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Attribution: A practical guide to navigating the blending of climate finance and carbon markets

Final Report
September 2021

This report was led by Carbon Limits AS

Project title: Attribution: A practical guide to navigating the blending of climate finance and carbon markets

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Report title:	Attribution: a practical guide to navigating the blending of climate finance and carbon markets
Finalized:	September 2021

Acknowledgements

We would like to thank the interviewees from governments, carbon funds and international organizations that provided their insights – in their personal capacity – for this paper: Malin Ahlberg (Germany), Tony Clamp (GCF), Mischa Classen (KliK), Felipe de Leon (Costa Rica), El Hadji Mbaye Diagne (Senegal), Veronika Elgart (Switzerland), Kevin Horsburgh (GCF), Stefan Innes (Canada), Phillip Ischer (Switzerland) , Thanos Katsantonis (GCF), Rajeev Mahajan (GCF), Neeraj Negi (GEF), Franck Portalupi (Canada), Adam Priban (Canada), Archi Rastogi (IEU, GCF), Andreas Reumann (IEU, GCF), Jerry Velasquez (GCF), Jan Willem van de Ven (EBRD), Mandy Rambharos (South Africa)

Disclaimer

We would like to thank the team at SEA for valuable feedback on the draft report. The views expressed in this report are the authors' own and do not represent any official position of the commissioning agency.

Citation

Please cite this report as: Spalding-Fecher, Randall; Kohli, Anik; Fallasch, Felix; Brown, Peter; Fuessler, Juerg; Broekhoff, Derik and Lambert Schneider (2021). Attribution: A practical guide to navigating the blending of climate finance and carbon markets. Eskilstuna, Sweden: Swedish Energy Agency.

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Acronyms

AI	Annex I
BAU	Business as usual
CA	Corresponding adjustments
CDM	Clean development mechanism
CORSIA	Carbon Offsetting and Reduction Scheme for International Aviation
GHG	Greenhouse gas
ITMO	Internationally transferred mitigation outcome
MOPA	Mitigation outcome purchase agreement
NDC	Nationally determined contribution
ODA	Official development assistance
LT-LEDS	Long-term low emissions development strategy
MACC	Marginal abatement cost curve
MO	Mitigation outcome
SCF	Standing Committee on Finance

Executive summary

Meeting the goals of the Paris Agreement will require an unprecedented scale of financing for low-carbon and climate-resilient development. This poses a particular challenge to developing countries. The current financial flows from carbon markets and climate finance[1] do not come close to meeting the incremental investment needs for these ambitious goals. Historically, climate finance and carbon markets have worked almost entirely independently. This landscape is starting to shift, however, because of the overwhelming need for mobilizing new investment and also the need in both carbon markets and climate finance to target larger-scale interventions, which are then more likely to require multiple streams of financial support. Blending different sources of finance provides more flexibility, because it allows multiple international actors to provide support for the same program and to combine different financial instruments. Blending climate finance instruments with international carbon market mechanisms is still in its early days, with limited practical experience even in the emerging piloting activities for Article 6. This report assessed both the principles of attribution of emission reductions to climate finance and carbon markets and the practical applications of these principles in Article 6 pilot activities.

The term “attribution” refers to how the emission reductions resulting from a program supported by both climate finance and compliance carbon markets are allocated to, or recognized by, each of those financing sources. “Climate finance” for the purpose of this report refers to international public resources that cover the additional costs of low carbon and climate resilient investments, beyond what commercial financing could support in a business-as-usual (BAU) scenario, and for which there are no transfers of mitigation outcomes from one country to another under Article 6 of the Paris Agreement. “Carbon markets”, on the other hand, refers to international payments for mitigation outcomes (by public or private actors) that are internationally transferred from one country to another under Article 6 of the Paris Agreement and generate “corresponding adjustments” for the host (i.e., transferring) country, regardless of whether or not the buyer (i.e., acquiring) country uses the mitigation outcomes for compliance with its nationally determined contribution (NDC) target.[2] Attribution is a key issue when both climate finance and carbon markets are used in one mitigation intervention to support the *same mitigation outcomes*. If a mitigation intervention has components that occur at distinct sites (e.g. individual power plants within a sectoral mitigation program, or groups of households with improved cookstoves as part of a national program) and that are supported separately by climate finance and carbon markets, then attribution is not necessary, because each financing source can be linked to a separate set of mitigation outcomes.

The analysis in this study reiterates the conclusion of an earlier TCAF/CPF study (Fuessler, Kansy, and Spalding-Fecher 2019) that “proportional attribution” of climate finance and carbon markets is essential when both sources of financing are supporting the same mitigation outcomes. “Proportional attribution” means attributing emission reductions to climate finance and to carbon markets in proportion to their financial contribution to the abatement costs of the mitigation activity, expressed in “grant value equivalent”. The conclusion on proportional attribution is true across all types of crediting, even project-based crediting, with the understanding that crediting baseline incorporates the NDC targets, and so there is no need to attribute mitigation outcomes to host country government financing. Without proportional attribution, there is a risk that climate finance will essentially subsidize the price of

[1] As explained in section 2.1, in the context of this report, climate finance refers to international public resources that cover the additional costs of low carbon and climate resilient investments, beyond what commercial financing could support in a business-as-usual scenario, and for which there are no transfers of mitigation outcomes from one country to another. In other words, the resulting mitigation may be used by the host country towards their mitigation goals.

[2] The focus here is on compliance carbon markets under the Paris Agreement, because of the current need to agree on rules for Article 6 and to being piloting cooperation. Whether voluntary carbon markets may also be relevant for attribution is an important subject for future research.

internationally transferred mitigation outcomes (ITMOs) (i.e., the ITMO price will be lower than the unit abatement cost of the mitigation intervention), undermining the efficiency of markets, and also lead to higher global emissions, violating the principle of environmental integrity.

Proportional attribution should be agreed early in the development of mitigation programs and is possible even when not all the financing sources are yet known by estimating the total abatement costs for the mitigation intervention relative to the carbon market contribution. The benefit of establishing those costs and attribution upfront is that they then only need to be revised when there is a material change in the overall scale of the program or the total abatement costs required to realize the mitigation. In addition, the mitigation outcome purchase agreement (MOPA) governing the ITMO transaction could include conditions for how or whether the attribution would be reviewed in the future. Clearly stating such cases or making explicit what revisions are possible would create more certainty for all parties.

Attribution analysis should focus mainly on financing streams that support implementation and investment, rather than the smaller funding for activities such as technical assistance and capacity building. All financing streams should be converted to grant value equivalent to conduct the attribution analysis. This analysis can utilize existing tools for the grant value of concessionary loans, but more work is needed for other financing instruments. An important future step in supporting attribution would be to develop attribution tools that can be used by project proponents, tools which would combine the grant-equivalent calculations for climate finance instruments with the expected carbon market contributions.

While both host countries and buyer countries can support the practice of proportional attribution, host countries have a key role in the rules they set for climate finance contributions as well as the authorization criteria for ITMOs, both of which could include a requirement to conduct attribution. The host country government could support potential carbon market project participants in identifying existing climate finance programs in a sector that might need to be included in the attribution analysis.

Because of the limited experience in blending climate finance with carbon markets, governments and funders need to raise awareness among key actors in climate finance and carbon market and also support them in applying these attribution principles to pilot programs. This could include: providing information for the relevant processes on climate finance and carbon market, organizing exchanges among key actors on practical issues after program implementation, and sharing experiences with attribution. Multilateral funds are generally aware of the opportunities that blending climate finance and carbon markets provide and see increased interest in this topic within the networks of their implementing partners, so they can be a key contributor to exchanges and sharing experience.

Independent crediting standards could also have an important role to play in attribution. One option could be that standards would require project proponents to provide relevant information based on attribution methodologies as a part of the standard. The other option would be that standards only require *reporting* of information on attribution, but project proponents could choose their own approach to attribution. To ensure consistency and high environmental integrity, independent standards should consider integrating attribution rules and modalities in their regulatory systems. In addition, they could use the current piloting phase to test options and make an informed choice based on experience.

While this study focuses on the interaction of climate finance with compliance carbon markets under Article 6, attribution could also be an issue for voluntary carbon market transactions, which are growing rapidly. Future research is needed to assess the environmental integrity implications of blending this voluntary carbon market financing with climate finance, and even ruling out double counting with compliance carbon market funding. The sooner policy makers and funders can agree on the relevant policies that would govern such approaches, the easier it will be to pilot innovative blending approached to scale-up mitigation cooperation.

1. Introduction

Meeting the goals of the Paris Agreement will require an unprecedented scale of financing for low carbon and climate resilient development. Even with the implementation of all current unconditional and conditional NDC pledges, the world still faces a gap of more than 15 billion tCO_2e in emission reduction in 2030 to stay below 2 ˚C warming, and 32 billion tCO_2e (i.e., almost 50% reduction) to stay safely below 1.5 ºC (UNEP 2020). In addition, while the benefits of averting catastrophic climate change clearly outweigh the costs of emission reductions over the long term, the investment required in the coming decades is massive. In the energy sector alone, almost 400 billion USD of incremental investment *per year* between 2015 and 2050 will be required to reach a 2 ˚C goal, with another USD 300 billion per year to reach the 1.5 ˚C goal, on top of the more than USD 2 trillion per year needed for the baseline energy system (IPCC 2018, figure 2.27). In order to meet this challenge, the global community has the opportunity to innovatively combine many forms and sources of financing, from public resources at the international and domestic level to private resources in both industrialized and developing countries.

The current financial flows from carbon markets and climate finance[3] do not come close to meeting the incremental investment needs for these ambitious Paris Agreement goals. While there is no estimate of the total value of all compliance and voluntary carbon markets, the total volume of credits issued by all major systems in the last two decades is 4.3 billion tCO_2, or just over 200 million tCO_2/yr (World Bank 2021). Climate finance is tracked based on value, although, as discussed in this report, the definitions of this financing vary widely. In terms of international public funding, driven by the commitment to mobilize jointly USD 100 billion per year by 2020 to address the needs of developing countries (UNFCCC 2011), many developed countries have increased their annual climate finance contributions via bilateral and multilateral channels. As a result, public climate finance provided by developed countries increased from USD 37.9 billion in 2013 to USD 62.2 billion in 2018 (OECD 2020). Broader definitions of climate finance, which include private financing on commercial terms, reach almost USD 600 billion in 2018 (Buchner et al. 2019), but this commercial financing would be part of the baseline investment requirements and would not cover the abatement costs of low carbon development.[4] The challenge for climate action is to identify the sources of concessional finance that can cover the incremental costs of low emission, climate resilient development.

Historically, climate finance and carbon markets have worked almost entirely independently, with climate finance providers often intending that the mitigation benefits should remain in the host country. Climate finance providers often required the beneficiaries to agree not to participate in carbon markets. Where carbon markets did help fund low carbon investments with climate finance support, often the market mechanisms claimed all the emissions reductions, ignoring the complementary nature of the financing. This landscape is starting to shift, however, because of both the overwhelming need for mobilizing new investment and the trend in both carbon markets and climate finance to target larger-scale interventions, which are then more likely to require multiple streams of financial support. For governments, it becomes increasingly important to ensure that both instruments of providing support for mitigation activities in developing countries can be used in a complementary manner and that methodologies are in place that facilitate appropriate attribution of emission reduction impacts

[3] As explained in section 2.1, in the context of this report, climate finance refers to international public resources that cover the additional costs of low carbon and climate resilient investments, beyond what commercial financing could support in a business-as-usual scenario, and for which there are no transfers of mitigation outcomes from one country to another. In other words, the resulting mitigation may be used by the host country towards their mitigation goals.

[4] As explained later in this paper, the abatement costs for low emissions development cannot be covered by commercial financing, because, if they could be, then these technologies would already be part of the “business as usual” scenario.

achieved when these different types of finance are blended. This applies both to contributions provided through bilateral channels as well as through multilateral funds with climate mandates such as the Green Climate Fund (GCF), the Climate Investment Funds (CIF), or other specialized investment vehicles.

Blending different sources of finance provides more flexibility because it allows multiple international actors to provide support for the same program and to combine different financial instruments. This is particularly important for larger mitigation activities, e.g., seeking to transform the entire power sector of a country. Climate finance alone cannot mobilize the resources needed to achieve the Paris Agreement targets. There is significant value in developing business models and practices that allow for the blending of climate finance with carbon markets. While there is a substantial body of knowledge on blending of different financial instruments, blending climate finance instruments with international carbon market mechanisms is still in its early days. The major analysis of this issue in 2019 (Fuessler, Kansy, and Spalding-Fecher 2019), noted the benefits of blending and argued that using a "proportional attribution" approach was important for environmental integrity as well as market efficiency. The report also pointed to, but did not address, new methodological issues when discussing blending of climate finance with carbon markets.

The objective of this report is to assess both the principles of attribution of emission reductions to climate finance and carbon markets, as well as the practical applications of these principles in Article 6 pilot activities. The report addresses not only project-based mitigation activities, but also programmatic interventions and, to a lesser extent, scaled-up crediting (e.g., sectoral crediting, policy-based crediting), and the implications of attribution for these different crediting approaches. The report builds on not only research and literature in this field, but also a series of interviews with potential host and buyer countries[5] and funds for Article 6 as well as major climate finance providers. Section 2 provides important background on the objectives and previous analysis on attribution, as well as defining the terms used in the report. Section 3 then introduces a model demonstrating the impact of different attribution approaches on global emissions and mitigation costs, to explain the importance of the "proportional attribution" approach. Because key stakeholders in the carbon market and climate finance fields are already thinking about attribution issues, section 4 summarizes some of their views and early experiences raised in interviews, as well as the challenges they have identified. This leads to a discussion of the conceptional and practical challenges with proportional attribution in chapters 5 and 6, which also provide options on how to meet these challenges. Section 7 then concludes with some overall recommendations.

2. Why attribution? Definitions and objectives

This section clarifies the terminology used in the discussion of attribution, recalls the findings of earlier studies on this topic and presents the rationale for considering attribution of emission reductions in the first place.

2.1 Definitions

The term "attribution" refers to how the emission reductions resulting from a program supported by both climate finance and compliance carbon markets are allocated to or recognized by each of those financing sources. "Blended finance" in this context refers to blending climate finance and carbon markets – as opposed to this term meaning blending public and private finance or blending multiple public financing instruments. "Climate finance" for this report refers to international public resources that cover the additional costs of low carbon and climate resilient investments, beyond what

[5] While the draft rules for Article 6.2 refer to "transferring" and "acquiring" countries, this report uses the more common terms of "host" and "buyer" country, with the same meaning.

commercial financing could support in a BAU scenario, and for which there are no transfers of mitigation outcomes from one country to another under Article 6 of the Paris Agreement. Generally, climate finance providers are interested in the recognition of their mitigation impact, not allocation *per se*, while carbon markets need allocation of units to be transferred. As section 6.5 explains in more detail, there are a range of different definitions of what other institutions and processes recognize as climate finance, but for all these the main distinction with carbon markets is that there is no transfer and use of emission reductions units in return for these payments. There is also no use of internationally transferred mitigation outcomes towards compliance with the NDC of the buyer country. "Carbon markets", on the other hand, refers to international payments for mitigation outcomes (by public or private actors) that are internationally transferred from one country to another under Article 6 of the Paris Agreement and generate "corresponding adjustments" for the host country, regardless of whether the buyer country uses the mitigation outcomes for compliance with its NDC target.[6] This financing and the related transfer, therefore, will impact the host country's NDC achievement, because the mitigation outcomes can no longer be used by the host country towards meeting its NDC target.[7]

Note that attribution is a key issue when both climate finance and carbon markets are used to support the same mitigation outcomes. If a mitigation program has different components or phases that are supported separately by climate finance and carbon markets, then attribution is not necessary, because each financing source can be linked to a separate set of mitigation outcomes. For example, if climate finance provides concessionary loans for a sub-set of the investment activities in a mitigation program (e.g. several landfill sites within a larger sectoral investment program in waste management), but then a guarantee fund backed by carbon market payments takes over from this and supports later tranches of investment (i.e. investment at different sites), then each financing source is supporting a different set of mitigation outcomes. Only when the financing sources support the same investments and mitigation outcomes is there a need to attribute. This might be the case, for example, when climate finance continues to provide concessionary financing to all installations while carbon markets also provide some of the necessary incentives needed, or when a financing facility is supported by both climate finance and carbon market sources.

2.2 Attribution under the CDM and in the context of Paris Agreement

The clean development mechanism (CDM) of the Kyoto Protocol allowed a country with an emission-reduction or emission-limitation target to implement mitigation projects in developing countries and use the resulting certified emission reductions towards compliance with its Kyoto target. Many CDM projects were subsidized by host country policies (e.g. through feed-in tariffs) and others were partially funded by official development assistance (ODA). On the one hand, ODA rules excluded funds spent for the purchase of certified emission reductions to be accounted as ODA (OECD 2004). On the other hand, CDM rules required confirmation from buyer countries that the CDM funding did not result in a diversion of ODA. In addition, project participants were required to demonstrate that CDM projects were not profitable in the absence of CDM revenues (UNFCCC 2006). As long as these rules were respected, a CDM project proponent could claim the entirety of the emission reductions, and buyers of the certified emission reductions could use all of them for offsetting purposes, irrespective of the level of contribution from the carbon market funding. Thus, in practice, an "all to carbon market" approach (see section 2.3) was applied (Fuessler, Kansy, and Spalding-Fecher 2019). Because of this

[6] The focus here is on compliance carbon markets under the Paris Agreement because of the current need to agree on rules for Article 6 and to being piloting cooperation. Whether voluntary carbon markets may also be relevant for attribution is an important subject for future research.

[7] If a portion of a results-based climate finance (RBCF) facility requires the host country to transfer mitigation outcomes, then this component of the facility would be part of carbon markets in this analysis, not climate finance (i.e., the facility would be a blended finance fund).

approach, some climate finance facilities such as the Global Environmental Facility excluded in general the possibility of using their funding for CDM projects.

In contrast to the earlier Kyoto Protocol, virtually all countries have mitigation pledges under the current Paris Agreement. It is foreseen that developing countries are supported with climate finance to achieve their NDC, to, amongst other things, increase ambition. In addition, the market mechanisms under Article 6 of the Paris Agreement should help participating countries to increase their ambition in mitigation actions. Since double counting of emission reductions is explicitly prohibited, international transfers of mitigation outcomes under Article 6 of the Paris Agreement require "corresponding adjustments". This may affect the host country's ability to achieve its mitigation pledge. This makes it even more important to attribute emission reductions to climate finance and carbon markets.

2.3 Previous analysis of attribution

A recent study commissioned by TCAF/CPF (Fuessler, Kansy, and Spalding-Fecher 2019) discussed three alternative approaches to attribution in the case of blending climate finance with carbon markets:[8]

- "all to climate finance" approach;
- "all to carbon market" approach; and
- "proportional attribution" approach.

The "all to climate finance" approach would attribute all emission reductions to climate finance and so, essentially, would prevent any blending. Climate finance and carbon markets would not support the same mitigation activities but would instead act separately. The analysis suggested that this approach would reduce the efficiency of carbon markets because climate finance could then not be used to overcome implementation barriers in blended finance programs. The study also noted that this fragmentation of the financing sources would also limit the effectiveness of climate finance, because these programs could not leverage potential private sector involvement from carbon markets (e.g., private companies buyer emission reductions to comply with domestic emission trading scheme obligations).

The "all to carbon market" approach would attribute all emission reductions to the financing provided by carbon markets. Climate finance might still be part of the overall support for these mitigation activities, but all of the resulting emission reductions from the blended program would be converted to ITMOs and transferred to the buyer country (i.e., the origin of the carbon market payments). The study found that this approach would create environmental integrity concerns, because of the difficulty of demonstrating additionality where a project has already benefitted from concessional finance. In addition, if the total emission reductions were all transferred as ITMOs and accounted towards the buyer country's NDC, this could increase global emissions related to a scenario that only included climate finance. The approach also would have an impact on economic efficiency because the climate finance would essentially be subsidizing carbon markets, leading to suboptimal distribution of mitigation activities and inefficient allocation of resources. Finally, this approach might make it more difficult for host countries to comply with their NDC mitigation pledges.

The "proportional attribution" approach would attribute emission reductions to climate finance and to carbon markets in proportion to their financial contribution to the abatement costs of the mitigation activity. The study suggested that this approach could address environmental integrity concerns as well as economic efficiency concerns of the other two approaches. The main challenge could be the additional data required on the various streams of finance and their financial terms. This is because the attribution approach would only consider the grant-equivalent value of the climate finance provided.

[8] The paragraphs on the three approaches paraphrase the conclusions of this earlier study.

Another paper (Strand 2019) also considered the implications of blending climate finance and carbon markets, using an analytical economic model. It came to a similar conclusion, noting that, "with finance blending and 'all attribution to the carbon market,' the market equilibrium is inefficient…. Instead, emission reductions in the offset market should be attributed to the two finance types in proportion to their finance shares provided to the low-income countries through this market." The study also points to the need to support blending of climate finance and carbon markets, noting that, "when low-income country market participants have limited access to credit markets, climate finance can increase mitigation by supplying the capital required to implement efficient mitigation projects."

These previous studies point to the importance of attribution for economic efficiency, environmental integrity and double counting – or, more specifically, "double claiming" of emission reductions (i.e. both forms of financing cannot claim the same mitigation impact). These initial studies also had their limitations, however. First, while they did consider scaled-up approaches to crediting, they did not investigate whether the results of different approaches to attribution would vary based on the type of crediting (i.e. project-based, programmatic or scaled-up).[9] They also did not explicitly address the external market environment, and whether having an international carbon price (i.e. a mature market with transparent global pricing) would impact the analysis. While the studies acknowledged that data availability could present a challenge to attribution, they did not consider how proportional attribution might be used where not all of the financing sources for a blended program had been identified. This paper essentially picks up where the earlier studies left off and tries to go deeper into both the conceptual issues related to attribution (in section 4) and some of the practical issues (in section 6).

For climate finance, mixing different funding sources (which is also often called "blending") is not new, because there are already experiences from multilateral funds and special investment vehicles that blend public and private finance. This is fundamentally different from blending in the context of this paper, however, in which the attribution of mitigation outcomes is critically important. Examples of traditional "blending" of multiple climate finance sources are the Global Energy Efficiency and Renewable Energy Fund and Climate Investor One, which blend private finance with investments by the Green Climate Fund, the Ministry of Foreign Affairs of the Netherlands, the European Union, the Nordic Development Fund, and the United States Agency for International Development. Recent research highlights the contribution of blending approaches to provide more significant and lasting impacts, also highlighting the complexity of monitoring the impacts of blended approaches due to their multi-layered capital structure, which could become an impediment to their efficiency and effectiveness (Choi and Seiger 2020).

Attribution is also an important aspect for tracking private finance mobilized by public interventions. In a situation where several countries or public institutions are involved in a project, it is also necessary to attribute the mobilized private finance to the public flows.

2.4 Objectives of attribution

Blending financing solutions is needed to encourage complementary support for large-scale mitigation interventions by both climate finance and carbon markets. Blending can combine the different benefits of these instruments (e.g., both upfront financing and incentives for performance from results-based payments) and potentially "crowd in" carbon market participation (i.e., from the private sector), while carbon market contributions can, over time, take over from climate finance in supporting cost-effective mitigation.

Evaluating different approaches to attribution and solutions to the conceptual and practical challenges requires first identifying the objectives of attribution. This paper takes it as a starting point that the choice of attribution approach and the detail of that attribution approach should ensure environmental integrity – meaning that global emissions should not increase as a result of using carbon markets alongside climate finance. Sending accurate economic signals to carbon market participants helps to

[9] For an explanation of the different types of crediting, see section 5.2.

direct financing to the most cost-effective abatement options that are also beyond what host countries need to meet their own NDC pledges.

Attribution approaches must also be tested in different market environments. Currently, there is no global market price for ITMOs, so that the effective price of ITMOs is actually determined by the attribution approach. In other words, if the total amounts of carbon market contribution and climate finance are fixed, then the attribution of emission reductions across these two financing types will determine the effective price of the achieved emission reductions. This is why the effective price may diverge from the underlying economic abatement costs of the mitigation intervention, as explained in more detail in section 3.

3. Modeling the impact of attribution approaches in different carbon market scenarios

To illustrate the impact of different attribution approaches under different market conditions, and for different types of crediting, this paper develops and presents a simplified model of blended financing for mitigation. The focus is on scalable mitigation interventions[10] (e.g., programmatic approaches such as sector-wide investment programs or other initiatives with a large number of facilities or sites), rather than more traditional project-based activities with a binary "go/no go" decision on implementation. With scalable or programmatic interventions, the question is not so much whether they will be implemented but at what scale they will be implemented (i.e. at how many sites), with climate finance and carbon markets both potentially playing a role. The analysis shows the impacts of different attribution approaches on global emissions and the cost-effectiveness of mitigation action. This current section describes the basic assumptions and framework conditions for the simplified model, as well as the qualitative results under different market conditions and attribution approaches. Annex A, on the other hand, includes a more detailed explanation of the examples and the quantitative results of the exercises.

Because the focus of this study is on blended financing, the analysis only covers the "all to carbon markets" and "proportional attribution" approaches to attribution from the previous study (because "all to climate finance" would keep the two financing sources separate). Importantly, the analysis also considers two different market environments:

- The current situation with no global carbon market price, where the financial contributions from carbon market funders may not be directly related to the volume of emission reductions. To simplify the analysis, this situation is represented by funding envelopes for both carbon market contribution and climate finance contribution.[11]
- A future situation with a global carbon market price and carbon market contributions based on whether the price of ITMOs for a given intervention is below or above this global market price.[12] In this future scenario, climate finance donors might also reduce their contributions to a given intervention (i.e., so these funds could be used elsewhere for additional mitigation) if carbon markets could fully cover the abatement costs.

[10] Note that section 5.2 also discussed scaled-up crediting such as policy-based crediting or sectoral aggregated crediting.

[11] Some current Article 6 pilots may include an agreement on a fixed ITMO price, but this is not related to any global market price, since there is not yet any global market.

[12] This is not meant to imply that the ITMO price is variable based on current market prices at the time of transfer, but only that there is some reference price that can be used in a ITMO purchase contract – whether the contractual arrangements are for fixed or variable pricing.

The first step in the attribution analysis is to identify the total abatement cost for the mitigation invention – again, bearing in mind that "mitigation intervention" means the sum of a large number of specific activities or sites where investment takes place. Abatement costs incorporate both changes in upfront capital costs and changes in ongoing revenues and costs, by comparing the mitigation technology to the "business as usual" baseline technology. For example, an efficient industrial boiler might cost 50% more than the current commercially financed technology but might have lower fuel costs and operating costs. The net increase in costs, in present value terms, would therefore be less than 50% when these future benefits were considered. The same would therefore be true of a large mitigation intervention that involved replacing all boilers across an industrial segment. The "total abatement costs" (e.g., in million US dollars) of the large-scale mitigation intervention would be the present value of all changes in costs and revenues over the life of the intervention (i.e. across all of the sites or activities that were part of the intervention).[13] Dividing this value by the discounted[14] emission reductions over the life of the intervention yields the "unit abatement costs" (e.g., USD/tCO_2), which is a standard measure of the cost-effectiveness of a mitigation intervention. Note that the abatement cost calculations are not related to the sources of financing – rather, these show the total financial requirements to realize the mitigation investment instead of the set of baseline investments. The source of these financial requirements is a separate issue.

Because the baseline is defined by the technology that would be viable with existing commercial financing, this commercial financing cannot, by definition, cover any of the total abatement costs. In fact, the abatement costs can only be covered by financial flows that do not require a financial return. This would include:

- public financing from the host country government;
- grants (or the grant-equivalent on instruments such as concessional loans, guarantees or other financial instruments[15]) from international public climate finance; and
- carbon market payments (i.e., since these do not require a financial return, even though they have economic value to buyers).

The emerging literature on baselines for Article 6 generally suggests that, to ensure that Article 6 transactions increase ambition and do not create risks for host country overselling, the crediting baseline should be set to already incorporate the host country's (unconditional) NDC pledges (Fuessler, Kohli, et al. 2019; Spalding-Fecher et al. 2020; Broekhoff et al. 2017).[16] This means that financial contributions from the host country government (e.g., feed-in tariffs for renewable electricity or subsidies for methane reductions in landfills) should be reflected in the baseline for the Article 6 crediting program. The total abatement costs must therefore be covered by a combination of the grant-equivalent value of climate finance and carbon market payments. This is another reason why attribution is essential for Article 6 crediting programs, and why attribution for Article 6 does not need to address either private sector financing or host country government contributions – as long as the baseline reflects the host country (unconditional) NDC pledges. Of course, the total project financing

[13] Another way to understand total abatement cost is as the difference in the net present value (NPV) of the baseline investment project and the mitigation investment project. The latter will have a lower NPV, and the different between the two is the total abatement cost. While total abatement cost is similar to the GEF concept of "incremental costs" (Michaelowa 2016), it is also the same as the abatement costs calculated in marginal abatement cost curves (i.e., those unit abatement costs times the abatement potential is the total abatement cost of a given intervention).

[14] This is based on the IPCC metric of "levelized cost of conserved carbon", where emissions reductions are discounted so to correspond to the "annualized" costs of achieving those reductions (Edenhofer et al. 2014).

[15] This could also include equity investments from MDBs, where the reduced rate of return requirements create a grant-equivalent component of the finance, although there are not currently methodologies to estimate this value.

[16] Note that section 5.1 explains a case in which host country financing might be considered, but this is with a different baseline (i.e., BAU baseline) and therefore a larger total emission reduction volume.

package for mitigation activities will and should include private sector financing (Michaelowa, Moslener, et al. 2019; Fuessler, Wunderlich, et al. 2019), but this financing can be thought of as the "BAU component" of the investment (i.e., the costs of a baseline technology).

The attribution modelling also requires certain assumptions about mitigation interventions and the behaviour of the actors involved. As explained in section 2.1, the attribution analysis is applied to a mitigation program in which both climate finance and carbon markets contribute to all of the investments involved, and so contribute to all mitigation outcomes. Programs that implemented in discrete components such that only climate finance or carbon market support a given component, or where the individual activities within the program were only supported by one type of finance, would not require attribution analysis.

The framework conditions for the modelling include the following:

- The unit abatement cost of the mitigation intervention is higher than for the set of interventions that the host country has selected to achieve its unconditional NDC.[17] Therefore, the emission reductions from the project are not required for the host country to meet its NDC and transferring them will not jeopardize the achievement of the NDC.
- The unit abatement cost of the mitigation intervention is lower than the domestic abatement costs of a potential buyer country (i.e., the cost of the most expensive measure it will implement to meet its NDC goal), so there is a possibility for both countries to gain from a carbon market trade.
- Climate finance donors have pledged funds to contribute to the mitigation intervention, but these funds (measured in grant equivalent) are not sufficient to cover the total abatement cost. In other words, there is still a gap in covering the total abatement cost to fully implement the mitigation intervention. This is an important assumption, because it means that the baseline to which we compare the blended finance mitigation intervention is a scenario where there is only climate finance – not a scenario without any cooperation at all. Because the focus of this analysis is on blended finance, then it must address the question of what happens when you add a carbon market contribution to climate finance, and how this impact varies according to the attribution approach.
- Climate finance donors are focused on providing funds only when necessary, so if carbon markets could provide the entire necessary funding to cover the total abatement costs, climate finance would be reduced (or eliminated) accordingly.
- In the current scenario without a global market price for ITMOs, the contribution envelope from carbon markets for a given intervention is essentially fixed, so that the minimum ITMO price is determined by the allocation approach.
- ITMOs which are transferred by the host country are then used towards the buyer country' NDC goal.

Next this model investigates how the attribution approach affects the ITMO price and emissions outcomes in the scenario without a global market price for ITMOs, building on the earlier study on attribution. As mentioned, the focus is on scalable mitigation interventions where partial implementation is possible. For a scalable mitigation intervention, if all of the emission reductions are attributed to carbon markets (i.e., the total volume of emission reductions are converted to ITMOs), the climate finance essentially subsidizes the price of ITMOs – in other words, the ITMO price will be lower than the unit abatement cost of the mitigation intervention. If the emission reductions are attributed proportionally between carbon markets and climate finance, on the other hand, the price of ITMOs will be the same as the unit abatement cost and the volume of transfer will be lower than in the "all to

[17] While the host country might decide to include some higher cost interventions as part of what it will implement for its unconditional NDC (e.g., because of the other benefits of the interventions or alignment with national or sectoral policies), generally countries are likely to select lower-cost interventions for their own implementation, to minimize the overall cost of complying with their unconditional pledges.

carbon markets" approach. In fact, because of the larger volume of transfers in the "all to carbon markets" approach, global emissions will be higher than in the "proportional attribution" approach or a scenario without any carbon market at all (but with the climate finance contribution to reduce the host country emissions, as explained in the bullet points above). This is because, under the "all to carbon markets" approach, the emission reductions supported by climate finance no longer help the host country go beyond its unconditional NDC (which they would if there were only climate finance with no related transfers), but instead the transfers allow the buyer country to emit more and still reach its NDC goals. The "all to carbon markets" approach would therefore violate the principle of environmental integrity. For a quantitative explanation of this, see Annex A.

The situation would be somewhat different under a scenario with a global market price. In this market scenario, carbon market actors will not buy ITMOs at a price that is higher than the global market price, so the participation of carbon markets depends on the price of ITMOs relative to this market price. With a high world price (i.e., higher than the unit abatement cost of the mitigation intervention), carbon markets could actually cover all of the total abatement costs. In this case, climate finance would not be necessary, so the climate finance providers would redirect this support to other mitigation interventions. The attribution approach does not have an impact in this case, because the climate finance would be replaced by carbon markets (i.e., so no need for blending). As long as this climate finance was still used to support a similar level of mitigation elsewhere (i.e., in another country or in another program in the host country), global emissions would not change. With a low world price (i.e., below the unit abatement cost of the mitigation intervention), under "proportional attribution", there would be no participation from carbon markets, so only the portion of the program that could be supported by climate finance would be implemented. Under "all to carbon markets", the climate finance would subsidize the ITMO price, so it could potentially be below the relatively low market price. In that case, carbon markets would participate, the intervention could be fully financed, and there would be similar environmental integrity issues as in the case with no global market prices. In other words, since all of the emission reductions would be transferred and allow the buyer country to emit more, this scenario has higher global emissions than the baseline scenario in which climate finance supported some mitigation in the host country and there were no carbon markets at all.

The main outcomes of an attribution modelling analysis are summarized in Table 1. This highlights the environmental integrity risks from the "all to carbon markets" approach to attribution. For project-based activities where carbon market support is "last in" (i.e., all other financing, including some climate finance has been secured), these risks would be lower (see detail in Annex A). However, such activities are likely to be the exception rather than the rule, as the emphasis on scaling-up climate action increases.

Table 1. Implications of attribution approaches on global emissions and mitigation costs, for scalable mitigation interventions in different carbon market environments

Attribution approach	*Carbon markets scenario*	*Mitigation financed?*	*ITMO price compared to unit abatement cost*	*Global emissions*	*Global mitigation cost*
Baseline*	No participation of markets	Partially	N/A – no ITMOs	Baseline	Baseline
All to carbon markets	No world price	Fully	Lower	Increased	Decreased
Proportional	No world price	Fully	Equal	Baseline	Decreased
All to carbon markets	World price (high)	Fully, but with no climate finance	Lower	Baseline**	Decreased
Proportional	World price (high)	Fully, but with no climate finance	Lower	Baseline**	Decreased
All to carbon markets	World price (low)	Fully***	Lower	Increased	Decreased

Attribution approach	*Carbon markets scenario*	*Mitigation financed?*	*ITMO price compared to unit abatement cost*	*Global emissions*	*Global mitigation cost*
Proportional	World price (low)	Partially	No trade, since potential price > market price	Baseline	Baseline

Notes:
* The baseline is a scenario in which some climate finance support is available for the mitigation (not sufficient for entire intervention), but there are no carbon markets.
** This holds as long as the climate finance is now used for other mitigation interventions, since it is no longer needed for this particular mitigation intervention.
*** This assumes that the subsidized ITMO price created by the climate finance is lower than the relatively low global market price.
Source: Authors' analysis

4. State of awareness with key actors

This section summarizes some of the views and early experiences by potential host and buyer countries and provides an overview of funds for Article 6 as well as major climate finance providers. In order to profit from experience as much as possible to elaborate on conceptual as well as practical/implementation issues with attribution (see sections 5 and 6), the focus was on stakeholders that are already thinking about attribution. Nevertheless, the interviews showed that it is early days and many practical issues still need further elaboration.

There seems to be general awareness on the importance of attribution and support for the proportional approach among almost all interview partners. One interview partner contended that the Paris Agreement rulebook addresses attribution in Decision 18/CMA.1, Annex, paragraph 121(m), which requires countries to provide information on "how double counting was avoided between the resources reported as provided or mobilized, and the resources used under Article 6 of the Paris Agreement by the buyer Party for use towards the achievement of its NDC".[18] Some host countries have a particular interest in the issue in order to benefit from both sources by distinguishing between the resulting emission reductions from climate finance and carbon markets. Given the lack of agreed rules for Article 6, some countries are also starting with climate finance and hope to add carbon markets to their international cooperation on mitigation later.

Most climate finance facilities are familiar with the general concept of attribution – although not with the same meaning as in this report – because the projects and programs that they support often include co-financing arrangements with other public and private actors (both domestic and international). Attribution of results is therefore something that is generally relevant and – to varying degrees – already practiced by climate finance facilities as part of their reporting and evaluation processes. The methodologies and approaches that facilities apply often differ between projects and the type of project partners that are involved. While proportional attribution is practiced in some cases where all contributors pursue similar mandates, there might be situations where actors that co-fund a mitigation activity are mainly interested in different results (e.g., improved health, women's economic empowerment) that are delivered by the particular project. In these cases, other attribution methodologies might be more accurate, such as allocating the results according to each contributor's mandate. If other contributors do not have mitigation goals for their financing, the contribution by the climate finance facility often functions to cover the increment for the mitigation part. Hence, this

[18] Another interview partner referred to the San José Principles as a relevant basis for proportional attribution, as they stipulate the application of "allocation methodologies […] that support domestic NDC achievement and contribute to achievement of the Paris Agreement's long-term temperature goal".

approach follows a logic similar to that of the “all to climate finance approach” described in section 3. One climate finance provider interviewed emphasized that they do not attribute results towards different donor contributions as they do not have a mandate for this.

There is currently limited experience in blending climate finance with carbon markets. This reflects the fact that historically some of the key donors preferred to keep both instruments separate. One interviewee raised the concern that climate finance providers are less aware of the issue of attribution, and that this might be a barrier to realizing the benefits of blending of climate finance with carbon markets. While some actors have only started initial expert discussions, others have already addressed the principle of attribution in bilateral agreements and so now must address more practical challenges. In the bilateral agreements that Switzerland has signed with both Ghana and Peru, for example, one of the articles emphasizes that emission reductions shall originate from activities that “[…] apply attribution of the mitigation outcomes to the sources of finance, where adequate”.

Multilateral funds currently lack policies that would govern blending of climate finance and carbon markets. Interviewees emphasized the need for clear rules on attribution as a prerequisite for blending, in order to avoid double counting of emission reductions. In the absence of such rules some funds currently oblige implementing entities to retire any carbon credits from projects that receive climate finance. This has limited the potential for blending financing and synergies between climate finance and carbon markets.

Most Article 6 pilot programs have not developed far enough to address attribution at a practical level yet. Several interview partners raised concerns and the need for clarification of open questions about the concrete implementation on program and project level. Questions raised during the interviews included issues such as:

- whether to include domestic financial resources in the analysis (see section 5.1);
- when the attribution analysis and decision should take place (see sections 6.1);
- whether attribution should be revised during the project life if the financial flows change (see section 6.2);
- whether there is a difference in the effectiveness of different financial sources in contributing to mitigation (see section 6.4); and
- how to address the lack of availability of data on financial sources and transparency (see sections 6.6 and 6.7).

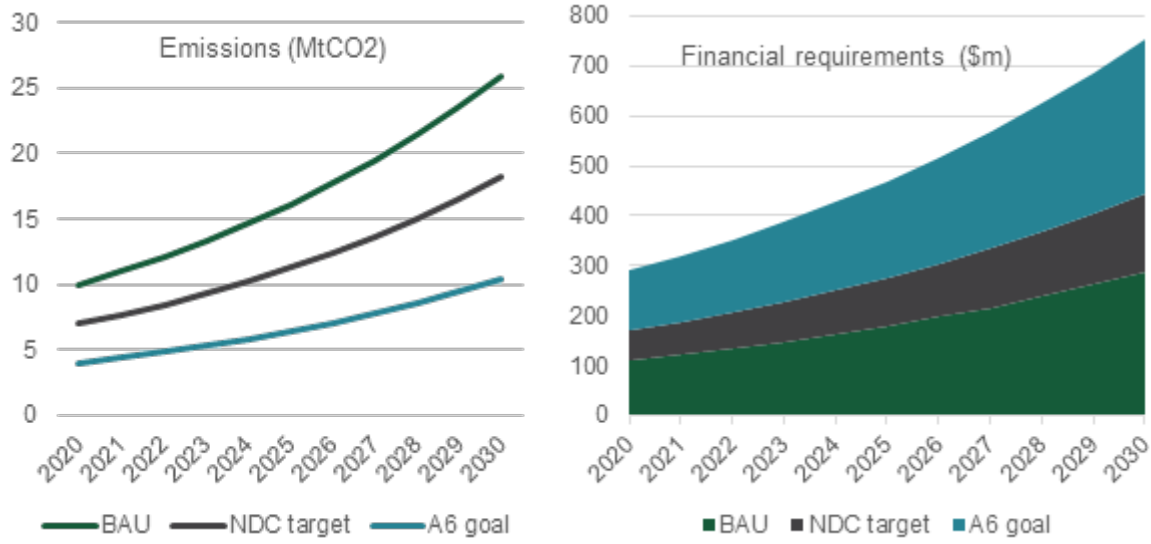
Because of limited resources, the number of interviews was limited to a few actors that currently address these issues in Article 6 pilot activities. Some of the interviewees indicated that the general level of awareness and knowledge of Article 6 actors on the topic of attribution is low. The interviews showed that there is a great interest in exchange of experiences and in learning from each other’s experience. Thus, exchange through webinars and side events as well as information and input for more formal bilateral and multilateral discussions seem to be of interest and could bring attention to the importance of proportional attribution as well as possible practical implementation issues.

5. Conceptual issues with attribution

5.1 Attribution and baselines: host country and private sector contributions

A common question when discussing attribution with stakeholders is “what about the host country’s contribution? If the host country government is also providing some form of incentive or support to low carbon and climate resilient development, then why is this not considered in the attribution analysis?” The answer to this question relates to the crediting baseline for Article 6 cooperative activities.

Countries with ambitious NDC goals will indeed have financial requirements[19] to meet those goals on top of the financial needs for BAU investment (Figure 1, right side, grey and green areas). As discussed earlier, recent research on Article 6 suggests, where possible, setting the baseline for Article 6 activities at the emission level of the host country's NDC, to reduce the risk of overselling (Figure 1, left side, grey line). This would mean that the financial requirements for the Article 6 mitigation intervention are only those for the emissions level beyond the NDC target ((Figure 1, right side, blue area).



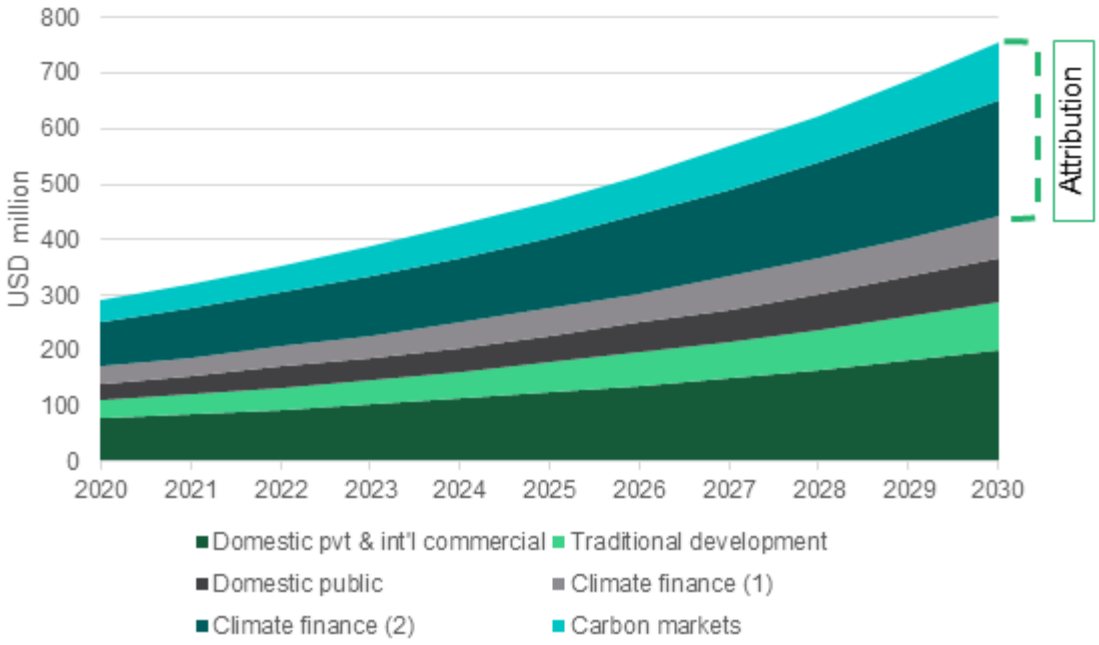
Source: Adapted from Fuessler et al. (2019)

Figure 1. Illustration of emissions goals (left) and financial requirements (right)

In terms of sources for these financial requirements, BAU levels of investment could come from the private sector both domestically and internationally (Figure 2, light and dark green areas). To meet the NDC, the host country will need to provide additional public funding (Figure 2, dark grey area). In addition, some climate finance facilities – and even traditional development assistance – may support host countries in reaching their NDC goals (Figure 2, light grey area). Finally, to move from the NDC goal to the Article 6 program goal will require financial support from climate finance and carbon markets (dark and light blue areas) – and it is here that attribution is required.[20] The other streams of finance are not included in the attribution analysis because they do not contribute to moving beyond the NDC goal to the Article 6 program goal.

[19] The financial requirements for the Article 6 program goal shown here are the annualized (i.e., levelized) equivalent of the total abatement cost.

[20] While some climate finance sources may be used for the NDC target, the Article 6 program defined in this analysis is one that is explicitly beyond the NDC goal, so all of the financing sources are dedicated to going beyond that NDC target. The difficulty of identifying the different sources will depend on the scope of the program and articulation of the NDC goals (see section 6.3).



Source: Adapted from Fuessler et al. (2019)

Figure 2. Illustration of financing sources for BAU, NDC goal and Article 6 program

Of course, an alternative would be to set the baseline at the BAU level of emissions and calculate total emission reductions as the difference between BAU emissions and the Article 6 program goal (Figure 1, green and blue lines). In this case, attribution would be needed for not only climate finance and carbon markets, but also the domestic public financing supporting NDC achievement (i.e., Figure 2, light grey, dark grey, light blue and dark blue areas). While this approach may be necessary when it is difficult to identify a baseline scenario that reflects the host country's NDC goals, the more different the sources of financing involved, the more complex the analysis becomes, and the more data sources and analysis is required. The most important conclusion is that the choice of baseline will determine which types of financing must be considered in the attribution analysis. Where the baseline is BAU, domestic public finance contributions would need to be considered alongside international climate finance and carbon markets.

5.2 Additionality for project-based and programmatic interventions

The concept and application of attribution is also related to additionality assessment, in the sense that attribution analysis examines what would have happened without the impact of carbon markets. Projects are generally considered additional if they would not have been implemented without the incentives provided by the crediting mechanism (Michaelowa, Hermwille, et al. 2019; PMR 2021). In other words, a project proponent must demonstrate that, without support from carbon markets, no mitigation activity would be implemented. Under the CDM and other earlier carbon markets, additionality was generally viewed as a binary "go/no-go" assessment, which often included an analysis of the potential financial returns to demonstrate that the project was not financially viable without carbon market support (Gillenwater 2011; PMR 2016). Even in cases where a project might have had access to concessionary climate finance, the additionality assessment still had to show that no implementation would have happened without carbon markets. Within this framework, stakeholders have argued that attribution is not necessary, because it is only the "last in" carbon market contribution that makes the difference in project implementation, not any climate finance that might have been secured earlier. There are problems with this argument, however:

- Even if carbon markets were the last financing source identified, if any of the climate finance support pulled out, the project would still not happen. So, the climate finance was no less essential to covering the total abatement cost of the mitigation activity than carbon markets.
- The climate finance sources were not always known or identified in the additionality assessment, since this was not a requirement under most crediting programs.
- More importantly, once the mitigation intervention expands to cover multiple activities or even sectors rolled out over time, it becomes more difficult to argue that, for every single installation, nothing would happen without carbon markets. This is because partial implementation (i.e., at a subset of facilities) might be possible with only the climate finance, so that carbon markets are not “last in” for every site.

As discussed in section 3, for scalable mitigation interventions, the question is not whether any mitigation will happen, but how much mitigation can be financed. The binary model for project-based activities is clearly not relevant for this type of activity, which is increasingly the focus on most Article 6 pilots (Greiner et al. 2020).

5.3 Implications for scaled-up crediting

In addition to project-based crediting and programmatic crediting, some Article 6 pilot activities are also exploring scaled-up crediting, although these are all in early stages of development. Based on a recent TCAF paper (TCAF 2021), scaled-up crediting can take several forms, and is conceptually different from even large-scale programmatic interventions. Scaled-up crediting includes the following:

- *Jurisdictional crediting:* For this type of crediting, the system boundary is not defined by a set of physical sites, facilities or even households but instead the physical boundaries of a national or sub-national jurisdiction. Baseline emissions for the entire jurisdiction are fixed ex-ante, so that the crediting baseline is a fixed emission level to which total emissions in the jurisdiction with the mitigation program are compared. In other words, emission reductions are not estimated or measured based on specific technological or behavioural interventions but calculated from the change in the total GHG inventory of the jurisdiction.
- *Sectoral aggregated crediting:* Similarly to jurisdictional crediting, this approach compares total program emissions (i.e., emissions after the start of the crediting program) of an entire sector to a fixed level of sectoral baseline emissions. Baseline emissions could be fixed at an absolute level of emissions or emissions intensity (e.g. tCO_2/MWh). Emissions reductions are based only on the total change in emissions for the entire sector, regardless of how these are achieved – nor would any specific interventions within the sector be monitored, since it is only the net impact of all changes in the sector that determines emission reductions.
- *Policy-based crediting:* this approach uses modelling to determine the emissions for both the baseline counterfactual scenario and the program scenario, with the only change in the two modelling exercises being the introduction of the policy-based crediting intervention (e.g., application of a carbon tax or emission-related incentives). In other words, although the modelling approach – often macroeconomic modelling tools – are calibrated to the national or sector economy, neither baseline nor program emissions are based on direct measurement of the GHG inventory. This is necessary to isolate the impact of the policy intervention from the many other drivers of economic output and emissions.

Jurisdiction and sectoral aggregated crediting present particular challenges for attribution. First, unlike project-based or programmatic interventions, the project proponent may not know in advance which specific technologies will be used to meet the program goals – and therefore may not know the total abatement costs and financing requirements. Given the scale of these interventions, it may also be more difficult to identify all the climate finance sources that might contribute to the eventual mitigation, unless they are clearly dedicated to the relevant sector or sub-national jurisdiction. Given the importance of attribution, therefore, more effort will be required for these proposed crediting approaches to estimate mitigation costs (i.e., unless all of the actual funding sources are already known, so it is just a matter of converting them to grant-equivalent) and survey the relevant sources of

climate finance both upfront and on an ongoing basis (see section 6.1 for a discussion of ongoing monitoring).

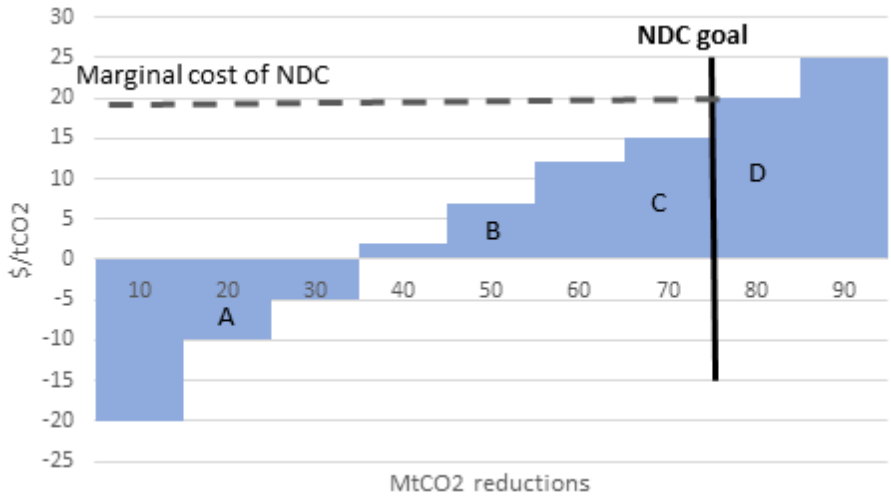
For policy-based crediting, while it may still be difficult to identify all of the relevant sources of climate finance, the benefit of the modelling approach is the possibility of isolating the impact of the specific policy supported by carbon markets from other climate finance support to mitigation. For example, if policy-based crediting were used for a sectoral carbon tax, then the baseline modelling could include the impact of any mitigation incentives already provided by climate finance facilities (e.g., concessional loans to cleaner production facilities in the sector). This means that the calculated emissions reductions would only be those from the carbon market-supported policy, already excluding the impacts of climate finance. As with the other forms of scaled-up crediting, policy-based crediting remains at the conceptual stage of development. Nevertheless, it is important to consider attribution issues when designing a demonstration program. This should start with an assessment of the overall mitigation costs required to achieve the desired objectives, in order to understand the financing that will be needed from all sources, even if those sources of financing are not known.

5.4 ITMO pricing

As discussed earlier, one of the disadvantages of the “all to carbon markets” approach is that the price of ITMOs may be quite different from the unit abatement cost of the underlying mitigation intervention. In fact, using “all to carbon markets” would mean that, for a given mitigation intervention, the more climate finance used, the cheaper the ITMOs would be. This sends incorrect information to global markets on which mitigation interventions are or are not cost-effective, and distorts the flow of carbon market payments, so that carbon market funds may not be used efficiently. ITMO pricing should ideally not depend on the underlying financial structuring but should reflect the real abatement costs of the interventions. The “proportional attribution” approach will support transparent ITMO pricing that matches the underlying abatement costs. This will make it easier for both climate finance providers and carbon market funders to allocate resources where they can be used most effectively. This holds in both the current situation of project-specific pricing and also in the future as the global carbon market develops.

Some recent literature of overselling (e.g., Spalding-Fecher et al. 2020) has noted that, for mitigation interventions that are within the measures a host country has selected for its NDC (i.e., the “NDC package”, such as options A, B and C in Figure 3), these could only be used for Article 6 if the host country received sufficient funding to replace these mitigation options with more expensive ones. In other words, the ITMOs should be priced at the marginal cost of meeting the NDC, not the abatement cost of the specific mitigation intervention. An example of the financial flows between the different government and non-government actors to illustrate this are shown in Annex B. However, this analysis focuses on mitigation interventions that go beyond the NDC and are outside of this NDC package (e.g., option D in Figure 3). Their abatement cost would be expected to be higher than the marginal cost of meeting the NDC, and so no opportunity-cost pricing adjustment would be necessary.[21]

[21] There could, of course, still be adjustments to reflect the uncertainty of NDC achievement and of the impact of the mitigation intervention.



Source: Authors

Figure 3. Illustration of marginal abatement cost curve, NDC goal, and marginal cost of NDC

6. Practical/implementation issues with attribution

6.1 Timing of attribution analysis

In cases of blended finance, carbon market funders would need to consider attribution analysis quite early in the project development process, since this will affect the volume of ITMOs that can be authorized. This analysis might also need to be conducted in parallel with any national requirements for an approval process prior to authorization of ITMOs, because the host country may also be concerned about the proper attribution of emission reductions. The challenge is that – particularly for large, scalable interventions – the earlier the analysis is done, the less that may be known about all the streams of financing needed to reach financial closure across the entire intervention, making it difficult to identify all of the relevant streams of financing. This is even more difficult with programmatic interventions that roll out across a sector over many years, and where little may be known upfront about how specific investments within the program will be financed. However, even for these scalable, programmatic interventions, the carbon market project proponents are able to estimate the total abatement costs for the mitigation intervention early in the process – even if these estimates are further refined later. The estimate of total abatement costs could therefore be used as the starting point for the attribution analysis. For example, if the total abatement cost for a 10 $mtCO_2$ mitigation program covering a large number of municipal solid waste management sites is estimated at USD 200 million (i.e. an abatement cost of USD 20/tCO_2), and the carbon market funder will be providing an expected envelope of USD 50 million for purchasing ITMOs, then the expectation should be that 25% of the emission reductions (i.e., 2.5 $mtCO_2$) from the total program will be attributed to carbon markets and transferred as ITMOs – even if the sources for the other USD 150 million have not yet been identified when the carbon market contracts are signed and the ITMOs are authorized. If the carbon market participant would like to purchase more of the ITMOs, then they would need to provide a larger funding envelope. The abatement cost analysis is critical, because it would not make sense for a country to agree to ITMO transfers at a price of, for example, USD 10/tCO_2 when the actual abatement cost of the intervention is USD 20/tCO_2.[22] While the carbon market funder could, in principle, agree to pay

[22] Recall that the analysis of mitigation inventions in this report is all for interventions that are outside of the set of actions the host country has chosen to reach its unconditional NDC. In other words, in Figure 3, these are to the

more than the abatement, the only way the host country could accept a price below the abatement cost is if the “all to carbon markets” attribution approach were used, and climate finance could subsidize carbon markets. As explained in this report and elsewhere, this would not be a desirable outcome and would weaken the environmental integrity of Article 6.

6.2 Revision of attribution analysis and addressing gaps in financing

Agreeing on the attribution of emission reductions at the start of a project or program creates greater certainty for the carbon market participants, as opposed to a transaction in which the attribution might change over time. This is why the proposal in the previous section is so important: by estimating the total abatement costs and the carbon market funder’s share of this financial contribution, the attribution can be established even when not all of the sources of financing are known at the start of the program.[23] However, the total abatement cost – as well as the size and mitigation potential of the mitigation program – is only an estimate, and better information may be available after implementation begins. In addition, technology options, performance and costs change over time, which may also affect the parameters related to attribution. For these reasons, one option would be to specify a process by which the attribution analysis might be revised in the future, and under what conditions could happen.

For example, in the previous section, the carbon market funder is contributing USD 50 million out of a total estimated abatement cost of USD 200 million. Once the program is three years into implementation, it may become clear that the total abatement cost will only be USD 100 million, so only another USD 50 million in grant equivalent financing is needed for the entire program. In this case, it might make sense to revise the attribution to carbon markets upward to 50% instead of 25%. In a different example, the program proponents and funders may decide after several years of operation that the realistic mitigation goal for the program is only 7.5 $mtCO_2$ and this will require only USD 150 million in total abatement cost. In this case, the attribution analysis could be revised to attribute 33% of the emission reductions to the carbon market funding – although this would not change the absolute quantity of emission reductions received (i.e., 2.5 $mtCO_2$).

If revisions are considered, the time frame and frequency will depend on the nature of the intervention (e.g., single project investment versus larger scalable intervention) and whether the underlying investments have reached financial closure.

6.3 Relationship to external standards

Some Article 6 activities may rely on existing independent crediting mechanisms such as Gold Standard or Verified Carbon Standard to quantity and MRV emission reductions that can then be authorized as ITMOs. Currently, the rules of these standards do not address the issue of attribution. For the future, standards can address the issue of attribution in two ways: either within or outside their own methodology, MRV, registration and labelling processes.

In the first option, standards would include requirements on attribution into the MRV, registration and labelling processes. In their guidance documents, standards would not only include the principle of proportional attribution and the requirement to use the “grant-equivalent” value of financial instruments, but also provide options on attribution methodologies that need to be used. Project proponents would then need to provide the relevant information on the different financial sources and the respective

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right of the “NDC goal” line. This is why the abatement cost can be used as the ITMO price. If the interventions were inside the set of NDC actions, a higher cost would be needed to reflect the opportunity cost of replacing the mitigation activity to still meet the NDC goals.

[23] Of course, the carbon market project participant might decide to increase its funding envelope to purchase a larger share of the mitigation outcomes. However, as explained in the previous section, the ITMO price would still need to be at least as high as the abatement cost of the intervention. The funding envelope is simply this price multiplied by the amount of ITMOs that the buyer wants, which might increase in the future.

proportional attribution. This would allow the standard to verify the attribution information and certify the emission reductions (e.g., with a label) that result from the correct application of the standard's attribution rules and have environmental integrity.

In the second option, standards would see attribution as outside of their scope. The would simply require that the project proponent provide relevant information on the attribution approach chosen for registered projects and/or verified emission reductions. In this approach, the project proponent would be responsible for developing and correctly applying an attribution approach[24] and there would be no verification and certification of the attribution approach from the standard. The emission reductions that were attributed to climate finance could be retired or cancelled. The verification by the standard would demonstrate the impact of the climate finance, and this mitigation impact would not be monetized in carbon markets. This might pose a risk for the standard because some attribution approaches could compromise environmental integrity, but the choice of approach would be out of their control. If the proportion of emission reductions is attributed to a larger extent to carbon markets than it should be, considering its financial contributions, global emissions could increase as the result of the carbon market and environmental integrity might be compromised, which might also affect the underlying standard (see section 2.3 for the implications of an "all to carbon markets" approach). Therefore, program standards may consider integrating attribution rules and modalities in their regulatory systems.

6.4 Relative value of financing and timing

This discussion of attribution in this report treats all (present value) cash flows from (grant equivalent) climate finance and carbon markets equally, regardless of their origin, purpose or classification. While a loan that provides upfront financing has a different value to the project proponents than carbon revenue received after implementation, this difference is addressed through discounting all cash flows to present value. The designation of the climate finance (e.g., whether it is an explicit "climate mitigation" fund or a fund focusing energy efficiency investments or improve waste management for cites) is not considered relevant. One issue raised in the stakeholder interviews was whether financing that is subject to greater risk should be somehow attributed with more emissions reductions per dollar – in other words, whether risk (or perhaps the timing of the financial flow) should affect the attribution. In some cases, for example, carbon market funders are the first movers in large mitigation programs and can help catalyze greater long-term change and replication in the sector. Should this financing therefore be given a higher attribution per dollar provided in carbon market payments compared to the grant equivalent of climate finance contributions? There are several reasons why this would not be recommended:

- Even if carbon market players are early movers and catalyze action, the actual financial flows always come after implementation,[25] and in some cases might come a few years after the project proponent makes an investment commitment.
- Similarly, the carbon market players are not taking "risk" if their payments are only made ex-post. They will not lose money if the mitigation program fails to deliver emission reductions.[26] The risk is only that the carbon market player must then find other sources of emission reductions, which might not be available at the same price.

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[24] This option is similar to the current situation where attribution is not addressed by the standards and thus left to the buyer and host countries. Thus, while the standards are verifying all emission reductions of a project/program, only part of these are authorized as ITMOs by the competent authorities of the buyer and host countries.

[25] The exception would be when a carbon market player agrees to a partial upfront payment, but this has historically not been the standard practice. It could become more widely used as competition for scarce ITMOs increases.

[26] In some cases, carbon market funders might choose to provide a portion of the ITMO payments upfront. This is not common in the current Article 6 pilots but could change over time as the market matures.

- Finally, while carbon market funds could have broader catalytic effects on long-term mitigation, the same can be said of climate finance facilities. In fact, all sources of mitigation financing should be designed to maximize the transformational impact of that financing.

6.5 Defining climate finance

Different actors have a different understanding of the term “climate finance”. The Standing Committee on Finance under the UNFCCC, in its first Biennial Assessment and Overview of Climate Finance Flows (SCF BA) in 2014, considered technical work on operational definitions of climate finance and offered a working definition: “Climate finance aims at reducing emissions, and enhancing sinks of GHG and aims at reducing vulnerability of, and maintaining and increasing the resilience of, human and ecological systems to negative climate change impacts” (SCF 2014).

An operational definition for climate finance is important to track climate finance flows and measure progress against commitments such as the USD 100 billion goal by 2020. The main institutions and initiatives that undertake tracking of climate finance include: the above-mentioned SCF biennial assessment, the OECD Creditor Reporting System, the OECD Research Collaborative on Tracking Private Climate Finance, the Climate Policy Initiative’s Global Landscape of Climate Finance reports, and the Joint Reporting on Climate Finance by the Multilateral Development Banks. The type of flows that are tracked under each initiative differ because of the mandate and scope of the reporting system. The SCF biennial assessment and Climate Policy Initiative’s Global Landscape of Climate Finance, for example, look at a broad variety of sources that include public and private financial flows on both the domestic and international levels. The OECD primarily looks into flows provided by its government members, while the multilateral development banks report on climate finance flows within their portfolio. The SCF biennial assessments also include a useful overview of how each organisation defines the term climate finance.

In the context of attribution, further specificity is needed, because the key issue is whether the financing results in the transfer of emission reductions or not – and not just what types of activities are supported. First, climate finance in the context of attribution is restricted to international public resources that cover the additional costs of low carbon and climate resilient investments. The rationale for only including public finance from international sources is discussed in section 5.1. Second, climate finance flows do not result in the transfers of emission reductions and therefore do not lead to corresponding adjustments for the host country. This is true even if the financing is “results-based climate finance” and if verification emission reductions are used as the trigger for payments – as long as no transfer occurs between countries.

6.6 Identifying relevant financing streams

Identifying the relevant financial streams of a mitigation activity is crucial for attribution. Thus, part of a project proponent’s due diligence should be to get an overview of the financing for a project or program. This information is the necessary basis for blending finance and managing a project. To get this overview, partners may be required to provide relevant information on the various financing streams. In international climate finance it may be assumed to be good practice that donor countries have full transparency about the identity of each of the sources of financial contributions and of recipients.

Carbon market payments are generally demarcated from other forms of financing. Other financial streams can have a variety of sources, magnitudes and uses. Technical assistance, support for policy reforms or broader capacity building are often one or several orders of magnitude smaller than the direct project finance (several million USD for technical assistance around a multi-billion USD investment). In addition, they might also be provided long before the crediting intervention begins and have a less direct causal link to the activity. Technical assistance – including support for policy reforms or capacity building - should therefore not be included in the attribution analysis, unless there is a clear link to the direct impact on the activity or program.

Data availability on the different financing streams can also be an issue. The larger the scale of the crediting intervention, the larger the number of potential financing streams may be needed. However, for larger scale interventions, including those that cover most or all of a sector, the host country government should be able to provide the relevant information. The general trend towards more transparency in finance for mitigation action will also foster the availability of better and more comprehensive data. Finally, there is already an extensive system of donor reporting on both climate finance and carbon market funding. Data on development projects (e.g., in the OECD creditor reporting system (CRS)) would be reported in the year after signing a commitment agreement, so most of the necessary data on projects in a given sector is available with a one-year delay. For the most recent projects, the project proponent could check with governments to ensure they are not missed. The OECD CRS, through the Rio Markers for identifying climate change projects, for example allows to search ODA and other official flows by recipient country, and a microdata function provides an overview of financial flows within a country on a project-by-project basis. Further, sectoral codes used by the OECD allow for filtering flows for a specific sector. Another relevant source for identifying climate finance flows is the biennial report that developed countries submit to the UNFCCC (from 2024 these flows will be part of the biennial transparency reports). Table 7 (b) of the biennial report in the common tabular format provides a project-by-project overview on climate finance provided. Nevertheless, the project proponent and the authorizing governments may also require that all financing participants provide transparent data on their contributions in order to have complete and up to date data.

Clearly defining a project or program activities is important, particularly the careful consideration of program boundaries. This can help to explicitly identify the financial sources considered and excluded (e.g., those for technical assistance, support for policy changes or capacity building). Making the project boundaries explicit can also help specify the information a project proponent needs from the partners. The chosen definition and boundaries should be clearly stated in the project design documentation.

All the aspects above should feed into scope of mitigation activities that is specified in the contract for the Article 6 program. Thus, the program/project definition and boundaries as well as the identified relevant financial sources should be made explicit as part of definition of the ITMO volume in the MOPA. In a MOPA, the parties could also include clauses for how or whether the attribution would be reviewed in the future (see section 6.2). Clearly stating such cases or making explicit what revisions are possible would increase certainty for all parties.

6.7 Tools for grant-equivalent analysis

As outlined above, for climate finance flows that are provided in form of concessional loans, only the grant equivalent of the loan is relevant for the attribution analysis. Counting only the grant-equivalent of ODA loans is international standard since the OECD in 2014 agreed to move away from the system to account these loans on a cash flow basis. As donor countries now must calculate the grant-equivalent of concessional loans provided to recipient countries, there is widespread experience with this methodology and both the OECD and the World Bank International Development Association provide a web-based calculator that can be used for this purpose.[27] The main concept and key steps are described here.

The grant element is calculated as the difference between the face value of a loan and the present value of repayments of cash flow and interest, expressed as a percentage of the face value of the loan. Four main factors determine the grant element: the interest rate, the grace period before

[27] http://tabsoft.co/1Dq0alP

http://ida.worldbank.org/financing/resource-management/grant-element-calculator

repayments are required, the loan maturity, and the discount rate used to represent standard commercial financing.

The discount rate is the key parameter in the calculation of the grant element. The higher the discount rate, the lower the present value of future repayments and the higher the grant element, all other things being equal. In 2014, the OECD agreed to apply three discount rates for calculating the grant element of concessional loans. They differentiate by the income category of the recipient country. The prescribed discount rates consist of two elements: a base rate that is equal to the IMF discount rate (currently 5%), and an adjustment factor that represents the risk of lending to specific country groupings.

Table 2 summarizes the parameters that were agreed by the OECD for the three country groupings: (i) least developed countries and other low-income countries, (ii) lower middle-income countries, and (iii) upper-middle--income countries. For calculating the grant-equivalents of a concessional loan, project proponents must identify the income group of the host country to set the correct discount rate.

Table 2. Parameters adopted in the 2014 agreement on concessionality of instruments

	Least developed countries and other low-income countries	*Lower middle-income countries*	*Upper-middle-income countries*
IMF rate	5%	5%	5%
Adjustment factor	4%	2%	1%
Discount rate	9%	7%	6%

Source: OECD (2014)

The following simplified example (adapted from OECD 2017)) is used to illustrate the methodology for calculating the grant equivalent of a loan: A loan provider extends a loan of USD 1 million to a recipient. The commercial market rate for such a loan would be 6% annual interest payments. Instead, the concessional finance provider extends the loan at a concessional level of 2% interest, with the interest being paid every year and the principal being repaid in a lump sum after ten years. The grant equivalent of this loan would be the amount extended, which is USD 1 million minus the total discounted repayments of USD 705,597, amounting to USD 294,403. The latter is the part of the loan that would be relevant for the attribution analysis.

Table 3. Simplified example for calculating the grant element of a loan (all numbers in USD)

Year	*Amount extended*	*Amount repaid - principal*	*Amount paid interest*	*Total repaid*	*Discount factor 1.06 per year compounded*	*Discounted repayments (present value)*
2021	1,000,000				1.0000	
2022			20,000	20,000	1.0600	18,868
2023			20,000	20,000	1.1236	17,800
2024			20,000	20,000	1.1910	16,792
2025			20,000	20,000	1.2625	15,842
2026			20,000	20,000	1.3382	14,945
2027			20,000	20,000	1.4185	14,099
2028			20,000	20,000	1.5036	13,301
2029			20,000	20,000	1.5938	12,548
2030			20,000	20,000	1.6895	11,838
2031		1,000,000	20,000	1,020,000	1.7908	569,563
Total						**705,597**

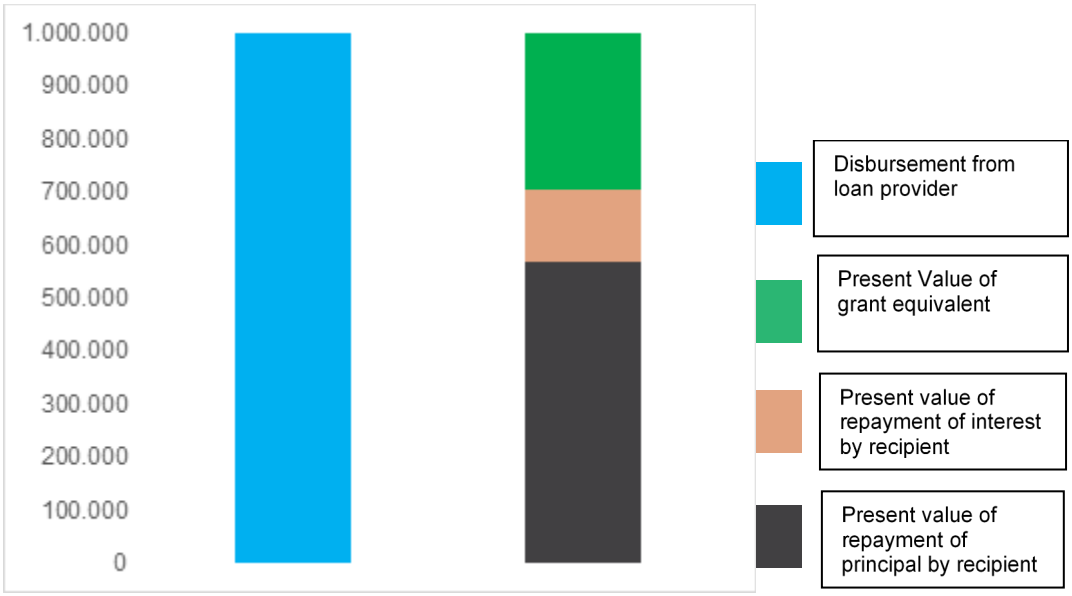

Figure 4. Illustration of different components of the concessional loan using the grant-equivalent methodology

At its 2016 high-level meeting, the OECD Development Assistance Committee decided to apply the grant equivalent method also to other non-grant instruments such as equities and guarantees. Work at the OECD currently continues on the parameters for such measurements.

7. Recommendations

The analysis in this study reiterates the earlier conclusions that proportional attribution of climate finance and carbon markets is essential when both sources of financing are supporting the same mitigation outcomes. This is true across all types of crediting (e.g., project-based, programmatic, scaled-up), with the understanding that this implies that the crediting baseline incorporates the NDC targets, so there is no need to attribute mitigation outcomes to host country government financing. This

proportional attribution should be agreed early in the development of mitigation programs, and is possible even when not all the financing sources are known, by estimating the total abatement costs for the mitigation intervention relative to the carbon market contribution. The benefit of establishing those costs and attribution upfront is that they then only need to be revised when there is a material change in the overall scale of the program or the total abatement costs required to realize the mitigation. In addition, the MOPA governing the ITMO transaction could include conditions for how or whether the attribution would be reviewed in the future. Clearly stating such cases or making explicit what revisions are possible would create more certainty for all parties.

Attribution analysis should focus mainly on financing streams that support implementation and investment, rather than the smaller funding for activities such as technical assistance and capacity building. All financing streams should be converted to the grant value equivalent to conduct the attribution analysis. This analysis can utilize existing tools for the grant value of concessionary loans, but more work is needed for other financing instruments. An important future step in supporting attribution would be to develop attribution tools that can be used by project proponents, which would combine the grant-equivalent calculations for climate finance instruments with the expected carbon market contributions.

While both host countries and buyer countries can support the practice of proportional attribution, host countries have a key role in the rules they set for climate finance contributions as well as the authorization criteria for ITMOs, both of which could include a requirement to conduct attribution. The host county government could support potential carbon market project participants in identifying existing climate finance programs in a sector that might need to be included in the attribution analysis.

Because of the limited experience in blending climate finance with carbon markets, governments and funders need to raise awareness among key actors in climate finance and carbon markets and also support them in applying these attribution principles to pilot programs. This could include: providing information for the relevant processes on climate finance and carbon market, organizing exchanges among key actors on practical issues after program implementation, and sharing experiences with attribution. Multilateral funds are generally aware of the opportunities that blending climate finance and carbon markets provide and see increased interest in this topic within the networks of their implementing partners, so they can be key contributors to exchanges and sharing experience.

Independent crediting standards could also have an important role to play in attribution. One option could be that standards would require project proponents to provide relevant information based on attribution methodologies as a part of the standard. The other option would be that standards only require reporting of information on attribution, but project proponents could choose their own approach to attribution. To ensure consistency and high environmental integrity, independent standards should consider integrating attribution rules and modalities in their regulatory systems. In addition, they could use the current piloting phase to test options and make an informed choice based on experience.

While this study focuses on the interaction of climate finance with compliance carbon markets under Article 6, attribution could also be in issue for voluntary carbon market transactions, which are rapidly becoming more numerous. Future research is needed to assess the environmental integrity implications of blending this voluntary carbon market financing with climate finance, and even ruling out double counting with compliance carbon market funding. The sooner policy makers and funders can agree on the relevant policies that would govern such approaches, the easier it will be to pilot innovative blending approached to scale-up mitigation cooperation.

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9. Glossary

Term	*Meaning*
Buyer country	The country that receives the transferring mitigation outcomes and uses them for purposes of NDC compliance; the “corresponding adjustment” in this country would be to adjust its reporting emissions by subtracting the amount of the transfer.
Carbon credit	Credits stem from a crediting program. They are calculated as the difference of emissions between a baseline scenario (that is, that which would have occurred in the absence of the scheme itself) and the actual prevailing (or “project”) scenario. Credits accrue to the entity responsible for the action.
Corresponding adjustment	The requirement under Article 6 that both countries involved in any transferred mitigation outcomes adjust their reported emissions (or other metric) for purposes of NDC compliance; the buyer country subtracts the amount of the transfer to adjust its reported emissions, while the host country adds the amount of the transfer to adjust its reported emissions.
Crediting program	A system that recognizes that a certain action (project, policy, measure) has delivered emission reductions compared to a scenario without the emission reduction incentives.
Host country	The country that hosts the activity that generates the emissions reductions that are transferred. The “corresponding adjustment” in this country would be to adjust its reported emissions (or other NDC metric) by adding back the amount of the transfer
International carbon markets	This includes Article 6.2 and 6.4 cooperation, as well as existing international linking of ETS, use of international offsets in carbon tax and ETS, as well as international crediting programs (e.g., CDM, Verified Carbon Standard, Climate Action Reserve, Gold Standard, etc.).
Internationally transferred mitigation outcomes (ITMOs)	Mitigation outcomes that are transferred from one country to another for purposes of NDC compliance (or other international uses such as CORSIA).

Term	*Meaning*
Mitigation outcomes	An umbrella term for what can be transferred between countries under Article 6.2 or 6.4. This covers ITMOs and Article 6.4 emission reductions. While mitigation outcomes will often be in units of tCO_2-eq, Article 6.2 transfers may also occur using other units (e.g. MWh renewable electricity).
Offset	Use of credits towards meeting a particular greenhouse gas related commitment (e.g. mandatory cap, compensation scheme, carbon tax liability, purely voluntary).

Annex A. Modeling attribution approaches in different market environments

A simplified numerical model has been used to evaluate the effects of different attribution approaches under various framework conditions and assumptions. The focus is on large, scalable mitigation interventions, such as programmatic or sector-wide mitigation interventions, where partial funding would lead to partial implementation (i.e., as opposed to a binary "go/no go" project investment decision). Additional implications for single projects are discussed at the end.

The model is structured in two parts:

- Part 1. First, the commercial value and emissions of a conventional investment are calculated as a baseline. These are compared to the commercial value and emissions of an alternative investment with reduced emissions. The total and unit abatement costs are calculated from the differences in net present value (NPV) and program lifetime emissions between the baseline and alternative investment.
- Part 2. Second, the model uses assumptions on the behavior and contributions from climate finance and carbon markets, as well as the buyer and host countries, to calculate the volume of transferred ITMOs, effective ITMO price, "global" emissions and mitigation costs.

Each part of the model is described below, followed by a demonstration using numerical input parameters.

Part 1 – Program financials

Framework conditions and assumptions

To model a scalable mitigation program in a country, the model assumes the following:

- The potential BAU investment uses conventional, high-carbon technology. This investment is commercially viable, based on capital costs, operational costs, non-carbon revenue and commercial interest rates.
- Furthermore, the model assumes that there is an alternative mitigation investment using more efficient, low-carbon technology. The technology has higher capital costs, equivalent revenue, and lower operational costs. The mitigation investment is not commercially viable when compared to the high-carbon alternative. The investment therefore would run a financial loss, which must be compensated if it is to be commercially viable.
- The financial loss can be compensated by climate-related financing. With sufficient funding from carbon markets and/or climate finance, the program could allow for a large scale-up of mitigation investments (e.g., solar home systems, small scale power plants, electric vehicles).

Simplifying assumptions

Some additional assumptions can be made to simplify the analysis without changing the fundamental results:

- Each investment activity within the scalable mitigation intervention is identical in terms of costs, benefits, and climate effects. The investment activity is replicable and can scale-up to a maximum potential (e.g., 200,000 identical activities).
- The support program is fully implemented in one year (i.e., all activities are realized in the same year).
- For simplicity, the model assumes that the commercial interest rate is identical to the project proponent's threshold internal rate of return for investments.

- The model assumes that the conventional program has a break-even NPV,[28] and the NPV of the mitigation program is negative. This NPV of the mitigation program is also the total abatement cost (in present value terms) for the mitigation program (i.e., the amount grant-equivalent climate finance and/or carbon market funding required to make the program viable).[29]

Numerical examples of inputs for part 1 are presented in Table 4.

Table 4. Example inputs of modeling Part 1

Input variable	*Value*	
	High carbon technology	*Low carbon technology*
Investment	USD 2000	USD 3000
Revenue	USD 475	USD 475
O&M cost	USD 100	USD 50
Annual emissions	5 t CO_2e	0 t CO_2e
Program lifetime	8 years	
Discount rate	10%	
Program potential	200,000 activity units	

Source: author analysis

Calculating the unit abatement costs

Next the model calculates the commercial value and emission impacts, as well as the total abatement cost for the mitigation program. Cash flows of both baseline and mitigation programs are discounted at the commercial interest rate/discount rate to calculate NPV. Emission reductions are calculated as the difference between the two, over the program lifetimes, and discounted. The unit abatement cost for the mitigation program (i.e., cost per ton CO_2) is the NPV of the mitigation program (i.e., total abatement cost or total grant equivalent financing needs, because the NPV of the BAU program is zero) divided by the discounted emission reductions.[30] Numerical examples are presented in Table 5.

Table 5. Example outputs of modeling Part 1

Output variable	*Value*
Net present value of baseline, business-as-usual program	USD 0
Net present value of mitigation program	USD -733
Discounted incremental cash flow	USD -733
Annual emission reductions	5 t CO_2e
Discounted emission reductions	26.7 t CO_2e
Unit cost of abatement	USD 27.5 /t CO_2e
Total discounted cost of mitigation program (i.e. total abatement cost)	USD 147 m
Total annual emission reductions	1 Mt CO_2e
Total discounted emission reductions	5.3 Mt CO_2e

Source: Author analysis

[28] For simplicity we assume here that the interest rates are equal to the company's necessary internal rate of return for investments.

[29] Note that even if we don't know all of the sources of funding, this total abatement costs will eventually have to be covered to realize the emissions reductions. As a conservative assumption, we should assume that any gap will have to be covered with concessional finance that will also require attribution

[30] Emission reductions are discounted to make the analysis equivalent to the IPCC levelized cost of conserved carbon approach to abatement analysis. Normally for levelized cost of conserved energy and levelized cost of conserved carbon, the future cash flows are discounted to a "levelized" annual cost, which is then divided by annual saved energy or avoided emissions, respectively. This is mathematically equivalent to discounting both cash flows and emission reductions by the same value, with the added benefit that the second approach can address fluctuations in emission reductions over time.

Part 2: Assessing the impact of attribution approaches for carbon markets and climate finance

Framework conditions and assumptions

- Both buyer and host countries are assumed to achieve their NDC target, regardless of whether trading is a possibility.
- The NDC targets in both buyer and host countries are exogenous (i.e., not dependent on trading effects on mitigation costs).
- The buyer country has significantly higher domestic abatement costs per tCO_2e than the host country, which is the rationale for exploring trading.
- The unit abatement cost for the mitigation program is higher than the host country's domestic abatement cost to meet their NDC. Therefore, the host country NDC goal is not compromised by the transaction – it does not view the emission reductions from this particular program as essential to meeting its NDC. This means that both sides can gain from the trade.
- Some climate finance is available, but the maximum climate finance available is not sufficient to fully finance the mitigation program.
- Climate finance is only used if necessary, so if carbon markets could provide all the necessary grant-equivalent financing for the mitigation program, then climate finance will be reduced (or eliminated) accordingly. In other words, climate finance providers do not want to pay for something that (private) markets will cover.

Simplifying assumptions

Some additional assumptions can be made to simplify the analysis without changing the fundamental results:

- Only two countries are modeled – one buyer country and one host country. This the entire "world" for the purposes of the modelling.
- Each country has only one domestic NDC option other than the potential Article 6 program, with a fixed unit abatement cost (i.e., cost per tCO_2).
- The crediting period is equal to program lifetime, so that the total financial contribution provided by all sources is directly related to the total emission reductions achieved.

Based on assumptions related to climate finance and carbon markets, buyer and host countries, the mitigation outcomes are calculated in each scenario. Numerical examples of inputs to Part 2 are presented in Table 6.

Table 6. Example inputs for modeling Part 2

	Input variable	*Value*	
Inputs and outputs from Part 1	Total discounted cost of mitigation program (i.e. total abatement cost)		USD 147 m
	Annual emission reductions		1 Mt CO_2e
	Total discounted emission reductions		5.3 Mt CO_2e
	Unit cost of abatement		USD 27.5 /tCO_2e
	Crediting period		8 years
New input variables	World price of ITMOs (for Scenario B)		USD 30 / tCO_2e
	Maximum amount of climate finance		USD 50 m
		Buyer country	*Host country*
	BAU emissions	140 Mt CO_2e	100 Mt CO_2e
	NDC target	100 Mt CO_2e	80 Mt CO_2e
	Domestic abatement cost other than the A6 cooperative program	USD 50 /t CO_2e	USD 15 /t CO_2e

Source: Author analysis

Attribution approaches

The two attribution approaches are compared to a reference case without carbon markets (i.e., the climate finance is still provided, but no carbon market trading is allowed):

- All to carbon markets (i.e., all emissions reductions are attributed to the carbon market contribution even if climate finance is also supporting the program).
- Proportional attribution based on grant-equivalent contributions from each source.

Analysis for Scenario A: No world price

In this scenario, there is no world price for carbon markets (i.e., the current situation). The providers of climate finance and carbon market actors are assumed to only cover the total abatement cost in the host country (i.e., in the current Article 6 pilots, only incremental costs are considered, not a surplus for the host country, even though the domestic abatement cost in the buyer country is much higher). The envelope of climate finance and carbon market contributions is essentially fixed by the contributors and is not related to any unit price for ITMOs. For example, the climate finance program may have already agreed to providing a concessionary loan and the carbon market actor has also designated a budget envelope.

The model performs the following steps based on the assumptions and input data:

1. After taking into account available climate finance, the residual financing need (in NPV) is calculated. If this exceeds the maximum amount of carbon market financing available (e.g., if there is USD 50m in climate finance and USD 50m in carbon markets but the program needs USD 120m), the share of the potential program which can be financed is calculated.
2. Based on the program share that could be financed and the attribution approach, the emission reductions attributed to climate finance and to carbon markets (converted to ITMOs) are calculated.
3. Based on the volume of ITMOs, crediting period, and carbon market contribution, the effective *price* of ITMOs is calculated.

   Three conditions are key determinants of the model output:

   a. If the price of ITMOs is higher than buyer country abatement costs, there is no trade (but a share is realized by climate finance alone). However, because the assumption is that the unit abatement cost of the mitigation program is lower than the buyer country's domestic abatement costs, this outcome would not be possible.
   b. If the price of ITMOs is lower than buyer country abatement costs, under the "all to carbon markets" approach, the entire program ERs are converted to ITMOs; the resulting price is therefore below unit abatement cost of the program
   c. If the price of ITMOs is lower than buyer country abatement costs, under the proportional attribution approach the attributed share of program ERs are converted to ITMOs; the resulting price is therefore equivalent to unit abatement costs

4. Calculate the average abatement cost for each country based on the ITMO transfer volume and price.
5. Present outcomes for buyer and host country (i.e. inventory emissions, adjusted emissions, average and total cost of reaching NDC), along with "global" mitigation and global cost of mitigation.

Analysis for Scenario B: World price

In this scenario ITMO prices are set exogenously in a global market. The carbon market buyer and host country will transact ITMOs only at the global market price. There is a potential for surplus in the host country, but only as a result of higher ITMO prices than unit abatement costs of the program (e.g., if the unit abatement cost is USD 10/tCO_2 but the market price is USD 20/tCO_2).

The model performs the following steps based on the assumptions and input data:

6. Compare the unit abatement cost for the mitigation program to the global market price.
    a. If the global market price is higher than the unit abatement cost, then carbon markets cover the entire program costs and no climate finance would be required.
    b. If the global market price is lower than the unit abatement cost for the mitigation program, then move on to step 2.
7. Consider the attribution approaches:
    a. Under proportional attribution, ITMO prices are the same as the unit abatement cost. In this case, because the global market price is lower than the unit abatement cost for the mitigation program, then no ITMO sales are possible (i.e. because the cost to generate the ITMOs is higher than the market price). A partial share of the program potential is financed by carbon finance alone, and there is no trade.
    b. Under the all to carbon markets approach, calculate the NPV of ITMOs at global market price over the crediting period. Determine if the climate finance envelope is sufficient to cover the residual financing need. If sufficient, the entire program potential ERs are converted to ITMOs and sold at market price.
8. Calculate the average abatement cost for each country based on the ITMO transfer volume and price
9. Present outcomes for buyer and host country (i.e. inventory emissions, adjusted emissions, average and total cost of reaching NDC), along with "global" mitigation and global cost of mitigation.

With the input data from Table 6 above, Table 7 presents the outputs of the different scenarios.

Table 7. Example outputs of modelling Part 2

		No trade (baseline scenario)	*All to carbon markets*		*Proportional attribution*	
			No world price	*World price**	*No world price*	*World price**
Buyer (Country A)	Actual emissions	100 Mt CO_2e	101 Mt CO_2e	101 Mt CO_2e	100.66 Mt CO_2e	101 Mt CO_2e
	Reported/ Adjusted emissions	100 Mt CO_2e	100 Mt CO_2e	100 Mt CO_2e	100 Mt CO_2e	100 Mt CO_2e
Host (Country B)	Actual emissions	79.66 Mt CO_2e	79 Mt CO_2e	79 Mt CO_2e	79 Mt CO_2e	79 Mt CO_2e
	Reported/ Adjusted emissions	79.66 Mt CO_2e	80 Mt CO_2e	80 Mt CO_2e	79.66 Mt CO_2e	80 Mt CO_2e
Climate finance (grant equivalent)		USD 50 m	USD 50 m	USD 0 m	USD 50 m	USD 0 m
Attribution to climate finance		0.34 Mt CO_2e	0 Mt CO_2e	0 Mt CO_2e	0.34 Mt CO_2e	0 Mt CO_2e
Carbon markets funds		0	USD 96.65 m	USD 160 m	USD 96.65 m	USD 160 m
ITMOs generated and transferred		0 Mt CO_2e	1 Mt CO_2e	1 Mt CO_2e	0.66 Mt CO_2e	1 Mt CO_2e
"Global" emissions		179.66 Mt CO_2e	180 Mt CO_2e	180 Mt CO_2e	179.66 Mt CO2e	179.66 (180 – 0.37) Mt CO_2e **
Global cost of mitigation		USD 2299.2 m	USD 2267.1 m	USD 2278.9 m	USD 2278.0 m	USD 2278.9 m

Notes:
* Where world price is higher than the unit abatement cost of the mitigation intervention.
** This assumes that the climate finance that is not used in the Country B is used in another country with similar mitigation impact.
Source: Author analysis

Annex B. Contractual models and financial flows for Article 6 transactions

Because of the central role of national governments in authorizing and transferring ITMOs, contractual models for cooperative activities under Article 6.2 could be more complex than traditional emission reduction purchase agreements used for the CDM. This Annex provides a brief illustration[31] of the different possible models, some of which are being explored in current Article 6 pilots.

Government-to-government: The first model is one in which the Article 6.2 contractual arrangements only involve the host (i.e., transferring) and buyer (i.e., acquiring) country governments. The MOPA would specify, among other things, the conditions for transfers of ITMOs and the payments that would be triggered by these transfers (or by some other action). Since much of the action in the host country might be undertaken by private or non-government actors, however, the host country government would need to structure domestic incentives that would drive the necessary mitigation action to generate the mitigation outcomes that could be authorized and transferred as ITMOs. These domestic incentive structures, however, would not be part of the MOPA or other bilateral arrangements. This would be similar to output-based aid agreements or results-based finance programs, where the host country has freedom on how to generate the outcome that triggers payments.

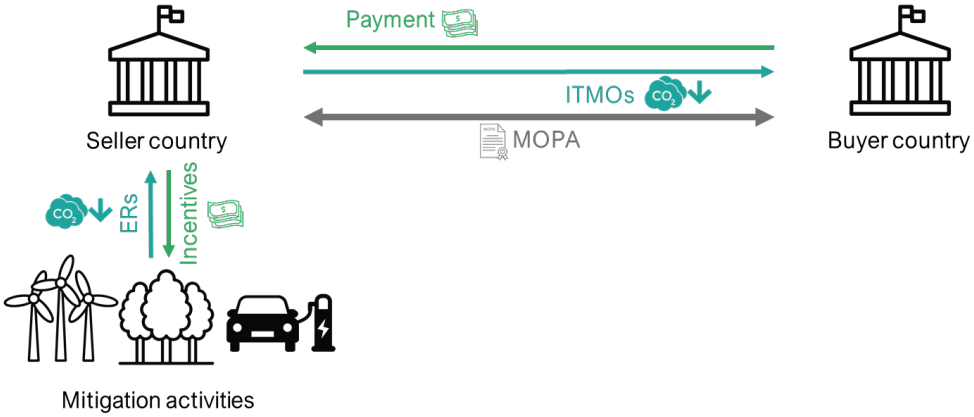

Figure 5. Illustration of a government-to-government transaction under Article 6.2

Government-to-private-seller: In this model, the buyer country government wants to contract with a private entity in the host country for the purchase of ITMOs. Because many of the conditions for successful authorization and transfer involve the host country government, the two countries would likely need to have some form of bilateral cooperation agreement or memorandum of understanding that would specify how the various requirements in the Article 6.2 rules would be met. In parallel, the buyer country government would sign a MOPA with the private sector project proponent that would also spell out the obligations of both parties, particularly around implementation and monitoring for the host entity and payment structure for the buyer government. The MOPA might refer directly to the bilateral cooperation agreement, or it might specify what the project proponent must provide as evidence of host country action (e.g., a letter of authorization, a notification confirming a transfer, or an Article 6 report that confirms that corresponding adjustment).

In turn, the project proponent would need to have not only an approval from the government but also some confidence that the government would carry out their responsibilities for authorization, transfer and reporting. These responsibilities could, for example, be enumerated in the letter of approval, which the project proponent could then provide as evidence to the buyer. In practice, the buyer could be deeply involved in these negotiations with the host country government, both because the buyer might

[31] Thanks to Manon Simon for designing the figures.

have more leverage (i.e., as another government) and because it is in the buyer's interest to make sure that the project proponent receives the necessary approvals and guarantees of eventual transfers.

The financial flows might also be more complex in this model. Even if the payments to cover the actual costs of mitigation action went directly to the project proponent, the host country government might also require payment of an administrative fee. It might also requirement payment of a levy that would ensure that sufficient funding was available to the government to reinvest in mitigation if the ITMO transfer risked compromising its NDC goal (i.e., overselling). It is even possible that the full payment would go to the host country government, which would in turn disburse the funds for the actual cost of mitigation to the project proponent.

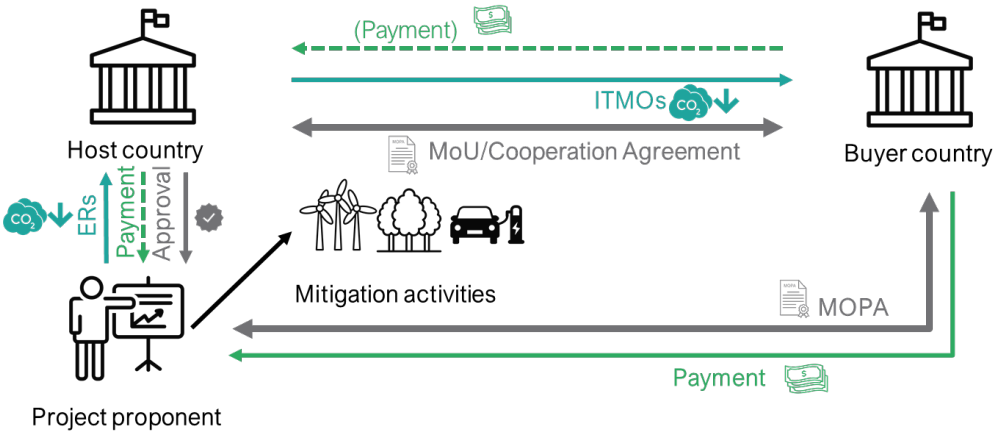

Figure 6. Illustration of government buyer and private seller transaction under Article 6.2

Private-buyer-to-private-seller: this model proposes how two private entities in the two different countries might be able to enter into a MOPA, and what other arrangements would be required to facilitate this. As with the previous model, the two countries would need a bilateral cooperation agreement that covered the national requirements under the Article 6.2 rules. The project proponent would need an approval or even an agreement with the host country government to ensure that ITMOs would be transferred based on successful implementation of the mitigation activity. As with the previous model, the buyer entity – or even the buyer country – could be involved in supporting the project proponent in securing approvals and other action by the host country government. In addition to these arrangements, the private buyer in the buyer country would most likely need approval to use the ITMOs against whatever compliance obligation they faced in the country.[32] The financial flows would start from the buyer entity and, as above, mainly be paid to the project proponents, but some fees to the host country government might also be required.

[32] While private buyers might, in the future, also use ITMOs to fulfill voluntary mitigation pledges, this Annex only covers their use for compliance in the buyer country and where the buyer country uses the ITMOs towards its NDC goal.

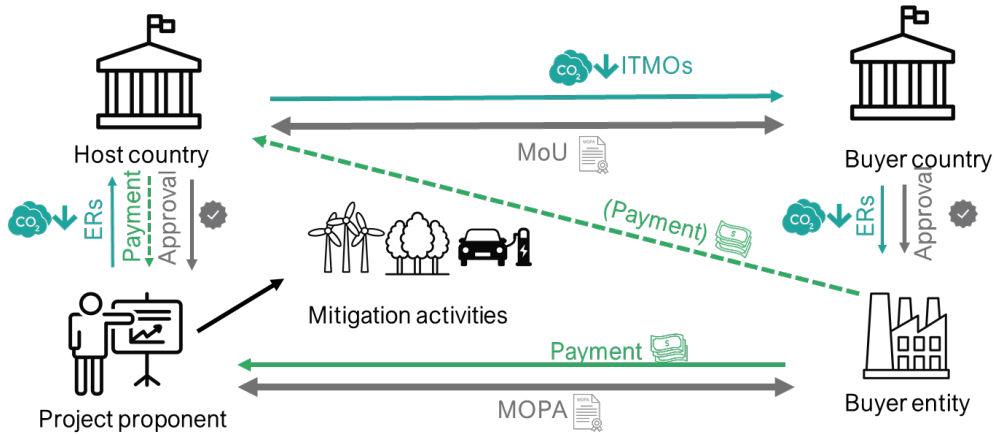

Figure 7. Illustration of private-to-private transaction under Article 6.2