



**Using the Clean Development Mechanism for nationally  
determined contributions and international aviation**

**Assessment of impacts on global GHG emissions**

Lambert Schneider and Stephanie La Hoz Theuer



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Lambert Schneider<sup>a</sup> and Stephanie La Hoz Theuer<sup>b</sup>

Study prepared for the Federal Ministry of Agriculture, Forestry, Environment and Water Management of Austria and the Office of Environment of Liechtenstein

a Associate to Stockholm Environment Institute U.S.

b Independent researcher

Stockholm Environment Institute  
Linnégatan 87D, Box 24218  
104 51 Stockholm  
Sweden  
Tel: +46 8 30 80 44  
Web: [www.sei-international.org](http://www.sei-international.org)

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Editor: Emily Yehle

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## ACRONYMS

BUR	Biennial Update Report
CDM	Clean development mechanism
CER	Certified emission reduction
CORSIA	Carbon Offsetting and Reduction Scheme for International Aviation
CPA	Component project activity
DOE	Designated operational entity
ERU	Emission reduction unit
ETS	Emissions trading system
GHG	Greenhouse gas
ICAO	International Civil Aviation Organization
IET	International Emissions Trading
ITL	International Transaction Log
JI	Joint Implementation
JCM	Joint Crediting Mechanism
LDCs	Least developed countries
NDCs	Nationally determined contributions
PAF	Pilot Auction Facility for Methane and Climate Change Mitigation
PoA	Programme of activities
RBF	Results-based finance
SIDS	Small Island Developing States
tCO <sub>2</sub> e	Tonnes of carbon dioxide equivalent
UNFCCC	United Nations Framework Convention on Climate Change

## ABSTRACT

Countries are currently considering using certified emission reductions (CERs) issued under the Clean Development Mechanism to achieve targets under the Paris Agreement and the Carbon Offsetting and Reduction Scheme for International Aviation (CORSA) recently adopted by the International Civil Aviation Organization. Using CERs could lower compliance costs, support stranded projects and ensure sufficient supply for the implementation of CORSA. This study, however, finds that purchase programmes or policies that recognize *all* types of CERs for use after 2020 are unlikely to trigger significant emission reductions beyond those that would have occurred in the absence of the pro-

gramme or policy. To ensure that further emission reductions are triggered and respective economic incentives are provided to project developers and host countries, it is recommended that policy-makers (a) prioritize or limit eligibility to CERs from projects that are newly developed in response to the programme or policy and have a high likelihood of additionality, and/or projects that have already been implemented and are at risk of discontinuing greenhouse gas abatement; and (b) ensure robust accounting, in particular by addressing the risk of double claiming with 2020 targets and appropriately accounting for the vintage of CERs and the time frame of mitigation targets.

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## SUMMARY

The Clean Development Mechanism (CDM) is the world's largest greenhouse gas (GHG) crediting mechanism, with 1.8 billion certified emission reductions (CERs) issued from about 8,000 registered CDM activities. The Paris Agreement established, through Article 6, provisions that enable countries to use international carbon market mechanisms to achieve mitigation targets pledged in their nationally determined contributions (NDCs). In the ongoing negotiations on Article 6, several Parties and stakeholders have proposed arrangements to transition the CDM to the Paris Agreement.

There are several ways the CDM could be incorporated under the Paris Agreement. First, CDM rules and governance arrangements could be adapted to the new mechanisms operating under Article 6. Second, CDM projects could be transitioned to mechanisms under Article 6, thereby allowing them to generate units for emission reductions achieved after 2020. And third, CERs issued for emission reductions up to 2020 could be used towards achieving international mitigation targets after 2020, including NDCs under the Paris Agreement and the Carbon Offsetting and Reduction Scheme for International Aviation (CORSIA) recently adopted by the International Civil Aviation Organization (ICAO).

This last option has been tied to several objectives. Using CERs towards post-2020 targets could, for example, lower the costs of meeting targets, prevent the loss of existing mitigation efforts, ensure continuity in the use of crediting schemes, and preserve investor trust and confidence (Greiner, Howard, Chagas, and Hunzai, 2017; Michaelowa et al., 2015). These are important objectives, but less attention has been devoted to what this option would mean for the environment.

This study focuses specifically on those environmental implications, systematically analyzing how the use of CERs for post-2020 mitigation targets would impact global GHG emissions. It provides recommendations to policy-makers on how to use CERs in a manner that ensures environmental integrity, drawing upon a bottom-up model to quantitatively assess the implications under different scenarios. In this study, environmental integrity is considered safeguarded if the use of CERs towards achieving targets under NDCs or CORSIA does not result in higher global GHG emissions than if the targets were achieved without CERs or other unit transfers.

### Supply and demand for CERs

This analysis is informed by a detailed estimate of the CER supply potential from 2013 to 2020. It draws on a bottom-up model – co-developed with NewClimate Institute – that reflects recent research on the status and operation of CDM project activities, as well as CDM regulatory requirements that could limit the ability of projects to issue CERs (Schneider, Day, La Hoz Theuer, and Warnecke, 2017; Warnecke et al., 2017; Warnecke, Day, and Klein, 2015).

The supply potential from the 8,000 **registered projects and programmes of activities (PoAs)** is estimated to be about **4.7 billion CERs** from 2013 to 2020. The supply from non-registered projects in the pipeline – i.e. projects that initiated steps to seek CDM status, but have not (yet) been registered – is more uncertain, as it is not known how many projects have been implemented, are operating, and are able to comply with all CDM requirements. About 4,000 projects are under various steps of the validation process and about 8,000 non-registered projects have secured the possibility to register under the CDM through official notifications to the secretariat of the United Nations Framework Convention on Climate Change (UNFCCC). It is estimated that all **12,000 non-registered projects and PoAs in the pipeline** could generate an added **1.0 billion CERs** in emission reductions from 2013 to 2020.

Together, the **total CER supply potential** from registered and non-registered projects in the pipeline amounts to about **5.7 billion CERs**. This is not an estimate of the likely CER issuance under the current market conditions, but rather an estimate of the CER supply *potential*, assuming that project owners would have sufficient incentives to proceed to issuance.

The demand for CERs from 2013 to 2020 is estimated to be about 660 million. Consequently, about 5.0 billion CERs – from both registered and non-registered projects – could be left over for use after 2020. This is significantly larger than the potential demand from CORSIA, which is estimated to amount to about 2.7 billion in the period 2020 to 2035. The potential demand from countries that intend to use CERs towards achieving NDCs is not yet known.

### What factors are critical for the GHG emissions impact?

Several factors influence how international market mechanisms impact global GHG emissions, including robust accounting, the quality of transferred units, the ambition and scope of any international mitigation targets of the transferring country, and possible incentives or disincentives for further mitigation action (Schneider, Füssler, et al., 2017). This study identifies four factors that are particularly critical in the specific context of using CERs after 2020:

1. For new projects, the **additionality** of the projects;
2. For already implemented projects, their **vulnerability to (or risk of) discontinuing GHG abatement**;
3. The risk of **double claiming** with 2020 targets (which include both pledges and Nationally Appropriate Mitigation Actions put forward in response to COP15 in Copenhagen and COP16 in Cancun); and
4. How the **vintage of CERs** is accounted for in relation to the time frame of mitigation targets.

These four factors are further discussed below. Other aspects – such as the risk of double issuance, double use, over-crediting, or disincentives for further mitigation action – would not have a significant impact when using CERs to achieve mitigation targets after 2020.

### Additionality and vulnerability to discontinuing GHG abatement

Under crediting mechanisms, the quality of credits is in principle ensured if the mitigation action is: (a) additional – that is, it would not occur in the absence of the incentives from the crediting mechanism; and (b) the emission reductions are not overestimated. Additionality is assessed when a new project is developed and the decision is made on whether to proceed with the investment. The consideration of additionality is thus relevant when **new** projects are developed in response to a carbon market price and respective demand.

The direct emissions impact from using CERs beyond 2020 is more complex. The CDM market is currently characterized by a strong imbalance between supply

and demand, resulting in low CER prices. In recent years, the supply of CERs has outstripped the demand, leading CER prices to plummet to less than 0.50 euros from well above 10 euros before 2011 (ICE, 2017). If in such a market situation projects have **already been implemented** – and hence investment costs are sunk – a key consideration for the global GHG emissions impact is whether the projects would continue to reduce GHG emissions even without CER revenues, or whether they are **vulnerable to (or at risk of)** discontinuing GHG abatement.

For some project types, such as hydropower or wind power projects, ongoing revenues from electricity sales typically exceed ongoing operational expenditures. Once implemented, these projects have strong economic incentives to continue GHG abatement, with or without CER revenues, because continued GHG abatement generates more income than discontinuing GHG abatement.

Other projects have ongoing operational costs but insufficient financial benefits beyond CER revenues. For example, the abatement of N<sub>2</sub>O from nitric acid production requires the regular replacement of catalysts but does not save costs or generate income other than CER revenues. These projects have a high risk of discontinuing GHG abatement, because continuing GHG abatement is only economically attractive if they have ongoing financial support.

A project that is vulnerable to discontinuing GHG abatement is by definition additional. However, it is important to note that if a project is not vulnerable, it can still be additional. Rather, the lack of vulnerability recognizes that, from today's perspective of sunk investment costs, the project's ongoing revenues or cost savings – other than CER revenues – exceed its ongoing operational expenditures for the GHG abatement. Projects also might continue GHG abatement because policies promote or require continuation or because discontinuation is technically not viable.

This implies that in the current market situation, the impact of new demand for CERs on global GHG emissions differs between already implemented and new projects. For new projects, the additionality and the quantification of emission reductions determine the GHG emissions impact, whereas for already implemented projects the risk that projects discontinue GHG abatement and the quantification of emission reductions matter. A new programme or policy – such as CORSIA – that creates new demand for CERs would only trigger emissions reductions to the extent that:

1. The implementation of new GHG abatement projects that are additional is triggered through the programme or policy, and their emission reductions are not over-estimated; or
2. Already implemented projects that are at risk of discontinuing GHG abatement are spurred to continue GHG abatement, and their emission reductions are not over-estimated.

This situation would only change if the current imbalance between supply and demand ceases, i.e. if the overall demand from new programmes and policies exceeded the potential CER supply from already implemented and operating projects.

Drawing on previous research, the study finds that the risk of over-estimating emission reductions is limited (Cames et al., 2016). However, the likelihood that a project is additional or at risk of discontinuing GHG abatement depends on the project type and, to some extent, project-specific circumstances. Figure 1 shows the CER supply potential from registered projects, differentiated by the vulnerability of project types to discontinue GHG abatement, as assessed in recent research (Schneider, Day, et al., 2017; Warnecke et al., 2017; Warnecke, Day, and Klein, 2015).

About 3.8 billion CERs, or 82% of the total CER supply potential from registered projects, stem from project types that typically have a low vulnerability to

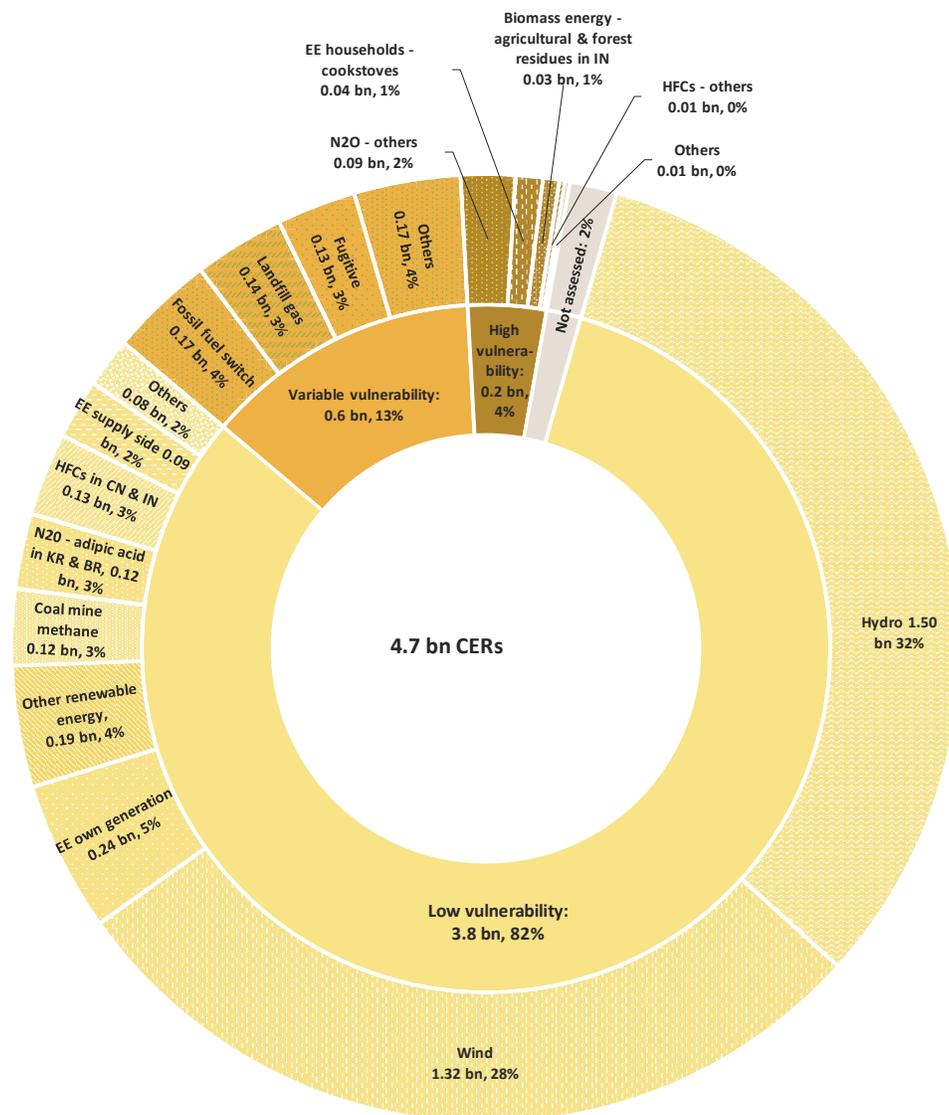


Figure 1: CER supply potential from registered projects for the period 2013 to 2020, differentiated by the vulnerability of project types to discontinue GHG abatement

Source: Adapted from Schneider, Day, et al. (2017)

discontinuing GHG abatement. While many of these projects currently do not issue CERs, most could resume CER issuance if they had enough incentives to do so. For another 13%, the vulnerability is typically variable, depending on the specific circumstances of the project.

Only about 170 million CERs, or 4% of the CER supply potential, are from project types that typically have a high vulnerability to discontinuing GHG abatement. The CER supply potential from vulnerable projects is relatively low because (a) many vulnerable projects have already discontinued GHG abatement or monitoring and can either not resume abatement or are temporarily not eligible for issuing CERs, (b) some methodologies for vulnerable project types use rather conservative approaches to quantify emission reductions, and (c) some countries have introduced domestic policies that ensure continued GHG abatement.

### Double claiming

Double claiming is one form of double counting. It occurs if the same emission reductions are counted twice towards fulfilling mitigation targets: once by the country or entity where the reductions occur, through reporting of its emissions in its GHG inventory, and again by the country or entity using CERs. Double claiming could thereby lead to an increase in global GHG emissions.

The risk of double claiming is material for two reasons:

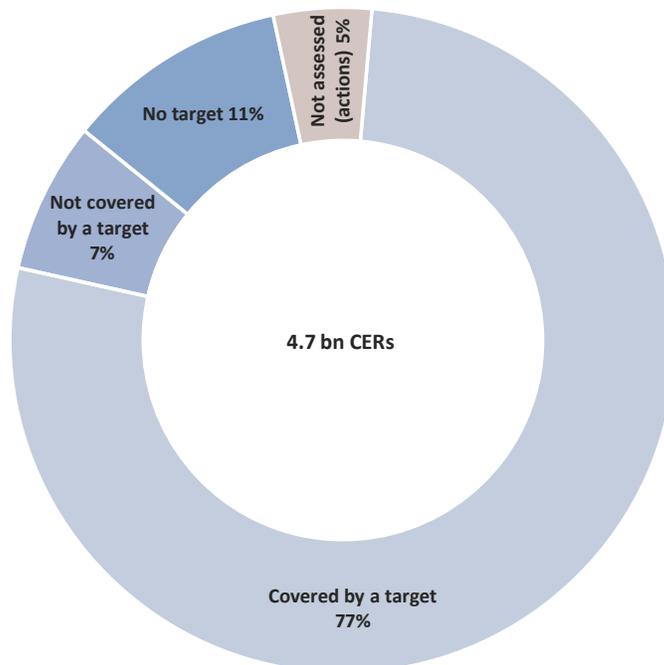
1. A large share of the CER supply potential is from countries with 2020 targets. About 77% of the CERs would originate from emission sources covered by a 2020 target, and only 18% would originate either from countries without a target or from sectors or GHGs not covered by a target (Figure 2).
2. Although the decision adopting the Paris Agreement and decisions under UNFCCC emphasize the need to avoid double counting in the context of international transfers in the period up to 2020, this principle has never been effectively integrated into an accounting framework. Developing countries submitting Biennial Update Reports (BURs) “shall” provide “information on international market

mechanisms”, but this is to be done for information which Parties “consider suitable and relevant for reporting”. An evaluation of the most recent BURs of key CDM host countries found that none reported on or accounted for emission reductions from CERs claimed by other countries.

The risk of double claiming applies not only to using CERs after 2020, but also to using CERs under the Kyoto Protocol, and to using units from other GHG offsetting programmes. Double claiming with 2020 targets does not always increase global GHG emissions; the impact depends on whether host countries overachieve their 2020 targets. If a host country overachieves its 2020 target by an amount greater than the emission reductions issued and transferred under the CDM, then global GHG emissions would not increase, double claiming notwithstanding. This is because in this case the host country does not effectively make use of the reductions to achieve its 2020 target.

While the risk of double claiming is material, the political context of 2020 targets is an important consideration. Developing countries put forward mitigation targets for the first time – despite their lower capacity, capability, and historical responsibility for climate change. Some developing countries have argued that they submitted their targets assuming international support from developed countries – including through the use of mechanisms – and should therefore be able to use the emission reductions from CERs to achieve their targets. Moreover, countries approved CDM projects before communicating 2020 targets and were possibly unaware of any double claiming consequences. Lastly, 2020 targets do not have the same legal status as NDC targets or commitments under the Kyoto Protocol. For these reasons, countries could have different expectations with respect to avoiding double claiming in the context of 2020 targets.

However, one could also argue that the political context is different if CERs issued for emission reductions up to 2020 are used *after* 2020, towards NDCs or CORSIA. Both the Paris Agreement and the CORSIA resolution require the avoidance of double counting, and the decision adopting the Paris Agreement emphasizes the need to avoid double counting also with regard to pre-2020 mitigation action. If double claiming is addressed for units issued under the Paris Agreement – but not for CERs – that could potentially distort the carbon market. Avoiding double claiming with 2020 targets may thus be important for ensuring environmental integrity in the post-2020 period.



**Figure 2: CER supply potential from registered projects in the period 2013 to 2020, differentiated by the coverage of 2020 targets**

### Accounting for the vintage of CERs and the time frame of mitigation targets

Appropriately accounting for the vintage of CERs and the time frame of mitigation targets is an important and complex issue for ensuring robust accounting. In theory, using CERs from emission reductions up to 2020 towards achieving post-2020 mitigation targets only affects the timing of emission reductions but not the cumulative GHG emissions levels: emissions are reduced by an entity or a country at an earlier point in time, which enables the same or another entity or country to emit more at a later stage. In practice, however, using CERs towards achieving future targets could also increase the cumulative emissions paths of the countries involved. The risk of this depends on the specific context.

Accounting rules for the Paris Agreement have not yet been determined, and it is unclear how the rules will account for the vintage of mitigation outcomes and the time frame of mitigation targets. Figure 3 illustrates the potential implications for two hypothetical countries that both have a single-year NDC target of stabilizing their emissions in 2030 at their 2010 level. In this example, Country A implements

a CDM project with a technical lifetime of eight years – from 2013 to 2020 – and transfers the associated CERs to Country B, which uses them to achieve its target in 2030. The CDM project lowers the GHG emissions in Country A (dark green area), leading to lower actual emissions (black line) than would occur without the CDM project (red line). Country B uses the CERs from Country A to achieve its single-year emissions target in 2030 (light green area).

In Figure 3, Country B offsets the 2030 emissions above its target with the emission reductions from CERs created in Country A from 2013 to 2020. But the ability to use all CERs in a single year enables Country B to pursue a higher emissions path in the period up to 2030. This could thereby significantly increase the aggregated cumulative GHG emissions from both countries (by the grey area).

This environmental integrity risk decreases if CERs were instead used towards achieving multi-year emissions targets or trajectories (e.g. from 2021 to 2030). In this case, the emission reductions from CERs would be spread over more years, mitigating possible implications on pre-2020 emissions pathways.

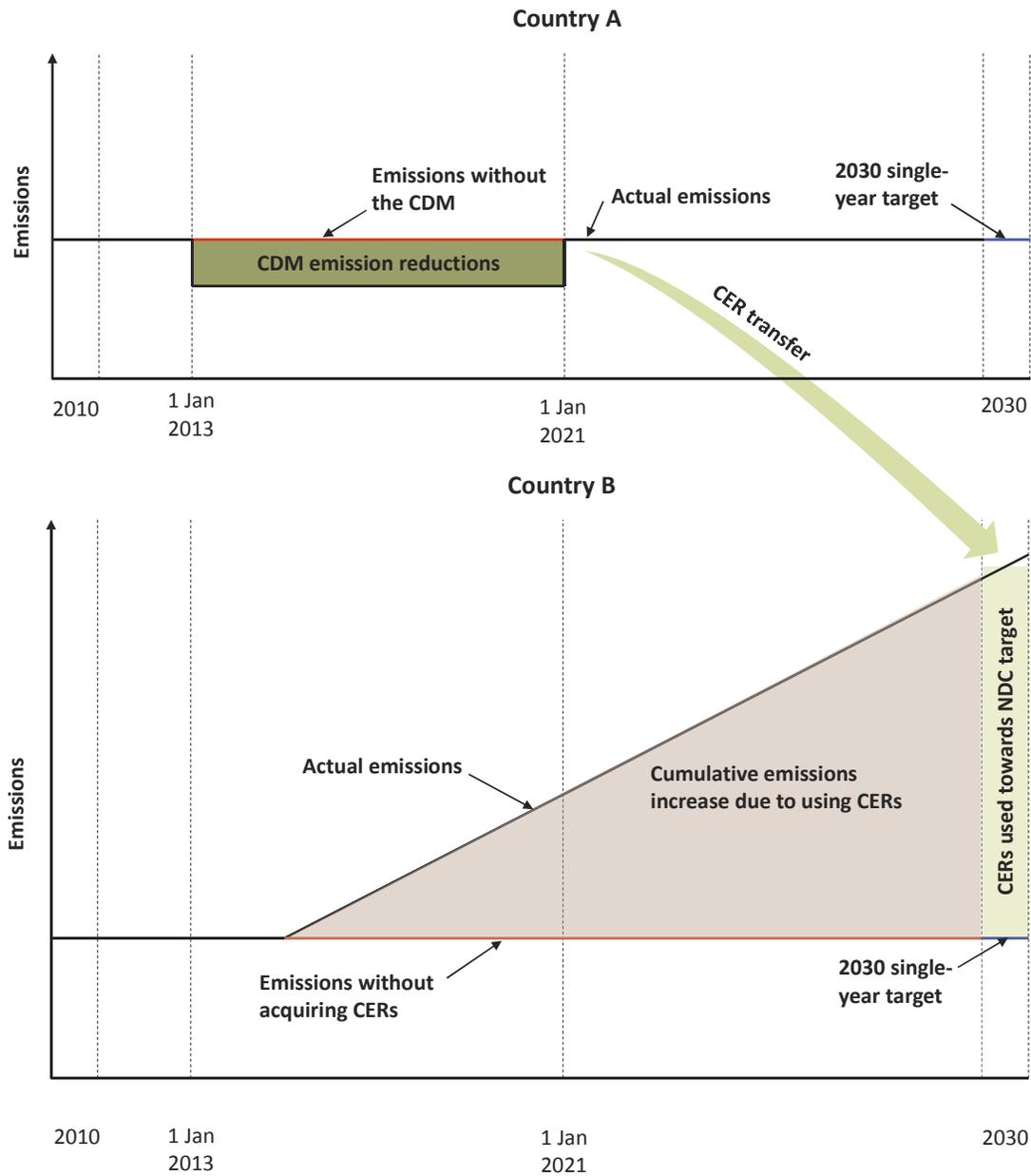


Figure 3: Implications of using CERs towards a single-year target in 2030

### Implications of using all types of CERs

A key question for policy-makers is how to address the risks for environmental integrity discussed above. Here we first assess the implications of using all types of CERs and then discuss possible restrictions to address critical environmental integrity risks.

The study finds that purchase programmes or policies that recognize all types of CERs for use after 2020 are unlikely to trigger significant emission reductions beyond those that would have occurred in the absence of the programme or policy. This is largely owed to

two reasons. First, under current CDM market conditions, new demand for CERs would mostly be served by projects that have already been implemented and would continue GHG abatement even without CER revenues. While purchasing CERs from projects that continue GHG abatement would financially support them (e.g. by helping investors recoup costs or increase profits), it would not impact their GHG abatement. Second, robust accounting for the transfer of CERs is not ensured under the current international framework. The use of CERs after 2020 could lead to double claiming or lead to higher emissions pathways in pre-target years, in particular if used towards single-year targets.

While this study focuses on the environmental implications, it is important to note that recognizing all types of CERs would not only fail to trigger significant further emission reductions but could also have adverse economic implications for project developers and host countries. CER prices would likely remain low, and thus might not generate sufficient incentives to develop new projects or continue GHG abatement in vulnerable projects. Moreover, a considerable part of the funding dedicated to purchasing CERs might be used to cover transaction costs, and only a small part might remain with the project owners. For these reasons, recognizing all types of CERs may not maintain investor trust and confidence or spur new investments.

Policy-makers may thus carefully consider whether and how they use CERs after 2020. To promote new or continued mitigation action, they could consider prioritizing or limiting the eligibility of CERs. Most programmes or policies deliberating the purchase or recognition of CERs use some type of eligibility criteria. For example, the assembly resolution adopting the CORSIA refers to an “eligible vintage and timeframe” of units and the World Bank’s Pilot Auction Facility focuses on project types that are at risk of discontinuing GHG abatement.

Restrictions could be implemented to achieve one or more policy objectives, such as incentivizing the implementation of new and additional GHG abatement projects, supporting already implemented projects at risk of discontinuing GHG abatement, avoiding double claiming with 2020 targets, and promoting projects from specific host countries.

### Restrictions to promote new and additional projects and to support vulnerable ones

Restrictions on project features could be used to prioritize or limit the eligibility of CERs to new projects that have a high likelihood of additionality and to already implemented projects that are at risk of discontinuing GHG abatement. This would require a method to (a) differentiate “new” from “already implemented” projects; (b) identify which new projects have a high likelihood of being additional; and (c) identify which already implemented projects are likely to be at risk of discontinuing GHG abatement.

**Vintage restrictions** based on documented project development milestones could be used to differentiate new from already implemented projects. Several milestones could be considered:

- The **registration date** – the date on which a project is formally accepted under the CDM – is inadequate to differentiate new from already implemented projects, due to the large number of non-registered projects in the pipeline. Many of these projects were likely implemented before 2013, but could still register under the CDM if they had the economic incentive to do so. These projects are estimated to be able to issue about 1 billion CERs in the period up to 2020.
- The **start date of the crediting period** – the date from which emission reductions can be issued as CERs – is also inadequate, because it is not necessarily related to when the emission reductions begin. Moreover, CDM rules allow projects to change the date after registration, and projects could thus change the date in order to become eligible under a CER purchase programme or policy.
- The **start date of the project** – the date on which the investment decision to proceed with implementation is made – is best suited to differentiate new from already implemented projects. It enables policy-makers to effectively ensure that only projects implemented *after* the adoption of a CER purchase programme or policy are eligible. Another advantage is that this date cannot be changed or influenced by project participants once the investment decision has been made. Under the current market conditions, however, few new projects are being developed. The CER supply potential from recent projects in the pipeline is therefore limited, and new projects would have to be developed in response to such a vintage restriction.

To identify new projects that have a **high likelihood of additionality**, policy-makers could establish a list of eligible project types. This poses several challenges, however, because additionality assessments are uncertain and depend on predictions of future developments, such as future energy prices. Project-specific circumstances also can play an important role. Existing analyses of the likelihood of additionality of different project types, and project categories considered automatically as additional under the CDM, could inform the prioritization of project types.

To identify projects that are **vulnerable to discontinuing GHG abatement**, policy-makers could also establish a list of eligible project types, based on the typical cost and revenue structure of the project type. Alternately, they could establish a methodo-

logical tool and a dedicated process to assess project vulnerability, under which individual projects would have to demonstrate that they would discontinue GHG abatement without continued CER revenues. Both options may require further research, building on previous assessments of project vulnerability. Project types that are typically highly vulnerable have a supply potential of about 170 million CERs, while project types with a typically variable vulnerability have a supply potential of another 600 million CERs.

### Restrictions to address double claiming with 2020 targets

To mitigate the risks arising from double claiming with 2020 targets, two approaches could be pursued:

#### 1. **Prioritizing or limiting eligibility to CERs issued for emission reductions that are not covered by 2020 targets.** This would apply to:

- CERs from host countries without any 2020 target (corresponding to a supply potential from registered projects of about 500 million for the period 2013 to 2020); and
- CERs from host countries with a 2020 target but for which the emission reductions are not covered by the target (corresponding to a supply potential from registered projects of about 340 million for the period 2013 to 2020).

#### 2. **Prioritizing or limiting eligibility to CERs from host countries that commit to avoiding double counting.** Host countries could, for example, account for CERs by applying “corresponding adjustments” to their GHG emissions reported under the UNFCCC. Once an accounting framework has been agreed to under the Paris Agreement, host countries might also apply this framework *mutatis mutandis* to the context of 2020 targets.

Both approaches could in principle address the risk of double claiming and are not mutually exclusive. Approach 1 would be relatively simple to implement, but could penalize countries that put forward 2020 targets and provide an advantage to countries that were not ready to do so. Approach 2 would enable all countries to benefit from the opportunity of selling CERs for use after 2020, but could be politically challenging. Past efforts to gain agreement on common account-

ing principles under the UNFCCC have failed. Applying the accounting rules agreed under the Paris Agreement to the pre-2020 period would ensure that a consistent accounting framework is used for both emission reductions from CDM projects in the period up to 2020 and any international transfers after 2020. It would also help ensure that all carbon market units used under the Paris Agreement towards achieving NDC targets comply with the same requirements. A further, practical challenge of Approach 2 is applying corresponding adjustments in light of the diversity of 2020 targets, including their expression as single-year targets for 2020.

### Restrictions to promote projects in specific host countries

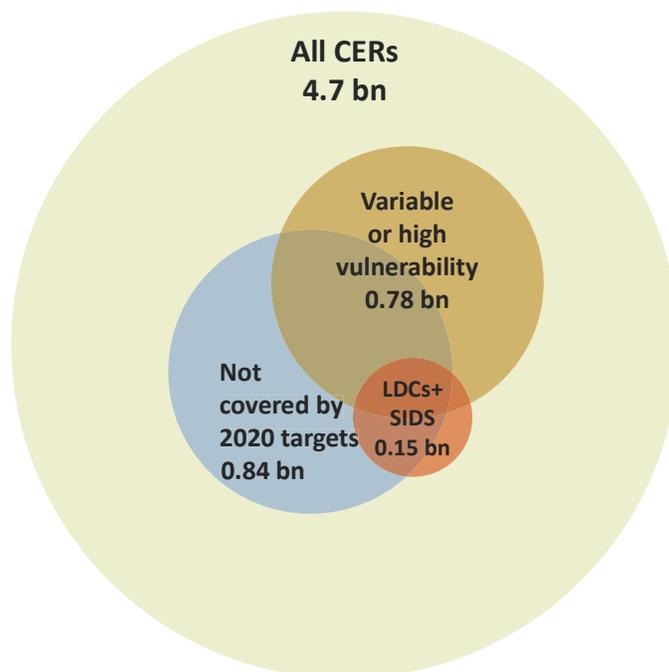
Policy-makers could also limit the eligibility of CERs to specific host countries or regions, notably Least Developed Countries (LDCs) and Small Island Developing States (SIDS). Limiting CER eligibility to LDCs and SIDS could promote emission reductions in those countries and possibly improve regional distribution of CDM projects, potentially facilitating a more balanced regional distribution in the period after 2020 if the projects were transitioned and continued under Article 6. The CER supply potential of registered projects hosted in LDCs and SIDS lies at around 150 million CERs, corresponding to about 3% of the potential from all countries.

### Combinations of restrictions

Policy-makers could also pursue combinations of the restrictions discussed above. Figure 4 shows the implications for the CER supply potential if different types of restrictions are combined. About 300 million CERs are from projects with a variable or high vulnerability and for which the emission reductions are not covered by 2020 targets. If eligibility would in addition be limited to LDCs or SIDS, only about 40 million CERs would be eligible, corresponding to about 1% of the overall CER supply potential.

### Recommendations

Countries are currently considering using CERs to achieve targets under CORSIA and the Paris Agreement. Using CERs could lower compliance costs, support stranded projects and ensure sufficient supply for the implementation of CORSIA. This study, however, finds that CER purchase programmes or poli-



**Figure 4: Implications of combinations of restrictions on the CER supply potential from registered projects in the period 2013 to 2020**

cies that recognize *all* types of CERs for use after 2020 are unlikely to trigger significant emission reductions beyond those that would have occurred in the absence of the programme or policy. Recognizing all types of CERs could also lead to low CER prices and may not maintain or restore investor trust and spur new investments.

To ensure that further emission reductions are triggered and respective economic incentives are provided to project developers and host countries, it is recommended that policy-makers:

1. Prioritize or limit eligibility to CERs from:

- Projects that are newly developed in response to the programme or policy and have a high likelihood of additionality, e.g. by restricting eligibility to projects with a start date on or after the adoption or implementation of the CER purchase programme or policy, and by prioritizing project types that are more likely to be additional; and

- Already implemented projects that are at risk of discontinuing GHG abatement, e.g. by limiting CER eligibility of already implemented projects to a list of project types that are typically at risk of discontinuing GHG abatement.

2. Ensure robust accounting, in particular:

- Address the risk of double claiming with 2020 targets, e.g. by requiring that CDM host countries apply corresponding adjustments for CERs used after 2020; and
- Appropriately account for the vintage of CERs and the time frame of mitigation targets, e.g. by using CERs in the context of multi-year emissions targets or trajectories.