulting in higher aggregated cumulative emissions from both countries.

2.2 State of play in the UNFCCC negotiations on accounting under Article 6

Parties to the UNFCCC are currently negotiating the accounting rules for the use of ITMOs under Article 6 of the Paris Agreement. Specifically, Article 6.2 of the Paris Agreement requires countries to apply “robust accounting to ensure, inter alia, the avoidance of double counting”. Double counting occurs if the same mitigation outcome is used more than once to achieve mitigation goals. To avoid double counting, countries shall make “**corresponding adjustments**” to the emissions covered by their NDC (paragraph 36 of decision 1/CP.21). How such adjustments are applied is to be defined through specific accounting rules and approaches. The latest draft negotiation text on Article 6.2 from COP25 in Madrid in 2019 requires that countries that generate and transfer ITMOs shall make a corresponding number of additions to their reported emissions, and that countries that acquire and use ITMOs to achieve their NDC shall make a subtraction from their reported emissions by the

corresponding amount. In this way, additions and subtractions balance each other. Both countries are to prepare an adjusted emissions balance which is then compared with the target level. This approach ensures that the acquiring country can use the acquired mitigation outcomes to achieve its NDC (by reporting lower adjusted emissions) and the transferring can no longer claim these mitigation outcomes towards its NDC (by reporting higher adjusted emissions). In the negotiations, an important question is how such adjustments should be applied in the context of single-year targets. The latest draft negotiation text includes two approaches for accounting of ITMOs in the context of single-year targets: defining a multi-year emissions trajectory or budget and averaging.

2.2.1 Defining a multi-year emissions trajectory or budget

The draft negotiation text discussed at COP25 provides the option to countries with single-year NDCs to establish a multi-year emissions trajectory (or several trajectories) or a budget for the NDC implementation period and apply annual corresponding adjustments for each year of this period. In the case of an emissions trajectory, countries would need to establish a multi-year trajectory of emissions that is consistent with reaching the target level in the single target year. This trajectory would not change the NDC itself but support the accounting for ITMOs by defining a path according to which emissions will develop. Both acquiring and transferring countries would account for their emissions for all years of the NDC implementation period against this trajectory and not only for the single-target year. This means that in each year of the NDC implementation period, countries need to make additions or subtractions to their annual level of emissions covered by the NDC if they transfer or use ITMOs to/from other countries. To assess the implementation and achievement of the NDC, the adjusted emissions balance is compared with the trajectory. This comparison could be implemented in two ways: either individually for each year of the NDC implementation period or cumulatively for the entire NDC implementation period.

Alternatively, countries can calculate a budget of emissions for the entire NDC implementation period. To assess the achievement of NDCs, countries would compare the cumulative emissions with the emissions budget for the NDC implementation period. Corresponding adjustments could be applied to the emissions or to the budget. An emissions budget approach has been implemented for mitigation targets of industrialised countries under the Kyoto Protocol. Each country established an "assigned amount" for its commitment period and makes additions and subtractions to that amount to account for international transfers of Kyoto units.

Both approaches, defining a multi-year emissions trajectory and defining a multi-year budget, are referred to as "**multi-year approaches**" in this paper. The two approaches are similar in that they implicitly "translate" a single-year target in a multi-year approach for accounting purposes. The main difference is that emission budgets may be expressed in units, such as the assigned amount under the Kyoto Protocol. A concern with emission budgets is that they may create expectations that a surplus of a budget could be internationally sold or carried over to future NDC implementation periods even if the surplus may not represent actual mitigation outcomes.

2.2.2 Averaging

A second option currently discussed for accounting of ITMOs in the context of single-year targets implies that transferring and acquiring countries account only for the single target year, but the number of adjustments to be applied in the target year are determined on the basis of the average transfer or use of ITMOs over the NDC implementation period. In this way, the transfer and use of ITMOs in years preceding the target year are recognised in accounting. According to the draft

negotiation text from COP25, transferring and acquiring countries with single-year targets need to annually apply “indicative corresponding adjustments” equal to the cumulative amount of ITMOs divided by the elapsed years in the NDC period when *reporting* their emissions and transferred/used ITMOs for each year of the NDC implementation period. This increases transparency of reported emissions, but only the final average of transfers or use over the NDC implementation period are ultimately *accounted* for in the single target year. Table 2-1 illustrates this approach for a transferring country in which the engagement in Article 6 leads to a decrease of its emissions from 10 MtCO_{2e} in 2026 to 6 MtCO_{2e} in 2030.

Table 2-1: Accounting based on averaging for a transferring country (MtCO_{2e})

Year	Emissions without the use of Article 6	ITMOs generated and transferred	Actual emissions with use of Article 6	“Indicative corresponding adjustments”: Total transferred ITMOs/years elapsed	Adjusted emissions balance
2026	10	0	10	0/1 = 0	10
2027	10	1	9	1/2 = 0.5	9.5
2028	10	2	8	3/3 = 1	9
2029	10	3	7	6/4 = 1.5	8.5
2030	10	4	6 = Actual emissions in the single target year	10/5 = 2 = Final corresponding adjustment in the single target year	8 = Level of adjusted emissions in the single target year

3 Implications of averaging and multi-year accounting on environmental integrity

The current draft negotiation text for guidance on Article 6.2 of the Paris Agreement includes the possibility for countries to choose between multi-year approaches and averaging for accounting for ITMOs. This section analyses the environmental integrity implications of these two accounting approaches on aggregated emissions. It assesses which combination of accounting approaches leads to an increase, to a decrease, or to no change of aggregated emissions and under which circumstances. We identify two factors that are decisive for the impact on cumulative emissions:

1. The development of **the engagement in ITMOs over time**, i.e. to what extent countries transfer or use an increasing or decreasing amount of ITMOs over the NDC implementation period (“ITMO engagement trajectory”) (section 3.1); and
2. To what extent the **emissions level in the target year** is representative for the country’s emissions trend (section 3.2).

3.1 Development of the engagement in ITMOs over time

To assess the implications of the engagement in ITMOs over the NDC implementation period, we first define a number of example scenarios of countries’ engagement in ITMOs over the NDC implementation period (section 3.1.1). We then analyse the implications of these scenarios for target achievement for the two different accounting approaches (3.1.2). Section 3.1.3 summarises the implications for cumulative emissions of different constellations of accounting approaches by two countries engaged in the transfer of ITMOs. Section 3.1.4 analyses which implications the possibility to choose between the accounting approaches may have on countries’ behaviour and hence on cumulative emissions.

3.1.1 Definition of example scenarios

We introduce here a simplified example of a transferring and an acquiring country which both have a single-year target corresponding to emissions of 10 MtCO₂e in 2030. For simplicity of illustration, we assume that without the engagement in ITMOs both countries would achieve these targets by keeping emissions constant at 10 MtCO₂e over the NDC implementation period of 2026 to 2030.

For the transferring and the acquiring country, we further assume three scenarios for how these countries engage in ITMOs over time:

1. **Increasing engagement in ITMOs over the NDC implementation period:** Such a scenario may apply to countries which have not engaged in international transfers in the past and start to ramp up their engagement in ITMOs over time. For example, some countries may sell an increasing number of ITMOs over the next decade as they start to develop and implement more mitigation projects over time. An increasing engagement in ITMOs could also occur in response to an increasing demand for carbon credits under the Carbon Offsetting and Reduction Scheme for International Aviation (CORSIA), adopted by the International Civil Aviation Organization (ICAO). CORSIA requires airline operators to offset any increase in their CO₂ emissions from international flights beyond 2019 levels. Demand for carbon credits under CORSIA is expected to increase considerably over time, and so may the generation of ITMOs for use under CORSIA.
2. **Constant engagement in ITMOs over the NDC implementation period:** After a country has started to engage in ITMOs, there might be a period of time in which rather constant amounts of

ITMOs are transferred or acquired over the years. For example, a transferring country that does not develop new mitigation projects but mainly authorises projects already implemented under the Clean Development Mechanism for continuation under Article 6 after 2020 may offer a relatively constant number of ITMOs on the market. Similarly, a country that has already purchased a significant amount of carbon credits under the Kyoto Protocol and intends to continue to rely on international carbon credits may purchase a relatively constant number of credits throughout its first NDC implementation period.

3. **Decreasing engagement in ITMOs over the NDC implementation period:** After a certain period of time, some countries might cease their engagement in ITMOs, e.g. if policymakers decide to achieve their NDC domestically. For example, the European Union used a decreasing number of carbon credits over time to achieve its mitigation target in the second commitment period of the Kyoto Protocol and intends to use no international carbon credits after 2020.

Figure 3-1: Emissions with and without use of Article 6 under different ITMO engagement scenarios for transferring and acquiring countries

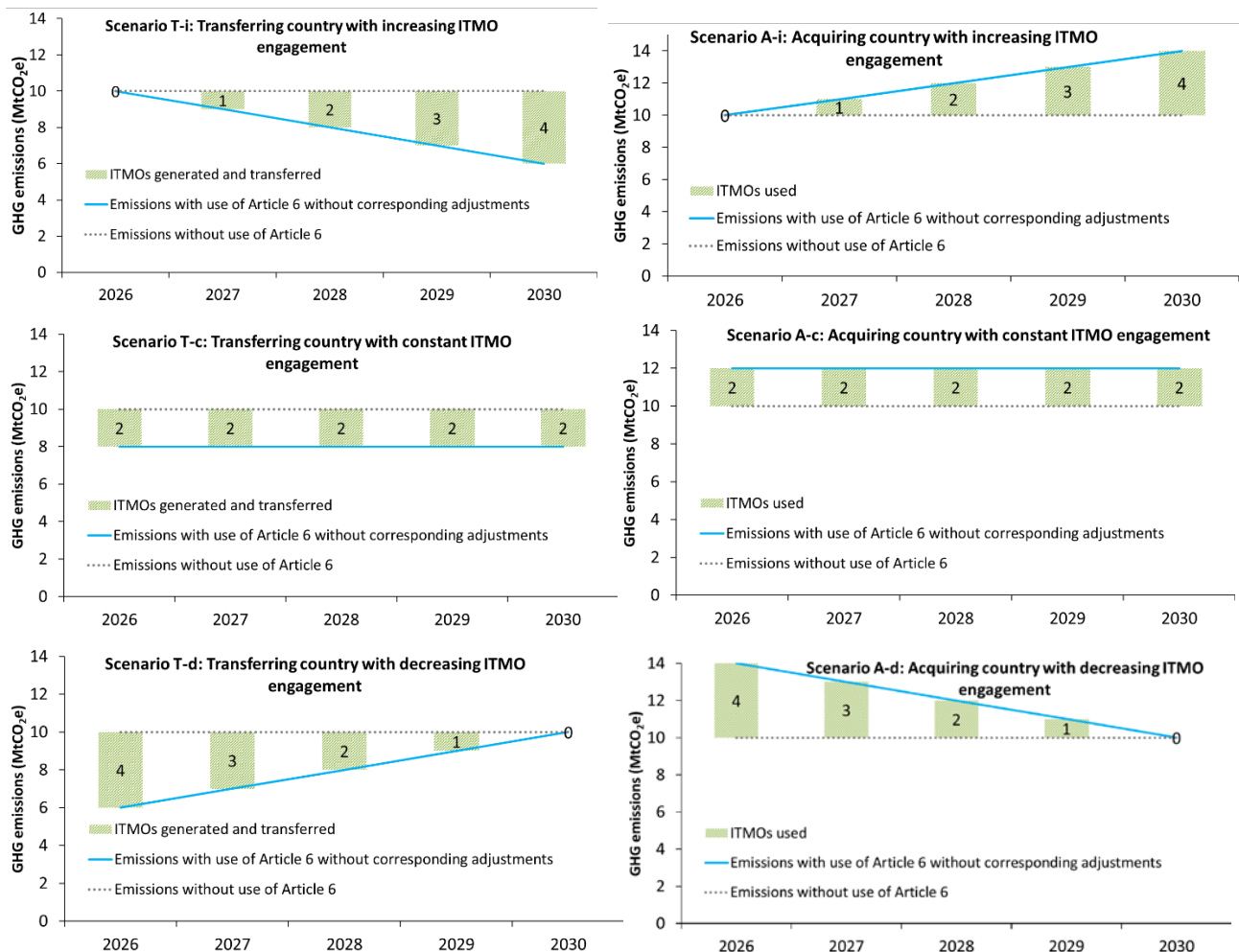


Figure 3-1 illustrates these three scenarios for our simplified example of a transferring and an acquiring country. In all scenarios we assume that the total number of ITMOs generated, transferred and used over the NDC implementation period is the same, corresponding to 10 MtCO₂e over the period. As a simplification, all scenarios assume a linear pathway of ITMO engagement. In the

scenarios with an increasing ITMO engagement (scenarios T-i and A-i), this starts with no engagement in ITMOs in 2026 and ends with 4 million ITMOs in 2030 (green bars). In the scenarios with a constant ITMO engagement (scenarios T-c and A-c), this corresponds to a constant level of 2 million ITMOs annually. In the scenarios with a decreasing ITMO engagement (scenarios T-d and A-d), the pathway of ITMO engagement starts from 4 million ITMOs in 2026 and ends with no engagement in ITMOs in 2030.

These scenarios aim to illustrate different possible pathways of a country's engagement in ITMOs over the NDC implementation period. Figure 3-1 shows the emissions with and without the use of Article 6 for these different pathways, while disregarding the implications of different accounting approaches as well as the effects of applying corresponding adjustments.

In the transferring country, the engagement in Article 6 results in lower emissions compared to the situation without using Article 6. In our example, an increasing engagement in ITMOs is associated with a decreasing emissions pathway (Scenario T-i), a constant engagement is associated with a constantly lower emissions pathway (Scenario T-c), and a declining engagement with an increasing emissions pathway (Scenario T-d). In the acquiring country, the engagement in Article 6 enables the country to have higher emissions than without the use of Article 6. In our example, an increasing engagement in ITMOs goes along with an increasing emissions pathway (Scenario A-i), a constant engagement with a constantly higher emissions pathway (Scenario A-c) and a declining engagement with a decreasing emissions pathway (Scenario A-d).

In practice, multiple reasons will impact the actual development of a country's engagement in ITMOs over an NDC period. To what extent such engagement will increase or decrease depends on the potential and costs of domestic mitigation options, the ambition of the current NDC, the planned trajectory towards achieving long-term goals, and political factors, e.g. to what degree a country intends to achieve its targets domestically without using ITMOs. In practice, emissions will also fluctuate more strongly from year to year.

In our analysis, we make several further assumptions. We assume that ITMOs represent actual emission reductions that are additional and permanent. We assume that countries' NDC targets are more ambitious than their likely business-as-usual emissions, meaning that the countries do not over-achieve their targets without pursuing mitigation action, a situation sometimes referred to as 'hot air' in the context of the Kyoto Protocol (Kollmuss et al. 2015; La Hoz Theuer et al. 2019; Boehringer 2000; Brandt und Svendsen 2002; den Elzen und Roelfsema 2009; Woerdman 2005). We also assume that ITMOs are not banked from one NDC implementation period to another. Finally, we assume that countries take the necessary action to achieve their NDC targets. While these assumptions are simplified, they are helpful to illustrate that even under "ideal" conditions aggregated emissions may increase through the choice of accounting approaches.

3.1.2 Implications of accounting approaches for target achievement

This section evaluates how the choice of the accounting approach and the ITMO engagement trajectory affects the ability of a country to achieve its NDC target. As will be shown below, some combinations of accounting approaches and ITMO engagement trajectories imply an over-achievement of the NDC target, others an under-achievement, and again others do not affect the target achievement at all. We first summarise the implications of accounting on the basis of multi-year approaches (section 3.1.2.1) and then discuss the implications of averaging (section 3.1.2.2).

3.1.2.1 Multi-year approaches

Multi-year approaches include multi-year targets or, in the case of single-year targets, the definition of a multi-year trajectory or budget for Article 6 accounting purposes.² For these approaches, a critical question is how the trajectory or budget is defined. To ensure environmental integrity, ITMOs have to represent additional mitigation outcomes. They should not result from over-achieving an unambitious target and selling the excess budget of emissions. This is ensured if the trajectory or budget represents the emissions path that the country would follow to achieve its NDC target without the engagement in ITMOs, or a lower emissions pathway.

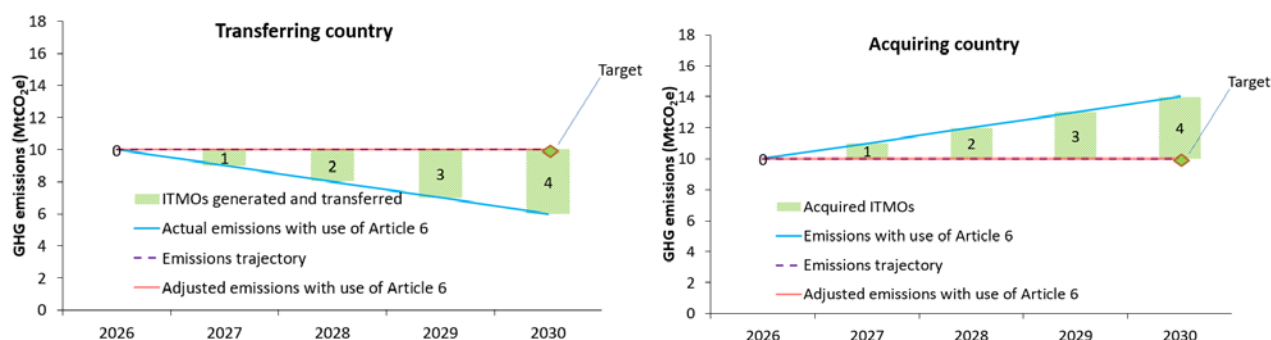
For our two example countries, we assumed that, without the use of Article 6, they would achieve their NDC targets by embarking on a constant emissions level of 10 MtCO₂e over the period 2026 to 2030 (see section 3.1.1 above). We respectively assume this emissions path to be the target trajectory, or correspondingly a budget of 50 MtCO₂e over that period.

If the trajectory or budget is defined in this way, the engagement in ITMOs does not affect the target achievement of the countries (see Figure 3-2). In the transferring country, the emission reductions achieved through the engagement in ITMOs are equal to the corresponding adjustments applied, resulting in an adjusted emissions balance that is equal to the trajectory. In the acquiring country, respectively, the increase in emissions enabled through the use of ITMOs is equal to the corresponding adjustments applied, also resulting in an adjusted emissions balance that equals the trajectory. This holds for all scenarios.

In practice, establishing robust multi-year trajectories can be challenging. An increase in aggregated emissions is only avoided if trajectories or budgets are defined in robust ways. However, countries may have incentives to define loose multi-year trajectories when fixing trajectories at the beginning of an NDC implementation period in order to ensure that they will meet their targets. To address this risk, countries could adopt principles for establishing multi-year trajectories. Ideally, trajectories should reflect the emissions pathway of the country to achieve its NDC without the engagement in Article 6. Most objectively, trajectories may be set for all countries on a linear basis over the NDC implementation period. This would be a simple approach and would discourage opting for high, non-linear paths that may be more likely to lead to inflated trajectories or budgets. However, linear paths may not always reflect expected emission trajectories without the use of Article 6. Moreover, the starting point of the linear trajectory is a critical choice. It could be based on the level of actual emissions at a certain point in time (e.g. when the country communicated its NDC or the start of the NDC implementation period) or on previous targets levels (e.g. 2020 targets communicated by countries in the context of the Cancun Agreements). It may also incorporate sector-level trajectories already mandated by domestic policy (e.g. by an ETS).

² See <https://unfccc.int/documents/204687> (third iteration of the draft negotiating text of 15 December 2019).

Figure 3-2: Implications of multi-year approaches on target achievement (Scenarios T-i and A-i)



3.1.2.2 Averaging

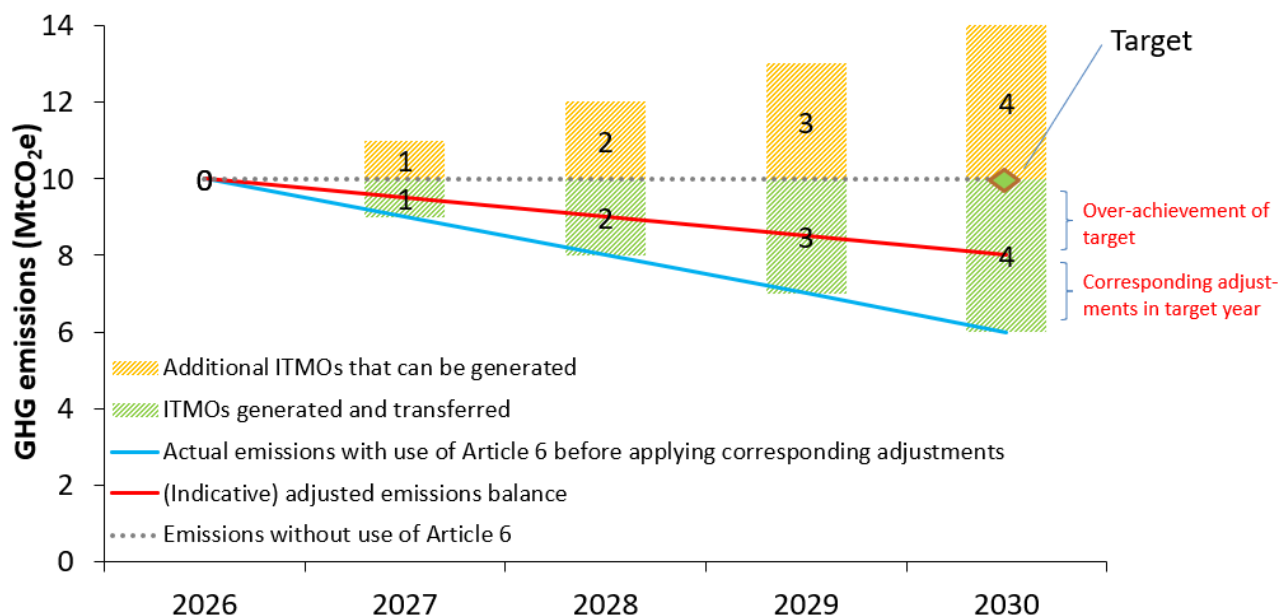
Averaging means that the average number of ITMOs transferred or used over the NDC implementation period is accounted for in the single target year (see section 2.2.2). In contrast to multi-year approaches, averaging can, keeping all other parameters constant, lead to an over- or under-achievement of targets.

This, in turn, can also lead to higher or lower aggregated emissions from both countries over the NDC implementation period, compared to a situation in which the countries achieved their targets without the use of Article 6. This can occur if the average adjustment value applied in the target year is higher or lower than the emission reductions achieved in that year through the engagement in ITMOs. Below we illustrate and explain these implications in detail for one of the six scenarios above (a transferring country with increasing ITMO engagement and accounting by averaging) and summarise the implications for the other five scenarios.

1. Transferring country, increasing ITMO engagement, accounting by averaging (Scenario T-i-AV)

Figure 3-3 illustrates the implications of averaging for a transferring country with an increasing engagement in ITMOs over time (scenario T-i-AV). The engagement in a cooperative approach under Article 6 results in mitigation outcomes of 4 MtCO₂e in 2030 which are all internationally transferred as ITMOs. The country would, however, only apply corresponding adjustments of 2 MtCO₂e in that year (10 million ITMOs transferred over the 5-year NDC implementation period divided by 5 years), resulting in an adjusted emissions level of 8 MtCO₂e. With a target level of 10 MtCO₂e, this leads to an over-achievement of the target by 2 MtCO₂e. This occurs because the **emission reductions achieved in the target year through the engagement in ITMOs** (4 MtCO₂e, i.e. the difference between the actual emissions in the target year with use of Article 6 and the level of emissions if no transfer had taken place) **are larger than the additions of corresponding adjustments applied in that year** (2 MtCO₂e). More generally, the emission reductions achieved in the target year through Article 6 may thus be higher or lower than the average engagement in ITMOs over the whole NDC implementation period, resulting in a possible over- or under-achievement of the NDC.

Figure 3-3: Transferring country, increasing ITMO engagement, accounting by averaging (Scenario T-i-AV)



An over- or under-achievement of the target may impact the climate action that the country pursues. Where averaging results in an over-achievement of the NDC target, the country could implement less climate mitigation action and embark on a higher emissions pathway. Alternatively, it could sell further ITMOs that do not need to be backed by actual emission reductions, while still achieving its target. Where averaging results in an under-achievement of the NDC target, the country would, in order to meet its target, need to compensate for the shortfall by either pursuing additional domestic mitigation efforts or acquiring (additional) ITMOs.

In the above example, the country could implement less mitigation action and embark on a higher emissions pathway by 2 MtCO₂e in the target year or, in the case of a linear emissions pathway, by 5 MtCO₂e over the NDC implementation period. Alternatively, the country could transfer an additional 10 million ITMOs that do not need to be backed by actual emission reductions, and still achieve its NDC target. The amount of additional ITMOs that the country could transfer is larger than the emissions increase that the country could embark on, as only the average of those additional ITMOs (2 MtCO₂e) are added to the emissions balance in the target year. In summary, in this scenario accounting based on averaging can lead to higher emissions compared to the situation in which the country accounted based on a multi-year approach.

As averaging can lead to an over-achievement or under-achievement of mitigation targets, it can also lead to higher or lower aggregated emissions from both countries over the NDC implementation period, as compared to the situation that the countries achieved their targets without the use of Article 6.

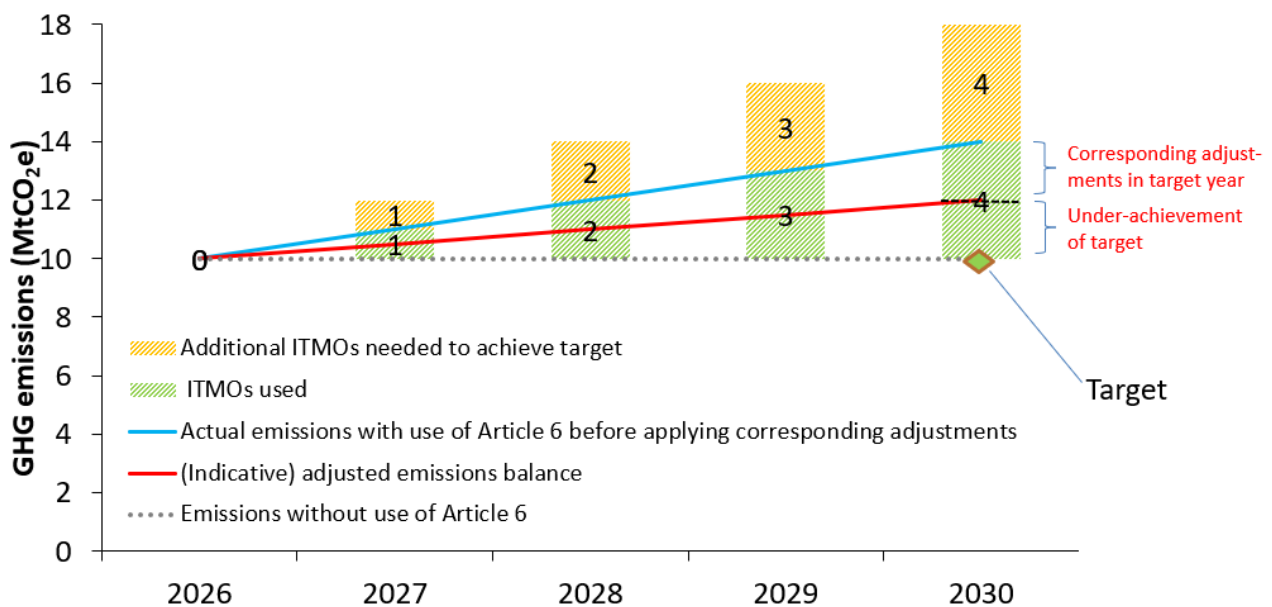
2. Acquiring country, increasing ITMO engagement, accounting by averaging (Scenario A-i-AV)

If the acquiring country increases its engagement in ITMOs over time and chooses to account on the basis of averaging, it will **under-achieve** its target (see Figure 3-4). In our example, the adjusted

emissions balance in the target year corresponds to 12 MtCO₂e, whereas the target level is 10 MtCO₂e, leading to an under-achievement of the target by 2 MtCO₂e. This occurs because the increase in emissions in the target year as a result of engagement in ITMOs (4 MtCO₂e, i.e. the difference between the actual emissions in the target year with use of Article 6 and the level of emissions if no transfer had taken place) is larger than the subtractions of corresponding adjustments applied in that year (2 MtCO₂e).

To still achieve its NDC target, the country would need to compensate for this under-achievement and decrease its emissions by a further 2 MtCO₂e in the target year (or, in the case of a linear emissions pathway, by 5 MtCO₂e over the NDC implementation period). Alternatively, the country could acquire an additional 10 million ITMOs. The amount of additional ITMOs which the country would need to acquire is larger than the additional emissions reductions that it would need to pursue domestically, as only the average of those additional ITMOs (2 MtCO₂e) are subtracted from the emissions balance in the target year. In summary, in this scenario accounting based on averaging can lead to lower emissions compared to the situation in which the country accounted based on a multi-year approach.

Figure 3-4: Acquiring country, increasing ITMO engagement, accounting by averaging (Scenario A-i-AV)

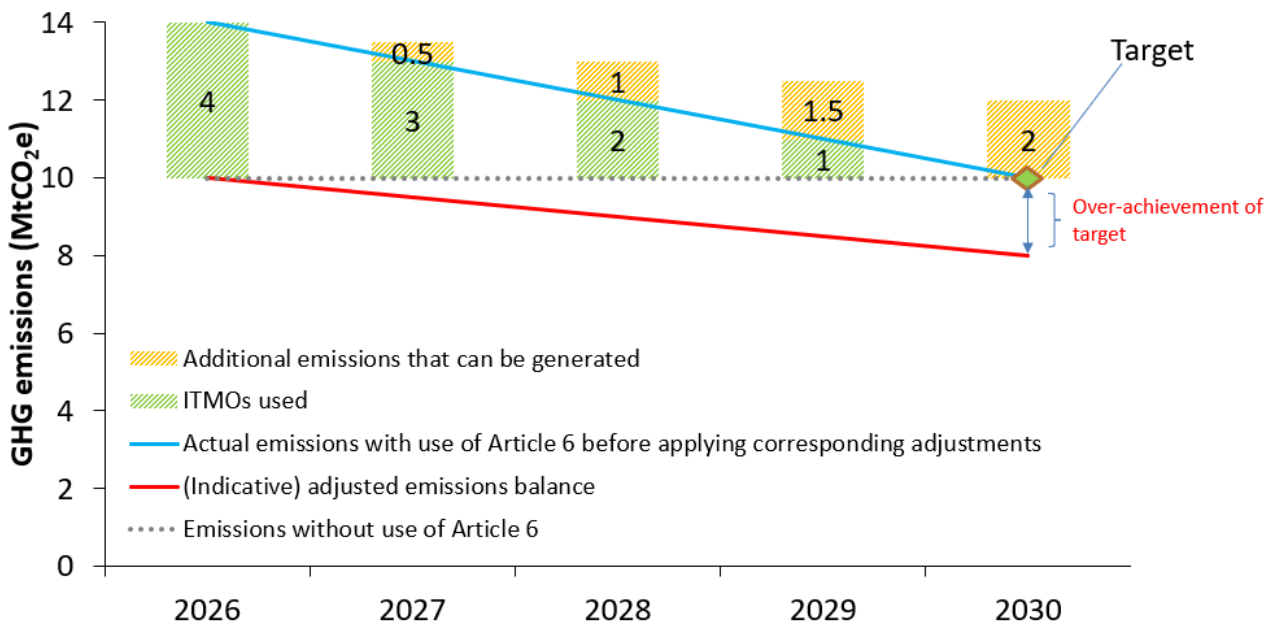


3. Acquiring country, decreasing ITMO engagement, accounting by averaging (Scenario A-d-AV)

If the acquiring country decreases its engagement in ITMOs over time and chooses to account based on averaging, it will **over-achieve** its target (see Figure 3-5). In our example, the adjusted emissions balance in the target year corresponds to 8 MtCO₂e, whereas the target level is 10 MtCO₂e, leading to an over-achievement of the target by 2 MtCO₂e. This occurs because the country subtracts 2 MtCO₂e of corresponding adjustments in the target year, although the country achieves its target in 2030 without the use of any ITMOs.

This over-achievement enables the country to implement less mitigation action and embark on a higher emissions pathway (by 2 MtCO_{2e} in the target year or, in the case of a linear emissions pathway, by 5 MtCO_{2e} over the NDC implementation period). Alternatively, the country could acquire no ITMOs at all or sell the previously acquired ITMOs to another country, while still achieving its NDC, as its emissions in the target year are already at the target level. In summary, in this scenario accounting based on averaging can lead to higher emissions compared to the situation in which the country accounted based on a multi-year approach.

Figure 3-5: Acquiring country, decreasing ITMO engagement, accounting by averaging (Scenario A-d-AV)

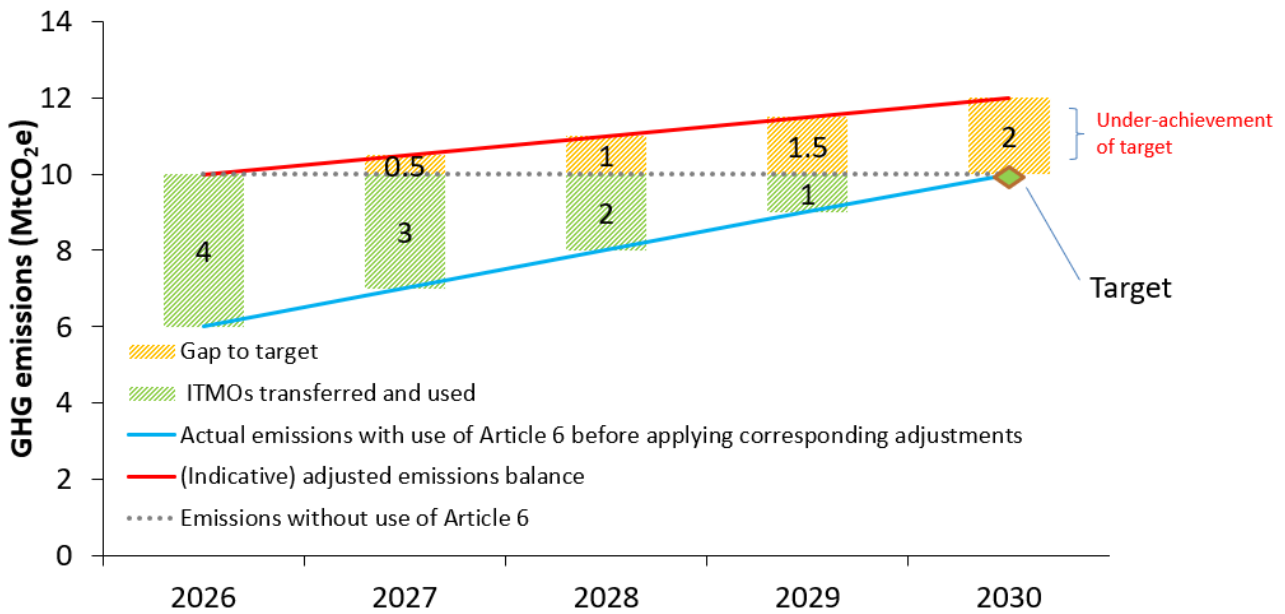


4. Transferring country, decreasing ITMO engagement, accounting by averaging (Scenario T-d-AV)

If the transferring country decreases its engagement in ITMOs over time and chooses to account on the basis of averaging, it will **under-achieve** its target (see Figure 3-6). In our example, the adjusted emissions balance in the target year corresponds to 12 MtCO_{2e}, whereas the target level is 10 MtCO_{2e}, leading to an under-achievement of the target by 2 MtCO_{2e}. This occurs because no emission reductions are achieved in the target year through the engagement in ITMOs, while the country still needs to add 2 MtCO_{2e} of corresponding adjustments in the target year.

To still achieve its NDC target, the country would need to compensate for this under-achievement and decrease its emissions by a further 2 MtCO_{2e} in the target year (or, in the case of a linear emissions pathway, by 5 MtCO_{2e} over the NDC implementation period). Alternatively, the country could redeem the previously transferred 10 million ITMOs. The amount of ITMOs that the country would need to acquire is larger than the additional emissions reductions that it would need to pursue domestically, as only the average of those ITMOs (2 MtCO_{2e}) are subtracted from the emissions balance in the target year. In summary, in this scenario accounting based on averaging can lead to lower emissions compared to the situation in which the country accounted based on a multi-year approach.

Figure 3-6: Transferring country, decreasing ITMO engagement, accounting by averaging (Scenario T-d-AV)



5. Acquiring/Transferring country, constant ITMO engagement, accounting by averaging (Scenarios A-c-AV and T-c-AV)

If the level of ITMO engagement remains constant over the NDC implementation period, accounting based on averaging will have no effect on the country's target achievement. This is because the corresponding adjustments applied in the target year are equal to the emission reductions achieved, or the emissions increase enabled, in the target year as a result of the engagement in ITMOs (2 MtCO₂e) (see Figure 3-7 and Figure 3-8). In these scenarios, accounting based on averaging will not lead to higher or lower emissions in the transferring or acquiring country compared to the situation in which the countries accounted based on a multi-year approach.

Figure 3-7: Transferring country, constant ITMO engagement, accounting by averaging (Scenario T-c-AV)

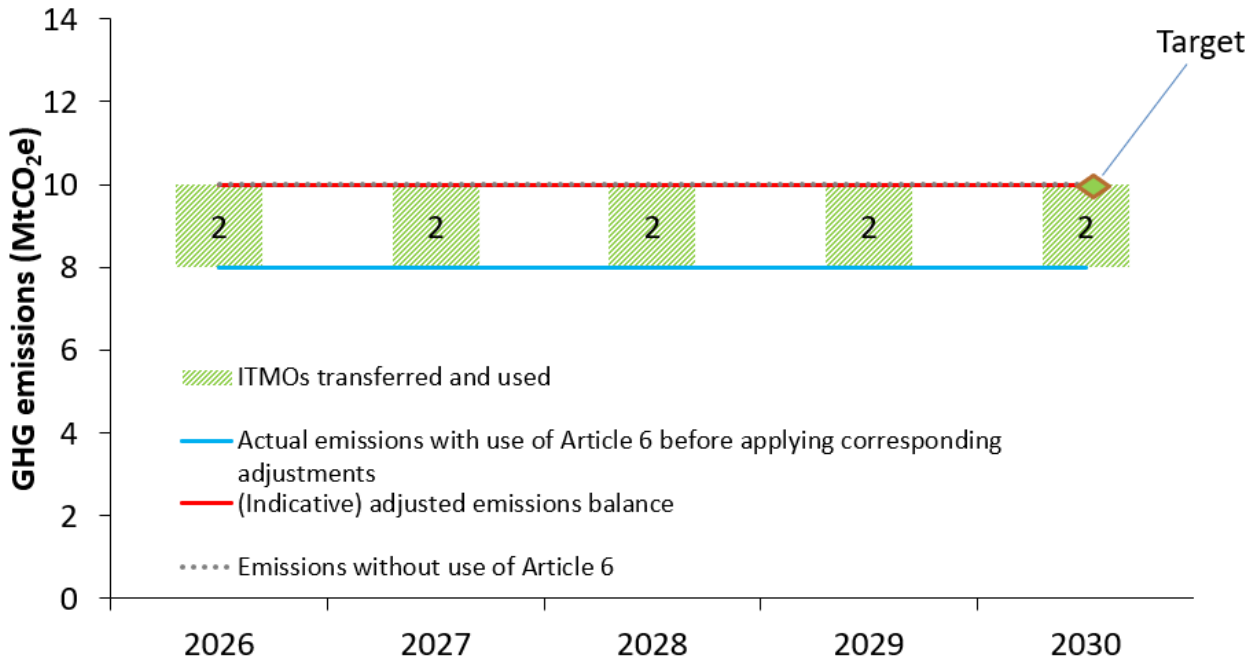
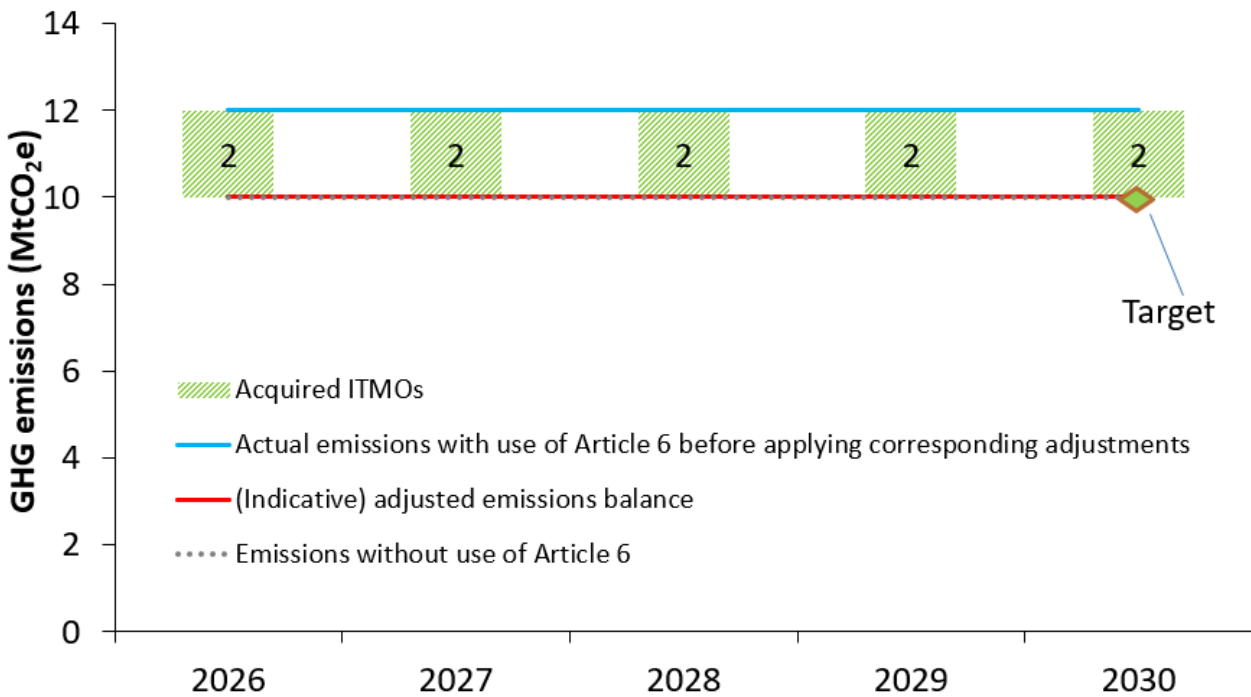


Figure 3-8: Acquiring country, constant ITMO engagement, accounting by averaging (Scenario A-c-AV)



The above analysis shows that, in contrast to multi-year approaches, accounting based on averaging can, keeping all other parameters constant, lead to an over-achievement or under-achievement of NDC targets. An over-achievement means that the country can either implement less domestic mitigation action and embark on a higher emissions pathway or sell (additional) ITMOs that do not need to be backed by actual emission reductions, leading to higher emissions compared to using multi-year approaches. An under-achievement means that the country, in order to still achieve its NDC target, would need to compensate for the shortfall by either implementing further mitigation actions or purchasing further ITMOs, leading to fewer emissions compared to using multi-year approaches. In some instances, accounting based on averaging has no effect on target achievement, and thus results in the same aggregated emissions as using multi-year approaches.

Table 3-1 summarises the outcomes under different circumstances. Two factors are decisive:

1. Whether the country is an **acquiring** or **transferring** country; and
2. Whether the emissions impact resulting from the engagement in Article 6 in the target year (i.e. the emission reductions achieved through the generation of ITMOs in the transferring country in the target year, or the emissions increase enabled in the acquiring country through the use of ITMOs in the target year) is **larger** or **smaller** than the average value of corresponding adjustments applied in that year. This depends on whether the ITMO engagement increases or decreases over time.

Table 3-1: Overview of impacts of accounting by averaging on target achievement and cumulative emissions

Country	ITMO engagement over time	Impact of ITMO engagement on target year emissions / average adjustment value applied in the target year	Impact on target achievement	Impact on emissions compared to using multi-year approaches*
Transferring	Increasing	>1	Over-achievement	Increase
Transferring	Decreasing	<1	Under-achievement	Decrease
Transferring	Constant	=1	No effect	No effect
Acquiring	Increasing	>1	Under-achievement	Decrease
Acquiring	Decreasing	<1	Over-achievement	Increase
Acquiring	Constant	=1	No effect	No effect

* This assumes that countries intend to achieve their NDC, and that countries will take more climate action if they realize that they are not on track to achieve their NDC and implement less mitigation action if they are likely to over-achieve their NDC.

3.1.3 Implications of accounting approaches for different constellations of two countries engaged in the transfer of ITMOs

In this section, we summarise the implications for all possible constellations of two countries engaged in the transfer of ITMOs, using the scenarios defined above (section 3.1.1): the transferring country may have a pathway of increasing, constant or decreasing engagement in ITMOs and may choose either a multi-year approach or averaging, resulting in six possible scenarios. These may be combined with six respective scenarios for the acquiring country, resulting in a total of 36 possible combinations. We analyse the combinations of accounting approaches and ITMO engagement trajectories under which the use of Article 6 can lead to higher, lower or constant aggregated emissions. Table 3-2 below summarises the implications for all 36 combinations.

If both countries engaged in the transfer of ITMOs account based on multi-year approaches, the ITMO engagement trajectory has no effect on target achievement. As a result, aggregated emissions from both countries are the same as without any transfers.

If one or both countries chooses averaging as the basis for accounting, the effects are more complex: aggregated emissions from both countries may increase, decrease, or remain constant compared to the situation without any transfers. If one country chooses a multi-year approach, and the other averaging, aggregated emissions may increase or decrease. The direction of change – i.e. increase or decrease – depends on whether the country is a transferring or acquiring country and whether the engagement in ITMOs increases or decreases over time. If the country choosing averaging engages in a constant number of ITMOs over time, there is no effect on target achievement and aggregated emissions from both countries are the same as without any transfers.

If both countries account their emissions by averaging, there are three constellations in which aggregated emissions from both countries are not affected, even though the two countries do over- or underachieve their target as a result of accounting by averaging. This is because, in our specific example scenarios, the amount by which countries over- or under-achieve their target is the same (2 MtCO_{2e}). As a result, the over-achievement in one country exactly balances the under-achievement in the other country. In practice, however, these combinations of ITMO engagement trajectories may easily lead to a change in aggregated emissions from countries, for example, depending on the exact pathway in which ITMO engagement increases or decreases over time.

The table shows that the results for the 36 combinations are diverse. For half of the combinations, there is no change in aggregated emissions from both countries, for a quarter emissions may increase, and for another quarter emissions may decrease.

The findings are also relevant when countries generate ITMOs that are used for purposes other than achieving NDCs. This holds in particular for CORSIA, which requires airline operators to offset any increase in their CO₂ emissions from international flights beyond 2019 levels. Demand for carbon credits under CORSIA is expected to increase considerably over time, and so may the generation of ITMOs for use under CORSIA. CORSIA establishes continuous multi-year obligations from 2021 to 2035, whereas most countries that may generate carbon credits for use under CORSIA have single-year targets. This means that the use of averaging for ITMOs used under CORSIA may undermine the mitigation efforts achieved through CORSIA.

Table 3-2: Possible effects on aggregated emissions from both countries for different combinations of ITMO engagement and accounting approaches

			ITMO use is					
			Increasing	Constant	Decreasing	Increasing	Constant	Decreasing
			Multi-year approaches			Averaging		
ITMO transfer is	Increasing	Multi-year approaches	No change	No change	No change	Lower aggregated emissions	No change	Higher aggregated emissions
	Constant		No change	No change	No change	Lower aggregated emissions	No change	Higher aggregated emissions
	Decreasing		No change	No change	No change	Lower aggregated emissions	No change	Higher aggregated emissions
	Increasing	Averaging	Higher aggregated emissions	Higher aggregated emissions	Higher aggregated emissions	No change (effects even out)	Higher aggregated emission	Higher aggregated emissions
	Constant		No change	No change	No change	Lower aggregated emissions	No change (effects even out)	Higher aggregated emissions
	Decreasing		Lower aggregated emissions	Lower aggregated emissions	Lower aggregated emissions	Lower aggregated emissions	Lower aggregated emissions	No change (effects even out)

3.1.4 Implications of free choice between accounting approaches

The current draft negotiation text allows each country to select between averaging and multi-year approaches. This flexibility is two-fold: first, the transferring country and the acquiring country may use a different approach; and second, countries need to apply the selected approach consistently throughout an NDC implementation period but may switch from one approach to another in their subsequent NDC implementation period.

As shown above, the choice of the accounting approach affects the mitigation effort needed to achieve a given NDC target. Countries may thus have incentives to strategically select an accounting approach under which less mitigation effort is needed to achieve their given NDC target, depending on whether the country is intending to transfer or acquire ITMOs and whether it is planning to ramp up ITMO generation or use over time, to keep it constant, or to decrease it over time:

- For transferring countries, it will be more favourable to choose averaging as the accounting approach if they intend to increase their transfer of ITMOs over the NDC implementation period (scenario T-i-AV, see Figure 3-3). If they intend to decrease the transfer of ITMOs over time, accounting on the basis of multi-year approaches would be more beneficial for the country (scenario T-d-AV, see Figure 3-6).
- For acquiring countries, it will be more favourable to choose averaging as the accounting approach if they intend to decrease their acquisition of ITMOs over the NDC implementation period (scenario A-i-AV, see Figure 3-5). If they intend to increase the acquisition of ITMOs over time, accounting on the basis of multi-year approaches would be more beneficial for the country (scenario A-i-AV, see Figure 3-4).

If each country picks for each NDC implementation period the accounting approach that requires less effort to achieve its NDC, then aggregate emissions from all countries may increase beyond levels that would occur if all countries had used only multi-year approaches or no international transfers took place. A free choice between accounting approaches can thus undermine environmental integrity and robust accounting.

3.2 Level of emissions in the target year

Next to the ITMO engagement over time, the effect of averaging on aggregate emissions depends on the level of emissions in the target year. This is because the number of ITMOs a country can transfer or needs to acquire over the full NDC implementation period strongly hinges on the specific circumstances in the target year. This is illustrated through two examples, drawing on the scenarios of examples countries introduced in section 3.1.1 above.

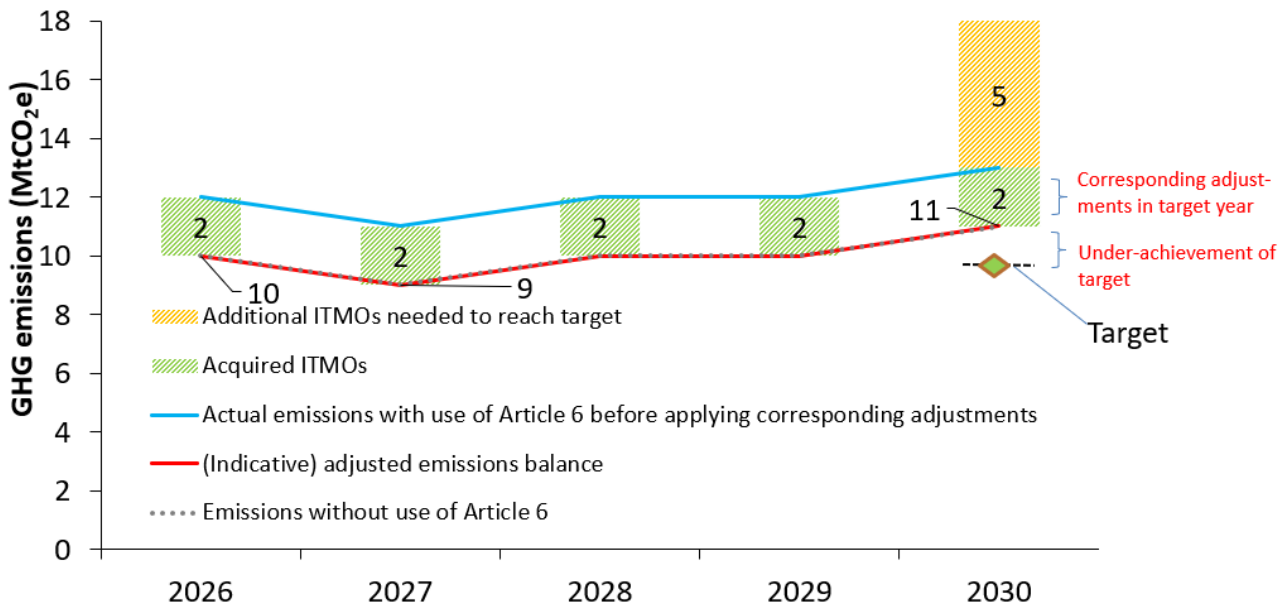
Example 1: Acquiring country with constant engagement in ITMOs and higher-than-normal emissions in the target year

Figure 3-9 illustrates a scenario of an acquiring country with a constant engagement in ITMOs (Scenario A-c). In this specific example, the emissions without the use of Article 6 fluctuate around 10 MtCO_{2e} per year, with lower emissions of 9 MtCO_{2e} in 2027 and higher emissions of 11 MtCO_{2e} in 2030. The fluctuation of emissions over time could occur due to changes in economic activity or weather conditions, such as colder or warmer winters or lower or higher precipitation levels resulting in lower or higher hydro power availability. If the country accounts based on a multi-year approach, these fluctuations have no impact, as in our example the lower emissions in 2027 balance the higher emissions in 2030. The country thus needs to purchase the same number of ITMOs over the NDC implementation period as without these fluctuations (10 MtCO_{2e}).

However, if the country accounts based on averaging, it would need to acquire 5 million additional ITMOs to compensate for the shortfall of 1 MtCO_{2e} in the target year in order to achieve its NDC target. This is because only one fifth of the total number of ITMOs acquired over the NDC implementation period can be used towards achieving the NDC in the target year. In this specific

case, accounting based on averaging may thus lead to 5 MtCO₂e fewer emissions than accounting based on multi-year approaches.

Figure 3-9: Acquiring country accounting based on averaging with higher-than-normal emissions in the single target year

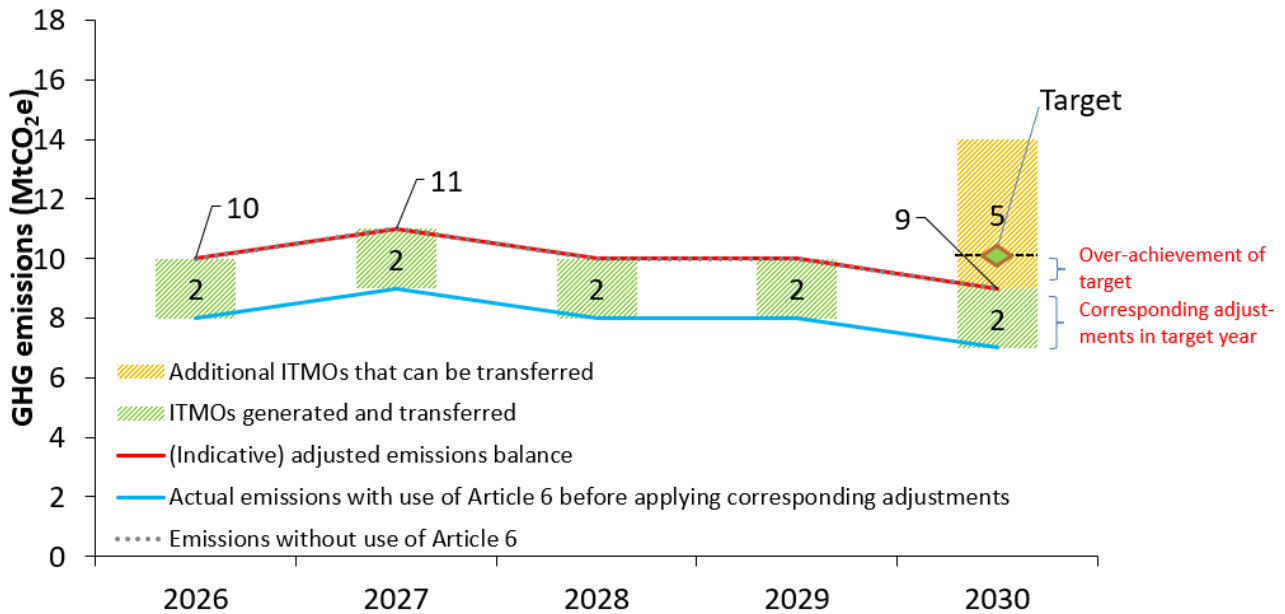


Example 2: Transferring country with constant engagement in ITMOs and lower-than-normal emissions in the target year

If emissions in the target year are lower than the country’s emissions trend, a transferring country using averaging could transfer a larger number of ITMOs than under a multi-year approach. Figure 3-10 illustrates a scenario of a transferring country with again a constant engagement in ITMOs (Scenario T-c). In this example, the emissions without the use of Article 6 fluctuate again around 10 MtCO₂e per year, this time with higher emissions of 11 MtCO₂e in 2027 and lower emissions of 9 MtCO₂e in 2030. If the country accounts based on a multi-year approach, these fluctuations have no impact, as the higher emissions in 2027 again balance the lower emissions in 2030. The country could thus transfer the same number of ITMOs over the NDC implementation period as without these fluctuations (10 MtCO₂e).

If the country accounts on the basis of averaging, it could transfer an additional 5 million ITMOs over the NDC implementation period, without reducing any emissions. This is because the incidental over-achievement by 1 MtCO₂e in the target year enables the country to sell five times the number of ITMOs over the entire NDC implementation period. As the country does not need to take any mitigation action to transfer these additional ITMOs, accounting on the basis of averaging may thus lead to 5 MtCO₂e more emissions than accounting on the basis of multi-year approaches.

Figure 3-10: Transferring country accounting based on averaging with lower-than-normal emissions in the single target year



These examples illustrate that year-on-year fluctuations in emissions, as commonly observed by countries, have very different impacts depending on whether a multi-year approach or averaging is used. With multi-year approaches, such fluctuations do not affect aggregated emissions from both countries and have minor impacts on the total number of ITMOs that countries can transfer or need to acquire to achieve their NDC target. By contrast, with averaging, the specific circumstances in the target year are decisive for the number of ITMOs that they are able to transfer or need to acquire over the entire NDC implementation period. For a five-year NDC implementation period, a change in emissions by 1 MtCO₂e in the target year means a shortfall or possible excess of 5 million ITMOs; for a 10-year NDC implementation period this effect worsens and means that emission reductions of 1 tCO₂e in the target year are worth as much as 10 million ITMOs.

This has multiple adverse implications. First, it can undermine environmental integrity and robust accounting, as aggregated emissions from both countries can increase as a result of engaging in ITMOs. Second, it involves considerable uncertainty for countries as to how many ITMOs they can transfer or need to acquire. For acquiring countries, unexpected increases in emissions in the target year, e.g. due to a particularly cold winter, could multiply the number of ITMOs they need to purchase over the NDC implementation period in order to still achieve their NDC. Conversely, for transferring countries, higher than expected emissions in the target year could mean that they over-sold ITMOs and do not achieve their NDC target. Lower than expected emissions in the target year, e.g. due to a recession, could seriously undermine environmental integrity, as countries may be able to transfers large number of ITMOs without reducing emissions respectively over the NDC implementation period.

This poses challenges for engaging in cooperative approaches because information on the number of ITMOs needed or available for transfer will only be available after the end of the NDC implementation period when the GHG inventories for the target year have been completed. As year-on-year emission fluctuations are partially impacted by factors that are beyond the control of countries, such as weather conditions, averaging creates considerable uncertainty for countries

regarding the number of ITMOs they need to acquire or may transfer and may reduce countries' readiness to provide advance authorisation of ITMOs.

This uncertainty could have different effects. On the one hand, countries may be risk averse and thus want to be on the safe side in achieving their NDC targets. This could imply that transferring countries sell fewer rather than too many ITMOs and acquiring countries purchase more rather than too few ITMOs, in order to ensure that they achieve their targets despite the uncertainty over the exact emissions level in the target year. In principle, this could lead to more countries over-achieving their targets, thereby implicitly promoting more ambition. On the other hand, some countries might engage in late ITMO trades for activities that started in the past, once they realize that they will over-achieve their NDC in the target year. The implications for ambition and environmental integrity will thus also depend on the behaviour of countries.

Finally, averaging may also distort incentives from carbon markets, as emission reductions achieved in the target year have a higher value to countries than emission reductions achieved in other years.

4 Conclusions and recommendations

This paper assesses the robustness of the two main options considered in the ongoing negotiations on under Article 6 of the Paris Agreement for accounting for carbon markets in the context of single-year targets: averaging and multi-year approaches.

Several findings result from our analysis:

1. **The choice of the accounting approach affects the mitigation effort needed by countries to achieve a given NDC target.** This study shows that, keeping all other parameters constant, averaging can lead to over- or under-achievement of mitigation targets, depending on whether the country is transferring or acquiring ITMOs and whether it is increasing or decreasing its ITMO engagement over time, or keeping it constant. This is because the emission reductions achieved in the target year through the engagement in ITMOs might be lower or higher than the corresponding adjustments applied in that year. The use of Article 6 in the target year may thus be higher or lower than the average engagement in ITMOs over the whole NDC implementation period, which may lead to an over- or under-achievement of the target.
2. **As averaging can lead to an over- or under-achievement of mitigation targets, it can also lead to higher or lower aggregated emissions from both countries over the NDC implementation period,** compared to a situation in which the countries achieved their targets without the use of Article 6. Among 27 scenarios analysed for combinations of countries using averaging and/or multi-year approaches, aggregated emissions increase in one third of the scenarios, decrease in another third, and remain constant in another third. By contrast, if both the transferring and the acquiring country account based on multi-year approaches, aggregated emissions are not affected, as long as multi-year trajectories are robustly defined.
3. **A free choice between averaging and multi-year approaches can undermine environmental integrity and robust accounting.** If each country strategically picks for each NDC implementation period the accounting approach which requires less effort to achieve its NDC, then aggregate emissions from all countries may increase beyond levels that would occur if all countries used only multi-year approaches or no international transfers took place.
4. **The use of averaging may be particularly problematic for countries that authorise ITMOs for use under CORSIA.** Demand for carbon credits under CORSIA is expected to increase considerably over time, and so may the generation of ITMOs for use under CORSIA. An increasing generation of ITMOs in combination with averaging, however, enables transferring countries to pursue less mitigation action while still achieving their NDC targets. This would undermine the mitigation efforts achieved through CORSIA.
5. **Year-on-year fluctuations in emissions, as commonly observed by countries, have very different impacts depending on whether a multi-year approach or averaging is used.** With multi-year approaches, such fluctuations do not affect aggregated emissions from both countries and have minor impacts on the total number of ITMOs that countries can transfer or need to acquire to achieve their NDC target. This is because a deviation from the budget or trajectory in any year of the NDC implementation period will only affect that particular year and may even out over time. Acquiring countries would only need to purchase ITMOs to close the *net* gap over the NDC implementation period. By contrast, with averaging, the emissions level in the target year is decisive for the total number of ITMOs that countries can transfer or need to acquire over the entire NDC implementation period. Any deviations between the emissions and the target in the target year magnify the number of ITMOs needed, or available for transfer, by a factor of 5 or 10

(depending on the length of the NDC implementation period). As this study shows, this can lead to higher or lower emissions than if countries had not engaged in Article 6 or used multi-year approaches.

- 6. The magnifying effects of year-to-year fluctuations in emissions when averaging is used involve considerable uncertainty for countries in terms of the number of ITMOs needed or available for transfer.** The precise number of ITMOs needed, or available for transfer, will only become apparent after the target year when GHG inventories for the target year are available. This might have negative repercussions on market dynamics. On the one hand, it may discourage countries from engaging in Article 6 at all. It could also encourage countries to sell fewer ITMOs, or purchase more ITMOs than likely needed, in order to ensure that they achieve their targets despite the uncertainty about the exact emissions level in the target year. In principle, this could lead to countries over-achieving their targets to a larger degree, thereby implicitly promoting more ambition. On the other hand, some countries might engage in late ITMO trades for activities that started in the past, once they realize that they will over-achieve their NDC in the target year. In this case, using Article 6 would not lead to additional mitigation action. The implications for ambition and environmental integrity will thus also depend on the behaviour of countries in practice.

Altogether, we conclude that **averaging is a problematic accounting approach in the context of single-year targets**. Its main advantage is that it is simple to implement and does not require countries to establish multi-year trajectories or budgets, which poses risks that countries define inflated emission trajectories or budgets in order to ensure that they will reach their targets. While averaging considers ITMO activity over the full NDC implementation period, the circumstances in the target year (i.e. the level of ITMO generation or use in that year and whether emissions are above or below the emissions trend in that year) are decisive for the total number of ITMOs that countries can transfer or need to acquire. This study showed that this particular feature of averaging can undermine environmental integrity in several ways.

Accounting based on multi-year approaches is, in principle, a more robust accounting approach than averaging. Multi-year approaches come with essential advantages. Firstly, they provide certainty regarding the cumulative emissions over the NDC implementation period. Most importantly, once trajectories or budgets are defined, the accounting for ITMOs cannot lead to an increase in the aggregated emissions from both countries, regardless of whether countries increase or decrease their engagement in ITMOs over time. Furthermore, accounting based on multi-year approaches enable continuous accounting over different NDC implementation periods.

However, multi-year approaches also involve several disadvantages. A key challenge is establishing trajectories or budgets. An increase in aggregated emissions is only avoided if trajectories or budgets are defined in robust ways. However, countries may have incentives to define loose multi-year trajectories when fixing them at the beginning of an NDC implementation period in order to ensure that they will meet their future targets. To address this risk, countries could adopt principles for establishing multi-year trajectories. Ideally, trajectories should reflect the emissions pathway of the country to achieve its NDC without the engagement in Article 6. Most objectively, trajectories may be set for all countries on a linear basis over the NDC implementation period. This would be a simple approach and would discourage opting for high, non-linear paths that may be more likely to lead to inflated trajectories or budgets. Linear paths may, however, not always reflect expected emission trajectories without the use of Article 6. Moreover, the starting point of the linear trajectory is a critical choice. It could be based on the level of actual emissions at a certain point in time (e.g. when the country communicated its NDC or the start of the NDC implementation period) or on previous targets

levels (e.g. 2020 targets communicated by countries in the context of the Cancun Agreements). It may also incorporate sector-level trajectories already mandated by domestic policy (e.g. by an ETS).

A specific disadvantage of budgets is that they might create expectations regarding the use of unused emissions surpluses without generating mitigation outcomes. This is contradictory to the principal idea that ITMOs should represent additional mitigation outcomes. To ensure environmental integrity, they may not result from over-achieving an (unambitious) target and selling the excess budget of emissions.

Recommendations for Article 6 negotiations

Based on these considerations, we recommend that countries engaging in Article 6 move over time towards robustly defined multi-year targets or trajectories and that the risks associated with inflating multi-year trajectories be addressed through international guidance on the establishment of trajectories. In the ongoing negotiations on Article 6 guidance, countries could consider either removing the option of averaging or limiting its application in time (e.g. up to 2030). From 2031 onwards, when countries are required to set common time frames for their NDCs, countries could consider defining NDC targets as multi-year targets, excluding the option to set single-year targets. To address the risk associated with emission budgets, countries could also consider removing the option of using “budgets”. Countries may also address the risks arising from the possibility of picking and choosing between accounting approaches. The negotiation text considered at COP24 in Katowice included a provision that both countries involved in the cooperative approach need to implement the same accounting approach. This provision would not fully address environmental integrity risks but could reduce them. Overall, the implications of multi-year approaches and averaging will only become fully apparent after the rules for accounting under Article 6 have been applied for the first time.

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