Analysis of options for determining OMGE, SOP and Transition within Article 6

Implications of policy decisions for international crediting under the Paris Agreement

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Foreword

This report has been produced in response to a request from the Least Developed Countries (LDC) Group for an analysis to support evidence-based decision making in the negotiation of rules and guidance under Article 6 of the Paris Agreement.

Our window of opportunity to avoid the worst impacts of climate change is fast disappearing. Climate impacts on LDCs increase with every tonne of cumulative emissions. The IPCC Special Report on 1.5^{o}C makes clear that globally a 45% reduction in carbon dioxide emissions below 2010 levels is needed by 2030, toward net zero by 2050, to meet the 1.5^{o}C limit in the Paris Agreement. Despite our push, and some recent encouraging signs, NDCs have still not improved sufficiently in their mitigation ambition since Paris. Adaptation financing also remains grossly insufficient to meet the developing country needs.

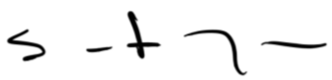
The LDC Group would like to share this analysis with Parties, in the hope and expectation that the policy decisions we take in Glasgow at COP 26 will be informed not by political expediency, but by what each policy decision to be taken means for levels of greenhouse gas abatement and for the generation of adaptation resources. We all stand to benefit from wise design choices, as does our climate.

We the LDCs contribute little to global emissions. The contribution we can make to global emission reductions is therefore limited. What we can do, however, is show leadership and put our voices behind creative and robust thinking that can leverage the tools we have at the international level to deliver more, for the benefit of all.

There are three key takeaways from this report. First, applying a significant OMGE percentage cancellation rate across Article 6 can deliver valuable GHG abatement between now and 2030, contributing materially to efforts to reach the Paris Agreement mitigation goal. Second, increasing the rate for Share of Proceeds can deliver substantial resources for the Adaptation Fund to support adaptation actions in developing countries. Third, only in very particular situations can the transition of CDM project activities be helpful from a global emissions perspective, and allowing a transfer of pre-2020 CERs for use under the Paris Agreement would be actively damaging to climate ambition.

I hope that this report helps all Parties take informed decisions that will benefit the Least Developed Countries and all countries striving to meet the Paris Agreement goals.

I would like to thank Climate Analytics, NewClimate Institute and Öko-Institut for conducting this technical study and delivering the report. I would also like to thank all the individual members of the LDC Group, in particular the Article 6 thematic group, who provided guidance, raised questions, and gave constructive feedback and inputs over the course of the development of this report.



Sonam P. Wangdi
Chair of the Least Developed Countries Group

The LDC Group on Climate Change brings together the work and vision of the Least Developed Countries at the intergovernmental negotiations, under the UN Framework Convention on Climate Change.

Summary

Rules for the implementation of Article 6 of the Paris Agreement are still under negotiation at the international level. This report explores three key unresolved issues that are closely interrelated and that can considerably impact the global emissions outcome from using Article 6 as well as the amount of revenues generated to help meet the adaptation needs of particularly vulnerable developing countries. These are:

- **OMGE:** the percentage of emission reduction credits to be cancelled in order to deliver an overall mitigation in global emissions (OMGE) under Article 6.4(d), and the application of OMGE to transfers under Article 6.2;
- **SOP:** the percentage of emission reduction credits to be set aside as a share of proceeds (SOP) for adaptation under Articles 6.4 and 6.6, and the application of a SOP to transfers under Article 6.2;
- **Transition:** the proposed transition of certified emission reductions (CERs) and/or categories of Clean Development Mechanism (CDM) project activities from the Kyoto Protocol to the Paris Agreement.

The report explores the potential quantitative implications of different policy choices on these matters, both in isolation and in combination with each other, with the aim to support decision-making in the context of the ongoing international climate change negotiations. Towards this end, we develop a simplified economic representation of the possible future Article 6 market. As the future supply and demand of internationally transferred mitigation outcomes (ITMOs) is highly uncertain, this hypothetical representation mainly serves to illustrate potential outcomes, rather than making a prediction about the future Article 6 market. Therefore, results in relative terms (e.g. the percentage change in overall abatement) may be less uncertain than results in absolute terms (e.g. the increase in abatement expressed in tonnes of carbon dioxide equivalent).

Our simplified representation of the Article 6 carbon credit market is informed by an evaluation of the possible future supply, demand and prices for ITMOs. There are a number of types of existing and future emission reduction credits; some of which buyers may consider as different products, and some which buyers may consider as more interchangeable (substitute) offerings. The main focus of our analysis is on what we label “A6+ ERs”. These are credits that are subject to the application of OMGE and SOP and eligible for international transfer and use under either Articles 6.4 or 6.2 of the Paris Agreement. These units may also be used for purposes other than achieving nationally determined contributions (NDCs), such as for the Carbon Offsetting and Reduction Scheme for International Aviation (CORSIA) or in the voluntary carbon market.

We identify likely key sources of demand for emission reduction credits, including from NDCs, CORSIA, and the voluntary carbon market. From these sources we derive indicative estimates of the potential magnitude and elasticity of demand for A6+ ERs. We then consider sources of supply of emission reduction credits in the light of the ambition of NDCs as well as the potential supply of credits from any transition of CERs from the second commitment period of the Kyoto Protocol or from the transition of CDM project activities. We establish a demand and supply curve – informed by data and assumptions detailed in Chapter 3 – for a reference scenario. At the market equilibrium in this hypothetical reference scenario for the period 2021-2030 approximately 2.5 billion A6+ ER units would be transferred and used over the period 2021 to 2030 at a basis price of €20.80 per tonne of CO_2 equivalent (tCO_2e). It is important to note that these parameters are driven by relatively high-level assumptions on the characteristics of the market demand and supply in our reference scenario, and are not the results of detailed economic modelling of, for example, individual project costs and credit buyer demand at different price levels.

We then use this simplified representation of the possible future supply and demand to assess the potential impact of different policy choices on SOP, OMGE and transition, drawn from the three iterations of the COP Presidency's texts produced during the international climate change negotiations in Madrid. We consider OMGE, SOP and transition policy options first separately, and then in combination.

The implications of these policy options are evaluated with regard to the following eight impacts:

1. Global greenhouse gas (GHG) emissions
2. Host country emissions
3. Buyer country emissions
4. Share of proceeds to finance adaptation
5. Credit price
6. Buyer cost savings
7. Market revenue
8. Project owner profits

We summarize these impacts below, with complete findings set out in greater detail in the full report.

Impact of Overall Mitigation in Global Emissions (OMGE)

Figure 1 summarises the impact of OMGE policy decisions in our simplified market representation, assuming that OMGE is implemented in isolation (i.e. with no SOP, nor any transition of CERs or activities from the CDM). We find that **net global abatement increases with an increasing OMGE cancellation rate across all scenarios** by driving further abatement both in credit buyer countries as well as in the host countries of project activities. Compared to our reference scenario in which no OMGE is applied and 2.5 billion A6+ ER units are transacted over the period 2021-2030, an OMGE rate of 2% would increase global abatement only modestly, by approximately 50 $MtCO_2e$ over the decade. OMGE levels of 5%, 10%, 20% and 30% would result in an increase in global abatement of approximately 130, 260, 530 and 800 $MtCO_2e$ respectively over the same decade. If the future market volume is higher or lower than set out in our reference scenario, the magnitude of the abatement impacts would rise or fall accordingly.

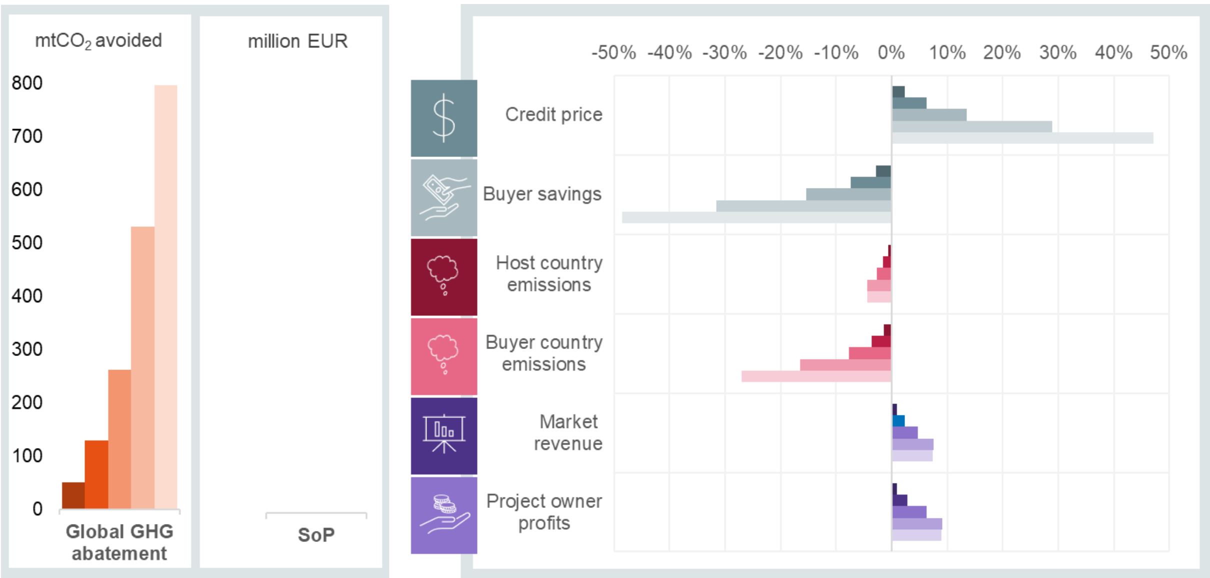


Figure 1: Impact of OMGE levels of 2% (darkest), 5%, 10%, 20% and 30% (lightest) on different indicators

Credit prices increase because the cancellation of a share of the credits increases the cost of supplying credits. This is because the revenues from the sale of the remaining credits need to cover the full costs of delivering all emission reductions. The degree to which the price increases also depends on the elasticity of the demand. In our representation of the market, a 2% rate of OMGE increases credit prices by about 2%. At a 10% OMGE rate, credit prices rise by 13%, from €20.80 (with no OMGE applied) to €23.60. At an OMGE level of 30%, prices increase by approximately 47% to €30.60.

Credit buyers' cost savings from using emission reduction credits fall, driven in large part by the higher credit prices. The relative reduction in buyer cost savings is comparable to the rise in credit prices. In our simplified market representation, a level of 2% OMGE leads to a 3% reduction in buyer savings. Levels of 5%, 10%, 20% and 30% OMGE result in buyer savings falling by 7%, 15%, 42% and 49%, respectively. Buyers nevertheless continue to benefit overall from the difference between the cost of domestic abatement and the cost of credit acquisition for offsetting purposes.

Buyer country emissions decrease with increasing OMGE rates, as higher prices incentivise more emission reductions undertaken in the buyer country. In our simplified market representation, an OMGE level of 2% decreases buyer country emissions by 1%; levels of 5%, 10%, 20% and 30% lead to a decrease in buyer country emissions by 4%, 8%, 17% and 27% respectively.

Host country emissions also decrease with increasing OMGE rates, although the magnitude of the impact is limited. In our simplified market representation, OMGE levels of 2% and 5% result in reductions in host country emissions of approximately 1% and OMGE levels of 10-30% lead to host country emission reductions of 3-4%. Even though the quantity of credits transacted decreases, the additional emission reductions delivered for OMGE more than compensate for the reduced demand.

Market revenue increases across all OMGE percent level options as the increase in price outweighs the reduction in quantity of credits transacted. A 2% level of OMGE increases market revenue by 1%; OMGE levels of 5%, 10%, 20% and 30% lead to increases in market revenues of 2%, 5%, 8% and 7% respectively. The increase in market revenues would be more pronounced if the demand curve were steeper than in our market representation, and less pronounced (to such an extent that revenues may even fall) if the demand curve were shallower.

Project owner profits increase across all levels of OMGE, aligned with increasing market revenues. In our market representation, levels of 2%, 5%, 10%, 20% and 30% OMGE lead to a 1%, 3%, 6%, 9% and 9% increase in project owner profits, respectively.

Table 1: Illustrative implications of different OMGE rates in our simplified market representation

Overall Mitigation in Global Emissions			
OMGE rate (%)	***Additional abatement of global GHG emissions (Mt)***	**Change in credit price from reference scenario (%)**	***Credit prices***
0	*0*	0%	*€20.80*
2	*50*	2%	*€21.30*
5	*130*	6%	*€22.10*
10	*260*	13%	*€23.60*
20	*530*	29%	*€26.80*
30	*800*	47%	*€30.60*

Impact of Share of Proceeds (SOP)

Figure 2 summarises the impact of SOP policy decisions in our simplified market representation, assuming that SOP is implemented in isolation (i.e. with no OMGE, nor any transition of CERs or activities from the CDM). We find that **higher percentage levels of SOP lead to increased levels of revenue for the Adaptation Fund.** An SOP rate of 2% would raise approximately **€1.0 billion** over the period 2021-2030; a rate of 5% raises available resources of approximately **€2.7 billion**; and a rate of 10% raises available resources of approximately **€5.5 billion**. Net global abatement is not affected by the rate of SOP when considered in isolation without any OMGE.

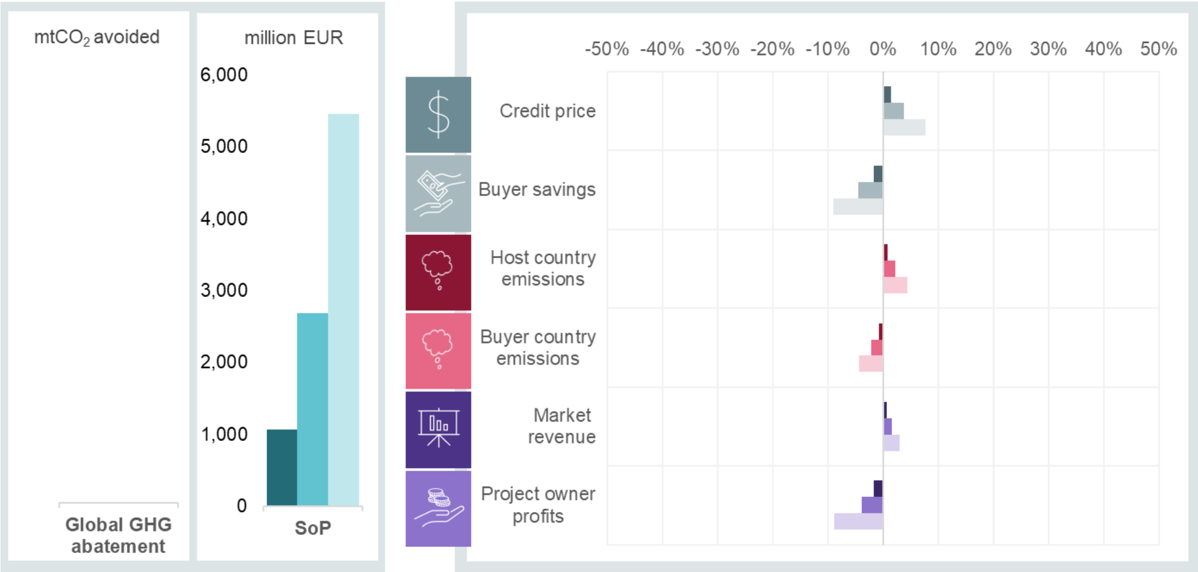


Figure 2: Impact of SOP levels of 2% (darkest), 5%, and 10% (lightest) across indicators

Credit prices increase because the transfer of a share of the credits to the Adaptation Fund increases the cost of supplying credits. Similar to OMGE, this is because the revenues from the sale of the remaining credits need to cover the full costs of delivering all emission reductions. However, the increase is lower than for the same percentage levels of OMGE because the credits transferred to the Adaptation Fund are still available to the buyers. As a result, in our simplified market representation, a 2% level of SOP increases the market price by just over 1%, which corresponds to an increase in price from €20.80 to €21.10. A 5% SOP increases the market price by 4% to €21.60, and a 10% SOP increases the price by 8% to €22.40.

Buyer cost savings decrease to a similar extent, but opposite direction to credit prices. In our simplified market representation, a level of 2% SOP leads to a decrease of approximately 2% in buyer savings; a level of 5% SOP leads to a decrease in buyer savings of 5%; and a 10% SOP leads to buyer savings falling by 9%.

Host country emissions increase as a result of the introduction of SOP, because fewer credits are transacted. **Buyer country emissions decrease** correspondingly as a result of the introduction of SOP because buyers reduce their own emissions to a larger degree instead of using carbon offset credits.

Market revenues increase modestly, as the increase in price outweighs the reduction in the number of credits transacted. Levels of 2%, 5% and 10% SOP increase market revenues by less than 1%, 2% and 3% respectively.

Project owner profits decrease across all levels of SOP in our simplified market representation. This is because project owners receive fewer credits and the increase in credit price is too small to compensate for this. The application of OMGE raises market prices in a more pronounced manner than

SOP. This is because the credits transferred to the Adaptation Fund are still supplied into the market, while they are cancelled with OMGE.

Table 2: Illustrative implications of different SOP rates in our simplified market representation

Share of Proceeds			
SOP rate (%)	**Change in credit price from reference scenario (%)**	***Credit prices relative to a hypothetical reference scenario price of €20.80***	***Revenue generation for adaptation from SOP***
0%	0%	*€20.80*	-
2%	1%	*€21.10*	*€1.0 billion*
5%	4%	*€21.60*	*€2.7 billion*
10%	8%	*€22.40*	*€5.5 billion*

Impact of OMGE and SOP policy choices in combination

After considering OMGE and SOP in isolation, we also analyse impacts if both OMGE and SOP are applied, using 2%, 10% and 30% levels of OMGE and 2% and 5% levels of SOP (and still assuming no transition of CERs or activities from the CDM). These options are drawn from the COP Presidency's texts and serve to illustrate the direction of the impacts on the eight indicators. Figure 3 summarises the impact of these scenarios under the assumptions of our representation of the market.

Global GHG abatement increases in all of the OMGE and SOP policy combination scenarios considered. The most pronounced impact on reducing global GHG emissions is where a 30% OMGE level is applied: In our market representation global emissions fall by 779 $MtCO_2e$ over the period 2021-2030 in combination with a 2% SOP and by the slightly lower figure of 758 $MtCO_2e$ with a 5% SOP. Increasing the level of SOP at a given level of OMGE reduces the global GHG abatement slightly because a higher level of SOP has the effect of reducing the absolute number of credits cancelled for OMGE.

Increasing the SOP level from 2% to 5% materially increases the funding made available for adaptation across the levels of OMGE considered. With OMGE set at 30%, funding for adaptation would be approximately **€1.6 billion** if SOP is set to 2% and **€4.0 billion** if set at 5%. SOP revenues increase with higher levels of OMGE because the increase in the credit price at which the Adaptation Fund can monetise the credits outweighs the reduction in the quantity of units transacted.

Impacts of OMGE and SOP policy combinations

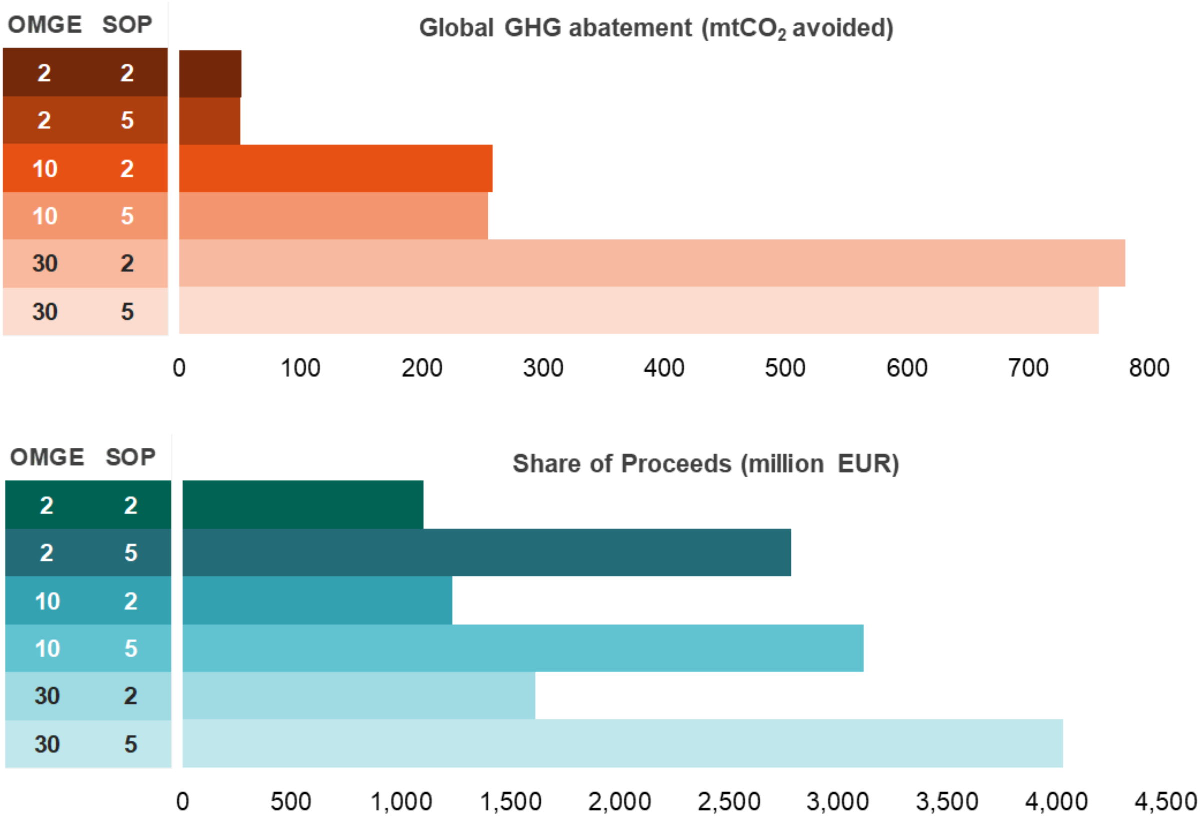


Figure 3: Estimated impacts on global GHG abatement and the Share of Proceeds for a range of OMGE and SOP policy combinations in our simplified market representation

Credit prices rise in all scenarios, leading to a corresponding fall in buyer cost savings. We find that levels of 2% OMGE, coupled with either 2% or 5% SOP, have a modest impact on the credit prices with credit prices rising by up to 7% (from €20.80 up to €22.20). Higher levels of OMGE have a more material impact on credit prices. A 10% level of OMGE - combined with either a 2%, or 5% level of SOP - increases credit prices by 15% (to €23.90) and 18% (to €24.50), respectively. If OMGE is increased to 30%, we find credit prices increase by around 50% (up to €31.90 with 5% SOP).

Reductions in global GHG emissions largely occur in buyer countries, with only a limited impact on host country emissions across all scenarios. This is because the higher prices incentivise greater reduction of buyers' own emissions. Buyer country emissions fall between 2% and 31% across the range of the scenarios. By contrast, host country emissions vary between a reduction of 2% and an increase of 2%.

All of the six combinations have a relatively modest impact on market revenues, with higher levels of OMGE driving the largest impacts. In our market representation, project owner profits range from falling by 2% (2% OMGE; 5% SOP) to rising by 5% (30% OMGE; 2% SOP). OMGE raises profits because the price increase more than compensates for the share of credits that are cancelled. However, SOP acts in the opposite direction, with higher SOP levels reducing profits.

Table 3: Illustrative implications of combinations of different OMGE and SOP rates in our simplified market representation

Impact of OMGE and SOP in combination			
OMGE %	**SOP %**	***Additional abatement of global GHG emissions (MtCO2e)***	***Revenue generation for adaption from SOP***
0%	0%	*0*	*-*
2%	2%	*51*	*1.1 billion*
2%	5%	*50*	*2.8 billion*
10%	2%	*258*	*1.2 billion*
10%	5%	*254*	*3.1 billion*
30%	2%	*779*	*1.6 billion*
30%	5%	*758*	*4.0 billion*

Impact of CER transition

We analyse three scenarios for the proposed transition of CERs issued for emission reductions achieved during the second commitment period of the Kyoto Protocol from the beginning of 2013 to the end of 2020 (which we refer to as CP2 CERs): (1) no transition of CERs; (2) the transition of CERs from projects registered on or after 1 January 2016; and (3) the transition of CERs from projects registered on or after 1 January 2013. These scenarios are first considered in isolation, i.e. assuming no OMGE, no SOP and no transition of CDM project activities.

The transition of CP2 CERs leads to an overall increase in global GHG emissions. This increase corresponds directly to the number of CP2 CERs transitioned. This is because these units represent emission reductions that have already occurred and new demand for these units cannot trigger any further emission reductions in the past. The purchase and use of CP2 CERs in the period after 2020 will not incentivise any further emission reductions and would potentially displace credits from new emission reduction activities. The reference scenario includes no transition of CP2 CERs. Under a 2016 registration date cut-off, global GHG emissions would rise by 63 $MtCO_2e$. Under a 2013 registration date cut-off, global GHG emissions would rise by 320 MtCO2e.

Table 4: Implications of CP2 CER transition scenarios

Impact of CP2 CER transition scenarios with no OMGE and no SOP	
Scenario	**Increase in global GHG emissions (MtCO2e)**
No transition (reference scenario)	0
Transition of projects registered on or after 1 January 2016	63
Transition of projects registered on or after 1 January 2013	320

Impact of CDM project activity transition

We analyse four scenarios for the proposed transition of CDM project activities: (1) no transition of project activities; (2) transition of only of vulnerable projects, i.e., those projects whose continued abatement depends on the receipt of carbon credit revenues; (3) transition of projects that were registered on or after 1 January 2016; and (4) full transition of projects, assuming that 30% of these projects actually take the administrative steps to transition.

The latter two scenarios have the potential to undermine host country mitigation efforts or to lead to an increase in global emissions. This is because a large share of the credit supply potential from existing CDM activities derives from so-called “non-vulnerable” projects. These projects continue

GHG abatement even without carbon credit revenues. Examples include grid-connected wind and solar PV electricity generation. For these projects, revenues from electricity sales typically exceed ongoing operational costs. This means that these projects are very likely to continue operation, even in the case they fail to repay their upfront capital investments. Therefore, transitioning these activities does not directly trigger any further emission reductions in the host country.

The impact of transitioning non-vulnerable project activities depends on two main factors: the ambition of the host country's NDC and any potential exemptions from applying corresponding adjustments:

1. **If host countries have ambitious NDCs and apply corresponding adjustments, transitioning non-vulnerable activities will undermine their ability to achieve their NDCs.** If a host country has an ambitious NDC and authorizes and accounts for the transition of non-vulnerable projects, the country would face a larger mitigation shortfall. This is because the host country would have to apply corresponding adjustments for emission reductions that would anyway have occurred without it authorising the transition. If the country still intends to achieve its NDC, it would have to compensate for the mitigation shortfall, by undertaking further domestic mitigation efforts. Under these circumstances, authorizing the transition of non-vulnerable projects for use under Article 6 would undermine the host country's mitigation efforts making it harder to achieve its NDC.

2. **If host countries have weak NDCs, or are exempted from applying corresponding adjustments, transitioning non-vulnerable projects will increase global emissions.** If a host country has a weak NDC – i.e., the country will overachieve its NDC without pursuing any further mitigation policies – authorizing emission reductions from non-vulnerable projects for use under Article 6 could lead to an increase in global emissions, up to the level of the supply potential of non-vulnerable projects that are eligible to transition. This is because the country could sell emission reductions that would have occurred regardless of the authorization of the transition, without facing any consequences for achieving its NDC. Global emissions increase because no further emission reductions would occur in the host country while the buyer country could use the acquired credits to increase, or avoid reducing, its emissions. Similarly, transitioning non-vulnerable projects would increase global emissions if international rules were to exempt countries from applying corresponding adjustments for some period, or exempt sectors or gases not covered by their NDC. In this case, the host country would not need to compensate for transferring credits from activities that continue abatement regardless of whether they are authorized for transition.

By contrast, no transition or limiting transition to vulnerable CDM project activities only, does not pose a risk of either undermining host country mitigation efforts or raising global GHG emissions. The use of credits from vulnerable projects – projects that are dependent on the receipt of carbon credit revenues to continue abatement – can directly support emission reductions that would not otherwise have occurred, with an impact similar to investments in new activities. An example of CDM projects that are typically "vulnerable" to discontinuing abatement are activities involving the abatement of nitrous oxide emissions from nitric acid production. These abatement activities incur additional operational costs but produce no financial benefits other than through the sale of carbon credits. The vulnerability of some projects – such as biomass energy, household energy efficiency measures and methane avoidance – may depend on the specific characteristics of the project as well as local conditions. To implement this option, and ensure that there are no risks, it is however critical that the assessment process for approving activities to transition correctly identifies those activities that depend on continued financial support from the sale of carbon credits and avoids approving activities that are not vulnerable. The option of transitioning only vulnerable project activities is not currently contained in the COP Presidency's texts.

Our reference scenario includes no transition of CDM project activities. **With a full transition of CDM project activities (assuming 30% of activities take the administrative steps to transition), host country mitigation efforts could be undermined, or global emissions could increase, by as much**

as 763 $MtCO_2e$. Transition of project activities registered after 1 January 2016 could undermine host country mitigation efforts or increase global emissions by as much as **139 $MtCO_2e$**.

Table 5: Implications of different scenarios for the transition of CDM project activities

Transition of project activities - proposed options		
Scenario	**Potential credit supply ($MtCO_2e$)**	**Potential volume of GHG emissions by which either host country mitigation efforts are undermined or global emissions increase ($MtCO_2e$)**
No transition	0	0
Transition of vulnerable projects only	700	0
Transition of projects registered on or after 1 January 2016	269	139
Full transition	962*	763

* Note that our estimate of the supply potential for emission reductions over the period 2021-2030 is approximately 3,200 $MtCO_2e$ if *all* registered CDM projects were to transition. We here assume that 30% of projects actually take the administrative steps to transition, reflecting a credit supply potential of 962 $MtCO_2e$.

Impact of transition options in combination with OMGE and SOP policy choices

Figure 4 provides an overview of the estimated global GHG abatement impacts for our simplified representation of a future market across the range of scenarios we considered, including different policy decisions for OMGE, SOP as well as the transition of CDM units and activities.

The transition of CP2 CERs directly erodes the level of abatement that would otherwise be produced by all OMGE rate options. A 2% OMGE rate does not lead to net global GHG reductions when combined with 2013 or 2016 registration date cut-offs for CER unit transition. Even with a 10% OMGE rate, net global GHG reductions rise in our simplified representation of the market when combined with the transition of CERs from CDM project activities registered on or after 1 January 2013.

The impact on global GHG emissions of project activity transition in combination with different levels of OMGE and SOP depends critically on the extent to which host countries increase their abatement efforts to compensate for emission reductions from non-vulnerable projects which transition. If host countries increase their abatement efforts accordingly then the impact on overall GHG emissions from different activity transition scenarios may be of a similar magnitude to the scenarios above in which OMGE and SOP levels are considered in combination with no transition of project activities. However, this would effectively represent a shift in the burden of mitigation effort from credit buyers to the host countries of the project activities.

In the case that host countries do not compensate for the mitigation shortfall due to the transition of non-vulnerable projects, full transition of CDM project activities has potential to erode much of the overall abatement facilitated through the introduction of OMGE and SOP, and it could negate this abatement completely in some scenarios, compared to our reference scenario with no OMGE, SOP or transition. When a full transition of CDM project activities is introduced to OMGE and SOP policy combinations, our simplified representation of the market shows there could be an increase in global GHG emissions, where OMGE levels of 2% and 10% are applied. Global GHG emissions could increase by 654-676 $MtCO_2e$ with a 2% OMGE rate and increase by 363-382 $MtCO_2e$ despite application of a 10% OMGE rate. Under scenarios with 30% OMGE the net effect of our full transition scenario – assuming host countries do not compensate for credits issued to non-vulnerable projects – leads to an overall reduction in global GHG emissions of approximately 390 $MtCO_2e$. This is still markedly lower than our estimate of approximately an 800 $MtCO_2e$ increase in global abatement with 30% OMGE and no transition at all. Revenue collected from SOP remains similar to the same policy combinations with no transition.

Use of a 2016 registration date cut-off for CDM project activity transition also could lead to an increase in global GHG emissions across all scenarios, compared to a situation in which no activities are eligible to transition to the new Article 6.4 mechanism, if host countries do not compensate for credits issued to non-vulnerable projects. With 2% OMGE, emissions over the 2021-2030 period increase by 80 $MtCO_2e$. With 10% OMGE, emissions fall by 145 $MtCO_2e$ but this nevertheless represents a decrease in abatement compared to a situation with no transition. With 30% OMGE, overall global emissions decrease by just over 700 $MtCO_2e$, but again this reflects a decrease in abatement compared to a situation with no transition. SOP revenues remain similar to those in scenarios with no transition, as we assume units generated for post-2020 emission reductions from these activities are subject to the same SOP and OMGE as credits from new activities. The reduction in price per credit is compensated for by the increase in quantity of units transferred to the Adaptation Fund.

Combining OMGE and SOP scenarios with the transition of vulnerable CDM projects (i.e., those projects whose continued operation depends on the receipt of carbon credit revenues) could lead to the largest reduction in global GHG emissions, but only if the limitation to vulnerable projects is implemented robustly. However, this effect is only slightly higher than if no transition is permitted and the process of determining the extent to which a project is vulnerable to discontinuing abatement may be challenging and subject to interpretation, creating a risk that projects that are in fact not vulnerable are allowed to transition. Where the limitation to vulnerable projects is strictly applied (and there is no transition of CDM units), our analysis of a hypothetical market indicates OMGE levels of 2% lead to global GHG abatement in the order of 50 $MtCO_2e$. OMGE levels of 10% lead to global GHG abatement of 280 $MtCO_2e$. OMGE levels of 30% could lead to global GHG abatement of at least 850 $MtCO_2e$. SOP revenues remain similar to those collected under OMGE and SOP scenarios with no vulnerable project transition.

Neither the transition of activities, nor units from the CDM has a particularly material impact on the SOP collected. Scenarios with a higher SOP lead to the most funding for adaptation, regardless of the other policy decisions with which the SOP percentage is combined. Higher levels of OMGE also facilitate increased SOP revenues under the market representation used for our analysis.

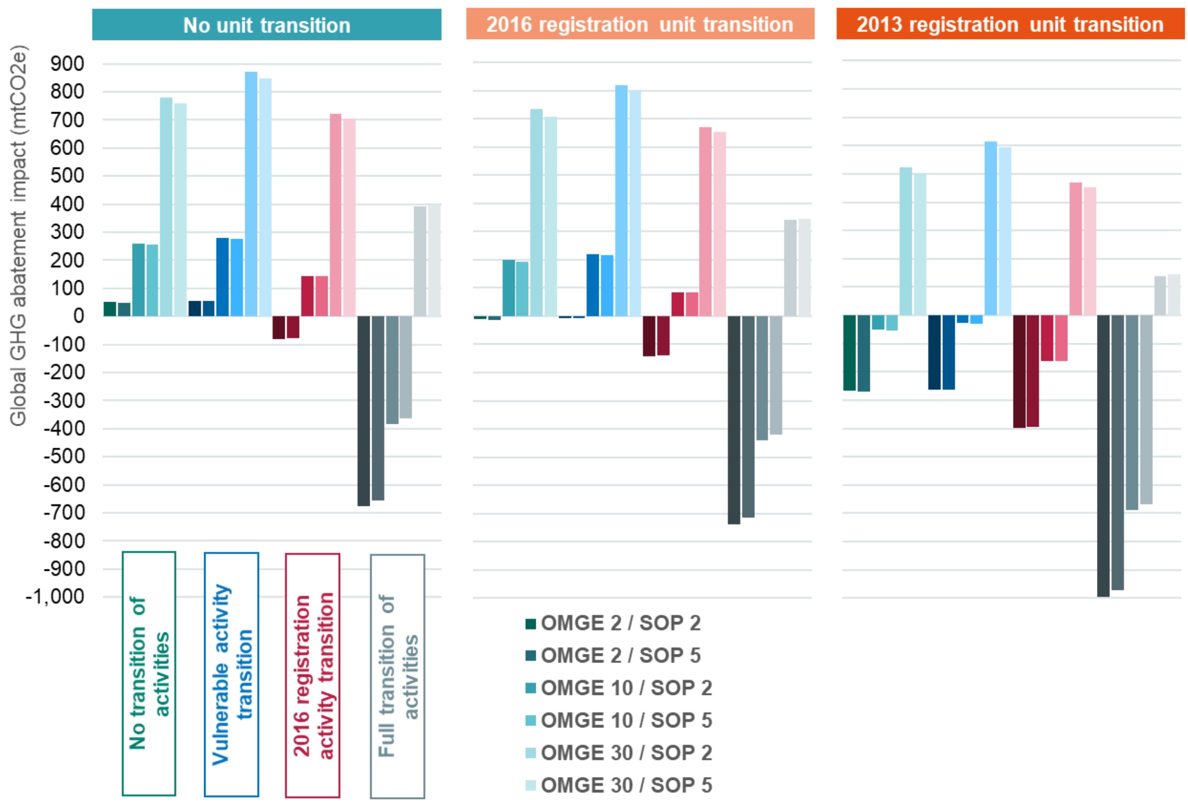


Figure 4: Overview of potential global GHG abatement impacts across all scenarios considered

Notes: The three sets of charts show the global GHG abatement impacts for scenarios with different rules for the transition of CDM units (CP2 CERs), from left-to-right: (1) no transition of units; (2) transition of units from project activities registered from 1 January 2016; and (3) transition of units from project activities registered from 1 January 2013. Within each chart, the block of six bars with similar colour shading shows the outcomes for different rules for the transition of CDM activities: (1) no transition of activities; (2) vulnerable activity transition only; (3) transition of project activities registered from 1 January 2016; and (4) full transition of project activities registered from 1 January 2013 (assuming only 30% take administrative steps to transition). The results pertaining to the transition of activities show the impact under the assumption that host countries do not alter their climate action to compensate for credits issued to non-vulnerable projects. Should host countries increase their mitigation efforts accordingly the global GHG abatement impacts under the "2016 registration activity transition" and "Full transition of activities" scenarios may be higher.

Impact of policy choices in the context of the Paris Agreement goals

Current NDCs remain inadequate to achieve the climate goals of the Paris Agreement. The NDCs communicated by Parties and the mitigation policies now in place around the world are projected to result in close to 3.0°C of warming.[1] Failure to significantly reduce global emissions by 2030 will make it impossible to keep global warming below 1.5°C. The IPCC Special Report on Global Warming of 1.5°C indicates that emission pathways consistent with no or limited overshoot of 1.5°C require a 45% reduction in emissions from 2010 levels by 2030.[2]

[1] Emissions Gap Report 2020, Executive Summary at XI (NDCs in line with 3°C of warming); Climate Action Tracker (as of May 2021, pledges and targets in line with 2.4°C of warming (range 1.9-3.0); current policies in line with 2.9°C of warming (range 2.1-3.9)). https://climateactiontracker.org/global/cat-thermometer/ accessed 6 May 2021.

[2] IPCC Special Report on Global Warming of 1.5°C, Executive Summary at 12, https://www.ipcc.ch/site/assets/uploads/sites/2/2019/05/SR15_SPM_version_report_LR.pdf

The application of OMGE could facilitate valuable additional emission reductions over the period from 2021-2030, depending on the cancellation percentage chosen, whether OMGE is applied only under Article 6.4 or also to transactions under Article 6.2, and the overall size and role of Article 6 transactions in this period.

The analysis of a hypothetical future market set out above shows that application of OMGE at a rate of 30% could achieve additional abatement in the order of 800 $MtCO_2e$ over the 2021-2030 period, relative to our reference scenario with no OMGE. 800 Mt of additional abatement represents more than 6 months' worth of current GHG emissions from all 46 of the LDC countries combined. It also is more than two years' worth of LDC current CO_2 emissions combined, and more than two years' worth of total GHG emissions from all AOSIS countries (see Table 6).

In addition to emission reductions generated over the 2021-2030 period, an acceleration in emissions reductions achieved through a high level of OMGE could have the effect of reducing mitigation challenges in the medium-to-longer term, facilitating a faster transition to net zero. A near-term reduction in emissions can facilitate further abatement in the longer term if those mitigation efforts enable structural change. Using an assessment of modelled emissions pathways, we estimate that additional abatement of 800 Mt over the next decade could facilitate a further reduction in emissions of approximately three times this amount by 2050, provided that global mitigation efforts are maintained after 2030. This suggests that an OMGE rate of 30% could, under the assumptions of our simplified market representation and assuming that mitigation efforts are maintained thereafter, lead to cumulative emissions savings by mid-century of around 3 $GtCO_2e$. This estimate is subject to large uncertainties in the assumptions made for this study and in projected global emissions trajectories but illustrates the potential for near-term abatement to enable accelerated decarbonisation over the longer term.

The additional abatement resulting from an OMGE rate of 30% could avoid an estimated $45-181 billion in global damages using United States and German primary estimates of the social cost of carbon, if application of a 30% OMGE rate were to increase global GHG abatement by around 800 MtCO2e over the 2021-2030 period.[3] Avoided damages would be approximately **$15-66 billion** if global GHG abatement increased by around 260 MtCO2e, as per the application of a 10% OMGE rate in our simplified market representation. If United States and German high impact values for the social cost of carbon are included in these avoided damage estimates, these ranges then expand to $45-640 billion in avoided global damages (for 800 Mt of avoided emissions) and USD 15-208 billion in avoided damages (for 260 Mt of avoided emissions). See section 5.4 below.

Higher rates of SOP could also generate significant revenues for the Adaptation Fund. The Adaptation Fund's cumulative resources had reached approximately USD 1 billion by June 30, 2020. Under our simplified market representation, an SOP rate of 5% could raise **€2.7 billion** in resources for adaptation over 2021-2030; an SOP rate of 10% could raise **€5.5 billion**, without materially impacting overall emissions. The amounts of adaptation support that could be generated are significant when compared to the current resources directed to particularly vulnerable developing countries under the Adaptation Fund and under the Green Climate Fund.

Article 6.4 requires that the mechanism shall aim to deliver an overall mitigation in global emissions. Our analysis indicates that the transition of CERs and CDM project activities for use under the Paris Agreement, if permitted, has potential to erode or eliminate the level of abatement that would otherwise be produced by all OMGE scenario rate options over the 2021-2030 period.

Further, by displacing new emission reduction activities, the impacts of CDM transition could lead to a much larger impact on global emissions in the longer term, through lock-in of carbon-intensive technologies, reduced flexibility, and cost escalation. A scenario with full activity transition could, depending on the market assumptions and other circumstances, lead to an increase in

[3] The bottom end of this range reflects the US central estimate, at a discount rate of 3%; the top end of this range is the German primary estimate. See Section 5.4 below for further detail.

global emissions of around 700 $MtCO_2$ by 2030 (assuming only 30% of activities actually take steps to transition), raising the likelihood of global emissions following a more carbon-intensive trajectory in the following decades. Our analysis of modelled global emissions pathways suggests that under a full transition scenario, the overall impact on emissions over the period to 2050 could be three times greater than the additional emissions enabled by activity transition during the 2021-2030 period.

Implications of differentiated OMGE and SOP requirements between Articles 6.2 and 6.4

Applying SOP and OMGE to credits issued by the Article 6.4 Supervisory Body, without applying the same elements to all ITMO transfers under Article 6.2, may jeopardise the climate mitigation and adaptation benefits sought by Article 6.4's SOP and OMGE requirements. Negotiations have considered the value of extending SOP and OMGE to transfers of ITMOs that take place under Article 6.2, in recognition that both emission reductions from the Article 6.4 mechanism and mitigation outcomes from cooperative approaches under Article 6.2 may be used toward NDCs, or toward other international purposes, and in this sense are interchangeable. In addition, e**xtension also provides an opportunity to leverage Article 6, to secure additional adaptation funding and additional global abatement.**

Our quantitative analysis focuses on A6+ ERs – those credits for emission reductions that are subject to OMGE and SOP and eligible for international transfer and use under either Articles 6.4 or 6.2 of the Paris Agreement – for which we set out a simplified representation of the future market. Our analysis assumes that all A6+ ER credits for emission reductions from the beginning of 2021 are subject to OMGE and SOP at the levels specified in the respective scenarios. If there is a difference between Articles 6.4 and 6.2 in the application of OMGE and SOP – either in terms of their level or the obligation to apply – this will distort the broader market for internationally transferable mitigation outcomes, or ITMOs. For example, the application of OMGE and SOP has the effect of increasing the cost to supply each credit, relative to a reference case in which credits are derived from emission reduction activities that are not subject to OMGE and SOP. A possible implication of agreeing high OMGE and SOP percentage levels under Article 6.4, coupled with only voluntary application under Article 6.2, is that demand for ITMOs shifts to credits without any OMGE and SOP because these credits are cheaper to procure. In this case the overall effect of agreeing high levels under Article 6.4 could be limited in terms of the impact on global emissions and adaptation funding. However, a number of other non-price differences between 6.2 and 6.4 crediting activities – including fundamental aspects such as the method used to calculate emission reductions, or the transaction costs and uncertainty involved in verifying, issuing and transferring units – will also play an important role in determining their overall relative attractiveness for different countries. Similarly, it is feasible that credit buyers for non-Article 6 purposes – such as for CORSIA, or voluntary market buyers – would also demand credits that are subject to OMGE and SOP.

Key findings

For OMGE:

- **Net global abatement increases** with increasing OMGE cancellation rates across all OMGE scenarios considered, with emissions decreasing in both buyer countries as well as – to a lesser extent – host countries. A 30% OMGE rate could deliver about 800 $MtCO_2$ of additional abatement over the period 2021-2030, avoiding roughly $45-181 billion in global damages. 800 $MtCO_2$ is roughly equivalent to 6 months' worth of total GHG emissions from all 46 LDC countries combined, or two years' worth of emissions from all AOSIS countries.
- **Credit prices, market revenues, and project owner profits increase** with increasing OMGE cancellation rates, while buyers cost savings from using credits decrease.

For SOP:

- **Higher percentage levels of SOP lead to increased levels of revenue for the Adaptation Fund** across all SOP scenarios considered.
- **Net global abatement is unaffected by SOP.** Host country emissions increase, while buyer country emissions decrease by an equivalent amount.
- **Credit prices and market revenues increase** with increasing SOP rates, while **project owner profits and buyer cost savings decrease.**

For OMGE and SOP applied in combination, with no CDM transition:

- **Global GHG abatement increases across all OMGE and SOP scenario considered**, with the most pronounced impact where a 30% OMGE rate is applied.
- **SOP revenues increase with higher levels of OMGE** because the increase in the credit price at which the Adaptation Fund can monetise credits outweighs the reduction in the quantity of credits transacted. An SOP rate of 5% could raise €2.7- 4.6 billion in resources for adaptation over the 2021-2030 period, depending on the rate of OMGE applied (2-30%).

For CDM CP2 CER transition:

- **The transition of CP2 CERs leads to an increase in global GHG emissions corresponding directly to the number of CP2 CERs transitioned** (up to 320 $MtCO_2e$ if projects registered on or after 1 January 2013 were eligible for transition).

For CDM activity transition:

- **CDM activity transition can either undermine the host country's ability to achieve its NDC or increase global emissions,** due to the large number of CDM project activities that are not dependent on carbon market revenues to continue abatement (by about 763 MtCO2e if 30% of all CDM projects were to transition).
- **No transition or limiting transition to vulnerable CDM project activities** – those at risk of discontinuing GHG abatement without carbon credit revenues – **does not pose such a risk**.

For combinations of CDM activity transition, OMGE and SOP:

- **Scenarios in which only vulnerable CDM activities are eligible to transition lead to the largest potential reductions in global GHG emissions**, but this relies on a robust assessment process for approving transition that categorically avoids authorising any activities that would continue abatement regardless.
- **SOP revenues remain similar to OMGE and SOP policy combination scenarios with no activity transition**.

For any differentiation between OMGE and SOP requirements for 6.2 and 6.4:

- **Applying SOP and OMGE to credits issued by the Article 6.4 Supervisory Body, without applying the same elements to all ITMO transfers under Article 6.2, may jeopardise the climate mitigation and adaptation benefits** sought by Article 6.4's SOP and OMGE requirements.

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Abbreviations

A6+ ER	Emission reduction unit subject to the application of OMGE and SOP and eligible for international transfer and use under either Articles 6.4 or 6.2 of the Paris Agreement
A6.4 ER	Emission reduction unit issued by the Supervisory Body under Article 6.4 of the Paris Agreement
AOSIS	Alliance of Small Island States
CDM	Clean Development Mechanism
CER	Certified Emission Reduction under the Kyoto Protocol
CORSIA	Carbon Offsetting and Reduction Scheme for International Aviation
CMA	Conference of the Parties serving as the meeting of the Parties to the Paris Agreement
CMP	Conference of the Parties serving as the meeting of the Parties to the Kyoto Protocol
CP2 CERs	Certified emission reductions issued by the CDM Executive Board for emission reductions achieved during the Kyoto Protocol's second commitment period
ITMO	Internationally Transferred Mitigation Outcome
JI	Joint Implementation
LDC	Least Developed Countries
NDC	Nationally Determined Contribution
OMGE	Overall Mitigation in Global Emissions
OTHER ERs	Catchall term for emission reduction units issued by standard bodies other than those supervised by UN organisations
SB	Supervisory Body
SBSTA	Subsidiary Body for Scientific and Technological Advice
SOP	Share of Proceeds
TRANS ERs	Emission reduction units achieved in the period from 2021 onwards, issued by the Article 6.4 Supervisory Body to activities previously registered with the CDM (before the end of 2020), and which transition to the 6.4 market mechanism

1 Introduction

Article 6 of the Paris Agreement recognises that Parties pursue voluntary cooperation to allow for higher ambition in their mitigation and adaptation actions and to promote sustainable development and environmental integrity. Article 6.4 establishes a centralised mechanism to contribute to the mitigation of greenhouse gas emissions and support sustainable development, whereby reductions generated in a host Party may be used by another Party toward its nationally determined contribution (NDC). Article 6.2 addresses the use of internationally-transferred mitigation outcomes (ITMOs) toward Parties' pledged mitigation efforts – NDCs under the Paris Agreement.

Many papers have addressed the need for Article 6 implementation to secure environmental integrity, avoid double counting, apply robust baseline methodologies, address non-permanence and ensure additionality. These elements aim to ensure that any reductions that are transferred represent real, measurable, permanent and additional reductions so that Article 6 transfers do not undermine ambition.

In this paper we assess three issues that have yet to be resolved in the international climate change negotiations and which have potential to impact the overall level of mitigation as well as funding for adaptation achieved through the operation of Article 6:

1) the scale of a share of proceeds (SOP) for adaptation;
2) the scale of the overall mitigation in global emissions (OMGE) required to be delivered under the mechanism; and
3) the proposed transition of project activities registered with the Clean Development Mechanism (CDM) and/or credits from the Kyoto Protocol to the Paris Agreement.

We also consider the application of SOP and OMGE to transfers carried out under Article 6.2. The resolution of these issues will influence the supply, demand and prices of Article 6.4 units (A6.4 ERs) and ITMOs under Article 6.2, as well as the available funding for adaptation and the impact of carbon markets on global GHG emissions.

More specifically, this paper addresses the volumes involved or implied by options for OMGE, SOP and transition in the three versions of the Article 6 negotiating texts; the interaction of these quantitative elements; the risks and implications of these options for mitigation ambition and for adaptation finance; and the implications of these options and volumes in the context of achieving the goals of the Paris Agreement.

This paper aims to offer insight into the following questions, among others:

1. What could the different SOP percentages in the COP Presidency texts deliver for adaptation revenue?
2. What could the different OMGE cancellation rates in the negotiating texts deliver for global abatement?
3. How do the percentages applied to SOP and OMGE interact?
4. How do outcomes on 6.4 and 6.2 interrelate?
5. How might different proposed options for CDM transition impact SOP revenues and the achievement of an overall mitigation in global emissions (OMGE) under Article 6?
6. What are the implications of these options and volumes in the context of achieving the goals of the Paris Agreement?

With respect to OMGE, quantitative work has considered the relative implications on key market indicators of different levels of OMGE in isolation under a range of scenarios (see Schneider et al.

2018).[4] This work found that application of a percentage cancellation for OMGE leads to more overall abatement, more activity in transferring (host) countries, and an increase in net revenues for project owners under a broad range of circumstances, with additional costs borne by the buyers of offset credits. GHG abatement typically increases with higher rates of OMGE. Implementing OMGE increases the price of credits and, depending on the elasticity of demand, can reduce the number of credits transacted. In this paper we extend this previous work by exploring the implications of OMGE in combination with other parallel policy decisions as well as carrying out similar analysis in the context of a hypothetical market for carbon credits to illustrate the potential absolute magnitude of impacts.

With respect to SOP, little analysis is publicly available that seeks to quantify the implications of different percentage options under the Paris Agreement on potential revenues for adaptation. There is a common understanding that the market price of Article 6.4 emission reduction credits (A6.4 ERs) directly impacts the value of units monetised from a SOP for the Adaptation Fund, with a higher market price for A6.4 ERs delivering higher revenues for the same volume of units. Our analysis in this paper seeks to quantitatively examine the implications of a higher percentage SOP on the volumes delivered to the Adaptation Fund both in isolation, as well as in combination with different policy choices regarding OMGE levels or the transition of CDM units and activities.

On issues related to transition of CDM units and activities, a range of studies have considered the quantitative impact of different possible CER "transition" options captured in previous Article 6 negotiating texts and the impact these quantities may have in undermining Paris Agreement ambition (see, e.g., Ishikawa, et al. 2020).[5] However, these studies do not include analysis of the potential supply of credits for emission reductions achieved from 2021 from transitioning project activities to the new Article 6.4 mechanism. They also do not consider the interaction of transition options with OMGE rate options that aim to deliver an overall mitigation in global emissions under Article 6. We aim to shed light on both of these aspects with the quantitative analysis in this paper.

Issues regarding possible CDM transition, as well as levels of SOP and OMGE are interlinked: how one issue is resolved may impact the effectiveness or functioning of the other issues. Each of these three issues has both technical and political aspects. This paper seeks to provide a technical understanding of the quantitative implications, risks and opportunities related to textual options, to support evidence-based decision making.

The paper is structured as follows: In Chapter 2 we set out relevant background and the current state of play in Article 6 negotiations with respect to OMGE, SOP and transition options. In Chapter 3 we set out parameters for the future market for Article 6 credits, focusing on demand and supply, to derive a hypothetical reference scenario which informs the quantitative analysis of different policy options – both in isolation and in combination with each other – presented in Chapter 4. Finally, in Chapter 5 we consider the implications for the different options in the context of climate targets, both for mitigation pathways and adaptation needs.

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[4] Schneider et al., (2018), Operationalising an 'overall mitigation in global emissions' under Article 6 of the Paris Agreement, available at: https://newclimate.org/2018/11/21/operationalising-an-overall-mitigation-in-global-emissions-under-article-6-of-the-paris-agreement/

[5] Ishikawa et al., (2020), CDM supply potential for emission reductions up to the end of 2020, available at: https://newclimate.org/2020/11/25/cdm-supply-potential-for-emission-reductions-up-to-the-end-of-2020/

2 Article 6 negotiations: OMGE, SOP and Transition

2.1 Background to the negotiations

In Article 2 of the Paris Agreement, all Parties aim to strengthen the global response to climate change by (1) pursuing efforts to limit warming to 1.5C; (2) increasing the ability to adapt to the adverse effects of climate change; and (3) making finance flows consistent with a pathway toward low GHG emissions.

Article 6.4 of the Paris Agreement establishes a centralised mechanism to contribute to the mitigation of greenhouse gas emissions, building on the experiences with and lessons learned from the Kyoto Protocol mechanisms.[6] Article 6.2 is understood to establish the accounting system for transfers of emission reductions under 6.4, and to enable recognition of internationally-transferred mitigation outcomes toward NDCs.

As with the CDM, the 6.4 mechanism is required to deliver a share of proceeds, or SOP, "to cover administrative expenses as well as to assist developing country Parties that are particularly vulnerable to the adverse effects of climate change to meet the costs of adaptation."[7] However, in a distinct departure from the previous approach under the CDM, the 6.4 mechanism now aims "to deliver an overall mitigation in global emissions", or OMGE.

Mandated negotiations on SOP and OMGE have focused on the scale of the share of proceeds for adaptation and how best to implement this requirement, as well as the scale of OMGE to be delivered and how best to implement this requirement. In these negotiations, some parties have raised the concern that applying SOP and OMGE to credits issued under Article 6.4, without applying the same elements to all ITMO transfers under Article 6.2, may jeopardise the benefits sought by Article 6.4's SOP and OMGE requirements. Accordingly, negotiations have also considered the value of extending SOP and OMGE to transfers of ITMOs that take place under Article 6.2, in recognition that units and outcomes from both 6.4 and 6.2 may be used toward NDCs or toward other international purposes, and in this sense are interchangeable. Extension has also been seen as an opportunity to leverage Article 6, to secure additional adaptation funding and additional global abatement.

Outside the negotiating mandate of decision 1/CP.21 for Article 6, some countries have called for the transition of leftover Kyoto Protocol units (certified emission reductions, or CERs) and/or existing CDM project activities to the Paris Agreement. Such a transition has been flatly opposed by other countries. Significant effort and attention have been given, inside and outside the negotiating process, to the potential risk to environmental integrity and ambition from such a transition.

An important consideration in the selection of the percentage SOP and percentage OMGE required under Article 6.4, as well as in the extension of SOP and OMGE to Article 6.2, is the likelihood and scale of beneficial outcomes for both mitigation and adaptation.

[6] Decision 1/CP.21, para. 37.

[7] Article 6.6.

2.2 Textual basis for negotiations

Article 6 negotiators have been mandated to deliver three draft decisions for adoption by the Conference of the Parties working within the Subsidiary Body for Scientific and Technological Advice (SBSTA):

(1) guidance for the implementation of Article 6.2 of the Paris Agreement, addressing rules for the transfer of internationally transferred mitigation outcomes between Parties;
(2) rules, modalities and procedures for the centralized mechanism established under Article 6.4; and
(3) a decision on a work programme under Articles 6.8 and 6.9.

It is understood that these three texts will be adopted as a political package. Only the first two of these draft decisions relate to transfers of emission reductions and to internationally transferred mitigation outcomes and are therefore relevant to the analysis in this paper.

At COP 25 in Madrid in 2019, when agreement could not be reached among negotiators, unfinished SBSTA draft texts were passed to the COP Presidency for further consultations among Parties and groups of Parties. Building on the work of the SBSTA, the COP Presidency prepared three successive iterations of draft decision text, none of which was able to achieve consensus among the Parties by the time the session expired.

By decision 9/CMA.2, the Parties recognized the draft decisions prepared by the COP Presidency, noted that these texts did not represent a consensus among Parties, and requested SBSTA to continue its work at SBSTA 52 on the basis of these texts. Accordingly, it is likely that negotiations will resume on the basis of 9 draft texts, reflecting the three iterations of each text.

Decision text from COP 25:
9/CMA.2, FCCC/PA/CMA/2019/6/Add.1

Draft COP Presidency iterations of decision texts:

1) guidance on cooperative approaches referred to in Article 6, paragraph 2, of the Paris Agreement, available at
https://unfccc.int/documents/204687 (third iteration, 15 December)
https://unfccc.int/documents/202115 (second iteration, 14 December)
https://unfccc.int/documents/204639 (first iteration, 13 December)

2) rules, modalities and procedures for the mechanism established by Article 6, paragraph 4, of the Paris Agreement, available at
https://unfccc.int/documents/204686 (third iteration, 15 December)
https://unfccc.int/documents/201918 (second iteration, 14 December)
https://unfccc.int/documents/204644 (first iteration, 13 December)

3) the work programme under the framework for non-market approaches referred to in Article 6, paragraph 8, of the Paris Agreement available at
https://unfccc.int/documents/204667 (third iteration, 15 December)
https://unfccc.int/documents/202118 (second iteration, 14 December)
https://unfccc.int/documents/204638 (first iteration, 13 December).

2.3 Share of Proceeds for adaptation

Article 6.4 of the Paris Agreement establishes a centralized mechanism to contribute to the mitigation of greenhouse gas emissions and support sustainable development, to be supervised by a body designated by the Parties to the Agreement. Article 6.6 requires the Parties to:

> *ensure that a share of the proceeds from activities under the mechanism referred to in paragraph 4 of this Article is used to cover administrative expenses as well as to assist developing country Parties that are particularly vulnerable to the adverse effects of climate change to meet the costs of adaptation*.

The Parties to the Paris Agreement have not yet agreed upon the scale of the share of proceeds for adaptation under Article 6.4.

Article 6.6 echoes language previously used under the Kyoto Protocol to establish an automatic revenue stream for the Adaptation Fund from CDM project activities.[8] In the Kyoto Protocol context, the term "*proceeds*" refers to the units (CERs) generated through CDM project activities, each reflecting one tonne of emission reduction. The term "*share of proceeds*" (SOP) refers to a fixed portion of these units collected at issuance and directed to the Adaptation Fund "to assist developing country Parties that are particularly vulnerable to the adverse effects of climate change to meet the costs of adaptation." By decision 17/CP.7, this percentage was fixed at 2% under the Kyoto Protocol.[9] Once received by the Adaptation Fund, CERs have been "monetized" to generate revenue to support adaptation project activities.[10] In 2012, under the Doha Amendment (decision 1/CMP.8), Kyoto Parties agreed to augment the Adaptation Fund for the Protocol's second commitment period with a share of proceeds levied on the first international transfer of Assigned Amount Units under Article 17 and on the issuance of Emission Reduction Units from project-based activities under Article 6.[11] The Doha Amendment came into effect on 31 December 2020.

Under the Paris Agreement, use of the term "share of proceeds" invokes the system and understanding established under the Protocol. Parties are now debating how large this share of proceeds should be under the Paris Agreement, how it should be collected and whether a similar share of proceeds should be required of cooperative approaches taking place under Article 6.2. Open issues include:

(1) the **scale** of the share of the proceeds applicable to Article 6.4 activities: e.g., what percentage?
(2) the **scope** of application: whether the % SOP should also be applied to the transfer of ITMOs generated under Article 6.2, either mandatorily or voluntarily; and
(3) the **nature** (units or funding) and destination (Adaptation Fund or other) of any transfer of resources for purposes of adaptation under Article 6.2.

Related discussions have addressed the practical aspects of shifting responsibility for the Adaptation Fund from the Kyoto Protocol to the Paris Agreement, whether the SOP should be collected "in kind" in the form of CERs or instead through a direct financial levy, and how to address the share of proceeds for administrative expenses. By decisions 13/CMA.1 and 14/CMA.14, the Parties have agreed that the

[8] Article 12.8 provides as follows: "The [CMP] shall ensure that a share of the proceeds from certified project activities is used to cover administrative expenses as well as to assist developing country Parties that are particularly vulnerable to the adverse effects of climate change to meet the costs of adaptation." See also Decision 10/CP.7, establishing the Adaptation Fund.

[9] Decision 17/CP.7, para. 15 (a) and (b).

[10] See, e.g., Adaptation Fund Board, Amended and Restated CER Monetization Program Guidelines July 2013.

[11] Decision 1/CMP.8, para. 21 ("Decides also that for the second commitment period, the Adaptation Fund shall be further augmented through a 2 per cent share of the proceeds levied on the first international transfers of AAUs and the issuance of ERUs for Article 6 projects immediately upon the conversion to ERUs of AAUs or RMUs previously held by Parties").

Adaptation Fund will serve the Paris Agreement under the guidance and authority of the CMA[12], effective 1 January 2019, and will serve the Paris Agreement exclusively once the share of proceeds under Article 6.4 of the Paris Agreement becomes available.

Quantitative options for SOP reflected in iterations of the COP Presidency texts

Text	*Option*	*Iterations of text*
6.4	• 2%	*V.1, V.2, V.3*
	• 5%	*V.1*
	• Combination of monetary levy at registration and % levy at issuance in a manner to be later determined by CMA	*V.1*
6.2	• All cooperative approaches to contribute to Adaptation Fund; Developed countries shall provide same % as under 6.4 on volume of ITMOs used toward NDCs	*V.1*
	• Participating Parties using baseline and credit approaches strongly encouraged to contribute same % as under 6.4	*V.1, V.2, V.3*
	• Participating Parties in cooperative approaches encouraged to provide adaptation financing	*V.1*

Our quantitative analysis in Chapter 4 considers the impacts of the application of levels of SOP of 2%, 5% and 10% in isolation on a selection of key market indicators. In the analysis of the different combinations of policy options we limit the assessment to the applications of levels of SOP of 2% and 5%.

2.4 Overall Mitigation in Global Emissions

A characteristic of the new centralised Article 6.4 mechanism is that it "*shall aim: … (d) to deliver an overall mitigation in global emissions*." In this respect, Article 6.4 differs from the CDM, which was established as a zero-sum offsetting mechanism, with emission reductions achieved in the jurisdiction of one Party used to offset emissions in another. The Article 6.4 mechanism now aims to deliver net global emission reductions.

Open issues include:

(1) **Scale**: the percentage (%) to be cancelled under Article 6.4 to deliver an overall mitigation in global emissions;
(2) **Relationship with transfers under Article 6.2**: whether the same cancellation % agreed under Article 6.4 should be applied mandatorily or voluntarily to the transfer of internationally transferred mitigation outcomes (ITMOs) generated under Article 6.2; and
(3) **Mechanics of application** of OMGE to transfers under Article 6.2.

This paper assumes that the mechanism for ensuring delivery of an OMGE will be the application of a cancellation percentage to units generated under the 6.4 mechanism at issuance, paired with a corresponding adjustment by the host Party for total reductions achieved. The registry administrator transfers an agreed fixed percentage of issued A6.4ERs to a cancellation account in the 6.4 registry for OMGE, where these units are not usable by any Party toward its NDC or for other international mitigation purposes, but instead contribute to an overall mitigation in global emissions. We make this assumption because it is the approach adopted by the last COP Presidency text iteration from Madrid and the approach identified in various studies as the most reliable way to respond to Article 6.4's requirement

[12] The CMA, or Conference of the Parties serving as the meeting of the Parties to the Paris Agreement, oversees the implementation of the Paris Agreement.

that the mechanism deliver an OMGE, based on a range of criteria (Schneider et al., 2018; Wang-Helmreich et al., 2019; Warnecke et al., 2018).

Quantitative options reflected in the COP Presidency's texts

Various numerical options have been proposed for application under Article 6.4, including: 2%, 10%, 20%, 30% and X%. The COP Presidency's last iteration of text (dated 15 December 2019) did not adopt a percentage, but reserved a determination of the percentage to be transferred for cancellation to a later decision of the CMA as follows:

> *(b) The mechanism registry administrator shall transfer a percentage of the issued A6.4ERs to the cancellation account in the mechanism registry for overall mitigation in accordance with chapter V above (Article 6, paragraph 4, activity cycle), at a level to be determined by the CMA that shall not be less than 2 percent.*

While the text of Article 6 only agreed to define an OMGE for the 6.4 mechanism and does not address net global mitigation from cooperative approaches under Article 6.2, many Parties have called for Article 6.2 and 6.4 to be equally robust and for 6.2 also to deliver an overall mitigation in global emissions (Warnecke et al., 2018). The San Jose Principles for High Ambition and Integrity in International Carbon Markets, and the 30+ countries that expressly support these principles, have called for an Article 6 rulebook that "delivers an overall mitigation in global emissions, moving beyond zero-sum offsetting approaches to help accelerate the reduction of global greenhouse gas emissions."[13]

Options proposed for application under Article 6.2 include:

- Mandatory cancellation at the same percentage agreed for application Article 6.4 and using the same methodology;
- Encouragement to all cooperative approaches authorized for use by a Party to cancel at the same percentage agreed for application Article 6.4 and using the same methodology;
- Participating Parties and stakeholders strongly encouraged to cancel ITMOs to deliver OMGE at a level commensurate with the scale delivered under the Article 6.4 mechanism;
- Voluntary cancellation of ITMOs, with those ITMOs not for use by any Party toward an NDC or other international mitigation purpose and with no further guidance provided.

Within the discussion of extension of both SOP and OMGE to Article 6.2, some Parties have questioned whether it would be appropriate to treat units from capped emission trading systems in the same manner as units generated under baseline and credit approaches under Article 6.2. Others have pointed to the fungibility of ITMOs for use toward NDCs.

Quantitative options for OMGE reflected in iterations of the COP Presidency's texts

Text	*Option*	*Iterations of text*
6.4	• 2% • At least 2%, number to be determined • 10% • 20% • 30% • X%	*V.2* *V.3* *V.1* *V.1* *V.1* *V.1*
6.2	• Same % as 6.4 - Mandatory application - with all cooperative approaches required to apply same methodology and cancellation percentage as under 6.4	*V.1*

[13] https://cambioclimatico.go.cr/press-release-leading-countries-set-benchmark-for-carbon-markets-with-san-jose-principles/

	• Same % as 6.4 - Voluntary application - all cooperative approaches encouraged to apply same methodology and cancellation percentage as under 6.4 • Commensurate with scale under 6.4 - Participating Parties and stakeholders strongly encouraged to cancel commensurate with the scale delivered under 6.4 • Unspecified % - Voluntary - unspecified rate or scale	*V.1* *V.2, V.3* *V.1*

Our quantitative analysis in Chapter 4 below considers a range of % cancellation options for their effects on the scale of delivery of OMGE compared to a reference scenario in which there is no cancellation of units. We analyse the impact of OMGE levels of 2%, 5%, 10%, 20% and 30% where we assess the impact of OMGE in isolation. In the analysis of the different combinations of policy options we limit the assessment to the applications of levels of OMGE of 2%, 10% and 30%.

2.5 Transition of CDM activities and units

The latest draft negotiating text related to the mechanism established by Article 6.4 of the Paris Agreement (version 3, dated 15 December 2019) sets out potential options for transitioning Clean Development Mechanism (CDM) activities *and* certified emission reductions.

The transition of *activities* relates to the registration under Article 6.4 of projects or programmes of activities that were registered under the CDM. Once registered under the new Article 6.4 mechanism, these activities would be eligible to receive emission reductions credits, or A6.4ERs, for continued abatement activity in the period starting from the beginning of 2021. To date Parties have not agreed whether any CDM activities could be transitioned at all, or under which conditions transition may be approved. The latest draft negotiating text specifies that the transition of activities needs to be completed by the end of 2023. It also sets out that an activity's existing, approved CDM methodology for measuring emission reductions remains valid until either the end of 2023, or the expiry of its current crediting period, if earlier (paragraph 73). However, the text is subject to future change with critical decisions remaining open for further negotiation.

The transition of *units* relates to the future use of CERs, representing emission reduction or removal outcomes achieved in the period up to the end of 2020, by Parties towards their NDCs. Again, Parties have not yet reached an agreement on whether CERs can transition for use under the Paris Agreement and, if so, under what conditions. The latest draft negotiating text proposes (in paragraph 75(a)) that the registration date of the activity under the CDM would determine whether associated CERs would be eligible, but stops short of explicitly setting out which registration date. The text also proposes to limit use of any eligible CERs towards NDCs to the period up to the end of 2025, and not beyond.

As with the negotiations regarding the transition of activities, the text related to the transition of emission reduction units remains subject to further negotiation. This text also proposes a date restriction for determining which projects or programmes of activities might supply eligible CERs, but crucially does not provide a date. The previous iteration of the text included reference to transitioning CERs from CDM project activities registered from the beginning of 2016 (or 2013, if used by the host country), and also included an earlier cut-off, setting out that they should only be used in the period up to the end of 2023.[14]

The latest draft negotiating texts related to the mechanism established by Article 6.2 of the Paris Agreement (version 3, dated 15 December 2019) provide no reference to the use of CERs, or Kyoto Protocol units in general.[15] Previous iterations developed under SBSTA 51 and CMA 2 sessions during

[14] https://unfccc.int/sites/default/files/resource/DT.CMA2_.i11b_.pdf

[15] https://unfccc.int/sites/default/files/resource/DT.CMA2_.i11a.v3_0.pdf

December 2019, in Madrid, provided an alternative clarification on the use of Kyoto Protocol *units* for cooperative approaches between Parties. For example, the last draft text from the SBSTA 51 session (dated 9 December 2019) included one option (Option A) specifying that neither Kyoto Protocol units, nor the emission reduction outcomes underlying them, shall be used by Parties towards their NDC. The alternative option (Option B) proposed to include no reference to Kyoto Protocol units in the text.[16]

Options for transition reflected in iterations of the COP Presidency's texts

Activities	*6.4 texts*
A. Activities • transferable if (1) host provides approval to SB no later than [X date] [Dec 31 2023];	 *V.1, V.2, V.3*
(2) compliance with 6.4 rules and any further relevant decisions of CMA and requirements adopted by SB [Including those that relate to the application of a corresponding adjustment consistent with 6.2 guidance]	*V.1, V.2, V.3* *V.3*
(3) transition completed no later than [X date] [31 December 2023]	*V.1, V.2, V.3*
• may apply current CDM-approved methodology until earlier of end of current crediting period or 31 December [2023], then an approved meth	*V.1, V.2, V.3*
• A6.4ERs may be issued from 2021 for activities that have transitioned	*V.1, V.2, V.3*
• SB to ensure small scale CDM project activities and PoAs to undergo expedited [registration] [transition] process in accordance with SB decisions	*V.1; V.2, V.3*
Units	
Kyoto units or underlying reductions not usable • No use of CERs toward NDCs • Kyoto Protocol units, or emission reductions underlying such units, shall not be used by a Party towards its NDC or for other purposes.	 *V.1, option A* *V.1, option E (6.2 text V.1, Option A)*
No reference to Kyoto units • [Other than CERs used in accordance with this chapter, Kyoto Protocol units, or emission reductions underlying such units, shall not be used by a Party towards its NDC or for other purposes]. • {no reference to Kyoto Protocol units}]	 *V.1, option B* *V.1, option F; (6.2 text V.1, Option B)*
• **Quantitative limit** on volume of CERs that may be used by host or transferred for use toward NDCs	*V.1, option B*
• **A Party other than the CDM host Party** may use CERs toward its NDC where all of the following conditions are met: (1) activity or PoA registered on or after [X date] [1 January 2016] (2) CERs for reductions or removals achieved in 2020 or earlier; (3) CERs used toward NDC by non-host by end of [2023]; [CDM host Party not required to make a corresponding adjustment for NDCs used by [X date] [2023];	*V.1, V.2* *V.1, V.2* *V.1, V.2* *V.1, V.2* *V.1, V.2*
• **CDM host Party** may use toward its own NDC where all of the following conditions are met: (1) activity or PoA for which the CERs were issued was registered on or after 1 January [2013] [X] [2016]; (2) used toward the NDC no later than [X date] [2023]; (3) transferred to registry no later than [31 Dec 2023], upon request of host Party;	*V.1, V.2* *V.2* *V.1, V.2* *V.1, V.2*

[16] https://unfccc.int/sites/default/files/resource/DT.SBSTA51.i12a.3.pdf

(4) use of CERs is reported by host Party in BTR; [CDM host Party not required to make a corresponding adjustment for CERs to be used by [X date] [2023]].	*V.1, V.2* *V.1; V.2*
• **CERs may be used towards NDC of the CDM host Party or a participating Party** in accordance with all of the following conditions: (1) activity or PoA registered on or after a date to be determined by CMA; (2) CERs for reductions or removals achieved in 2020 or earlier; (3) CERs used towards the NDC no later than 31 December 2025; (4) CDM host Party not required to apply a corresponding adjustment for CERs identified as to be used by 31 December 2025; (5) Participating Party using the CERs towards its NDC shall apply corresponding adjustments consistent with Article 6, paragraph 2; (6) CERs are identified as pre-2021 CERs in reporting by CDM host and Participating Party	*V.3*
• CERs may be used towards NDCs consistent with guidance for cooperative approaches referred to in Article 6.2.	*V.1, option D*
Reserve • [Other than CERs used in accordance with this chapter, Kyoto Protocol units may be placed in reserve].	*V.1- CMP decision text* *V.2, option B*
• CERs that do not meet these conditions are in reserve and may only be used toward NDCs in accordance with a future decision of the CMA	*V.3*

In our quantitative analysis set out in Chapter 4 we analyse the following scenarios for the transition of CDM activities and CERs, both in isolation as well as in combination with the range of different policy decisions.

1. **Transition of CDM activities**
   a) No transition of activities (which we label as the reference scenario, to which other options are compared);
   b) Transition of activities registered with the CDM on, or after, 1 January 2016;
   c) Transition of vulnerable projects (i.e. those whose continued abatement depends on the receipt of carbon credit revenues); and
   d) Full transition of all activities.

2. **Transition of CERs**
   a) No transition of credits (which we label as the reference scenario, to which other options are compared);
   b) Transition of credits from CDM activities registered on, or after, 1 January 2016; and
   c) Transition of credits from CDM activities registered on, or after, 1 January 2013.

3 Parameters of the future market for Article 6 credits

In this chapter we set out possible characteristics of the future market for carbon credits – with a focus on offset credits that may be used to achieve climate targets under the Paris Agreement – over the period to 2030. These form a basis for analysis presented in Chapter 4 that quantitatively explores the potential implications of different Article 6 policy design decisions. We first consider the demand for Article 6 credits from different sources, both in terms of its potential magnitude as well as how responsive the level of demand is to the price of credits, i.e. the shape of the demand curve. Then we turn to the supply of credits and set out estimates of the volume of credits that might be supplied at different price levels.

Both the demand and supply of emission reduction credits over the coming decade are highly uncertain. The future market for Article 6 credits is particularly challenging to forecast as the Paris Agreement provides a very different setting to the governance framework for international market mechanisms over the past two decades of the Kyoto Protocol and its Doha Amendment. Many of the rules that will govern the new post-2020 market, and procedures that facilitate its operation, remain undecided. This lack of regulatory guidance, coupled with complex implications for both buying and supplying credits, mean that it is a highly uncertain market to analyse.

To explore the potential implications of different policy decisions on OMGE, SOP, and the transition of both units and activities from the Kyoto Protocol era, we use an economic framework with a simplified representation of the possible supply and demand for offset credits. This provides a useful tool to approximate the price as well as the quantity of credits exchanged between suppliers and buyers, along with a range of additional market indicators. By varying key inputs, such as the level of OMGE or SOP, we use the tool to offer insight into how policy decisions are likely to influence critical outcomes, such as the overall level of mitigation facilitated by Article 6; the quantum of funding available for adaptation projects collected via the SOP; the price and quantity of credits transacted; as well as the potential implications for different market stakeholders.

3.1 Demand for emission reduction credits

Demand for Article 6 credits over the next decade could stem from a variety of sources. In the following sections we set out the likely key sources of demand as well as estimates of their potential magnitude. There is a high degree of uncertainty around the possible level of demand at different price levels. As the post-2020 market for emission reduction credits has fundamental differences to credit markets that have existed to date, the historic evidence base is only of limited use. Our estimates serve to provide a credible (if uncertain) basis for quantitative analysis of potential trends in the implications of different levels of OMGE, SOP and CDM unit and activity transition. The estimates do not represent a forecast, or projection for the market.

There are a number of types of existing and future emission reduction credits; some of which buyers may consider as different products, and some which buyers may consider as more interchangeable (substitute) offerings. In many instances there is no single, accepted term for the different types of emission reduction credits. We use the following terminology and associated definitions for credits of particular relevance to this study:

- **CP2 CERs**: Certified emission reductions (CERs) issued by the CDM for emission reductions achieved during the Kyoto Protocol's second commitment period, running from the beginning of 2013 to the end of 2020.
- **TRANS ERs**: Credits for emission reductions achieved in the period from 2021 onwards, issued by the 6.4 Supervisory Body to activities previously registered with the CDM (before the end of 2020), and which transition to the 6.4 market mechanism.

- **A6.4 ERs**: Credits issued under the Paris Agreement by the 6.4 Supervisory Body to new activities registered with the 6.4 market mechanism for emission reductions in the period from 2021.
- **A6+ ERs**: Credits that are subject to the application of OMGE and SOP and eligible for international transfer and use under either Articles 6.4 or 6.2 of the Paris Agreement. (TRANS ERs and A6.4 ERs would also fall under this definition of credits in addition to other units that may be used under Article 6.2 where subject to OMGE and SOP).
- **Other ERs**: Catchall term for emission reduction credits issued by standard bodies other than those supervised by UN organisations – e.g. by private standards such as Gold Standard, Verra, CAR, etc. – and which are not subject to the application of OMGE and SOP. We do not analyse demand for Other ERs here aside from discussing the extent to which they offer buyers an alternative to the other listed types of credits.

The main focus of our analysis in this report is on A6+ ERs. These are units that are subject to OMGE and SOP and we assess the potential impact on their market of adopting different levels for these two policy levers. The market for these units would be directly influenced by the percentage level that is determined under Article 6 for both OMGE and SOP and their demand will contribute to any overall mitigation in global emissions as well as funding for adaptation.

A6+ ERs include units that will be issued by the 6.4 Supervisory Body (A6.4 ERs and, to the extent they are deemed eligible, TRANS ERs) for which we assume the application of OMGE and SOP is mandatory. If rules for Article 6.2 require that eligible units are subject to the mandatory application of OMGE and SOP, then these would also fall under the umbrella of A6+ ERs. However, if OMGE and SOP is only voluntary (or not encouraged at all) under Article 6.2, then only those units for which OMGE and SOP is actually applied would constitute A6+ ERs as we define them here. Similarly, it is feasible that credit buyers for non-Article 6 purposes – such as for CORSIA, or voluntary market buyers – would also demand credits that are subject to OMGE and SOP. Our analysis considers the potential magnitude of this demand as well, albeit subject to the uncertainties emphasised above.

Considering the types of credits listed above, each as separate (but inter-related) "products" with their own demand and supply curves, would add significant complexity to our analysis. To limit the number of assumptions and analytical permutations, we focus on estimating the potential magnitude of demand for A6+ ERs, which are subject to SOP and OMGE requirements. Some, or all, of the other types of credits could meet the same needs of buyers and are therefore relevant. For example, certain countries may use CP2 CERs to achieve their NDC targets, if deemed eligible. However, other buyers may distinguish their demand between the different products. For instance, some countries are clearly opposed to the use of CP2 CERs towards NDCs and are therefore unlikely to treat them as viable substitutes to A6.4 ERs, at least for their own use. We explore the implications of differing demand and supply across the types of credits quantitatively, where possible, as well as through qualitative description.

We group potential credit buyers into three categories. Each group has different carbon credit procurement needs as well as (eligibility) constraints.

- **NDC compliance:** Governments looking to use credits to assist in meeting their NDC targets;
- **CORSIA:** Aircraft operators aiming to satisfy compliance obligations under the Carbon Offsetting and Reduction Scheme for International Aviation;
- **Voluntary market:** Private or public sector buyers aiming to either offset their emissions or contribute to climate change mitigation, e.g. corporates, private individuals or national and multilateral funds.

In the following sub-sections we explore the characteristics of demand from these three groups of buyers and set out our assumptions on their respective demand for credits at a range of price levels. This informs the demand curve we use in our quantitative analysis, presented in Chapter 4.

3.1.1 NDC compliance

Sources of demand for NDC compliance

Article 6 is included in the Paris Agreement as a mechanism to facilitate raising global climate ambition through cooperation between countries, either bilaterally or multilaterally. A key source of demand for A6+ ERs, as well as CP2 CERs (if these were deemed eligible), will stem from countries purchasing emission reduction credits to use towards their NDC target. To date, a relatively large number of countries have expressed an interest in using international crediting mechanisms within their NDCs.[17] However, the majority of these are developing countries, who are likely most interested in hosting emission reduction projects over the coming decade, rather than purchasing credits from projects developed in other countries. Amongst the "industrialised" countries listed in Annex I of the Kyoto Protocol, only nine have expressed an interest in their NDCs in using international credit mechanisms: Switzerland, Japan, New Zealand, South Korea, Canada, Mexico, Norway, Liechtenstein and Monaco.[18] These countries account for 7% of global emissions.[19] Notably, large emitters, such as the EU and UK, have focused their NDC pledges on domestic emission reductions, explicitly ruling out use of international credits to make up for any shortfall in the period to 2030.

Estimating the order of magnitude of NDC compliance demand

We estimate the demand for A6+ ERs for NDC compliance on the order of **300-1,000 million** over the period 2021 to 2030. This is based on statements made in the NDCs of these Annex I countries that have expressed an interest in using international credit mechanisms for achieving their NDCs, as well as additional evidence available. For example, the draft proposal of the Swiss CO_2 Act indicates a level of demand to deliver Switzerland's NDC of approximately 35 million credits over the period to 2030.[20] Other public positions are far less specific.

To inform our analysis, we consider projections published by the Climate Action Tracker for the seven largest of these potential buyer countries which compare the emission reductions that current policies are likely to deliver, relative to their respective NDC target.[21] This offers insight into the expected gap between domestic action and the 2030 target based on existing policies, which could be met by purchasing credits. Our analysis, using the Climate Action Tracker data indicates that the gap between current policy emission projections and NDC targets across these seven countries is approximately **210–530** M**tCO_2e** over the period 2021-2030.[22]

These estimates would overestimate the demand for credits from amongst the seven countries if national targets remain unchanged and either more ambitious domestic mitigation policies are put in place, or where economic and other barriers to decarbonisation are removed without further policy measures, for instance through increased technology cost reductions. However, the Climate Action Tracker analysis also clearly highlights that almost all national targets, including for countries we identify

[17] Climate Watch Data, accessed October 2020, available here: https://www.climatewatchdata.org/data-explorer/ndc-content?ndc-content-categories=international_market_mechanism&ndc-content-countries=All%20Selected&ndc-content-indicators=All%20Selected&ndc-content-sectors=All%20Selected&page=1

[18] Own analysis of Climate Watch Data (see fn 17).

[19] Own analysis of Climate Watch Data (see fn 17).

[20] https://www.international.klik.ch/programme?opened=1937

[21] Climate Action Tracker data available here: https://climateactiontracker.org/countries/. Note, neither Liechtenstein, nor Monaco, are covered by the Climate Action Tracker, so we exclude them from the analysis. The magnitude of their combined emissions is expected to be negligible in the context of other potential sources of demand.

[22] The lower estimate is based on calculating the difference between the low end of current policy emission projections and the latest unconditional NDC target in each country (as of October 2020). The upper estimate is based on the difference between the high end of current policy emission projections and the latest conditional NDC target (which, where relevant, imply a more ambitious target than the unconditional target).

as potential credit buyers, are insufficient to stay within the temperature goals of the Paris Agreement. The demand for credits may rise if NDC targets are ratcheted up to more ambitious levels and offset credits, rather than increased domestic action, are used to fill this gap. The combined gap between current policy emission projections over the period 2021 to 2030 in the seven countries and Paris Agreement compatible targets[23] is approximately **2,500 mtCO_2e**.

We use a low demand estimate of 300 mtCO_2e as an order of magnitude approximation towards the lower end of the 210-530 mtCO_2e range of the gap between current policy projections and current NDC targets for the seven identified potential buyer countries (noted above). For the approximation of high NDC compliance credit demand we use 1,000 mtCO_2e. This reflects the seven countries using credits to meet 40% of the gap between their current policy projections and revised NDC targets that are compatible with achieving the goals of the Paris Agreement. Due to the high degree of uncertainty around these estimates, and the role that A6+ ERs will play in closing the mitigation gap, it is possible that demand for NDC compliance is lower or higher than the wide range that these estimates provide.

Implications of differentiated OMGE and SOP requirements between Articles 6.2 and 6.4

NDC compliance demand could be fulfilled with A6.4 ERs as well as via bilateral or multilateral arrangements accepted under Article 6.2, which may also include the use of eligible “Other ERs” if OMGE and SOP percentage requirements are not mandatory under 6.2. Subject to decisions on their eligibility, NDC compliance demand could also be met with TRANS ERs and CP2 CERs.

We assume all A6+ ER credits for emission reductions from the beginning of 2021 within our analysis are subject to OMGE and SOP as agreed under the Article 6.4 rules. If OMGE or SOP requirements agreed under Article 6.4 are not applied in the same way to Article 6.2 transactions, this is likely to raise the price of A6.4 ERs relative to units transacted under Article 6.2, and lead to a shift in demand away from units subject to OMGE and SOP towards Article 6.2 activities. Higher levels of OMGE and SOP will typically lead to more pronounced increases in the price of A6+ ERs (see analysis in Chapter 4). This is an important consideration in determining the relative attractiveness of activities under the two approaches.

If there is a difference between Articles 6.4 and 6.2 in the application of OMGE and SOP – either in terms of level or the obligation to apply – this will serve to distort the broader market for internationally transferable mitigation outcomes, or ITMOs. A possible implication of agreeing high OMGE and SOP percentage levels under Article 6.4, coupled with only voluntary application under Article 6.2, is that demand for ITMOs shifts to credits without any OMGE and SOP. In this case the overall effect of agreeing high levels under Article 6.4 could be somewhat limited in terms of the impact on global emissions and adaptation funding. However, a number of other non-price differences between 6.2 and 6.4 crediting activities – including fundamental aspects such as the method used to calculate emission reductions, or the transaction costs and uncertainty involved in verifying, issuing and transferring units – will also play an important role in determining their overall relative attractiveness for different countries.

Implications of using credits for historic emission reductions for NDC compliance

Demand from “industrialised” countries noted above is likely to focus on credits for emission reductions delivered from the start of 2021. CP2 CERs represent historic emission reductions that have already occurred. Purchasing these credits may offer additional revenues to project developers, but will not have any direct climate change mitigation impact, particularly as any policy decision on their eligibility under Article 6 will be made in 2021, or later, and therefore cannot influence abatement decisions prior to the end of 2020. In fact, their use may indirectly increase global GHG emissions by either displacing domestic mitigation policies or reducing the financing of new emission reduction projects. For climate,

[23] Determining Paris Agreement compatible targets at the country level depends on both assumptions on what the global carbon budget is to remain within its temperature limits and normative decisions about how the budget is allocated between countries in a fair manner – which is both uncertain and subject to different interpretations of how to determine a “fair” share.

and possibly reputational, reasons we therefore expect key credit buyers from developed economies to focus their demand either on new projects or existing projects that continue to generate credits for emission reductions after the start of 2021.

Demand for any CP2 CERs that are deemed eligible for use against NDC targets may arise from developing countries, looking for cheaper alternatives to domestic mitigation, possibly including those countries that hosted the emission reduction activities. Such demand would then be additional to the estimates provided above. In our quantitative analysis of the interactions between OMGE, SOP and credit and activity transition arrangements presented in section 4.4, we exclude both the demand for, and supply of, CP2 CERs. We do, however, quantify the potential climate implications of using CP2 CERs towards NDCs on the basis that the use of a CP2 CER in the period from 2021 leads to a corresponding increase in global emissions relative to the counterfactual case in which it is not used.

Elasticity of credit demand for NDC compliance

Much of the demand for credits for NDC compliance is likely to be relatively inelastic at low price levels, at least for the estimates of demand set out above towards the lower end of the range. This means that as prices rise, demand is reduced, but to a lesser extent than the change in the price. The Paris Agreement encourages all countries to take domestic mitigation action and does not prescribe the level of climate action required of parties, leaving it to individual countries to determine the ambition of their pledges. Decisions to use international credits to meet NDC targets are likely to be, at least in part, politically motivated, rather than based exclusively on the least cost abatement options available.

3.1.2 CORSIA

Aircraft operators travelling on routes between countries participating in CORSIA will need to purchase offset credits to compensate for emission growth in the international aviation sector from the beginning of 2021. Based on our analysis of data from the Climate Action Tracker (which in turn considers estimates from a range of alternative sources), we expect that demand for A6+ ERs in the period to 2030 may fall in the range of **25-750 million** credits. Four main factors impact future demand:

(1) The baseline level of emissions used to calculate growth under CORSIA after 2023;
(2) The recovery path of international aviation in the wake of the Covid-19 pandemic and future trends;
(3) The number of countries that participate in CORSIA and corresponding coverage of international aviation sector emissions;
(4) The share of demand for credits directed to A6+ ERs (relative to other offset credit types deemed eligible under the scheme that are not subject to OMGE and SOP and/or otherwise do not meet eligibility requirements for use under Article 6);

Emissions from international aviation more than doubled between 1990 and 2015 and the International Civil Aviation Organization (ICAO) expected this trend to continue until 2045. As a result of the Covid-19 pandemic and travel restrictions implemented throughout the world, international aviation activity significantly declined in 2020 and is likely to remain well below previously expected levels for several years.

Under CORSIA, airlines must offset any increase in annual CO_2 emissions above the baseline, which is set at 2019 emissions for the period 2021-2023. The baseline for the period 2024-2035 is currently determined by average 2019-2020 emission levels but may yet be revised up to cover just 2019 emissions. A lower baseline will result in a larger demand for offset credits. Until activity levels return to at least the average of 2019-20 levels (and potentially the higher 2019 levels if the baseline is reset to that year beyond CORSIA's pilot phase), demand for offset credits under CORSIA will likely be negligible at most.[24] Analysis of the impact of crises such as the Gulf War, 9/11 and the financial crisis on international aviation suggests that after a 2-6 year recovery period, the sector continues to grow at pre-crisis rates.[25] However, Covid-19 may have a long-lasting impact on travel behaviour, and result in growth rates that are much lower than previous expected.[26]

Our estimates of offset credit demand are based on analysis published by the Climate Action Tracker, which identifies two emission pathways: one in which international aviation sector activity returns to 2019 levels by 2023 and follows pre-Covid growth rates; and an alternative which assumes the sector activity returns to pre-crisis levels by 2025 with low growth rates thereafter. These projections suggest that annual emissions from international aviation may range between 715 and 835 $MtCO_2e$ by 2030.

Not all of these emissions require offsetting under CORSIA, however. As the scheme applies on a route basis, only emissions between participating states are covered. Eighty-eight states will participate from 2021. These include the United States, the United Kingdom and all EU Member States, but exclude China, India, Russia and Brazil.[27] We assume that these four countries will continue not to participate in CORSIA until 2030, given that they have expressed fundamental reservations with the scheme to date. Further, we estimate that flights between the 88 countries that confirmed participation are responsible for approximately half of all international aviation emissions.

ICAO has identified seven eligible carbon-offsetting programmes that aircraft operators may use under CORSIA during its pilot phase.[28] A6.4 ERs are currently not included, but would likely be added once rules for Article 6.4 are agreed and finalised. We assume that 20% of the offset credits required for CORSIA compliance are sourced from A6+ ERs in our low demand scenario, and 75% in the high demand scenario.

The overall demand for offset credits under CORSIA is likely to be highly inelastic as reducing emissions in the aviation sector is technically challenging and relatively expensive. Specific demand for A6+ ERs could, however, be more elastic if “Other ERs” are eligible (as currently is the case for CORSIA’s pilot phase) and eligibility restrictions for these alternative programmes are weak as they may offer a cheaper alternative to A6+ ERs.

3.1.3 Voluntary market

The voluntary purchase and cancellation of emission reduction credits offers a further important potential source of demand. We assume that credit demand from the voluntary market is on the order of between **300–2,700 million** credits in the period 2021 to 2030. This includes voluntary offset credit buyers, which we expect will account for the major share of credit demand, as well as results-based finance initiatives which use carbon credits as a channel for supporting emission reduction activities.

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[24] CORSIA is applied on a route-basis. It is possible that emissions on specific routes will increase to above average 2019-2020 levels, while total emissions of international aviation will remain below those levels in the coming years, potentially leading to some offset requirements on specific routes.

[25] Schneider and Graichen (2020), Should CORSIA be changed due to the COVID-19 crisis?, available at: https://www.oeko.de/fileadmin/oekodoc/Should-CORSIA-be-changed-due-to-the-COVID-19-crisis.pdf

[26] https://www.bloomberg.com/news/articles/2020-11-10/most-people-don-t-plan-to-resume-travel-regime-even-after-virus

[27] https://www.icao.int/environmental-protection/CORSIA/Documents/CORSIA_States_for_Chapter3_State_Pairs_Jul2020.pdf

[28] Programmes are evaluated by ICAO’s Technical Advisory Body (TAB), which makes recommendations to the ICAO Council. Details of the programme application processes and TAB recommendations to date are available here: https://www.icao.int/environmental-protection/CORSIA/Pages/TAB.aspx

An Ecosystem Marketplace survey found that 104 million credits were transacted in 2019.[29] With an increasing number of companies setting net-zero targets and increasing awareness of the importance of tackling climate change more generally, the voluntary market is likely to grow in size in the coming decade. While the Taskforce on Scaling Voluntary Carbon Markets estimates that voluntary markets need to scale up by 1,500% by 2030 to support the investments needed for a 1.5˚- aligned pathway,[30] this would be extremely challenging.

In the context of the Paris Agreement, where all countries are required to set their own ambitious emission reduction targets, there is a risk that reductions will be double counted, where the same outcome is used both by the project host country in accounting for emissions for its NDC and by the credit buyer to support an offset claim. This risk can be reduced, for instance if the host country applies a corresponding adjustment to its reported emissions. However, the administrative rules and procedures for authorising projects and applying corresponding adjustments are not yet determined and may introduce additional costs and risks. Further, the Paris Agreement requires that countries ratchet up the ambition level of their NDC targets, which implies that opportunities to deliver projects that can be issued with offset credits will decrease over time; or that countries face a perverse incentive to avoid scaling up the ambition of their NDC.[31]

Taking the estimate of 2019 voluntary market demand of approximately 100 million credits, we consider annual growth in the market of 10% as a low demand estimate, and annual growth of 25% as a high estimate. Annual demand in 2030 would reach 300 million and 1,200 million credits, respectively under these two scenarios.

Although credit demand from the voluntary market is likely to increase over the period, the demand explicitly for A6+ ERs may remain limited. Credits are currently offered to voluntary market buyers that are accredited by a number of non-governmental standards, with Verra and the Gold Standard amongst the largest current suppliers. For many buyers of carbon offset credits, associated co-benefits, like reduced air pollution and biodiversity protection, are an important consideration.[32] The engagement of private standards with corporate clients has led them to place increasing emphasis on packaging co-benefits associated with carbon offset credits. To date, despite UN campaigns to encourage voluntary market interest in CERs, only a low volume of credits originating from the CDM have been sold on the voluntary market in recent years, despite the typically low price of these credits.[33] From our estimates of total voluntary market demand over the period to 2030, we assume that 10% will be channelled to A6+ ERs in the low demand case and 40% in the high demand case.

Demand from results-based finance initiatives is typically also voluntary in nature, but often considered separately to the demand for credits from institutions and private individuals. Historical demand for results-based finance initiatives has focused on procuring CERs, often focused on specific characteristics of emission reduction projects.[34] In 2017, the SEI estimated demand for CERs in the

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[29] https://www.ecosystemmarketplace.com/articles/demand-for-voluntary-carbon-offsets-holds-strong-as-corporates-stick-with-climate-commitments/

[30] https://www.iif.com/Portals/1/Files/TSVCM_Consultation_Document.pdf

[31] Fearnehough et al. (2020), Future role for voluntary carbon markets in the Paris era, available here: https://newclimate.org/2020/11/24/future-role-for-voluntary-carbon-markets-in-the-paris-era/

[32] Donofrio et al. (2019), Financing Emissions Reductions for the Future: State of the Voluntary Carbon Markets 2019, available at: https://www.forest-trends.org/wp-content/uploads/2019/12/SOVCM2019.pdf

[33] Information on voluntary cancellation of CERs is available here: https://cdm.unfccc.int/Registry/vc_attest/index.html

[34] Day et al. (2020), Supporting vulnerable CDM projects through credit purchase facilities, available at: https://newclimate.org/2020/01/15/supporting-vulnerable-cdm-projects-through-credit-purchase-facilities/

period 2017-2020 to be around 110 million credits.[35] It is unclear how such demand may evolve over the coming decade. A recent example that other countries may follow is the latest NDC from Switzerland, which included reference to purchasing credits to offset the emissions embedded in imported goods (which do not feature in Switzerland's own GHG inventories submitted to the UNFCCC) as a results-based finance mechanism outside of the NDC target.[36] We include estimates of demand for 100 – 500 million credits from results-based finance initiatives over the period to 2030 within our overall low and high demand approximations for the voluntary market.

3.1.4 Magnitude and shape of demand curve

The range of demand estimates across the sources of demand set out above are summarised in Figure 5. Summing the low demand estimates across the different sources as well as the high demand estimates gives an implied total range of demand between 2021 and 2030 is on the order of **620–4,450 million** credits that would be subject to the OMGE and SOP requirements agreed under Article 6 of the Paris Agreement.

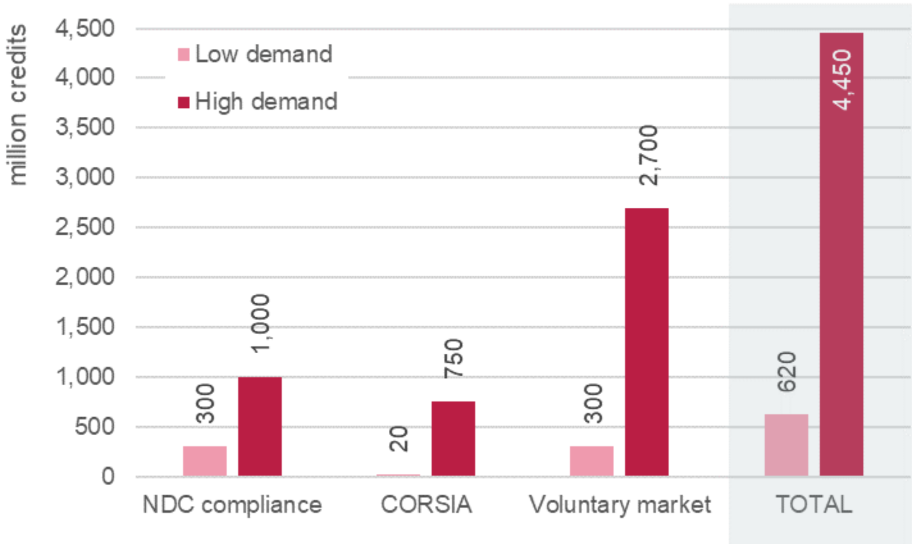

Figure 5: High and low A6+ ER credit demand estimates for period 2021-2030, by source and total

In the standard supply-and-demand framework diagram, the relationship between the quantity demanded (in this case of a carbon offset credit) and buyers' willingness to pay (for each credit) is captured by the slope of the demand curve at any point along it (Figure 6 in section 3.3 below shows an example of a demand curve sloping down from left to right). The price elasticity of demand – i.e. the relative response of demand to changes in price – in a typical market is influenced by a number of factors. A steep curve implies that demand adjusts less to different price changes than a flatter curve. In general, higher income buyers, such as developed nations, are likely to adjust their demand less in response to price changes, particularly if the costs are low relative to their overall budget; for example, the overall spending of public money on climate mitigation action.

Another key determinant of the relative response of demand to changes in price is the availability and cost of alternative options, or substitutes. In the context of carbon credits, this could refer to alternative

[35] Schneider and La Hoz Theuer (2017), Using the Clean Development Mechanism for nationally determined contributions and international aviation, available at: https://www.atmosfair.de/wp-content/uploads/sei-pr-2017-using-the-clean-development-mechanism.pdf

[36] Switzerland First NDC, updated submission 9 December 2020 (Switzerland's information necessary for clarity, transparency and understanding in accordance with decision 1/CP.21 of its updated and enhanced nationally determined contribution (NDC) under the Paris Agreement (2021 – 2030)0, available at: https://www4.unfccc.int/sites/NDCStaging/Pages/All.aspx

types of credits as well as alternative options to the use of credits; for example, taking further direct action to reduce one's own emissions; or simply not buying them (and potentially not claiming the same support for emission reduction outcomes). Demand for A6+ ERs will respond more to price changes if buyers consider other units – such as CP2 CERs or Other ERs – as suitable alternatives as well as if the implications of reducing their demand are limited, for instance where reputational or regulatory penalties for failing to achieve targets are less severe.

In our analysis presented in Chapter 4 we assume that a given percentage change in price induces a correspondingly smaller relative change in the quantity of credits demanded – i.e. the price elasticity of demand is relatively inelastic – at prices below approximately 30 Euros per credit. Above this level we assume demand is more responsive to prices. For our hypothetical quantitative analysis we use a linear representation of demand (i.e. the demand is a straight line), where the price elasticity of demand is very low at low price levels and increases with the level of the price. The maximum demand (i.e. where credit prices are zero) over the period 2021-2030 is set at 4 billion (A6+ ER) offset credits and falls by 700 million credits for every 1 Euro increase in the price level. Demand for offset credits at a price of 50 Euros is approximately 500 million over the period; just below the low end of our estimated range. We also test the implications of a more inelastic (steeper) linear demand curve.

3.2 Supply of emission reduction credits

We now turn to the supply of credits for emission reductions. A carbon credit supply curve reflects how many credits are offered to the market at a given price. In other words, it represents the cost of providing different quantities of credits. Evidence on the cost of delivering credited emission reductions is available to some extent from amongst existing carbon crediting approaches. However, many of the existing emission reduction projects are located in countries that have not had targets under the Kyoto Protocol. Under the Paris Agreement all countries now have committed to tackle domestic emissions. New projects that can issue offset credits need to be additional to these domestic efforts. Further complicating matters, in many instances the details of existing national commitments (NDCs) are unclear. And existing national commitments will need to be significantly enhanced in the coming years to move in-line with the temperature limits set out in the Paris Agreement.

The supply curve captures the unit cost of generating different volumes of carbon credits. In some markets costs fall as the quantity produced rises, because there are increasing returns to scale in production, and supply is depicted as a downward sloping curve. However, in the context of delivering emission reductions, costs are likely to rise with greater quantities demanded. This is because the availability of cheap mitigation options is limited and meeting higher levels of demand is likely to require moving towards increasingly expensive activities. We therefore assume that the credit supply curve is upward sloping.

With global GHG emissions in excess of 50 billion tonnes of carbon dioxide equivalent units a year, there is clearly ample scope to deliver emission reductions. However, some of these emissions are prohibitively expensive to abate with the state of technology today (they can still appear on the supply curve but at price levels well above the range we focus our analysis on). And, critically, many of these mitigation options are likely needed to achieve existing NDC targets, or even more ambitious NDCs that are developed over the coming years. As all countries now have to pledge emission targets or other mitigation actions under the Paris Agreement, it makes logical and economic sense for seller countries to use at least the cheapest mitigation options to achieve their NDC and to only transfer mitigation outcomes from more expensive or less accessible mitigation options. This means that the cost of generating credits under Article 6 could rise notably compared to historic costs for projects implemented in countries with no Kyoto targets. The ambition of current NDCs is, however, well short of efforts that are needed to stay within the Paris Agreement temperature limits and it remains unclear how countries prioritise the potential trade-off between keeping the lowest cost mitigation options for achieving their own targets and the lure of receiving carbon market revenues.

In the following sections we discuss the possible supply of credits from new emission reduction activities either registered under the future Article 6.4 mechanism, or with other programmes where the credits are subject to equivalent levels of OMGE and SOP. We then set out the potential supply of credits from the transition of CERs (CP2 CERs) and the transition of CDM project activities (TRANS ERs).

3.2.1 New Article 6 emission reduction activities

Determining the supply of credits from new emission reduction activities which register under the Article 6.4 mechanism, or another programme that satisfies eligibility requirements for use under Article 6.2 and where the credits are subject to OMGE and SOP, is highly uncertain. In particular, as noted above, it remains unclear to what extent countries will be willing to authorise emission reductions under Article 6 for use by another party or entity. The price that project owners receive for A6+ ERs is likely to play an important role in determining the volume of credits that are supplied from new activities, with higher prices incentivising larger volumes of credits.

For context, credit prices today are relatively low. A survey of transactions on the voluntary carbon market - covering carbon offset credits from a range of different programmes, such as the Climate Action Reserve, Gold Standard and the Verified Carbon Standard - reported by Ecosystem Marketplace found that the average price of units has been relatively stable at approximately $3 USD between 2016 and 2018, or slightly less than 3 Euros (Forest Trends' Ecosystem Marketplace, 2019). The order of magnitude of prices, however, can vary materially. In some instances credits are offered at prices in excess of 20 EUR. For example, Atmosfair – a project developer as well as market intermediary – currently offers carbon offset credits at €23 per tonne of carbon dioxide reduced.[37]

In compliance markets current prices for carbon offset credits are typically low. Certified emission reductions (CERs) from the CDM that are eligible in the EU ETS are traded at well below 1 Euro.[38] This is due to the large supply potential from CERs, which greatly exceeds the demand. The prices correspond approximately to the marginal costs of issuing CERs.[39] Likewise, prices for CORSIA eligible units are around 1 EUR. Prices are somewhat higher in other markets, such as for units eligible in the South Korean and Californian emissions trading schemes.

The price of credits from new activities is, in theory, determined by the marginal abatement cost of a tonne of carbon dioxide avoided or removed for new emission reduction projects and the transaction costs for issuing and marketing the carbon credit. A High-Level Commission on Carbon Prices appraised a range of evidence on carbon prices consistent with keeping within the temperate limits of the Paris Agreement and concluded that price levels would need to be at least within the range of $40-80 per tonne of carbon dioxide by 2020 and $50-100 USD by 2030 (High-Level Commission on Carbon Prices, 2017). The International Energy Agency publishes projections of carbon prices in its annual World Energy Outlook (WEO) report under different scenarios.[40] In the 2020 WEO the price projection for selected developing economies in their Sustainable Development scenario is $43 in 2025, rising to $125 in 2040. Both can be interpreted as relevant benchmarks for the pricing of credits under Article 6 under Paris Agreement compatible pathways. If credits were transacted at lower price levels then this implies the buyers should instead make more ambitious efforts to decarbonise their own economy before sourcing emission reduction outcomes transferred from elsewhere. In some instances, it may also mean that the host countries of the projects should use the emission reductions from the credited activities to

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[37] https://www.atmosfair.de/en/offset/fix; based on price offered via website on 13 February 2020.

[38] For example, the CER spot market settlement price on 1 April 2021 on the EEX exchange was €0.57, accessed at: https://www.eex.com/en/market-data/environmental-markets/spot-market

[39] Warnecke et al. (2019), Robust eligibility criteria essential for new global scheme to offset aviation emissions, available at: https://www.nature.com/articles/s41558-019-0415-y

[40] International Energy Agency, World Energy Outlook 2020, 2020; Table 2.3

achieve their own NDC in order to put their level of ambition on track to deliver the goals of the Paris Agreement.

Although these prices *should* emerge to achieve the goals of the Paris Agreement, market actors expect lower prices for Article 6 transactions in the period up to 2030. For example, Schwieger et al. (2020) expect prices around $15-30 per credit in middle range scenarios.

Given the considerable uncertainty about the costs of supplying carbon credits in the context of Article 6, this study establishes a hypothetical carbon credit supply curve for credits from new activities. The curve is not meant to reflect an estimate of the likely actual supply but is used for illustrative purposes. For simplicity we assume that the supply potential increases linearly with higher carbon credit prices. For the purpose of our analysis in Chapter 4 we use a linear supply curve for A6+ ERs that starts at approximately 7 Euros for the lowest cost credits, with each additional Euro added to the price incentivising the development of activities that supply a further 200 million credits over the period to 2030. This way, approximately 1 billion credits could be supplied at a price of 12 Euros; 2 billion at a price of almost 18 Euros; 3 billion at a price of around 23 Euros, and so on. The supply curve and its interaction with demand is shown in the following section. We also consider how a flatter supply curve may influence the results for the indicators we analyse in Chapter 4.

3.2.2 Transition of CERs

We estimate the supply and price at which CP2 CERs could be offered to the market for a number of different eligibility restrictions on their use under Article 6. The estimates are based on a CDM supply potential model developed and amended over the course of several research assignments and extensively used to offer insight into the potential volume of CER supply for policy decisions at both the UNFCCC and ICAO.[41] The analysis here is based on information from CDM projects available at the beginning of October 2020. The model also includes estimates for the cost of supplying CERs, which vary by project type, location, whether the project depends on carbon market revenues to continue operation, and other factors.[42] The analysis presented in Chapter 4 covers the following scenarios for CP2 CER eligibility.

1. **No transition**: CERs are ineligible for use towards achieving NDC targets.
2. **2016 registration date cut-off**: Only CERs from CDM project activities registered on or after 1 January 2016 and for emission reductions up to 31 December 2020 are eligible.
3. **2013 registration date cut-off**: Only CERs from CDM project activities registered on or after 1 January 2013 and for emission reductions up to 31 December 2020 are eligible.

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[41] See, for example: Warnecke et al. (2019), Robust eligibility criteria essential for new global scheme to offset aviation emissions, available at: https://www.nature.com/articles/s41558-019-0415-y;

Ishikawa et al., (2020), CDM supply potential for emission reductions up to the end of 2020, available at: https://newclimate.org/2020/11/25/cdm-supply-potential-for-emission-reductions-up-to-the-end-of-2020/;

Fearnehough et al. (2019); Offset credit supply potential for CORSIA, available at: https://newclimate.org/2019/11/05/offset-credit-supply-potential-for-corsia/;

Schneider at al. (2017), CDM supply potential up to 2020, available at: https://www.dehst.de/SharedDocs/downloads/EN/project-mechanisms/CDM-Supply-Potential-up-to-2020.pdf?__blob=publicationFile&v=2;

Schneider and La Hoz Theuer (2017), Using the Clean Development Mechanism for nationally determined contributions and international aviation, available at: https://www.atmosfair.de/wp-content/uploads/sei-pr-2017-using-the-clean-development-mechanism.pdf;

Warnecke et al., (2017), Vulnerability of CDM Projects for Discontinuation of Mitigation Activities, available at: https://newclimate.org/2017/05/11/vulnerability-of-cdm-projects-for-discontinuation-of-mitigation-activities/.

[42] Previous estimates of supply curves, including details of the methodology are set out in Fearnehough et al. (2018), Marginal cost of CER supply and implications of demand sources, available at: https://newclimate.org/2018/03/22/discussion-paper-marginal-cost-of-cer-supply-and-implications-of-demand-sources/

Based on the CDM supply potential model with project data updated to October 2020, we estimate that the supply of CP2 CERs under a 2013 registration date cut-off could be approximately **320 million** CERs, of which **63 million** would be eligible under a 2016 registration date cut-off. As these emission reductions have already occurred, they could be supplied to the market at a price which covers the administrative costs of issuing CERs, plus a margin required to incentivise project owners to seek issuance of these credits. For simplicity, we assume all eligible CP2 CERs could be supplied at a price of 0.50 Euros, although our analysis indicates many could likely be offered at even lower price levels.

Whilst the potential supply of CP2 CERs could displace demand for credits for emission reductions achieved after 2020 from countries looking to use credits to meet their NDC target, the CERs could also be used under CORSIA or purchased by voluntary market buyers. In our analysis in Chapter 4 we consider the impact of using the full supply potential of CP2 CERs as a substitute for A6+ ERs. The available supply may be reduced if there is material demand for these credits either from CORSIA, or from the voluntary market. However, as we note above, demand for credits during CORSIA's pilot phase are likely to be negligible and the use of CP2 CERs beyond that phase has not been approved. And, whilst voluntary market buyers are currently able to purchase CP2 CERs, such demand has been limited to date. A policy decision under Article 6 to allow the use of certain CP2 CERs towards NDC targets may provide a signal of legitimacy to all potential buyers that serves to boost their demand in the voluntary market.

3.2.3 Transition of CDM activities

Our estimates of the supply potential for the period after 2020 from existing CDM projects, if eligible to transition to the new Article 6.4 mechanism, are based on the same CDM supply potential model with project data updated to October 2020. We derive estimates for eligible projects for emission reductions from the period 2021 to 2030 to the extent that both the technical lifetime of projects as well as the full crediting period duration allows. The model also includes estimates for costs of delivering CERs, which vary by project type, location, whether the project depends on carbon market revenues to continue operation, and other factors.[43] The analysis presented in Chapter 4 covers the following scenarios for the eligibility to transition CDM activities:

1. **No transition:** Emission reductions from CDM project activities registered before the end of 2020 are ineligible for use towards achieving NDC targets.
2. **2016 registration date cut-off:** CDM project activities registered from 1 January 2016 can register with the new mechanism and continue to receive eligible credits up to the end of their full crediting period, including renewals.
3. **Vulnerable projects**: Vulnerable project types that depend on ongoing financial support from the sale of carbon credits to continue mitigation activities are eligible to register with the new mechanism. The assessment of which projects are likely to be vulnerable is based on a large survey conducted in 2015 and associated research.[44] For the purpose of this analysis we assume that the projects remain vulnerable and either have managed to continue operations or could restart abatement under the prospect of an attractive carbon pricing signal.
4. **Full transition (assuming only 30% of project activities transition)**: All existing registered CDM project activities are eligible to transition to the new mechanism and renew crediting

[43] For further details, see Fearnehough et al. (2018), Marginal cost of CER supply and implications of demand sources, available at: https://newclimate.org/2018/03/22/discussion-paper-marginal-cost-of-cer-supply-and-implications-of-demand-sources/

[44] See for example: Warnecke et al. (2015), Analysing the status quo of CDM projects: Status and prospects, available at: https://newclimate.org/2015/05/16/analysing-the-status-quo-of-cdm-projects/; and Warnecke et al., (2017), Vulnerability of CDM Projects for Discontinuation of Mitigation Activities, available at: https://newclimate.org/2017/05/11/vulnerability-of-cdm-projects-for-discontinuation-of-mitigation-activities/

periods as per existing CDM rules. Of the full potential, we assume that 30% of all project activities would actually take the steps required to register with the new mechanism.

Based on the CDM supply potential model, we estimate supply potential under the 2016 registration date cut-off scenario of **269 million** credits; for the vulnerable projects scenario of **663 million** credits; and under the full transition scenario of **962 million** credits (if all project activities were to transition – rather than the 30% we assume – the full supply potential could be 3,200 million). All of this supply is available at prices below 15 Euros per credit, although the distribution of prices at which these volumes could be supplied varies across the scenarios.

For each scenario, the supply is broken down between vulnerable and non-vulnerable projects to allow us to estimate the climate impact of using these credits. Channelling demand to existing, non-vulnerable projects will not lead to direct reductions in emission levels, even for emission reduction outcomes achieved in the future because these projects will anyway continue their abatement activities regardless of whether or not they receive revenues from the sale of carbon credits. Examples of project types that are considered non-vulnerable include grid-connected wind and solar PV electricity generation, amongst others. For these projects, revenues from electricity sales typically exceed ongoing operational costs. This means that these projects are very likely to continue operation, even in the case they fail to repay their upfront capital cost investments. Therefore, transitioning these activities does not directly trigger any further emission reductions in the host country. The use of credits from existing, non-vulnerable projects may in fact lead to a rise in GHG emissions by displacing the financing of either new activities or existing activities that depend on carbon market revenue streams to continue operations.

The impact of transitioning non-vulnerable project activities depends on two main factors: the ambition of the host country's NDC and any potential exemptions from applying corresponding adjustments:

1. **If host countries have ambitious NDCs and apply corresponding adjustments, transitioning non-vulnerable activities will undermine their ability to achieve their NDCs**. If a host country has an ambitious NDC and authorizes and accounts for the transition of non-vulnerable projects, the country would face a larger mitigation shortfall. This is because the host country would have to apply corresponding adjustments for emission reductions that would anyway have occurred without it authorising the transition. If the country still intends to achieve its NDC, it would have to compensate for the mitigation shortfall, by undertaking further domestic mitigation efforts. Under these circumstances, authorizing the transition of non-vulnerable projects for use under Article 6 would undermine the host country's mitigation efforts making it harder to achieve its NDC.
2. **If host countries have weak NDCs, or are exempted from applying corresponding adjustments, transitioning non-vulnerable projects will increase global emissions**. If a host country has a weak NDC – i.e., the country will overachieve its NDC without pursuing any further mitigation policies – authorizing emission reductions from non-vulnerable projects for use under Article 6 could lead to an increase in global emissions, up to the level of the supply potential of non-vulnerable projects that are eligible to transition. This is because the country could sell emission reductions that would have occurred regardless of the authorization of the transition, without facing any consequences for achieving its NDC. Global emissions increase because no further emission reductions would occur in the host country while the buyer country could use the acquired credits to increase, or avoid reducing, its emissions. Similarly, transitioning non-vulnerable projects would increase global emissions if international rules were to exempt countries from applying corresponding adjustments for some period, or exempt sectors or gases not covered by their NDC. In this case, the host country would not need to compensate for transferring credits from activities that continue abatement regardless of whether they are authorized for transition.

By contrast, no transition or limiting transition to vulnerable CDM project activities only, does not pose a risk of either undermining host country mitigation efforts or raising global GHG emissions. The use of credits from projects that are dependent on the receipt of carbon credit revenues to continue abatement can directly support emission reductions that would not otherwise have occurred. An example of CDM projects that are typically "vulnerable" to discontinuing abatement are activities involving the abatement of nitrous oxide emissions from nitric acid production. These abatement activities incur additional operational costs but produce no financial benefits other than through the sale of carbon credits. The vulnerability of some projects – such as biomass energy, household energy efficiency measures and methane avoidance – may depend on the specific characteristics of the project as well as local conditions.

The potential supply of credits from vulnerable projects may be lower than our estimates indicate, particularly if projects have ceased operations (and cannot restart for either practical or economic reasons) in the period since 2015 when data was collected to inform an assessment of project vulnerability across host countries and project types. Assessing the extent to which a project is vulnerable to discontinuing abatement may be administratively challenging and open to interpretation. There is therefore a risk that if a policy decision were made under Article 6 to allow "vulnerable projects", or those that can demonstrate "ongoing financial need" to transition to the new Article 6.4 mechanism any agreed assessment criteria may facilitate the transition of projects that are in fact not genuinely vulnerable.

Finally, it is important to note that our analysis of the climate impacts of different activity transition scenarios does not directly consider the implications of using credits from activities that are *ineligible* to transition to the new Article 6.4 mechanism. For example, if a decision is made that no activities can transition to the new mechanism, it remains possible that existing CDM projects could seek registration under alternative crediting programmes (such as non-governmental standards) and issue credits that are transacted under Article 6.2 to help meet NDC targets. Similar to the application of OMGE and SOP, if the governance of credit eligibility under Articles 6.2 and 6.4 is inconsistent any potential mitigation benefits (or avoidance of weaker outcomes) from policy decisions taken under Article 6.4, may be undermined and eroded through a shift in demand to Article 6.2-based transactions.

3.3 Interaction of demand and supply for Article 6 credits

In a supply and demand analytical framework the demand curve shows the volume of credits that buyers are willing to purchase at different price levels. The magnitude of demand typically increases as prices decline; more buyers are willing to buy greater volumes of credits at low prices. The supply curve depicts the volume of credits that could be supplied at different price levels. Higher prices typically incentivise sellers to supply larger volumes of credits as a high price can unlock more costly mitigation options. In a standard supply-and-demand diagram, the quantity of credits is depicted along the horizontal axis and the price of credits increases on the vertical axis. Under this simple framework, the equilibrium price and quantity of credits is determined at the point where the demand and supply curves intersect.

Based on our analysis of possible credit demand and supply detailed in the sections above Figure 6 presents our reference scenario. These demand and supply curves underlie the policy decision comparisons explored in the following chapter. This reference scenario serves as a credible basis for an assessment of the impacts of different policy decisions, both individually and in combination with each other. It is not, however, a forecast or prediction of the future market, and it is important to bear in mind the uncertainties noted in the sections above. From left-to-right, the demand curve (turquoise) slopes down and the supply curve (light red) rises. The price of credits is, in theory, determined by the interaction of supply and demand curves. The equilibrium market price for A6+ ERs in this hypothetical scenario is almost 21 Euros, for a transacted volume of 2,544 million credits.

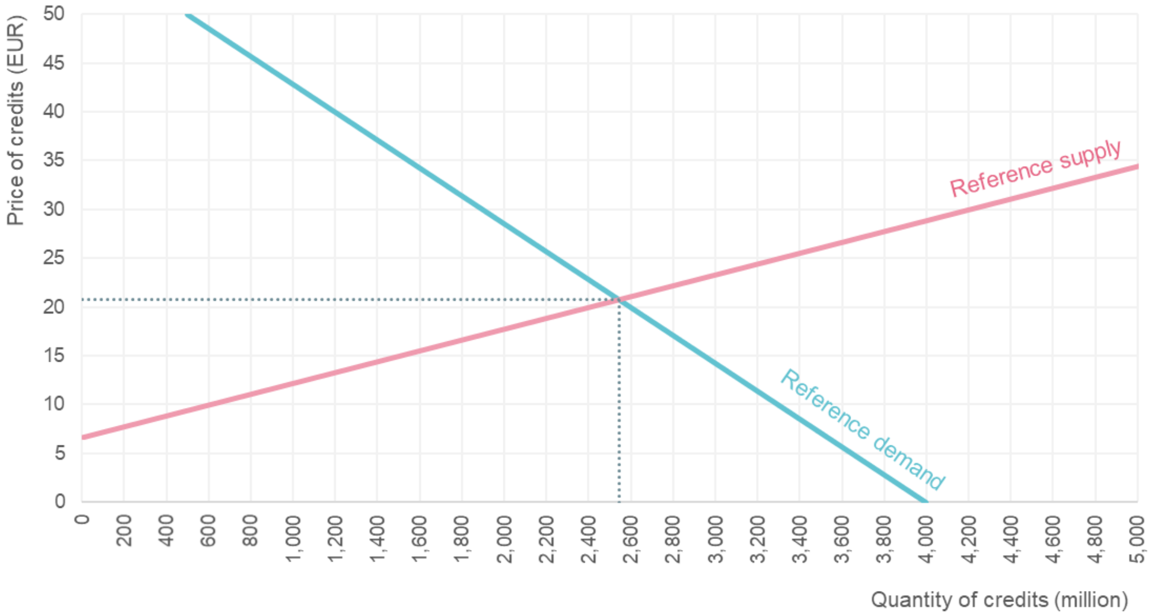

Figure 6: Reference supply and demand for credits over period to 2030, with no transition of CERs or activities; no SOP; and no OMGE

The credit price in this reference case is materially lower than the levels recommended by the High-Level Commission on Carbon Prices as necessary to achieve the Paris Agreement temperature goals. However, given that existing NDCs fall considerably short of what is required to deliver on the targets agreed in Paris in 2015, it is perhaps more reflective of a market under the reality of inadequate pledges. It also approximately reflects the average price expectations by Schwieger et al. (2020). The curves were furthermore constructed such that the quantity of credits transacted in the reference scenario is set at a level of approximately the mid-point of the high and low demand scenarios outlined in section 3.1 above and summarised in Figure 5.

We also test the implications for our quantitative analysis of a steeper demand curve and a flatter supply curve, both of which maintain the same equilibrium market price and quantity, but which affect the scale (and in some cases direction) of impacts of policy decisions on OMGE, SOP and transition of CDM activities and units across our different indicators. The steeper (less elastic) demand curve assumes a maximum demand of 3,000 million credits which falls by approximately 20 million for every 1 Euro increase in the price. The flatter (less elastic) supply curve assumes that new emission reductions activities could supply the market from 13 Euros per credit and each additional Euro would incentivise the supply of a further 325 million credits.

In the following chapter we consider how future decisions under Article 6 of the Paris Agreement regarding the transition of units and activities; SOP; and OMGE are likely to influence the price and quantity of credits transacted, as well as a number of additional indicators, compared to this reference scenario. These policy decisions primarily influence the shape of the supply curve.

4 Analysis of policy decision implications

In this chapter we use the demand and supply analytical framework set out in Chapter 3 to assess the impact of different policy decisions regarding the application of OMGE, SOP and the transition of units and activities from the CDM.

We quantitatively assess the impact of applying OMGE, SOP and different transition arrangements on a number of indicators. These are listed in the following bullets along with an explanation of how they are derived within our analytical framework:

- **Impact on global GHG emissions**: The impact on global GHG emissions, compared to the situation that no carbon credits are generated and transacted, is equal to the quantity of credits cancelled for OMGE, minus the quantity of CP2 CERs transitioned and used (as the associated emission reductions were achieved in the past and a decision in 2021 to allow these units to be used towards NDCs cannot induce more emission reductions in the past), minus credits issued from non-vulnerable CDM project activities that transition to the Article 6.4 mechanism (as these projects would continue abatement whether or not they can issue carbon credits).
- **Share of proceeds to finance adaptation**: The share of proceeds, or SOP, is equal to the quantity of credits transferred to the administrator of the Adaptation Fund, multiplied by the equilibrium credit price.
- **Credit price**: The equilibrium market price per credit is determined at the point where supply and demand are equal to one another, i.e. where the two curves intersect.
- **Quantity transacted**: The quantity of credits transacted is determined at the point where supply and demand are equal to one another, i.e. where the two curves intersect. This reflects the number credits that are issued and used, including those that are channelled to the Adaptation Fund and sold on the market. It does not consider any secondary trading of the same unit which may occur after the initial transaction. As this indicator is equal to the impact on buyer country emissions (see below) by definition within the assumptions of our analytical framework, we do not explicitly report the quantity transacted as a standalone result to avoid duplication.
- **Market revenue**: Market revenue is equal to the equilibrium credit price, multiplied by the quantity of credits transacted.
- **Host country emissions**: Emissions are reduced in host countries by the quantity of credits transacted, plus those cancelled for OMGE. In comparison to the situation that no carbon credits are transacted, emissions are however only reduced where they are sourced from either new activities or vulnerable existing projects that have transitioned to the Article 6.4 mechanism. There is no reduction in host country emissions over the period 2021-2030 where CP2 CERs are used as these emission reductions have already occurred in the period up to the end of 2020. And we also assume no reduction in host country emissions for the use of TRANS ERs from non-vulnerable activities (i.e. those that would continue abatement regardless of any carbon market revenues) because the purchase of these credits has no impact in triggering emission reductions beyond those that will anyway occur during the period (see section 3.2.3 above for further explanations).
- **Buyer country emissions**: Emissions in buyer countries[45] rise by the quantity of credits transacted. We assume that buyers would otherwise reduce their own emission reductions by the equivalent quantity to achieve the same outcome (e.g. for countries to meet their NDC target, airplane operators to comply with CORSIA, or voluntary buyers to claim the same carbon footprint).

[45] This refers to the country itself if an Article 6 transaction. For voluntary market purchases, it relates to the country in which the buyer's activities and associated emissions are located. For airplane operators, purchasing credits for CORSIA compliance, the "buyer country emissions" can be considered the emissions of the international aviation sector.

- **Buyer cost savings**: The savings achieved by credit buyers from use of the market (as opposed to reducing their own emissions by an equivalent amount), or “consumer surplus”, is estimated by calculating the difference between buyers’ costs to reduce their own emissions and the equilibrium market price, for all credits that are transacted to buyers in the market, except credits made available for the SOP. We assume that the credit demand curve reflects the credit buyer’s cost of reducing its own emissions.[46] In the supply and demand diagram, buyer savings are reflected by the area below the demand curve and above the equilibrium market price, excluding the part of the supply curve that relates to the offering of credits by the Adaptation Fund.
- **Project owner profits**: Profits for project owners, or “producer surplus”, is estimated by calculating the difference between the costs of generating carbon credits for project owners and the equilibrium price, for all credits that are transacted to buyers in the market, except credits made available for the SOP. In the supply and demand diagram, this is reflected by the area above the supply curve and below the equilibrium market price, excluding the part of the supply curve that relates to the offering of credits by the Adaptation Fund.

These indicators allow us to estimate the impact of a certain scenario on key market stakeholders, such as project owners and credit buyers, as well as on the financing made available to fund adaptation projects (SOP), emission levels in host and buyer countries, as well as the overall net impact on global GHG levels. In the following sections we present the results of our scenario analysis, first for each policy design parameter separately, followed by an assessment of different combinations of the parameters to understand how they interact with one another.

A number of modelling assumptions underpin the assessment of the different indicators. In the reference scenario all credits represent additional and permanent emission reductions of exactly one tonne of CO_2 equivalent. This also applies to all policy scenarios that consider different OMGE and SOP levels. We assume that the international transfer of mitigation outcomes is robustly accounted for by countries; that countries have quantified their NDCs in tonnes of CO_2 equivalent; that ITMOs are likewise expressed and quantified in tonnes of CO_2 equivalent; and that approaches used to apply corresponding adjustments do not affect the mitigation effort needed to achieve a given NDC. For simplicity, we further assume that the emission reductions transferred through credits are covered by NDCs.

4.1 OMGE

We analyse the impact on the Article 6 credit market of implementing OMGE requirements of 2%, 5%, 10%, 20% and 30%, in turn (in section 4.4 which considers policy decision combinations we limit the analysis to percentage levels of 2, 10 and 30). OMGE raises the cost of delivering emission reduction credits because a share of the total quantity of emission reductions actually delivered are cancelled and cannot be sold. As a result, the supply curve starts at a higher price and is steeper. Figure 7 illustrates the impact of 30% OMGE on our reference scenario. Here the new supply curve is shown by the dark red line, which intersects the demand curve at a higher price level (vertical axis) and a lower quantity of credits transacted (horizontal axis).

[46] In theory at any price level for credits above the demand curve, it is cheaper for the buyer to reduce its own emissions than buy carbon credits, and at any point below the curve it is cheaper for the buyer to purchase carbon credits instead of lowering its own emissions. Whilst this simplified representation of the market may not always hold in practice (decision making may well be influenced by alternative factors than fully informed mitigation costs) it nonetheless remains a helpful way of assessing the potential implications for the overall costs faced by buyers between different policy scenarios.

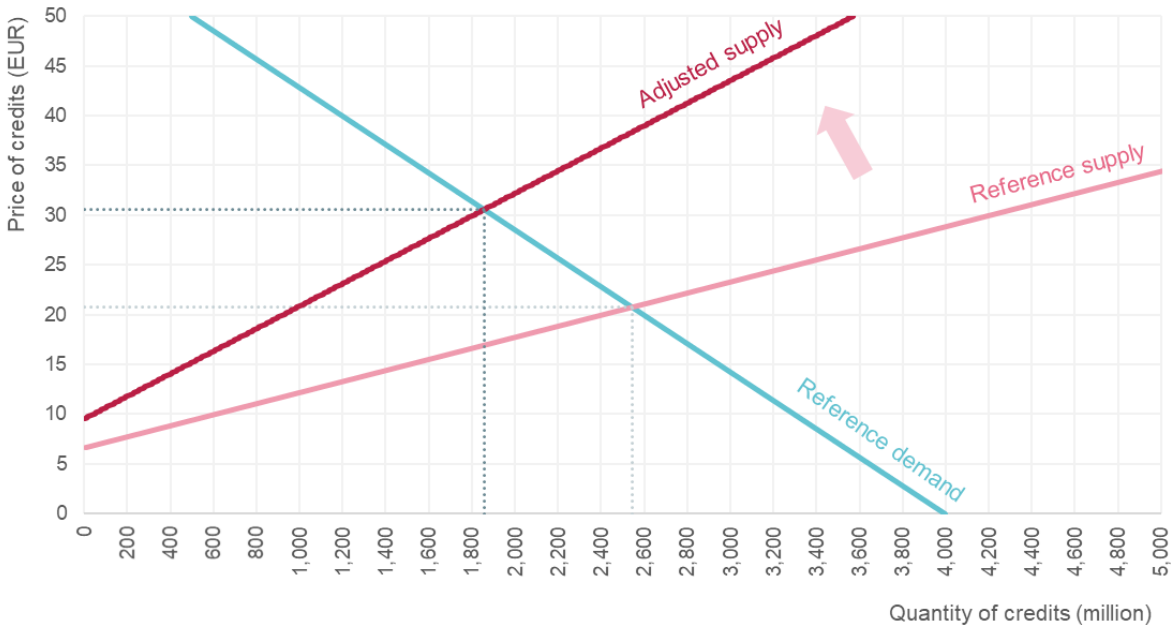

Figure 7: Supply of credits with 30% OMGE

The results of the impact on different indicators for 2%, 5%, 10%, 20% and 30% OMGE, respectively, are shown in Figure 8. We show the change in the impact for all indicators relative to the reference scenario, with the exception of SOP and the global GHG impact. The latter two are, by definition, equal to zero in the reference scenario. As it is not possible to show a change relative to zero, we report the absolute levels of SOP (zero in all cases here) and global GHG impact for each of the OMGE levels.

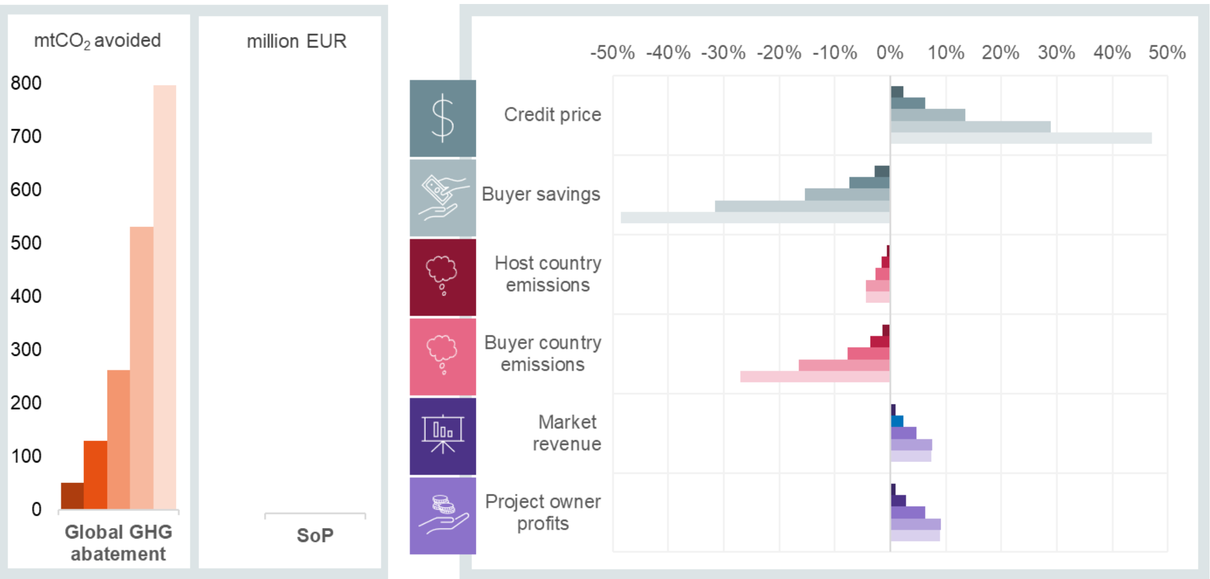

Figure 8: Impact of OMGE levels of 2% (darkest), 5%, 10%, 20% and 30% (lightest) across indicators

OMGE results in a reduction in global GHG emissions by driving further abatement in both host countries and buyer countries. In our hypothetical example of a possible future market, a level of 2% OMGE leads to a reduction in global GHG emissions of 50 $MtCO_2e$. Levels of 5%, 10%, 20% and 30% result in GHG emission reductions of approximately 130, 260, 530 and 800 $MtCO_2e$. The share of proceeds is zero, by definition, across these scenarios.

Applying OMGE increases the price of credits, as a share of the credits are cancelled and cannot be sold. The revenues from the sale of the remaining credits need to cover the full costs of delivering all of the emission reductions. In our analysis, 2% and 5% levels of OMGE have a similarly modest impact on the price level: carbon credit prices would increase by about 2% and 6%, respectively. If the OMGE level is 10%, this would cause credit prices to rise by 13%, from €20.80 with no OMGE, to €23.60. Higher levels of OMGE of 20% and 30%, drive credit prices to increase by approximately 29% (to €26.80) and 47% (to €30.60), respectively.

Credit buyers' savings from using the market fall, driven in large part by the higher credit prices. The relative reduction in buyer savings is comparable to the rise in credit prices. A level of 2% OMGE leads to a 3% reduction in buyer savings. Levels of 5%, 10%, 20% and 30% OMGE result in buyer savings falling by 7%, 15%, 32% and 49%, respectively.

The higher the level of OMGE the greater the **decrease in host country emissions**, across the scenarios we consider, compared to a case with no OMGE, although the magnitude of the impact is limited. In our analysis, OMGE levels of 2% and 5% result in reductions in host country emissions of approximately 1%; and OMGE levels of 10-30% lead to host country emission reductions of 3-4%. Whilst the quantity of credits transacted falls, the additional emission reductions that are delivered for OMGE more than compensates for the reduced demand. Higher OMGE levels also incentivise **more emission reductions in buyer countries**. We find that an OMGE level of 2% decreases buyer country emissions by over 1%, with levels of 5%, 10%, 20% and 30% leading to reductions in buyer country emissions of 4%, 8%, 17% and 27%, respectively.

Turning to broader market indicators, we find that **market revenues increase** across the levels of OMGE considered, compared to a case with no OMGE. Under our representation of a hypothetical market the increase in price outweighs the reduction in the quantity of credits transacted. A level of 2% OMGE increases market revenues by 1%, with 5%, 10%, 20% and 30% OMGE resulting in market revenues rising by 2%, 5%, 8% and 7%, respectively. The increase in market revenues would be more pronounced if the demand curve were steeper than under our reference scenario, and less pronounced (to such an extent that revenues may even fall) if the demand curve were shallower. **Project owner profits also increase** across the levels of OMGE considered, closely aligned to the relative increase in market revenue. Levels of 2%, 5%, 10%, 20% and 30% OMGE lead to a 1%, 3%, 6%, 9% and 9% increase in project owner profits. Project owner profits rise from just over €17.9 billion in the reference case to up to €19.5 billion, across the range of OMGE scenarios considered.

4.2 Share of Proceeds

Turning to the Share of Proceeds, we analyse the impact of implementing SOP of either 2%, 5% or 10% (in section 4.4 which considers policy decision combinations we limit the analysis to percentage levels of 2 and 5). Similar to OMGE, SOP also tends to increase the price of carbon credits and reduce the quantity of credits transacted. However, the impact of SOP on the supply curve is different to OMGE, as shown with a 5% SOP level in Figure 9. Instead of cancelling the designated share of total credits issued for emission reductions, the credits are transferred to an administrator, who then reintroduces them to the market in order to monetise their value. In theory the administrator should be willing to supply the credits to the market at a cost of (approximately) zero, as it receives the credits for free. We therefore assume that all credits transferred to the Adaptation Fund, via the SOP, are supplied to the market at zero cost. They therefore feature on the far left-hand side of the credit supply curve.

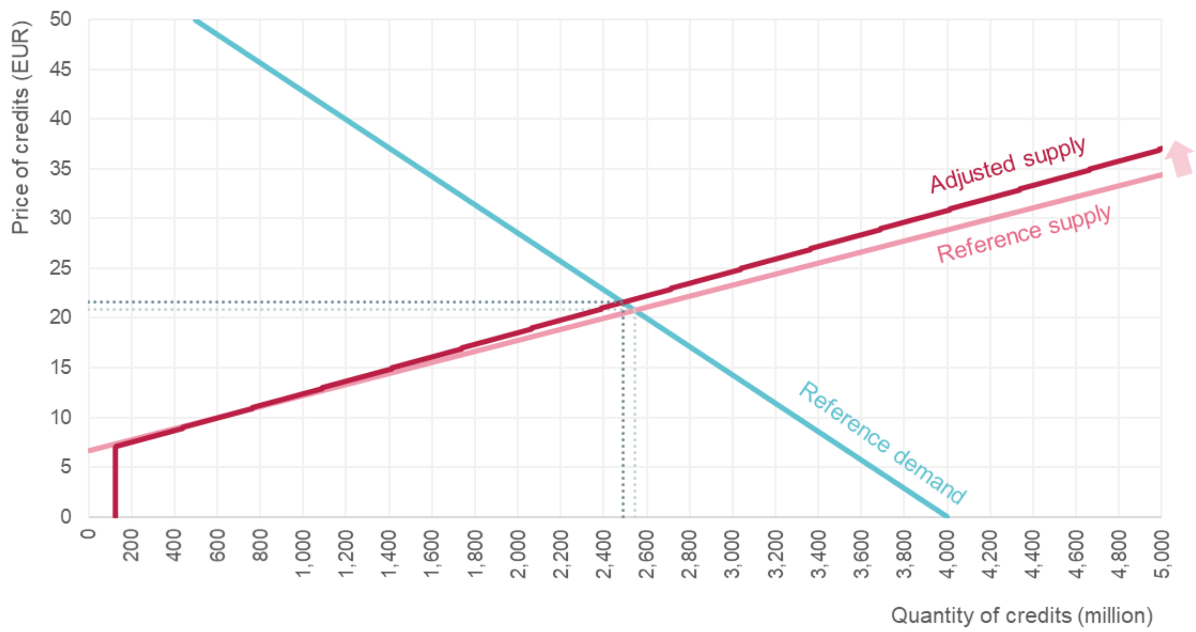

Figure 9: Supply of credits with 5% SOP

The results of the impact on different indicators for 2%, 5% and 10% SOP are shown in Figure 10. As for OMGE, we show the change in the impact for all indicators relative to the reference scenario, with the exception of SOP and the global GHG impact, for which we report the absolute levels in each scenario.

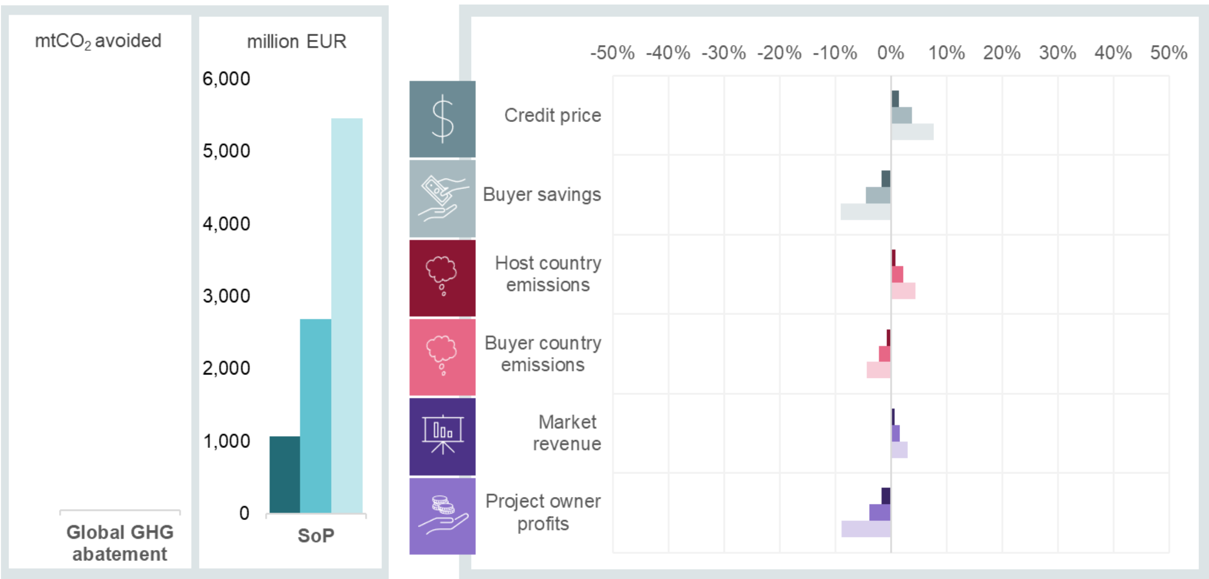

Figure 10: Impact of SOP levels of 2% (darkest), 5%, and 10% (lightest) across indicators

Higher percentage levels of SOP lead to increased levels of revenues for the Adaptation Fund. In our hypothetical example of a possible future Article 6 market, a level of 2% SOP would raise €1 billion in revenue for the Adaptation Fund; 5% SOP would raise approximately €2.7 billion; and 10% SOP would raise €5.5 billion over the period 2021-2030. Under these scenarios there is no impact on overall GHG emissions as the increase in host country emissions is offset with the equivalent decrease in buyer country emissions.

Applying SOP increases the price of credits, as a certain share of the emission reductions achieved and issued as credits are transferred to the administrator of the Adaptation Fund and cannot be sold by project owners. As for OMGE the revenues from the sale of the remaining credits needs to cover the full costs of delivering all of the emission reductions. However, the impacts on the market, for a given percentage level, are not identical to that of OMGE, because the transferred credits are re-introduced to the market, effectively entering the supply curve at the price level above which the Adaptation Fund administrator is willing to monetise the credits it holds. In our analysis, a 2% level of SOP increases the reference case market price of €20.80 by just over 1% (to €21.10), a 5% SOP increases it by 4% (to €21.60) and a 10% SOP increases the price by 8% (to €22.40).

Buyer savings fall in a similar manner to the increase in price. A level of 2% SOP leads to a decrease of approximately 2% in buyer savings; a level of 5% SOP leads to a decrease in buyer savings of 5%; and a 10% SOP leads to buyer savings falling by 9%.

Introducing SOP has the effect of **increasing host country emissions** as fewer credits are transacted; for SOP levels of 2%, 5% and 10% host country emissions rise by approximately 1%, 2% and 4%, respectively. The SOP leads to a corresponding **reduction in buyer country emissions**, such that total aggregated emissions from the host and buyer countries do not change.

Market revenues increase modestly, as in our hypothetical example of a future Article 6 market the increase in price outweighs the reduction in the quantity of credits transacted. Levels of 2%, 5% and 10% SOP increase market revenues by less than 1%, 2% and 3%, respectively.

Project owner profits decrease across the levels of SOP considered because project owners must transfer a share of the total credit issuance to the Adaptation Fund, for which they receive no revenues. Whilst this mechanism is similar for OMGE, the application of OMGE raises market prices in a more pronounced manner because the credits are cancelled. With SOP the credits that are transferred to the Adaptation Fund are still supplied in the market, limiting any increase in the steepness of the adjusted supply curve. A level of 2% SOP leads to a decrease of approximately 2% in project owner profits (from €17.9 billion to €17.5 billion). A level of 5% SOP leads to a decrease of 4% in project owner profits (to €17.1 billion). And 10% SOP reduces project owner profits by 9% to €16.3 billion.

4.3 Transition of CDM units and activities

4.3.1 CER transition

We assess three scenarios for the transition of CP2 CERs for use against NDC targets: no transition (i.e. the reference scenario), transition of CERs from CDM project activities registered on or after 1 January 2016 and the transition of CERs from project activities registered on or after 1 January 2013. We assume that project owners could supply these credits to the market at a unit cost of 0.50 Euros, which means they enter the supply curve on the left-hand side (they are available at a lower cost than credits from new emission reduction activities). Figure 11 illustrates how the supply curve is altered in the case of the transition of all CP2 CERs from CDM project activities registered since 1 January 2013 (dark red line), relative to the reference scenario (light red).

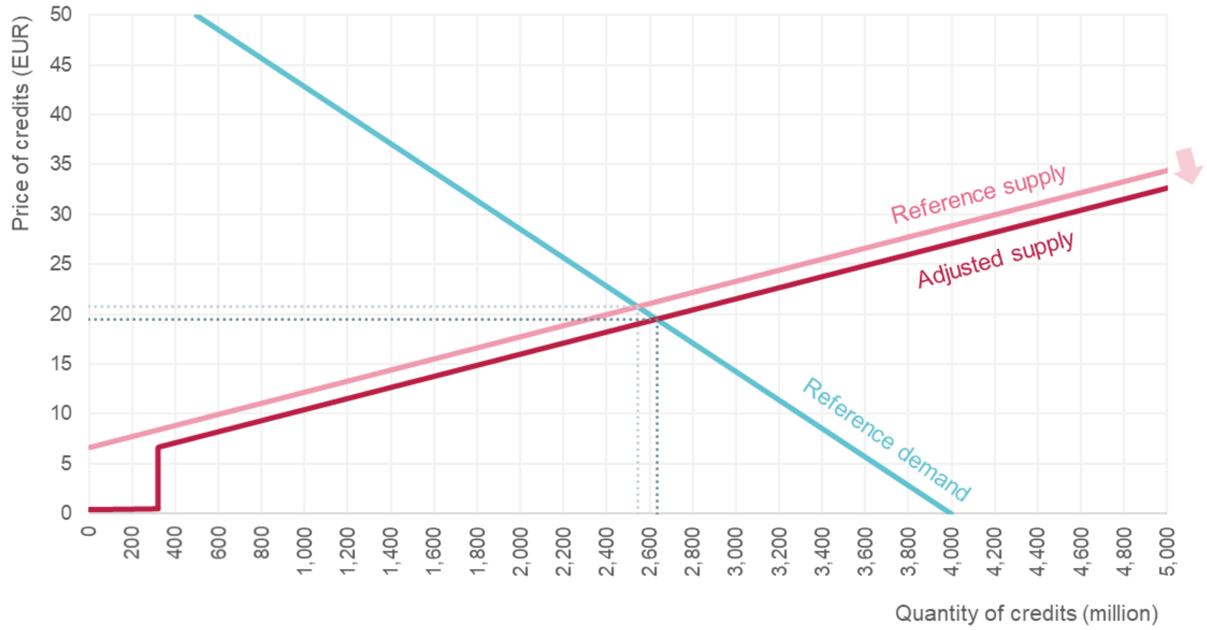

Figure 11: Supply of credits with transition of CERs under a 2013 activity registration date cut-off

The results for allowing the use of CP2 CERs either with a 2016 or 2013 registration date cut-off are shown below in Figure 12, compared to the reference scenario in which no CP2 CERs are eligible to use towards NDC targets.

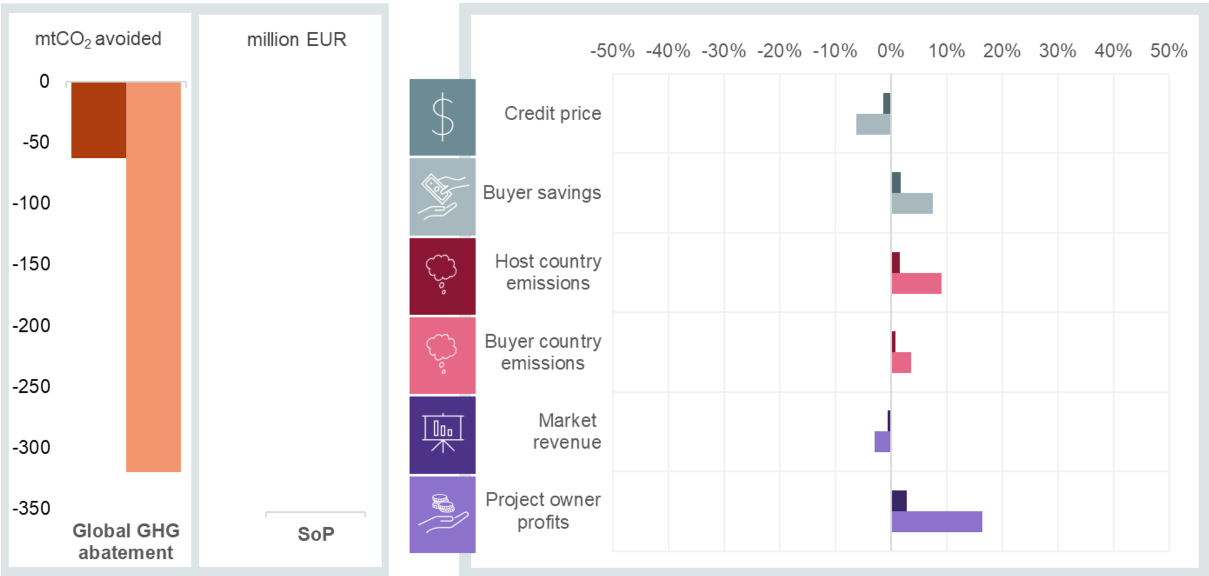

Figure 12: Impact of the transition of CERs under 2016 (darkest) and 2013 (lightest) registration date cut-offs across indicators.

The use of CP2 CERs leads to an overall increase in global GHG emissions compared to the case in which they are not used. As all of the eligible CP2 CERs are included in the quantity of transacted credits at the market equilibrium (because they are available at the lowest cost and therefore on the left hand side of the supply curve) the increase in global GHG emissions, relative to the case where CP2 CERs are ineligible for use towards NDC targets, corresponds directly to the supply potential of CP2 CERs: Global GHG emissions rise by 63 $MtCO_2e$ under a 2016 registration date cut-off and by 320 $MtCO_2e$ under a 2013 registration date cut-off. The share of proceeds is zero, by definition, across these scenarios.

The use of CP2 CERs decreases the price of credits, as CERs have low supply costs and displace credits from new emission reduction activities on the left-hand side of the supply curve. The use of CERs from project activities registered since the beginning of 2016 would reduce the market price in the reference case (€20.80) by just over 1% (to (€20.50). Extending eligibility to project activities registered since the beginning of 2013 would reduce the price by 6% (to €19.50). **The savings achieved by credit buyers increase** because they are able to purchase more credits at a lower price. Overall buyer savings rise by approximately 2% and 8% under 2016 and 2013 registration date cut-off scenarios.

CP2 CERs represent emission reductions that have already occurred. This means that their use will **increase host country emissions** in both of the scenarios because fewer new activities are incentivised at the market equilibrium. Under 2016 and 2013 registration date cut-offs host country emissions increase by almost 2% and 9%, respectively, compared to the reference scenario. There is also an **increase in buyer country emissions** which corresponds to the total increase in the quantity of credits transacted: 1% and 4% under 2016 and 2013 registration date cut-offs, respectively.

Market revenues decrease as in our hypothetical example of a future Article 6 market the decrease in price outweighs the increase in the quantity of credits transacted. Under 2016 and 2013 registration date cut-offs the market revenue decreases by less than 1% and 3%, respectively. However, **project owner profits increase** where CP2 CERs are considered eligible because they are able to sell credits that it would not otherwise be possible to monetise. Under 2016 and 2013 registration date cut-offs project owner profits increase relative to the reference scenario by 3% (or €0.5 billion) and 16% (or €2.9 billion), respectively. This large relative increase in project owner profits assumes that CP2 CERs are sold at the equilibrium market price, which is considerably higher than the costs associated with issuance of CP2 CERs. If CP2 CERs instead are transacted at a materially lower cost, e.g. because many buyers do not treat them as substitutes to A6+ ERs which results in a weaker demand signal, then the impact will be diminished.

4.3.2 Transition of CDM activities

We assess four scenarios for the transition of CDM project activities to the new Article 6.4 mechanism to continue supplying credits for emission reductions from the start of 2021: no transition (i.e. the reference scenario); transition of project activities registered from 1 January 2016; the transition of vulnerable projects (i.e. those whose continued operation depends on the receipt of carbon credit revenues); and the full transition of all project activities, where we assume 30% of projects take the administrative steps to transition. Credits from transitioned project activities, “TRANS ERs”, are typically available at costs below those of new activities as many of them are already implemented and have low operational costs (net of any non-carbon credit revenues they may receive, such as from the sale of electricity). Only a very small share of these projects (which are vulnerable) have costs to generate and issue carbon credits above the lowest cost of new activities. As for CP2 CERs, this means that TRANS ERs typically enter the supply curve on the left-hand side and displace credits from new activities. Figure 13 illustrates how the supply curve is altered where TRANS ERs are deemed eligible under the full transition scenario (dark red), compared to the reference scenario with no transition of activities (light red).

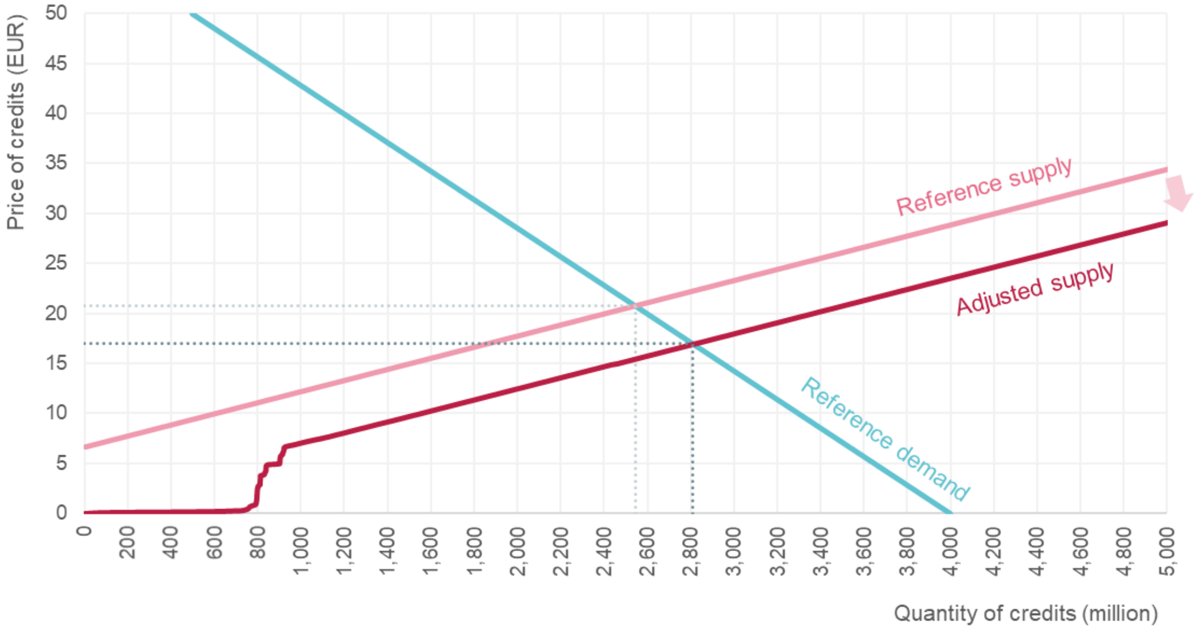

Figure 13: Supply of credits under the full transition scenario for CDM activities (for which we assume 30% of activities actually transition)

The transition of activities has the effect of shifting the reference supply curve to the right, which lowers the prices and increases the transacted credits. The results for different TRANS ER eligibility scenarios are shown below in Figure 14, compared to the reference scenario in which no activities are permitted to transition to the new Article 6.4 mechanism and continue issuance of credits.

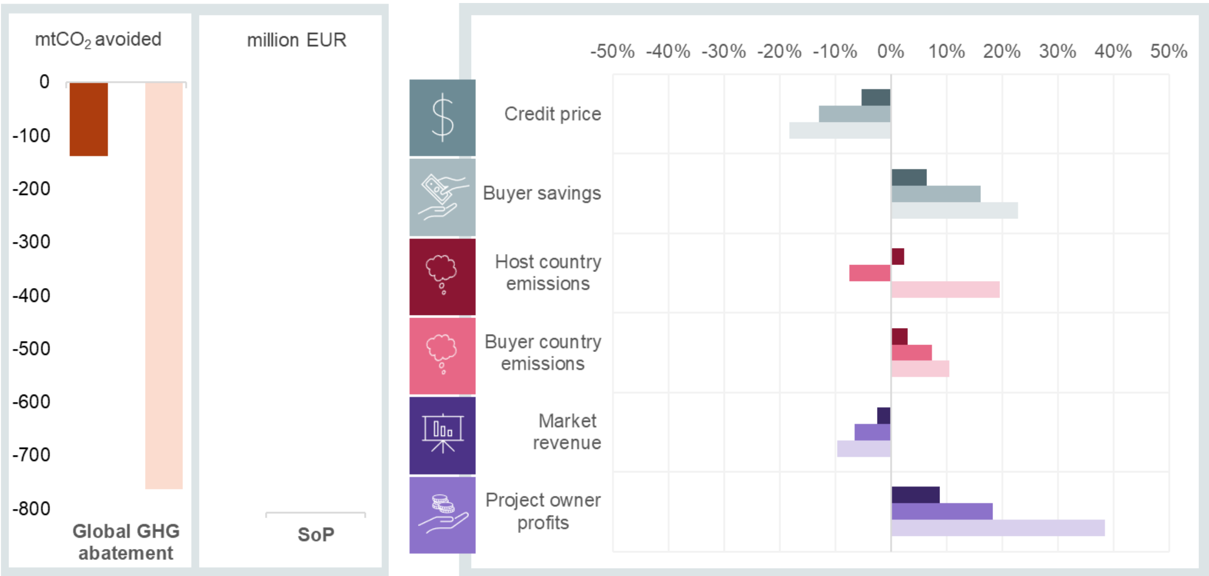

Figure 14: Impact of the transition of activities under 2016 registration date cut-off (darkest); vulnerable projects (medium shading) and full transition (lightest) scenarios across indicators

The transition of CDM activities leads to an overall increase in global GHG emissions, or undermines host country mitigation efforts (see section 3.2.3 above) in both the 2016 registration date cut-off and full transition scenarios. Global GHG emissions rise, or host country mitigation efforts are undermined, by 139 $MtCO_2e$ under a 2016 registration date cut-off and by 763 $MtCO_2e$ in the full transition scenario. The overall impact on global GHG emissions is zero where only vulnerable projects are permitted to transition as these projects deliver emission reductions that would not otherwise occur and are therefore similar in impact to new projects.

Allowing existing CDM activities to transition to the new Article 6.4 mechanism and supply credits for emission reductions between 2021-2030 decreases the market price of credits, as they provide a source of lower cost credits which displace credits from new emission reduction activities on the left-hand side of the supply curve. Allowing CDM project activities registered since the beginning of 2016 to transition would reduce the reference scenario market price (of €20.80) by 5% (to €19.70); allowing vulnerable projects to transition would reduce the price by 13% (to €18.10); and allowing full transition of CDM activities would reduce the price by 18% (to €17.00), compared to the reference scenario with no transition of activities. **Credit buyer savings rise by a similar order of magnitude** because they are able to purchase more credits at a lower price. Overall buyer savings increase by 6%, 16% and 23% under the 2016 registration date cut-off, vulnerable projects and full transition scenarios, respectively.

The direction of impact on host country emissions depends on the scenario. Host country emissions rise slightly, by 3%, in the 2016 registration date cut-off scenario and by 20% in the full transition scenario because, despite the increase in credits transacted, many of the total quantity come from non-vulnerable projects where the emission reductions would occur anyway (assuming host countries do not compensate for credits issued to non-vulnerable projects by delivering further abatement elsewhere). However, host country emissions fall by 7% (equivalent to the increase in the quantity of credits transacted) where only vulnerable projects are permitted to transition as all of these credits represent emission reductions that would not have otherwise occurred. All scenarios lead to an **increase in buyer country emissions** which corresponds to the total increase in the quantity of credits transacted. Under the 2016 registration date cut-off, vulnerable projects and full transition scenarios the quantity of credits transacted increases by 3%, 7% and 10%, respectively.

Market revenues decrease under all scenarios for the transition of activities as the decrease in price outweighs the increase in the quantity of credits transacted. Under the 2016 registration date cut-off, vulnerable projects and full transition scenarios market revenues decrease by 2%, 7% and 10%, respectively. **And project owner profits increase across all scenarios** because they are able to sell credits that it would not otherwise be possible to monetise and which are typically available at lower cost than the supply from new activities. Under the 2016 registration date cut-off, vulnerable projects and full transition scenarios project owner profits increase by 9%, 18% and 34%, respectively.

4.4 Policy decision combinations

We now assess different combinations of decisions across the three elements of OMGE, SOP and the transition of activities to show how they may interact and either exaggerate or offset impacts for the different indicators. We exclude the different scenarios for the transition of eligible CP2 CERs from this analysis. As noted above in section 3.1.1 we consider that the demand for CP2 CERs is likely to represent a somewhat separate market, with different buyers.

In the sub-sections below, we present results for each of the four CDM activity transition scenarios (i.e. no transition, 2016 registration date cut-off, vulnerable projects and full transition) with six OMGE and SOP combinations from the scenarios consider above (SOP levels of 2% and 5%; and OMGE levels of 2%, 10% and 30%).

Across all of the results that we present here, we assume no transition of CDM units. If Parties were to allow CP2 CER eligibility for use towards NDCs, the impact on global emissions (which is an increase in all cases) would be added to the outcome under the particular policy decision combination scenario analysed below.

4.4.1 OMGE and SOP policy combinations with no transition of CDM units or activities

Figure 15 shows the results of the six different combinations OMGE and SOP levels where there is no transition of CERs or CDM activities.

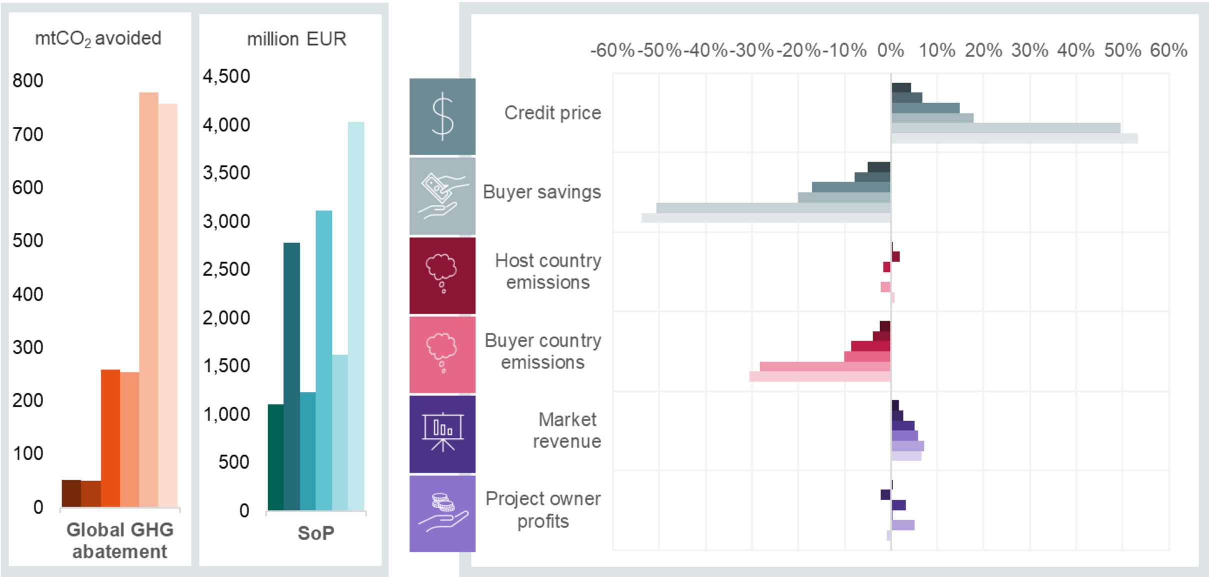

Figure 15: Impact of SOP and OMGE scenario combinations with no transition of CDM units or activities

Note: From top-to-bottom / left-to-right / darkest-to-lightest shading the six scenarios show: 1) 2% OMGE, 2% SOP; 2) 2% OMGE, 5% SOP; 3) 10% OMGE, 2% SOP; 4) 10% OMGE, 5% SOP; 5) 30% OMGE, 2% SOP; 6) 30% OMGE, 5% SOP)

Global GHG abatement rises in all of the OMGE and SOP policy combination scenarios considered. The most pronounced impact on reducing global GHG emissions is where a 30% OMGE level is applied: Global emissions fall by 779 $MtCO_2e$ over the period 2021-2030 in combination with 2% SOP and by the slightly lower figure of 758 $MtCO_2e$ with 5% SOP. Increasing the level of SOP slightly reduces the global GHG abatement facilitated by a given level of OMGE because it raises host country emissions relative to the reference case by more than the corresponding reduction in buyer country emissions. SOP effectively reduces the absolute number of credits cancelled for OMGE.

Increasing the SOP level from 2% to 5% materially increases the funding made available for adaptation across the levels of OMGE considered. With OMGE set at 30%, funding for adaptation would be approximately €1.6 billion if SOP is set to 2% and €4.0 billion if set at the higher level of 5%. The SOP revenues increase with higher levels of OMGE because the increase in the credit price at which the administrators of the Adaptation Fund can monetise the credits they receive outweighs the reduction in the quantity of units transacted.

Credit prices rise in all scenarios, leading to a corresponding fall in buyer savings. We find that levels of 2% OMGE, coupled with either 2% or 5% SOP, have a modest impact on the equilibrium credit price of €20.80 in the refence scenario: prices rise by 4-7% (up to €22.20). Higher levels of OMGE have a more material impact on credit prices. A 10% level of OMGE - combined with either a 2%, or 5% level of SOP - increases credit prices by 15% (€23.90) and 18% (€24.50), respectively. If OMGE is increased to 30%, we find credit prices increase by around 50% (up to €31.90 with 5% SOP).

Reductions in global GHG emissions are largely driven by reductions in buyer country emissions, with only a limited impact on host country emissions across all scenarios. This is because the higher prices incentivise greater reduction of buyer's own emissions. Across the range of scenarios buyer country emissions fall between 2% and 31%. Host country emissions on the other hand vary between a reduction of 2% and an increase of 2%.

All of the six combinations have a relatively modest impact on market revenues (2-7% increase) with higher levels of OMGE driving the largest impacts. Project owner profits range from falling by 2% (2% OMGE; 5% SOP) to rising by 5% (30% OMGE; 2% SOP). OMGE serves to raise profits under the supply and demand curves used for this analysis because the price increase more than compensates for the share of credits that are cancelled. However, SOP acts in the opposite direction, serving to erode profits.

Results of sensitivity analysis with steeper demand and flatter supply

We also consider the implications of a steeper demand and/or flatter supply for our hypothetical analysis of market indicators, as described in section 3.3.

Under our sensitivity test with a steeper demand curve (i.e., reflecting lower price elasticity of demand), the general trend in the direction of impacts for global GHG abatement, SOP, credit prices and buyer savings remains similar, but their magnitude increases. With a steeper demand curve, 30% OMGE levels could push overall abatement to over 900 $MtCO_2e$; SOP revenues to exceed €2 billion if SOP is set to 2% and reach almost €6 billion if set at the higher level of 5%; and prices to rise by as much as 70%. With the steeper demand curve host country emissions fall in all policy combinations, relative to the reference scenario, to over 20% with OMGE levels of 30%; and the magnitude of the drop in buyer country emissions falls compared to the results with the reference demand curve – the steeper demand curve means that the quantity of credits transacted does not fall as much due to the influence of OMGE and SOP on the supply curve. Finally, a steeper demand curve drives a much larger increase in market revenues because the rise in the equilibrium market price exceeds the magnitude of the fall in the equilibrium quantity of credits transacted by more than under the reference demand curve.

A flatter supply curve (i.e. reflecting lower price elasticity of supply) would also increase overall GHG abatement levels, but slightly reduces SOP revenues, across the various policy combinations. Both impacts are relatively minor in our sensitivity analysis using a flatter supply curve, and significantly less pronounced than the impacts with steeper demand curve. A flatter supply curve reduces the increase in credit prices associated with the application of OMGE and SOP and also reduces the fall in buyer savings. Host country emissions go down, and buyer country emissions rise because the quantity of credits transacted is higher with a flatter supply curve. The effect of a flatter supply curve on market revenues and project owner profits various across the different policy combinations, although the impacts are relatively negligible in our sensitivity analysis.

4.4.2 OMGE and SOP combinations with transition of CDM activities registered from 2016

Figure 16 shows the results of the same combinations OMGE and SOP levels where CDM activities registered since the 1 January 2016 are eligible to transition to the new Article 6.4 mechanism and receive credits for emission reductions from the beginning of 2021.

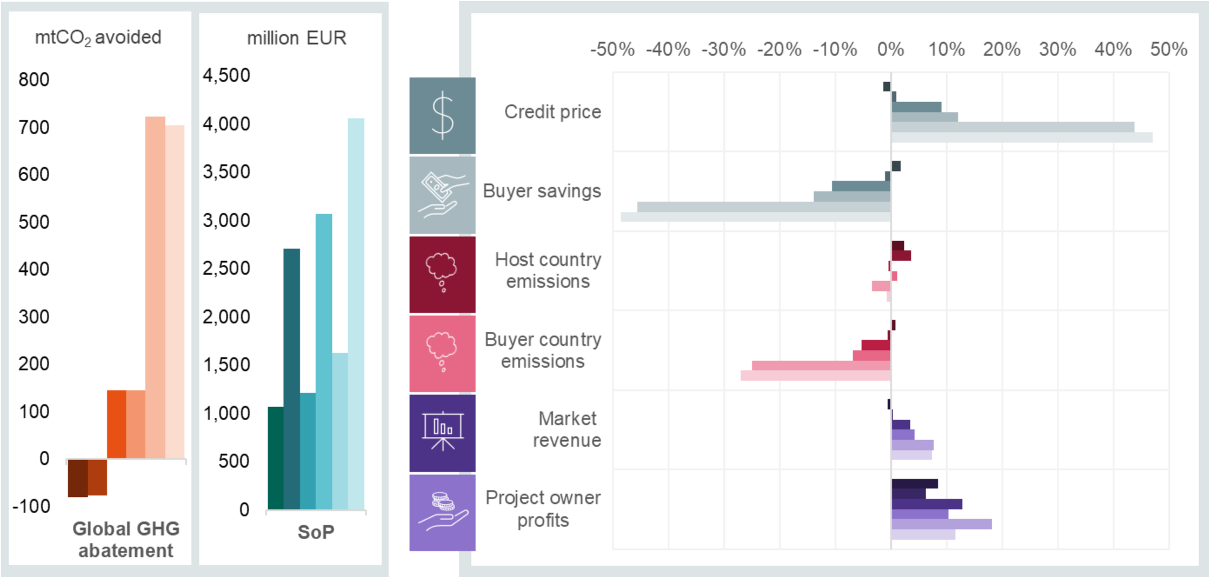

Figure 16: Impact of SOP and OMGE scenario combinations with transition of CDM activities registered from 1 January 2016

Note: From top-to-bottom / left-to-right / darkest-to-lightest shading the six scenarios show: 1) 2% OMGE, 2% SOP; 2) 2% OMGE, 5% SOP; 3) 10% OMGE, 2% SOP; 4) 10% OMGE, 5% SOP; 5) 30% OMGE, 2% SOP; 6) 30% OMGE, 5% SOP)

Allowing the transition of CDM activities registered from 1 January 2016 reduces the level of global GHG abatement across all scenarios, relative to the case where no activities are eligible to transition to the new Article 6.4 mechanism, if host countries do not compensate for credits issued to non-vulnerable projects. In scenarios with 2% OMGE, global GHG emissions rise on the order of 80 $MtCO_2e$. Levels of OMGE of 10% facilitate an overall reduction in GHG emissions of 145 $MtCO_2e$, and with 30% OMGE global GHG emissions reduce by just over 700 $MtCO_2e$.

SOP revenues remain very similar to those collected under the set of OMGE and SOP policy combination scenarios with no transition (Figure 15). This is because TRANS ERs are subject to the same percentage levels of OMGE and SOP as credits from new activities. The reduction in the price received per credit due to transition is approximately compensated for by the increase in the quantity of credits that are transferred to the Adaptation Fund.

Compared to the same scenarios with no transition (Figure 15 above), across the other indicators, the transition of CDM activities registered since the beginning of 2016 puts downward pressure on credit prices (i.e. for most scenarios it reduces the extent of their increase relative to the reference scenario) which increases buyer savings. The transition of activities also pushes up both host country (assuming host countries do not compensate for credits issued to non-vulnerable projects) and buyer country emissions, reduces market revenues and serves to boost project owner profits, when compared to the impacts for the same scenarios with no transition. These trends reflect the direction of impacts shown for the 2016 registration date cut-off transition scenario without any OMGE or SOP, shown above in Figure 14.

4.4.3 OMGE and SOP combinations with transition of vulnerable CDM projects

Figure 17 shows the results of different combinations OMGE and SOP levels where only vulnerable CDM projects are eligible to transition to the new Article 6.4 mechanism and receive credits for emission reductions from 2021.

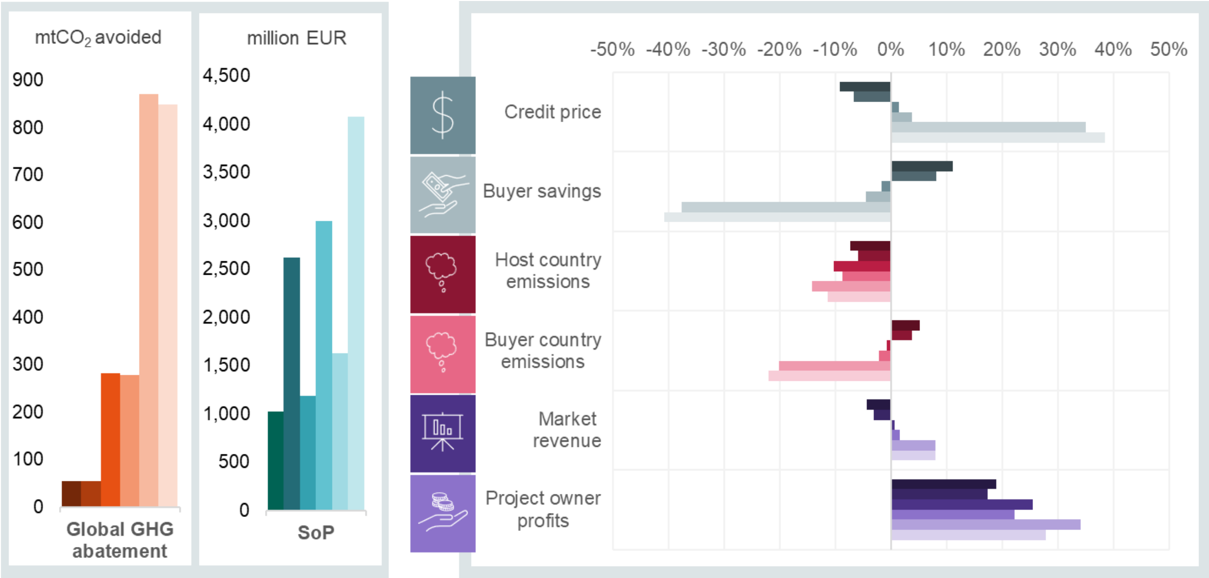

Figure 17: Impact of SOP and OMGE scenario combinations with transition of vulnerable CDM projects

Note: From top-to-bottom / left-to-right / darkest-to-lightest shading the six scenarios show: 1) 2% OMGE, 2% SOP; 2) 2% OMGE, 5% SOP; 3) 10% OMGE, 2% SOP; 4) 10% OMGE, 5% SOP; 5) 30% OMGE, 2% SOP; 6) 30% OMGE, 5% SOP)

Scenarios in which vulnerable CDM projects are eligible to transition lead to the largest reductions in global GHG emissions. In this case, OMGE levels of 2% lead to global GHG abatement of 54 $MtCO_2e$. Levels of OMGE of 10% facilitate an overall reduction in GHG emissions of approximately 280 $MtCO_2e$, and with 30% OMGE global GHG emissions reduce by 849-870 $MtCO_2e$. Abatement levels are higher than under the scenarios with no transition because purchasing credits from vulnerable projects has a similar impact on emissions as from new projects, but their lower cost lowers the supply curve, putting downward pressure on credit prices and upward pressure on the volume of credits transacted (raising the total number of credits cancelled for OMGE).

SOP revenues again remain very similar to those collected under the set of OMGE and SOP policy combination scenarios with no transition (Figure 15) because TRANS ERs are subject to the same percentage levels of OMGE and SOP as credits from new activities (as set out in the previous section for the scenarios with transition of CDM activities registered since 2016).

The scenarios of policy combinations with transition of vulnerable projects reduces the credit price and increases buyer savings, relative to the scenarios with no transition. The net effect with OMGE levels of 2% is a decrease in credit prices by 7-9%, with buyer savings rising 8-11%. For the higher OMGE levels we consider, the upward pressure from OMGE (and SOP) on prices leads to net increases in the market equilibrium price, and the corresponding downward pressure on buyer savings leads to net falls in savings. Host country emissions are lower and buyer country emissions slightly higher than the same policy combinations with no transition; market revenues are lower for OMGE levels of 2% and 10%, but fractionally higher with OMGE at 30%; and project owner profits are notably higher across all policy combination scenarios compared to those with no transition – with an OMGE level of 30% and SOP at 5% project owner profits are €22.8 billion, or €5.0 billion higher than in the reference scenario.

4.4.4 OMGE and SOP combinations with full transition of CDM activities

Figure 18 shows the results of different combinations OMGE and SOP levels where all CDM activities are eligible to transition to the new Article 6.4 mechanism, under the assumption that only 30% of activities actually take the administrative steps to register with the new mechanism.

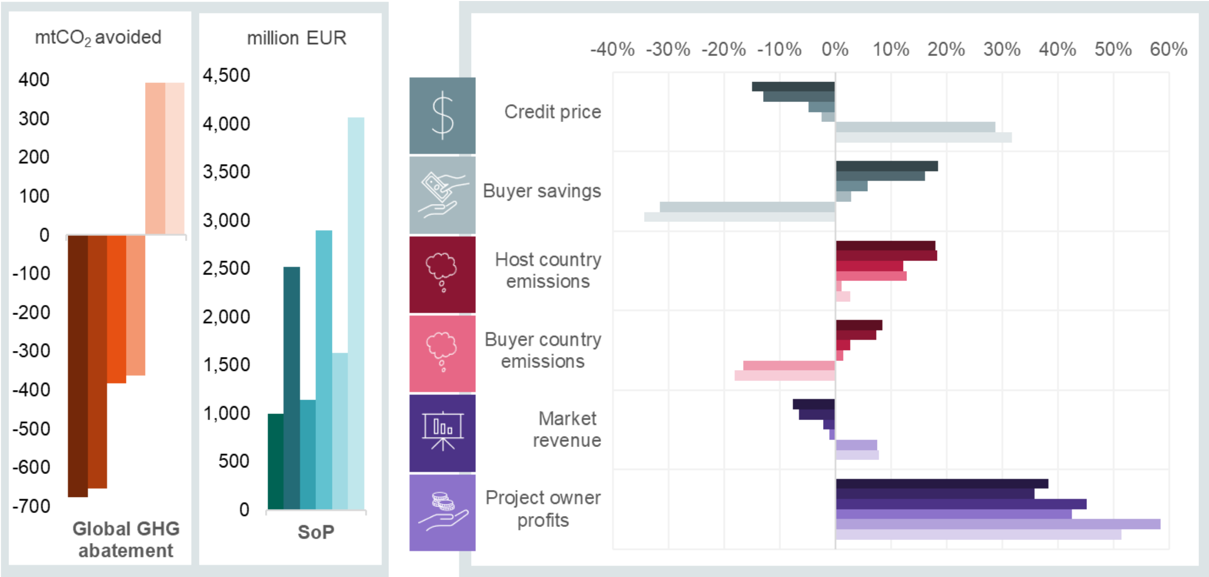

Figure 18: Impact of SOP and OMGE scenario combinations with full transition of CDM activities

Note: From top-to-bottom / left-to-right / darkest-to-lightest shading the six scenarios show: 1) 2% OMGE, 2% SOP; 2) 2% OMGE, 5% SOP; 3) 10% OMGE, 2% SOP; 4) 10% OMGE, 5% SOP; 5) 30% OMGE, 2% SOP; 6) 30% OMGE, 5% SOP)

In the case that host countries do not compensate for the mitigation shortfall due to the transition of non-vulnerable projects, scenarios with full transition of CDM activities lead to an increase in global GHG emissions for policy combinations with OMGE levels of 2% and 10%. Emissions increase by 654-676 $MtCO_2e$ with 2% OMGE and by 363-382 $MtCO_2e$ with 10% OMGE. Under scenarios with 30% OMGE there is an overall net reduction in global GHG emissions of approximately 390 $MtCO_2e$. Full transition therefore could erode much of the overall abatement facilitated through the introduction of OMGE and SOP, in some cases leading to outcomes that are worse for the climate.

SOP revenues are again broadly similar to the same policy combinations with no transition. They are slightly reduced, relative to the no transition scenarios, for OMGE levels of 2% and 10%, and slightly higher with OMGE at 30%, but the magnitude of the change is minimal.

Scenarios with full transition of CDM activities to the new Article 6.4 mechanism lead to lower credit prices and increased buyer savings than the reference scenario for OMGE levels of 2% and 10%. However, credit prices rise, and buyer savings fall, with OMGE of 30%, albeit to a lesser degree than with no transition. Host country emissions rise across all scenarios, largely because a significant volume of credits from non-vulnerable existing projects transitions to the new mechanism, which displace credits from new activities (and their associated emission reductions). Buyer country emissions also rise for OMGE levels of 2% and 10%, reducing only for OMGE of 30%. The variation in market revenues is more limited compared to the other indicators, remaining between plus 8% to minus 8% across the scenarios. Project owner profits, however, increase markedly in all cases to the highest levels across all of the scenarios considered in this study. Under the policy combination of full transition, 30% OMGE and 5% SOP, project owner profits rise to €27.0 billion over the 2021-2030 period.

4.4.5 Impacts on emissions and adaptation funding across all scenario combinations

Finally, we show the headline impacts on global GHG emissions and SOP revenues for all scenario combinations considered above, including OMGE, SOP, transition of CDM activities as well as the transition of CDM units. This comparative analysis assumes that CP2 CERs are treated as substitute units to other A6+ ERs by credit buyers and therefore displace more costly credits in the supply curve.

Figure 19 provides a summary of the global GHG abatement impacts across the range of (24) different scenarios analysed in section 4.4 which assume no transition of CDM units as well as the impact that allowing the transition of CP2 CERs from project activities registered since 2016 or 2013 would have. An OMGE level of 30% typically leads to the highest levels of overall abatement, even in most combinations with policy decisions that put downward pressure on abatement levels. Only in the scenario with a full transition of CDM activities and transition of units (CP2 CERs) from activities registered from 1 January 2013, does a 30% OMGE yield a lower abatement level than across some scenarios with 10% OMGE (and more limited transition).

Transitioning vulnerable projects leads to the highest levels of abatement. This result relies on the assumption that the assessment process for approving activities to transition correctly identifies those that depend on continued financial support from the sale of carbon credits to continue abatement activities and avoids approving activities that are not vulnerable. The impact on reducing GHG emissions is only slightly higher than if no transition is permitted. In the case that host countries do not compensate for the mitigation shortfall due to the transition of non-vulnerable projects, allowing all activities registered since 2016 to transition further erodes abatement levels, although the negative impact on abatement is far more pronounced under a decision to permit all CDM activities to transition.

The transition of CDM units generally reduces the level of abatement, with a more pronounced negative effect on abatement if units from all activities registered since 1 January 2013 are eligible for use towards NDC targets than if the cut-off date is 1 January 2016. Both scenarios for the transition of units lead to negative overall abatement levels in combination with 2% OMGE. Allowing the use of units from activities registered since the beginning of 2013 also leads to negative abatement levels when combined with 10% OMGE.

The decision to apply either a 2% or 5% level of SOP has no material impact on the overall level of abatement with outcomes broadly similar across these two options when combined with any of the other set of parameters.

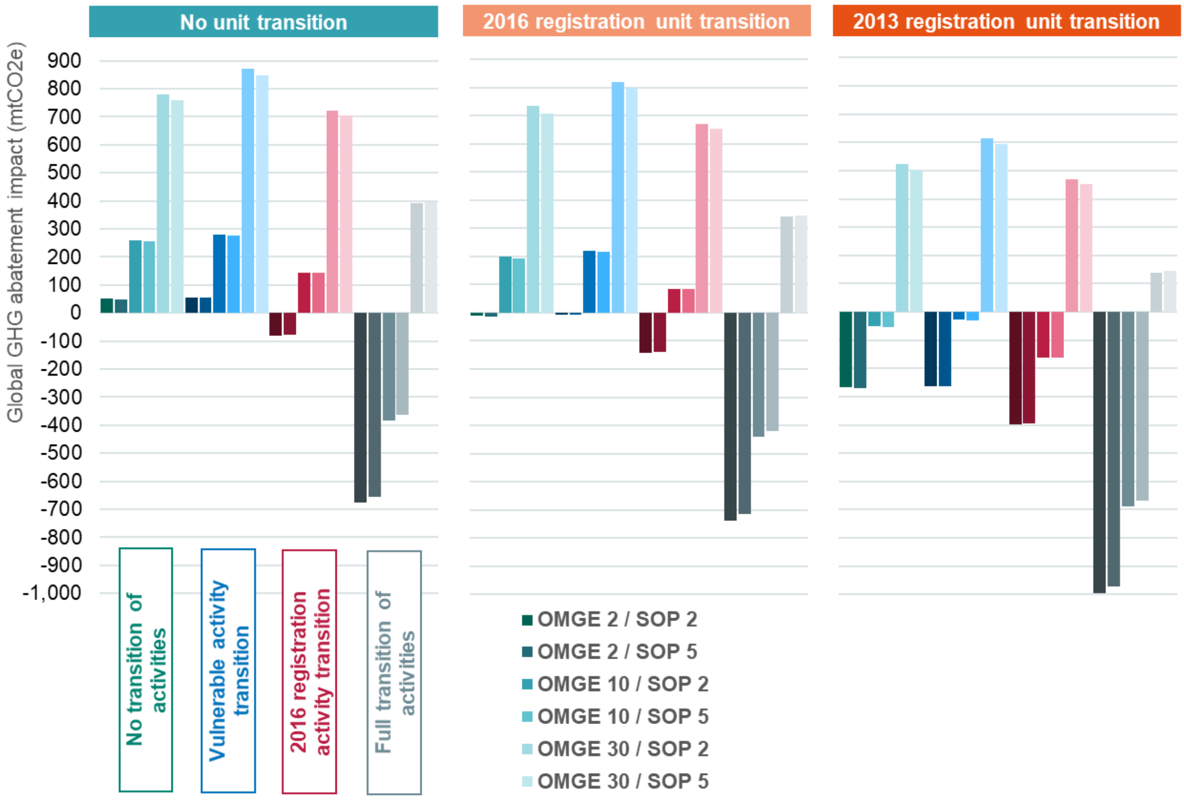

Figure 19: Overview of potential global GHG abatement impacts across all scenarios considered

Note: The three sets of charts show the global GHG abatement impacts for scenarios with different rules for the transition of CDM units (CP2 CERs), from left-to-right: No transition of units; transition of units from project activities registered from 1 January 2016; and transition of units from project activities registered from 1 January 2013.

Within each chart, the block of six bars with similar colour shading shows the outcomes for different rules for the transition of CDM activities (TRANS ERs), from left-to-right: No transition of activities (turquoise); transition of vulnerable project activities (blue); transition of activities registered from 1 January 2016 (red); and full transition of activities, for which we assume 30% actually transition (grey). The results pertaining to the transition of activities show the impact under the assumption that host countries do not alter their climate action to compensate for credits issued to non-vulnerable projects. Should host countries increase their mitigation efforts accordingly the global GHG abatement impacts under the “2016 registration activity transition” and “Full transition of activities” scenarios may be higher.

Each block of six bars with similar colour shading shows the outcomes for different combinations of OMGE and SOP percentage levels, from left-to-right (dark shading to light shading): OMGE 2% and SOP 2%; OMGE 2% and SOP 5%; OMGE 10% and SOP 2%; OMGE 10% and SOP 5%; OMGE 30% and SOP 2%; OMGE 30% and SOP 5%.

Figure 20 summarises the impacts on SOP revenues across the same set of scenarios. It is clear from the comparison that neither the transition of activities, nor units from the CDM have a particularly material impact on the SOP collected (each block of six bars leads to relatively similar outcomes for a given combination of OMGE and SOP levels). Scenarios with a 5% SOP lead to the most funding for adaptation, regardless of which other policy decisions it is combined with. Higher levels of OMGE also facilitate increased SOP revenues under the hypothetical supply and demand curves used for our analysis.

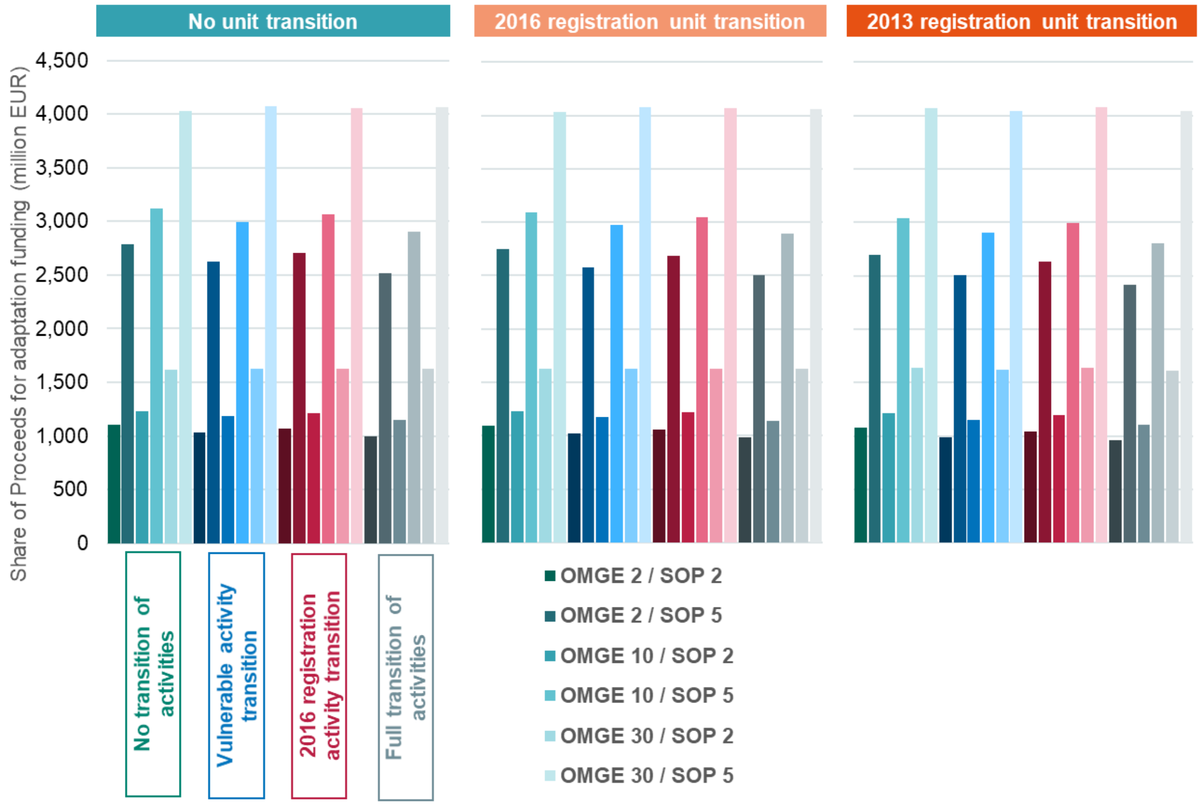

Figure 20: Overview of share of proceeds for adaptation funding across all scenarios considered

See notes to Figure 19 above for details of the scenarios presented in the different charts.

5 Implications for climate targets

Under Article 2 of the Paris Agreement, all Parties aim to strengthen the global response to climate change by:

(1) pursuing efforts to limit warming to 1.5°C;
(2) increasing the ability to adapt to the adverse effects of climate change;
(3) making finance flows consistent with a pathway toward low GHG emissions.

The implementation of OMGE and SOP has the potential to contribute to each of these three aims. We find under a range of scenarios that as the level of OMGE increases, net global GHG emissions decrease and adaptation needs are consequently reduced. As the level of SOP increases, greater resources are delivered to support adaptation.

In contrast, most proposed transition options contained in the COP Presidency texts have the potential to decrease the overall abatement of GHGs, relative to scenarios in which there is no transition of either CERs or activities, negatively impacting the three elements of Article 2. The sections below endeavour to place the implications -- in terms of scale -- of these three elements (OMGE, SOP and transition) in context.

5.1 Scale of potential abatement from OMGE over the 2021-30 period in context

The NDCs communicated by Parties and the mitigation policies now in place around the world are projected to result in close to 3.0°C of warming – a level of warming that would have devastating consequences on human and natural systems.[47] Emission pathways consistent with no or limited overshoot of 1.5C require a 45% reduction in CO_2 emissions from 2010 levels by 2030 and reach net zero CO_2 emissions by around 2050.[48] The IPCC's Special Report on Global Warming of 1.5°C found that limiting warming to 1.5°C would require rapid and far-reaching transitions in all systems, meaning a substantial upscaling of investments and changes at an unprecedented scale.[49] The lower the emissions in 2030, the better the chances of limiting global warming to 1.5°C after 2030 with no or limited overshoot. Delaying actions to reduce GHG emissions, in contrast, could lead to risks of "cost escalation, lock-in to carbon-emitting infrastructure, stranded assets, and reduced flexibility in future response options in the medium to long term.[50] The next decade is therefore critical; failure to significantly reduce global emissions by 2030 will make it impossible to keep global warming below 1.5°C.[51]

[47] Emissions Gap Report 2020, Executive Summary at XI (NDCs in line with 3°C of warming); compare Climate Action Tracker (as of May 2021, pledges and targets in line with 2.4°C of warming (range 1.9-3.0); current policies in line with 2.9°C of warming (range 2.1-3.9)). See https://climateactiontracker.org/global/cat-thermometer/, accessed 6 May 2021. For impacts, see IPCC Special Report on the impacts of global warming of 1.5 °C above pre-industrial levels and related global greenhouse gas emission pathways, in the context of strengthening the global response to the threat of climate change, sustainable development, and efforts to eradicate poverty (2018) (IPCC SR1.5), https://www.ipcc.ch/site/assets/uploads/sites/2/2019/05/SR15_SPM_version_report_LR.pdf

[48] IPCC SR1.5, Executive Summary at 12.

[49] IPCC SR1.5 SPM, C2.

[50] IPCC SR1.5 SPM, D1.3.

[51] Emissions Gap Report 2020 at XXI.

Current NDCs remain inadequate to achieve the climate goals of the Paris Agreement.[52] Emissions in 2030 are projected to be about double the level required to limit warming to 1.5°C.[53] According to the Emissions Gap Report, in 2019 total greenhouse gas emissions, including land-use change, reached 59.1 gigatonnes of CO_2 equivalent ($GtCO_2e$). The median estimate of emissions in 2030 consistent with a 2°C rise in global temperature compared to pre-industrial levels is 41 $GtCO_2e$ (range 39-46); the median consistent with 1.5°C is 25 $GtCO_2e$ (range 22-31).[54]

The OMGE rate applied under Article 6 could generate valuable additional emission reductions toward closing the mitigation gap. The analysis in Chapter 4 shows that – under the assumptions of our reference scenario – application of OMGE at a rate of 30% could achieve additional abatement on the order of 800 million metric tonnes (four-fifths of 1 $GtCO_2e$) over the 2021-2030 period, compared to a scenario in which there is no cancellation of units, achieve over 500 Mt (half of 1 $GtCO_2e$) of additional abatement if an OMGE rate of 20% OMGE is applied, or achieve over 250 Mt at an OMGE rate of 10%. The magnitude of these impacts may be higher (or lower) if the overall market is larger (or smaller) than set out in our hypothetical reference scenario and would also depend on the sensitivity of demand and supply to changes in credit price levels.

To place these numbers in context, securing 800 $MtCO_2e$ of additional abatement over the 2021-2030 period would be equivalent to eliminating 6 months' worth of total GHG emissions from all LDCs (based on 2017 emission figures), or 1 year's worth of total AILAC emissions, or 2 years of total AOSIS emissions. It would be equivalent to eliminating more than 2 years' worth of total emissions from France, or more than a year's worth of emissions from Canada, or more than one year's worth of carbon dioxide emissions from all LDCs and SIDS combined. Additional abatement of 800 $MtCO_2e$ is also roughly equivalent to two-thirds of the abatement estimated to be achieved through the Green Climate Fund's current portfolio of mitigation projects (as of 31 December 2020).[55] See Table 6 for these and further comparisons.

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[52] Nationally determined contributions under the Paris Agreement, Synthesis report by the secretariat, FCCC/PA/CMA/2021/2 (26 February 2021), available at https://unfccc.int/sites/default/files/resource/cma2021_02_adv.pdf This report assesses NDC updates submitted as of 31 December 2020, for 75 Parties, representing roughly 40% of the Parties to the Paris Agreement and roughly 30% of global emissions in 2017. If finds that these updates have reduced the projected emissions of these countries by less than 3% on average, and 398 Mt in total, compared to the ambition of their previously submitted NDCs. New and updated NDCs translate to a further reduction of only 0.5% below 2010 levels in aggregate for these 75 Parties in 2030. This is in a context in which, according to the IPCC SR1.5, a 45% reduction below 2010 emission levels is needed from all Parties collectively to keep the Paris Agreement's warming limit within reach.

[53] IPCC SR1.5.

[54] Emissions Gap Report 2020 at 25.

[55] GCF/ B.28/Inf.09, Status of the GCF Portfolio: approved projects and fulfilment of conditions (23 February, 2021), available at https://www.greenclimate.fund/sites/default/files/document/gcf-b28-inf09.pdf

Table 6: Opportunities and risks: scale comparisons for estimated OMGE impacts

			Potential additional GHG abatement from application of OMGE		Potential additional GHG emissions from CDM activity transition
Comparisons for scale	**Emissions**	**Source**	**if 10% OMGE yields ~260 Mt (2021-2030)**	**If 30% OMGE yields ~800 Mt (2021-2030)**	**~700 Mt (2021-2030)**
46 LDC countries: Total GHG emissions (2017)	1520 - 1680 $MtCO_2e$/yr	PRIMAP -hist	Equivalent to eliminating ~1.6 months' worth of total LDC GHG emissions	Equivalent to eliminating 6 months' worth of total LDC GHG emissions	Equivalent to adding 5 months' worth of total LDC emissions
46 LDC countries: Total CO_2 emissions (2017)	340 $MtCO_2$/yr	PRIMAP -hist	3/4 of annual emissions	+ >2 years' worth	adding ~2 years' worth
39 AOSIS countries: total GHG emissions (2017)	326 $MtCO_2e$/yr	CW[56]	4/5 of annual emissions	>2 years' worth	adding >2 years' worth
39 AOSIS countries: total CO_2 emissions (2017)	240 $MtCO_2$/yr	PRIMAP -hist	~1 year's worth	+ >3 years' worth	~3 years' worth
AILAC countries: Total GHG emissions (2017)	~710 $MtCO_2e$/yr	CW	4 months' worth	~1 year's worth	~1 year worth
United Kingdom: CO_2 emissions (2017)	390 $MtCO_2$/yr	PRIMAP -hist	8 months' worth	+ ~2 years' worth	~1.8 years' worth
Switzerland: projected emissions under current policies 2021-2030	~400 $MtCO_2$/yr	CAT[57]	2/3 of these projected emissions	~2 x these projected emissions	1.75 x these projected emissions
Canada: total emissions (2017)	~790 $MtCO_2e$/yr	CW	4 months' worth	1 year's worth	1.1 years' worth
France: total emissions (2017)	~350 $MtCO_2e$/yr	CW	9 months' worth	>2 years' worth	2 years' worth
GCF: expected mitigation impact of current portfolio	1,100 $MtCO_2e$[58]	GCF	25% of GCF's expected abatement	adding 70% to GCF's expected abatement	eliminating 60% of the abatement expected from GCF's existing portfolio
Combustion engine passenger vehicles	~4.6 metric tonnes/yr[59]	US EPA	taking 56 million cars off the road for one year [60]	taking 170 million cars off the road for one year	adding 150 million cars to the road for one year
Emissions gap between current policies and NDCs for 2021-2030	~13,000 $MtCO_2e$	CAT[61]	~2%	~6 – 7 %	~5 – 6 %
Current rate of carbon sequestered by CCS	40 $MtCO_2$/yr	IEA	Equivalent to running current CCS capacity for 6.5 years	Equivalent to running current CCS capacity for 20 years	Equivalent to running current CCS capacity for 17.5 years

56 Climate Watch, available at: https://www.climatewatchdata.org/

57 Climate Action Tracker, available at: https://climateactiontracker.org

58 GCF/B.28/Inf.09, Status of GCF portfolio: approved projects and status of conditions (23 Feb 2021) at 13, n. 17 (USD1.12bn), available at: https://www.greenclimate.fund/sites/default/files/document/gcf-project-portfolio-en.pdf

59 US EPA estimates that a typical passenger vehicle emits about 4.6 metric tons of carbon dioxide per year. See: https://www.epa.gov/greenvehicles/greenhouse-gas-emissions-typical-passenger-vehicle

60 By comparison, roughly 21 million cars were sold in China in 2019; 4.7 million new cars were sold in the US; Tesla sold 500,000 electric vehicles in 2020. See: https://www.statista.com/statistics/257660/passenger-car-sales-in-selected-countries/; and https://www.statista.com/topics/2086/tesla/

61 Climate Action Tracker, 2020, derived by comparing cumulative emissions from current policies and targets pathways from the Dec 2020 update. See: https://climateactiontracker.org/global/temperatures/, accessed 30 April 2021.

If we assume the mitigation benefit of 800 $MtCO_2e$ is spread evenly over the 2021-2030 period (resulting in an additional annual abatement of 80 $MtCO_2e$/yr), as shown in Figure 21 below, this level of additional abatement would exceed the annual CO_2 emissions of almost all LDCs, with the exception of Bangladesh. It would also exceed the annual total GHG emissions of all but six of the 46 LDCs.

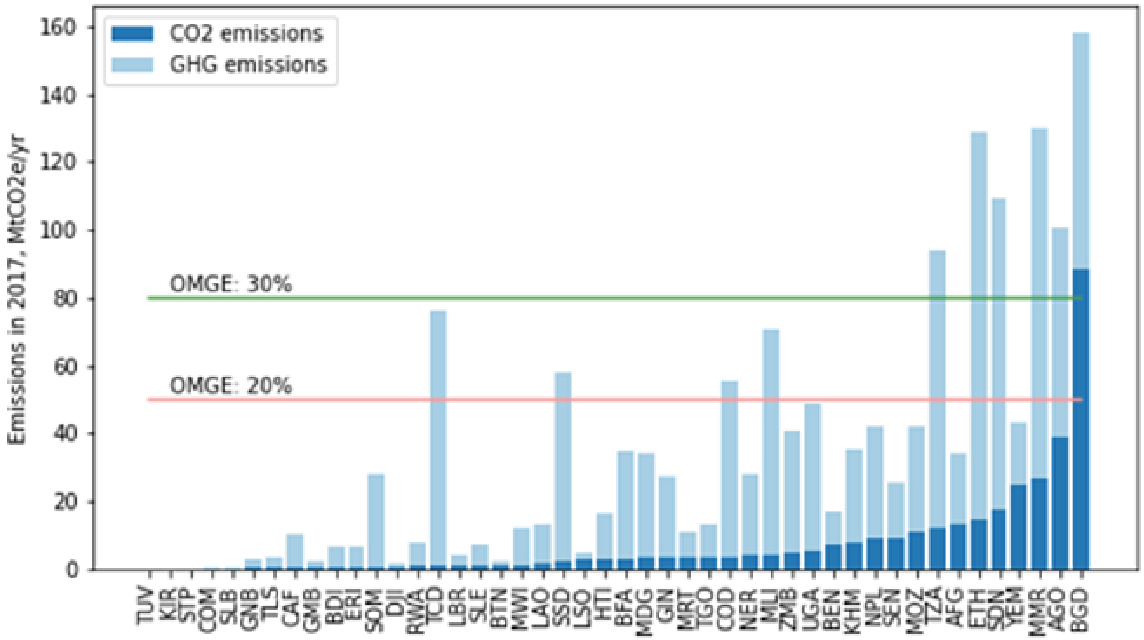

Figure 21: Annual GHG and CO2 emissions in 2017 from the 46 Least Developed Countries (LDCs)

Note: The chart includes indicative levels of annual abatement benefits from OMGE of 20% and 30%, if these benefits were spread evenly over the decade. Data source: PRIMAP-hist (2021).[62]

5.2 Impact of additional abatement in the 2021-2030 period over the medium to longer-term

An acceleration in emissions reductions achieved through a high level of OMGE could have the effect of reducing mitigation challenges in the medium-to-longer term and facilitating a faster transition to global net zero GHG emissions. Global mitigation pathways produced by cost optimising energy-economy models show a clear relationship between the emissions level in 2030 and the cumulative emissions released to the atmosphere over the course of the century. Early action to undertake the necessary systems transitions for decarbonisation can enable faster emissions reductions, leading to lower global cumulative emissions and lower levels of warming. This relationship can be used to estimate the long-term impact of a near-term increase in mitigation efforts.[63] Such an approach cannot predict the long-term impact of the application of OMGE. However, it can illustrate the potential magnitude of long-term benefits that could become available through accelerated near-term mitigation activities, if those activities enable structural change.

[62] Gütschow, J., Jeffery, L., Gieseke, R., Gebel, R., Stevens, D., Krapp, M., Rocha, M. (2016): The PRIMAP-hist national historical emissions time series, *Earth Syst. Sci. Data*, 8, 571-603, https://doi.org/10.5194/essd-8-571-2016

[63] United Nations Environment Programme (2020). Emissions Gap Report 2020. Nairobi. https://www.unep.org/emissions-gap-report-2020; Rogelj, J., den Elzen, M., Höhne, N. *et al.* Paris Agreement climate proposals need a boost to keep warming well below 2 °C. *Nature* 534, 631–639 (2016). https://doi.org/10.1038/nature18307; Meinshausen, M., Meinshausen, N., Hare, W. *et al.* Greenhouse-gas emission targets for limiting global warming to 2 °C. *Nature* 458, 1158–1162 (2009). https://doi.org/10.1038/nature08017

For the changes in near-term mitigation modelled in this paper, we use a 'constant quantile extension' approach[64] similar to that used by the Climate Action Tracker and other studies to project the impact on future emissions reductions over the course of the century that could result from a change in the annual global emissions level in 2030.[65] This method uses a distribution of modelled emissions pathways from the IPCC's AR5 database to construct a global pathway from the starting point in 2030 (emissions under current NDCs) out to 2100 by following the same relative position (or quantile) within the distribution. Maintaining the same relative position within the pathway distribution is interpreted as keeping the relative mitigation ambition of the pathway constant over time. By taking account of the inertia of near-term actions, this method provides a long-term projection that is as consistent as possible with assumed action in the shorter term. Geiges et al. 2020 use a similar method to estimate the effect of strengthening the current NDCs by different amounts on long-term global emissions pathways and temperature rise.[66]

Using the constant quantile extension approach, we determine possible emissions trajectories for a baseline scenario set at the emissions level in 2030 estimated to correspond to the current NDCs,[67] as well as for lower and higher emission levels in 2030. An 80 $MtCO_2$ reduction from the baseline level in 2030 (equivalent to one tenth of the potential abatement over 2021-2030 from an OMGE set at 30%) yields a global emissions trajectory that, when emissions are summed over the period to 2050, delivers around 3 $GtCO_2$eq fewer emissions than in the baseline scenario.

Under the assumptions described in Chapter 4, allowing the full Such a long-term reduction is not an inevitable result of an acceleration in near-term emission reductions, as it assumes continued similar levels of policy action globally throughout the century. The result is also subject to large uncertainties, both in the market assumptions made for this study and in the projected global emissions trajectory to 2100. Nevertheless, it is illustrative of the importance of near-term action in opening the door for decarbonisation transitions over the longer term, which should be a clear objective of Article 6.

5.3 Risk to abatement from CDM transition in context

The quantitative analysis presented in Chapter 4 identifies a risk to NDC ambition over the next decade both from proposed options for the transition of CP2 CERs and from proposed options for the transition of CDM project activities to the Paris Agreement.

Under the assumptions described in Chapter 4, allowing the full transition of CDM project activities alone (and assuming only 30% of projects actually take the steps to transition) could lead to **an additional 763 $MtCO_2e$** of global GHG emissions; use of a 2016 registration date cut-off could lead to **an additional 139 $MtCO_2e$** of global emissions. With governments clearly not on track to deliver on their near-term mitigation goals, any erosion of near-term abatement ambition increases the likelihood of overshooting the 1.5°C warming limit.

For comparison, the additional emissions of more than 700 $MtCO_2e$ that could result over the period from 2021-2030 from the full transition of CDM project activities (assuming only 30% actually transition) is roughly equivalent to an additional 5 months' worth of current emissions of total greenhouse gases from the entire group of LDC countries (see Table 6 above). It is also equivalent to about 5% of the gap that remains between projected emissions over the 2021-2030 period under all countries' existing

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[64] Gütschow, J., Jeffery, M. L., Schaeffer, M. & Hare, B. (2018). Extending Near-Term Emissions Scenarios to Assess Warming Implications of Paris Agreement NDCs. *Earth's Futur.* 6, 1242–1259 (2018).

[65] Climate Action Tracker (2020), Methodology, Global Pathways, https://climateactiontracker.org/methodology/global-pathways/

[66] Geiges, A., Nauels, A., Yanguas Parra, P., Andrijevic, M., Hare, W., Pfleiderer, P. Schaeffer, M., Schleussner, C.F. (2020). Incremental improvements of 2030 targets insufficient to achieve the Paris Agreement goals. Earth Syst. Dynam., 11, 697–708, 2020, https://doi.org/10.5194/esd-11-697-2020

[67] Climate Action Tracker (2020), CAT emissions gaps https://climateactiontracker.org/global/cat-emissions-gaps/ (September 2020 update)

policies and the projected emissions set out under the NDCs. This abatement gap, estimated at roughly 13 $GtCO_2e$ over the decade 2021-2030,[68] will need to be reduced to realise the benefit of pledged NDC emission reductions.

In addition, the erosion of ambition over the next decade through the full or partial transition of CDM project activities could also lead to a much larger impact in the longer term if delayed emissions reductions lead to technology lock-in, reduced flexibility, and abatement cost escalation. We use the constant quantile method outlined in section 5.2 above to estimate the potential long-term impact of our full transition scenario for CDM project activities. If we assume the impact of full transition of about 700 $MtCO_2e$ of additional emissions corresponds to an increase in global emissions above the NDC baseline level in 2030 of 70 $MtCO_2e$ (i.e., one tenth of the total), we derive a global emissions trajectory that delivers around 2 GtCO2e of additional GHG emissions by mid-century. While this value is subject to a high degree of uncertainty (see section 5.2 above), our analysis suggests that a near-term increase in global emissions of the magnitude implied by our full transition scenario raises the likelihood of following a more carbon intensive trajectory over the following decades, highlighting the risk of delayed emissions reductions for long-term decarbonisation.

5.4 Value of potential abatement in avoided damages

Regulators use estimates of the social cost of carbon (SCC) in assessing the costs and benefits of proposed policies. These figures are monetary estimates of the net present value of the future damages caused by emitting one additional metric tonne of emissions into the atmosphere in a given year. This figure equally represents an estimate of the value of damages avoided by the reduction of one tonne of CO_2 emissions.

The social cost of carbon is intended to be a comprehensive estimate of climate change damages, including, for example, changes in agricultural productivity, human health, property damages from flood risk and changes in energy system costs from reduced heating and increased air conditioning.[69] However, as the IPCC Fifth Assessment Report has observed, SCC estimates do not include all categories of climate impacts and are therefore likely to understate welfare impacts; they also vary widely due to uncertainty about future emissions, future climate change, future vulnerability and future valuation, as well as different approaches taken to aggregating impacts over time (discounting), regions (equity weighting), and states of the world (risk aversion).[70] Nevertheless, these estimates provide a way of considering the economic value of changes in greenhouse gas emissions resulting from policy decisions.

The US government currently applies its 2016 Guidance for SCC estimates[71] while this guidance is being reviewed and updated. The 2016 Guidance figures have recently been updated to 2020 dollars, producing values in 2020 of $14-152 per tonne (central value of $51); in 2025, $17–$169 per tonne (central value $56); and for 2030 $19-187 (central value $62). The ranges for each year include four values, with estimates at discount rates of 5%, 3% and 2.5% and a high impact estimate (95th

[68] Climate Action Tracker, 2020, derived by comparing cumulative emissions from the current policies and targets pathways from the CAT's December 2020 update. Data downloaded from https://climateactiontracker.org/global/temperatures/, accessed 30 April 2021.

[69] See USA EPA Fact Sheet, Social Cost of Carbon. Available at: https://www.epa.gov/sites/production/files/2016-12/documents/social_cost_of_carbon_fact_sheet.pdf

[70] IPCC Fifth Assessment Report, Ch. 10 at 691.

[71] Executive Order 13990 on Protecting Public Health and the Environment and Restoring Science to Tackle the Climate Crisis, at Sec. 5 (January 20, 2021), available at: https://www.federalregister.gov/documents/2021/01/25/2021-01765/protecting-public-health-and-the-environment-and-restoring-science-to-tackle-the-climate-crisis

percentile of estimates) at a rate of 3%.[72] The Interagency Working Group that produced these US federal estimates considers them to be low.[73]

Since the 2016 Guidance was adopted, the New York State Department of Environmental Conservation has estimated the cost of carbon dioxide emitted in 2020 at $53-$421 per tonne (central value of $125), rising in 2030 to $64-446 per tonne (central value of $142).[74]

Germany, for comparison, uses a primary estimate for the SSC in the range of $200 per metric tonne when calculating global damages from an additional tonne of carbon dioxide emitted. In June 2020, a US Government Accountability Office (GAO) Report compared SCC rates from a number of jurisdictions.[75] This Report referenced Germany's primary SCC estimate for 2016 at $218 (in 2018 US dollars), with a high-impact estimate of $776, and a primary estimate of $248 in 2030, with a high-impact estimate of $812 for sensitivity analysis.[76]

Canada also uses a global damages approach when monetising the value of changes in emissions, but with lower estimates of $38 for 2020 and $45 for 2030 (in 2018 dollars), and with high-impact estimates of $159 in 2020 and $197 in 2030 for sensitivity analysis.

Various academics have proposed other SCC figures, ranging from $100 to $200 to $400 or higher.[77]

Using United States federal SCC estimates, based on the 2016 Guidance,[78] roughly $14-137 billion in global damages (with a central estimate of $45 billion) could be avoided by application of an OMGE rate of 30% that abates an additional 800Mt of CO_2 emissions in total over the ten-year period from 2021-

[72] See Technical Support Document: Social Cost of Carbon, Methane, and Nitrous Oxide Interim Estimates under Executive Order 13990, Interagency Working Group on Social Cost of Greenhouse Gases, United States Government, February 21, 2021 (IWG Technical Support Document, 2021), Table ES-1 at p. 5 and Appendix, Table A-1 at p. 46, available at: https://www.whitehouse.gov/wp-content/uploads/2021/02/TechnicalSupportDocument_SocialCostofCarbonMethaneNitrousOxide.pdf

[73] IWG Technical Support Document, 2021 at 4 (new data and evidence strongly suggests that the discount rate regarded as appropriate for intergenerational analysis is lower; the integrated assessment models used to produce the interim estimates do not include all of the important physical, ecological, and economic impacts of climate change recognized in the climate change literature, and the science underlying their "damage functions" lags behind the most recent research; socioeconomic and emissions scenarios used as inputs to the model runs need to be updated; taken together, these limitations suggest that the range of four interim SC-GHG estimates presented in this TSD likely underestimate societal damages from GHG emissions). See also "Top Economists Warn U.S. Against Underestimating Climate Damage", Bloomberg News, 15 February 2021.

[74] New York Department of Environmental Conservation (2020), Establishing a Value of Carbon: Guidelines for use by State Agencies, https://www.dec.ny.gov/docs/administration_pdf/vocfguid.pdf and Appendices with SCC values https://www.dec.nu.gov/docs/administration_pdf/vocfapp.pdf. The low end of this range applies a 3% discount rate, the central value applies a 2% discount rate and the high end a 1% discount rate. NY DEC also supplies damage estimates calculated at a 0% discount rate but recommends use of rates from 1 to 3 percent.

[75] Social Cost of Carbon - Identifying a Federal Entity to Address the National Academies' Recommendations Could Strengthen Regulatory Analysis, US Government Accountability Office, June 2020 (GAO Report, 2020.)

[76] GAO Report Table 7. For comparison, in 2018 dollars the US central figures for global damages were $50 in 2020, and $60 in 2030 (3% discount rate). GAO Report.

[77] See IPCC AR5, Ch. 10 at 691, Table 10-9; Stern, N. and Stiglitz, J.E. (2021), The Social Cost of Carbon, Risk, Distribution, Market Failures: An Alternative Approach, NBER Working Paper No. 28472 February 2021 (suggesting that the social cost of carbon should be at least $100/tonne). Compare Pindyck, R.S. (2016), The Social Cost of Carbon Revisited (National Bureau of Economic Research) (survey of climate scientists and economists found SCC could be in excess of $200); Ricke, K., Drouet, L., Caldeira, K. and Tavoni, M. (2018), Country-level social cost of carbon, *Nature Climate Change*, Vol. 8, Oct. 2018, 895-900 (finding median global SCC value of US $417 per tonne of CO_2); Hansel et al. (2020), Climate economics support for the UN climate targets, *Nature Climate Change*, Vol. 10, Aug. 2020, 781-89 (updating the DICE model and noting that updating damages has a large impact on the SCC).

[78] See IWG Technical Support Document, 2021 at 4.

2030.[79] Using New York State values for the social cost of carbon this estimate of avoided global damages increases to a range of $47-348 billion (with a central estimate of $108 billion).[80] Using German SCC values produces an estimate of avoided damages of roughly $181-641 billion over the 2021-2030 period, with a primary estimate of $181 billion (in 2018 US dollars).[81]

Accordingly, using accepted (United States and German federal) primary estimates of the social cost of carbon, the additional abatement resulting from an OMGE rate of 30% would avoid roughly $45-181 billion in global damages, if application of a 30% OMGE rate abates an additional 800 MtCO2e over the 2021-2030 period.[82] Applying a 10% OMGE rate to avoid 260 MtCO_2e of emissions (as per our hypothetical scenario analysed in Chapter 4) would avoid roughly $15-66 billion in global damages, using United States and German primary estimate figures.cost of carbon are included in these avoided damage estimate ranges, these ranges then expand to $45-641 billion in avoided global damages (for 800 Mt of avoided emissions) and to $15-208 billion in avoided damages (for 260 Mt of avoided emissions). Lower OMGE rates would deliver correspondingly lower values for avoided emissions and avoided damages; using lower discount rates would result in higher values for avoided damages at any level of OMGE.

Equally, policy choices that would increase global emissions, such as the transition of CP2 CERs, or the full transition of CDM project activities (which we estimate could result in over 700 Mt in additional emissions (assuming 30% of activities take administrative steps to transition), or the transition of CDM project activities registered on or after 1 January 2016 (which could result in over 130 Mt) would lead to increased damages which could be estimated using SCC figures in a similar way.[83]

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[79] Avoided damage figures have been calculated using Table A-1 of the IWG Technical Support document, page 46. We have assumed an 80 million metric tonne reduction in each year of the 10-year period from 2021 through 2030 and multiplied 80 Mt by the annual SCC for that year. These yearly values have then been summed. This calculation has been carried out for each year and for each discount rate for which numbers are supplied. The resulting range in 2020 dollars is $13.6 billion calculated using a discount rate of 5%; $45.5 with a rate of 3% and $66.9 with a rate of 2.5%. Avoided global damages reach $137 billion using high-impact estimates that represent lower-probability but high-impact damages at a 3% discount rate.

[80] See NY DEC (2020), Establishing a Value of Carbon: Guidelines for use by State Agencies, available at https://www.dec.ny.gov/docs/administration_pdf/vocfguid.pdf and Appendix, available at https://www.dec.ny.gov/docs/administration_pdf/vocfapp.pdf These four figures represent discount rates of 3% ($47 billion), 2% ($108 billion), 1% ($348 billion) and 0% ($1.47 trillion)

[81] For German estimates we use figures drawn from Table 7 of the US GAO Report, 2020, reflecting SCC estimates in 2018 US dollars. We calculate annual avoided estimate figures by interpolating official values linearly as recommended where no annual values are indicated.

[82] The bottom end of this range reflects the US central estimate, at a discount rate of 3% (2020 dollars); the top end of this range is the German primary estimate (in US 2018 dollars). See Section 5.4 below for further detail.

[83] Country-level estimates of the social cost of carbon may also be calculated. See for example, Ricke et al. (2020) finding that China, the United States and India have the among the highest country level economic impacts from a tonne of CO_2 emissions and estimate the following country level social costs of carbon, among others: India – $86, the United States – $48; Saudi Arabia – $47; Brazil - $24, China – $24 and the United Arab Emirates – $24. See also Tol, Richard S.J., 2019, A social cost of carbon for (almost) every country, Energy Economics, Elsevier, Vol. 83(C), pages 555-566.

5.5 Scale of potential resources for adaptation in context

Under the Copenhagen Accords in 2009, developed countries pledged to mobilise USD100 billion annually by 2020 to support developing countries with climate change mitigation and adaptation. In Paris in 2015, Parties reiterated this goal and countries agreed to set a new collective quantified goal prior to 2025, using the $100 billion as a floor.[84] Estimates of the share of finance directed to adaptation are widely contested, with some estimating that to-date only about 20% of claimed climate finance flows have targeted adaptation.[85]

According to the Adaptation Gap Report, annual adaptation costs in developing countries alone are currently estimated to be in the range of $70 billion, with the expectation of reaching $140–300 billion in 2030 and $280–500 billion in 2050.[86] The IPCC SR1.5 identified both the scale of adaptation financing and access to adaptation finance as constituting barriers to adaptation. A 2020 report on progress towards the $100 billion goal, authored by a group of independent international experts, has emphasised the lack of progress to-date on mobilising finance, with adaptation finance in particular falling far short.[87]This expert group noted that ambitious replenishments for multilateral vehicles of concessional finance, including for the Adaptation Fund, will be critical over the coming five years given their importance for boosting mitigation and adaptation finance.[88] While the overall volume of finance provided by such funds is relatively modest, these funds play an important role in catalysing finance from other sources and providing targeted support to low income and vulnerable communities.[89]

The Adaptation Fund's cumulative pledged resources since inception, including proceeds from the sale of CERs, reached approximately $1 billion in 2020.[90] As of June 2020, the Adaptation Fund Board had approximately $170 million available to support funding decisions.[91]

The analysis in Chapter 4 indicates that an SOP of 5% could raise between €2.7- 4.6 billion in resources for adaptation over the 2021-2030 period, depending on the rate of OMGE applied (2-30%), under the hypothetical reference scenario assumptions for the supply of, and demand for, credits. An SOP rate of 5% could more than double or quadruple the cumulative resources previously available to the Adaptation Fund (of $1 billion).

These funds could have beneficial leveraging effects. The Global Commission on Adaptation (2019) estimated that a $1.8 trillion investment in certain adaptation measures could generate $7.1 trillion of benefits in avoided costs and non-monetary social and environmental benefits.[92] The Green Climate Fund aims for a 50:50 balance mitigation and adaptation investments over time, with a floor of 50 percent of the adaptation allocation directed to particularly vulnerable countries, including LDCs, SIDS and

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[84] Decision 1/CP.21, para 53. Article 9 of the Paris Agreement provides that industrialized countries should continue to take the lead in mobilizing climate finance from variety of sources, instruments and channels. The provision of scaled up finance should aim to achieve a balance between adaptation and mitigation and the priorities and needs of developing country Parties, especially those that are particularly vulnerable to the adverse effects of climate change and have significant capacity constraints, such as LDCs and SIDS.

[85] Robert, J.T., Weikmans, R., Robinson, Sa. Ciplet, D., Khan, M. and Falzon, D. (2021), Rebooting a failed promise of climate finance, *Nat. Clim. Change* 11, 180–182 (2021), https://doi.org/10.1038/s41558-021-00990-2

[86] Adaptation Gap Report 2020, Executive Summary at VI.

[87] The Independent Expert Group on Climate Finance, 2020, 'Delivering on the $100 billion climate finance commitment and transforming climate finance' (Independent Expert Group on Climate Finance, 2020), available at https://www.un.org/sites/un2.un.org/files/100_billion_climate_finance_report.pdf

[88] Independent Expert Group on Climate Finance, 2020 at 8-9.

[89] Independent Expert Group on Climate Finance, 2020 at 9, 11, 43.

[90] AFB/EFC.26 b/5, Adaptation Fund Trust Fund: Financial Report Prepared by the Trustee (as at 30 June 2020) (5 October 2020).

[91] AFB/EFC.26 b/5 at 4.

[92] Adaptation Gap Report 2020.

African States. From 2015 through to the end of 2020, the Green Climate Fund's allocation specifically to adaptation financing in particularly vulnerable countries was approximately $1.6 billion in grant equivalents, representing only about 24% of GCF funding.[93] The GCF estimates that for every $1 billion in GCF resources invested in adaptation, the anticipated number of people with enhanced resilience is upwards of 150 million people.[94] The GCF estimates that about 400 million people have increased resilience as a result of its adaptation finance.[95]

From the above analysis it is clear that: 1) the potential benefits from the application of SOP could be significant, both in monetary and non-economic terms, relative to current flows of adaptation funding through the Adaptation Fund and GCF; 2) the scale of adaptation finance needs to be urgently increased; and 3) SOP at a level of 5% or more could contribute to this scale-up.

[93] GCF/B.28/Inf.09 at 10.

[94] GCF/B.28/Inf.09 at 9.

[95] GCF/B.28/Inf.09 at 9.

Annex

SOP Options reflected in December 2019 COP Presidency texts

<table>
<tr><td></td><td>V.1</td><td>V.2</td><td>V.3</td></tr>
<tr><td>6.4 Text</td><td>VII. Levy of share of proceeds for adaptation and administrative expenses
The share of proceeds from a 6.4 activity shall be delivered to the Adaptation Fund pursuant to decisions 13/CMA.1 and 1/CMP.14.
Option A [% levy at issuance]
SOP set and levied at [2][5] per cent of A6.4ERs at issuance.
Option B [combination]
SOP a combination of monetary levy at registration and % levy of A.6ERs at issuance in a manner to be determined by the CMA
The share of proceeds to cover administrative expenses shall be set in monetary terms at a level and implemented in a manner to be determined by the CMA.</td><td>VII. Levy of share of proceeds for adaptation and administrative expenses
The share of proceeds from a A6.4 activity shall be delivered to the Adaptation Fund pursuant to decisions 13/CMA.1 and 1/CMP.14. and shall be set and levied at 2 per cent of A6.4ERs at issuance.
The share of proceeds to cover administrative expenses shall be set in monetary terms at a level and implemented in a manner to be determined by the CMA.</td><td>VII. Levy of share of proceeds for adaptation and administrative expenses
The share of proceeds from a A6.4 activity shall be delivered to the Adaptation Fund pursuant to decisions 13/CMA.1 and 1/CMP.14. and shall be set and levied at 2 per cent of A6.4ERs at issuance.
The share of proceeds to cover administrative expenses shall be set in monetary terms at a level and implemented in a manner to be determined by the CMA.</td></tr>
<tr><td>6.2 Text</td><td>VII. [Adaptation financing in the context of cooperative approaches

Option A – Mandatory / developed countries / annual
Use of cooperative approaches shall deliver a contribution to the Adaptation Fund
Developed countries participating in cooperative approaches shall provide contributions to the AF annually, equivalent to a percentage of the annual volume of ITMOs used towards NDC that is the same as the percentage for A6.4.
Parties shall report on contributions under annual information and in the Centralized accounting and reporting platform.
The burden sharing arrangements among participating developed country Parties shall be based on each participating Party's annual level of use of cooperative approaches referred to in 6.2.
Parties report annually, and record contributions to adaptation finance (and OMGE) in the Centralized accounting and reporting platform
Option B [Baseline and credit approaches / all Parties /strongly encourage]
Participating Parties using baseline and credit should/are strongly encouraged to contribute
to the Adaptation Fund
commensurate with share of proceeds percentage under A6.4.
Each participating Party shall report in their biennial transparency reporting according to Regular information guidance on how the cooperative approach contributes to the Adaptation Fund.
Option C – All approaches / all Parties / voluntary
Parties participating in cooperative approaches are encouraged to provide adaptation financing to assist developing country Parties that are particularly vulnerable to the adverse effects of climate change to meet the costs of adaptation.]</td><td>VII. Ambition in mitigation and adaptation actions
Participating parties using baseline and crediting approaches
are strongly encouraged to contribute to adaptation
primarily through contributions to the Adaptation Fund,
and commensurate with the rate delivered under the A6.4 mechanism
Each participating Party shall report on their contributions as part of their biennial transparency reporting.</td><td>VII. Ambition in mitigation and adaptation actions
Participating parties using baseline and crediting approaches
are strongly encouraged to contribute to adaptation
primarily through contributions to the Adaptation Fund,
and commensurate with the rate delivered under the 6.4. mechanism
Each participating Party shall report on their contributions as part of their biennial transparency reporting.</td></tr>
</table>

OMGE Options reflected in December 2019 COP Presidency texts

	V1	V2	V3
6.4 Text	**VIII. Delivering overall mitigation in global emissions** **Option A** The mechanism shall aim to deliver an overall mitigation in global emissions, through: a) Applying conservative baselines, or baselines that are below 'business as usual; b) applying conservative default emission factors in calculating emission reductions; Parties and stakeholders, including non-State actors may also voluntarily cancel of A6.4ERs for the purpose of delivering an OMGE; **OPTION: ALTERNATIVE APPROACH ADDRESSING CHAPTER VII AND CHAPTER VIII ABOVE TO BE READ IN CONJUNCTION WITH DRAFT GUIDANCE FOR COOPERATIVE APPROACHES** The mechanism shall aim to deliver an overall mitigation in global emissions as follows: (a) At issuance of A6.4ERs, the host Party shall make a corresponding adjustment consistent with A6.2 for the total number of issued A6.4ERs; (b) At issuance of A6.4ERs, the registry shall transfer [X/10/20/30] per cent of the issued A6.4ERs to the cancellation account for overall mitigation; (c) The cancelled A6.4ERs shall not be used for any transfer or purpose, including towards any NDC and shall not be further transferred; (d) The remaining A6.4ERs shall be forwarded in accordance with the request of the activity participants The Supervisory Body shall evaluate the % rate of cancellation established under Article 6, paragraph 4 [2][4] years after the initiation of the mechanism and every 5 years thereafter and, following the review, make recommendations to the CMA regarding any improvements to the cancellation rate applied, to optimize the delivery of an overall mitigation in global emissions through the operation of the A6.4 mechanism.	**VIII. Delivering overall mitigation in global emissions** **Option A** At issuance of A6.4ERs: (a) The host Party shall make a corresponding adjustment consistent with A6.2 rules for the total number of issued A6.4ERs; (b) The mechanism registry administrator shall transfer 2 per cent of the issued A6.4ERs to the cancellation account in the mechanism registry for overall mitigation. (c) The cancelled A6.4ERs shall not be used for any transfer or purpose, including towards any NDC or for other international mitigation purposes or for other purposes, and shall not be further transferred; The remaining A6.4ERs shall be forwarded in accordance with the request of the activity participants **Option B** The mechanism shall aim to deliver an overall mitigation in global emissions, through: (a) Applying conservative baselines, or baselines that are below 'business as usual', in calculating emission reductions for Article 6, paragraph 4, activities; (b) Applying conservative default emission factors in calculating emission reductions for Article 6, paragraph 4, activities. Parties and stakeholders, including non-State actors, may also enable the mechanism to deliver overall mitigation in global emissions through voluntary cancellation of A6.4ERs for that purpose.	**VIII. Delivering overall mitigation in global emissions** 67. At issuance of A6.4ERs: (a) The host Party shall make a corresponding adjustment consistent with [A6.2 guidance] for the total number of issued A6.4ERs. (b) The mechanism registry administrator shall transfer a percentage of the issued A6.4ERs to the cancellation account in the mechanism registry for overall mitigation in accordance with chapter V above (Article 6, paragraph 4, activity cycle), at a level to be determined by the CMA that shall not be less than 2 percent. 68. The cancelled A6.4ERs shall not be used for any transfer or purpose, including towards any NDC or for other international mitigation purposes or for other purposes, and shall not be further transferred. 69. The remaining A6.4ERs shall be forwarded in accordance with the request of the activity participants following the application of paragraphs 63 and 76(b) above *[sic]*

6.2 Text	**VIII. [Overall mitigation in global emissions** **Option A** Parties and stakeholders are strongly encouraged to cancel ITMOs (including A6.4ERs) to deliver an overall mitigation in global emissions, that is not counted towards any Party's NDC or other international mitigation purposes. **OPTION: ALTERNATIVE APPROACH ADDRESSING CHAPTER VII AND CHAPTER VIII ABOVE TO BE READ IN CONJUNCTION WITH DRAFT DECISION FOR THE RMP FOR THE MECHANISM ESTABLISHED BY ARTICLE 6, PARAGRAPH 4** All cooperative approaches authorized for use by a Party [shall] [are encouraged to] contribute to the delivery of an overall mitigation in global emissions in the context of Article 6, paragraph 2 through the cancellation or setting aside of a percentage of ITMOs that shall not be used for any transfer or purpose, including use by any Party towards its NDC or for other international mitigation purposes, in a manner consistent with the methodology and percentage for the delivery of an overall mitigation in global emissions implemented under A6.4. Parties shall apply the same cancellation rate specified for application under the A6.4.	**VII. Ambition in mitigation and adaptation actions** 39. Participating Parties and stakeholders are strongly encouraged to cancel ITMOs (including A6.4ERs) to deliver an overall mitigation in global emissions that is commensurate with the scale delivered under the A6.4 mechanism, and that is not counted towards any Party's NDC or for other international mitigation purposes. 40. Each participating Party shall report as part of their biennial transparency reporting, under regular information on any delivery of overall mitigation in global emissions related to its participation in cooperative approaches.]	**VII. Ambition in mitigation and adaptation actions** 39. Participating Parties and stakeholders are strongly encouraged to cancel ITMOs to deliver an overall mitigation in global emissions that is commensurate with the scale delivered under the A6.4 mechanism, and that is not counted towards any Party's NDC or for other international mitigation purposes. 40. Each participating Party shall report as part of their biennial transparency reporting, in Regular information on any delivery of overall mitigation in global emissions related to its participation in cooperative approaches.]

Transition Options reflected in December 2019 COP Presidency 6.4 texts

V1	V.2	V.3
(Bracketed section) **Option A:** Kyoto Protocol units, or emissions reductions underlying such units, shall not be used by any Party toward its NDC [or for other purposes] **Option B:** {No reference to Kyoto Protocol units}]		
XI. Transition of clean development mechanism activities and certified emission reductions **A. CDM activities transition** Project activities and programmes of activities registered under the CDM may transition to the mechanism and be registered as A6.4 activities subject to: (a) The provision of approval of such transition to the Supervisory Body by the host Party per decision 3/CMP.1 of the CDM project activity or CDM programme of activities, by no later than [31 December [2023][X date]]; (b) The compliance with these rules, modalities and procedures and any further relevant decisions of the CMA and relevant requirements adopted by the Supervisory Body; Where an activity is eligible for transition pursuant to above: (a) [The transition, including the necessary actions by the Supervisory Body, shall have been completed by no later than [31 December [2023] [X date]];] (b) [The Supervisory Body shall ensure that small-scale CDM project activities and CDM programme of activities undergo an expedited registration process in accordance with decisions of the Supervisory Body;] (c) [It may continue to apply its current approved CDM methodology until the earlier of the end of its current crediting period or 31 December [2023] [X date];] (d) [For CDM project activities and CDM programmes of activities that have transitioned, A6.4ERs may be issued for emission reductions achieved on or after 1 January 2020.]	**XI. Transition of clean development mechanism activities and certified emission reductions** **A. CDM activities transition** Project activities and programmes of activities registered under the clean development mechanism under Article 12 of the Kyoto Protocol (CDM) may transition to the mechanism and be registered as Article 6, paragraph 4, activities subject to: (a) The provision of approval of such transition to the Supervisory Body by the host Party per decision 3/CMP.1 of the CDM project activity or CDM programme of activities, by no later than 31 December [2023]; (b) The compliance with these rules, modalities and procedures and any further relevant decisions of the CMA and relevant requirements adopted by the Supervisory Body; Where an activity is eligible for transition pursuant to above: (a) The transition shall have been completed by no later than 31 December [2023]; (b) It may continue to apply its current approved CDM methodology until the earlier of the end of its current crediting period or 31 December [2023], following which, it shall apply an approved methodology pursuant to chapter V. B (Methodologies); (c) For CDM project activities and CDM programmes of activities that have transitioned, A6.4ERs may be issued for emission reductions achieved on or after 1 January 2020. The Supervisory Body shall ensure that small-scale CDM project activities and CDM programme of activities undergo an expedited transition process in accordance with decisions of the Supervisory Body.	**XI. Transition of clean development mechanism activities and certified emission reductions** **A. CDM activities transition** 72. Project activities and programmes of activities registered under the (CDM) may transition to the mechanism and be registered as A6.4, activities subject to: (a) The provision of approval of such transition to the Supervisory Body by the host Party per decision 3/CMP.1 of the CDM project activity or CDM programme of activities (CDM host Party), by no later than 31 December 2023; (b) The compliance with these rules, modalities and procedures and any further relevant decisions of the CMA and relevant requirements adopted by the Supervisory Body, including those that relate to the application of a corresponding adjustment consistent with A6.2 guidance; Where an activity is eligible for transition pursuant to above: (a) The transition shall have been completed by no later than 31 December 2023; (b) It may continue to apply its current approved CDM methodology until the earlier of the end of its current crediting period or 31 December 2023, following which, it shall apply an approved methodology pursuant to chapter V. B (Methodologies); (c) For CDM project activities and CDM programmes of activities that have transitioned, A6.4ERs may be issued for emission reductions achieved after 31 December 2020. The Supervisory Body shall ensure that small-scale CDM project activities and CDM programme of activities undergo an expedited transition process in accordance with decisions of the Supervisory Body.
B. Transition of Kyoto protocol units to the Article 6, paragraph 4, mechanism **Option A** CERs shall not be used by any Party towards its NDC. **Option B** A CDM host Party shall not use CERs for its own NDC or [first transfer][forward] CERs for use towards its NDC by another participating Party, more than [X] CERs {*formula for calculation of a volume limit*}.	**B. CER transition** **Option A** A Party other than a host Party per decision 3/CMP.1 may use CERs towards its NDC where all of the following conditions are met: (a) The CDM project activity or CDM programme of activities was registered on or after 1 January [X][2016]; (b) The CERs were issued in respect of emissions reductions or removals	**B. CER transition** CERs issued under the CDM may be used towards the NDC of the CDM host Party or a participating Party in accordance with all of the following conditions: (a) The CDM project activity or CDM programme of activities was registered on or after a date to be determined by the CMA; (b) The CERs were issued in respect of emissions reductions or removals achieved prior to or on 31 December 2020;

Option C A Party other than a host Party per decision 3/CMP.1 may use CERs towards its NDC where all of the following conditions are met: (a) The CDM project activity or CDM programme of activities was registered on or after [X date]; (b) The CERs were issued in respect of emissions reductions or removals achieved prior to or on 31 December 2020; (c) The CERs are used towards the NDC by no later than [31 December 2023]; (d) [The CDM host Party shall not be required to apply a corresponding adjustment) to the CERs identified as to be used by [2023][X date]]. **Option C1** A CDM host Party may use CERs towards its own NDC where all of the following conditions are met: (a) The CERs are used towards the NDC by no later than [2023][X date] (b) The CERs are transferred to the mechanism registry by no later than [31 December 2023], upon the request of the CDM host Party; (c) The use of such CERs is reported by the CDM host Party in the relevant biennial transparency reports in accordance with decision 18/CMA.1. [The CDM host Party shall not be required to apply a corresponding adjustment of the Paris Agreement) to the CERs identified as to be used by [2023][X date]].	achieved prior to or on 31 December 2020; (c) The CERs are used towards the NDC by no later than 31 December 2023; (d) The CDM host Party shall not be required to apply a corresponding adjustment to the CERs identified as to be used by 31 December 2023. A CDM host Party may use CERs issued in respect of emission reductions or removals achieved prior to or on 31 December 2020, towards its own NDC where all of the following conditions are met: (a) The CDM project activity or CDM programme of activities for which the CERs were issued was registered on or after 1 January [2013][X][2016]; (b) The CERs are transferred to the mechanism registry by no later than 31 December 2023; (c) The CERs are used towards the NDC by no later than 31 December 2023; (d) The use of such CERs is reported by the CDM host Party in the relevant biennial transparency reports in accordance with decision 18/CMA.1. **Option B** [Other than CERs used in accordance with this chapter, Kyoto Protocol units, or emission reductions underlying such units, shall not be used by a Party towards its NDC or for other purposes]. [Other than CERs used in accordance with this chapter, Kyoto Protocol units may be placed in reserve]. **Option C** {*no reference to Kyoto Protocol units other than CERs*}**]**	(c) The CERs are used towards the NDC by no later than 31 December 2025; (d) The CDM host Party shall not be required to apply a corresponding adjustment in respect of the CERs identified as to be used by 31 December 2025 pursuant to (c) above; (e) The participating Party using the CERs towards its NDC shall apply corresponding adjustments consistent with Article 6, paragraph 2; (f) The CERs shall be identified as pre-2021 CERs in the CDM host Party and participating Party's reporting in accordance with decision 18/CMA.1. 76. CERs that do not meet the conditions of paragraph 75 above are in reserve and may only be used towards NDCs in accordance with a future decision of the CMA.]

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