



# Supporting vulnerable CDM projects through credit purchase facilities

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## Abbreviations

<b>CCF</b>	Climate Cent Foundation (Switzerland)
<b>CDCF</b>	Community Development Carbon Fund (World Bank)
<b>CDM</b>	Clean Development Mechanism
<b>CER</b>	Certified emission reduction
<b>Ci-Dev</b>	Carbon Initiative for Development (World Bank)
<b>CORSIA</b>	Carbon Offsetting and Reduction Scheme for International Aviation
<b>CPA</b>	Component Project Activity
<b>EU ETS</b>	European Union Emissions Trading System
<b>GHG</b>	Greenhouse gas
<b>ICAO</b>	International Civil Aviation Organization
<b>LDC</b>	Least developed country
<b>NACAG</b>	Nitric Acid Climate Action Group
<b>NDC</b>	Nationally determined contribution
<b>PAF</b>	Pilot Auction Facility (World Bank)
<b>PDD</b>	Project design document
<b>PoA</b>	Programme of Activities
<b>tCO<sub>2</sub>e</b>	Tonnes of carbon dioxide equivalent
<b>UNFCCC</b>	United Nations Framework Convention on Climate Change

## Executive summary

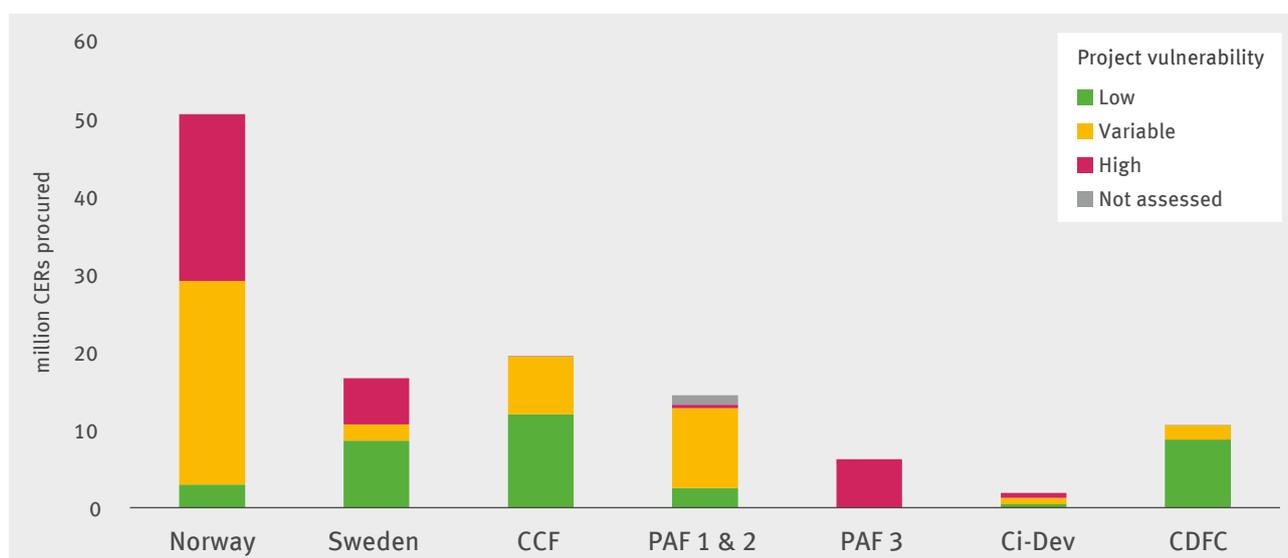
“Credit purchase facilities” are special purpose entities which procure certified emission reduction units (CERs) either to be cancelled as a form of climate or development finance, or for compliance with climate change mitigation targets, via a centralised procurement process. They have been established by multilateral and national initiatives.

This paper assesses whether and how national and multinational credit purchase facilities have supported Clean Development Mechanism (CDM) projects that are vulnerable to the risk of discontinuing GHG abatement. A project’s vulnerability is defined for this research based on the likelihood that a project would continue its GHG abatement activities in the continued absence of significant revenues from CERs or further support. Previous research by the authors found that the extent to which CDM projects are vulnerable to the discontinuation of their mitigation activities varies across project types and host countries. Although the maximum potential CER supply from existing CDM projects in the 2013–2020 period is 4.65 billion CERs, we estimated that the potential CER supply from registered CDM projects with a high vulnerability to discontinuation is only 171 million CERs for this same period, or less than 4 percent of the total.

Improving the understanding of the impact that the credit purchase facilities have had in supporting the continuation of emission reductions for vulnerable CDM projects can inform the available options for their further support. The analysis also provides further insights on the suitability of using CERs from existing CDM projects for new emission offsetting mechanisms, by estimating the remaining volume of potential CER supply from vulnerable projects after adjusting for the procurement from credit purchase facilities, and how feasible it is to target these projects.

Six major credit purchase facilities are included in the analysis of this paper: the Norwegian Carbon Credit Procurement Programme (Norway), Sweden’s International Climate Investment Programme (Sweden), Switzerland’s Climate Cent Foundation (CCF), the Pilot Auction Facility for Methane and Climate Change Mitigation (PAF), the Community Development Carbon Fund (CDCF), and the Carbon Initiative for Development (Ci-Dev). The quantitative results in the paper related to CER supply potential and the impact of credit purchase facilities for vulnerable projects are approximate estimates that are the direct output of the databases developed under this research project, and based on the authors’ definition of project vulnerability.

These six credit purchase facilities account for procurement of approximately 120 million CERs during the 2013–2020 period. Although the collective impact of these credit purchase facilities only accounts for 2.5% of the potential CER supply from all existing CDM projects in the 2013–2020 period, the impact for vulnerable projects specifically is more significant: approximately 30% of CERs procured from the credit purchase facilities came from project types classified as having generally high vulnerability to discontinuation, with a further 28% coming from project types with variable vulnerability. Procurement from the six credit purchase facilities accounts for 20% of the potential supply from highly vulnerable projects, reducing the remaining potential supply from 171 million CERs to approximately 137 million CERs.



Key to credit purchase facilities: The Norwegian Carbon Credit Procurement Programme (Norway); Sweden's International Climate Investment Programme (Sweden); Switzerland's Climate Cent Foundation (CCF); The Pilot Auction Facility for Methane and Climate Change Mitigation (PAF); The Community Development Carbon Fund (CDCF); The Carbon Initiative for Development (Ci-Dev)

**Figure 1: CER procurement from credit purchase facilities for the 2013–2020 period**

Figure 1 shows that the support provided to vulnerable projects by the six credit purchase facilities varies considerably across the facilities, depending on the approaches that they have taken to CER procurement. This offers insights for how to most effectively replicate and upscale these approaches. The impact of credit purchase facilities could be further enhanced to support the remaining highly vulnerable projects which account for potential emission reductions of approximately 137 MtCO<sub>2</sub> by:

- a) replicating existing facilities and increasing demand volumes: given that the existing credit purchase facilities that we analyse account for procurement of approximately 120 million CERs in the 2013–2020 period, roughly this same volume would need to be replicated again and targeted exclusively at vulnerable projects, to bridge the gap for the remaining potential CER supply from vulnerable projects of approximately 137 million CERs.
- b) narrowing the focus of facilities to target vulnerable project types more specifically: the proportion of procurement from project types with high or variable vulnerability varies considerably amongst the credit purchase facilities, from approximately 17% to 94%. Vulnerable project types most targeted through these existing efforts – nitric acid and efficient cookstoves – still represent the greatest remaining potential for upscaling and replication.
- c) reducing the barriers to access credit purchase facilities for the most vulnerable projects: some credit purchase facilities already implement measures to enhance the accessibility for the most vulnerable projects. For example, certain facilities reserve resources for capacity building and promoting awareness to encourage participation. Procurement approaches that require upfront capital investments on the part of project owners, such as for bid deposits or put option purchases, however, are less likely to target the most vulnerable projects.

Experiences from the credit purchase facilities show that new sources of CER demand that look to existing CDM projects will find it difficult to exclusively target vulnerable projects. None of the credit purchase facilities we analyse have exclusively procured CERs from projects that we categorise as vulnerable to discontinuing GHG abatement despite targeted efforts – in some cases – to restrict project eligibility and to improve awareness and access to the funding amongst smaller projects. That credit purchase facilities have experienced difficulties to exclusively target vulnerable projects is not only an important consideration for future replicated or upscaled purchase facilities, but even more so for other sources of CER demand such as potential new GHG offsetting programmes. Both technical and political difficulties to define and identify existing projects at risk of discontinuing abatement risk undermining the environmental integrity of future sources of demand that allow the use of offset credits from existing projects. Purchasing offset credits from existing projects that will anyway continue GHG abatement activities may lead to a net increase in GHG emissions if measures are not taken to compensate for this impact.

## Zusammenfassung

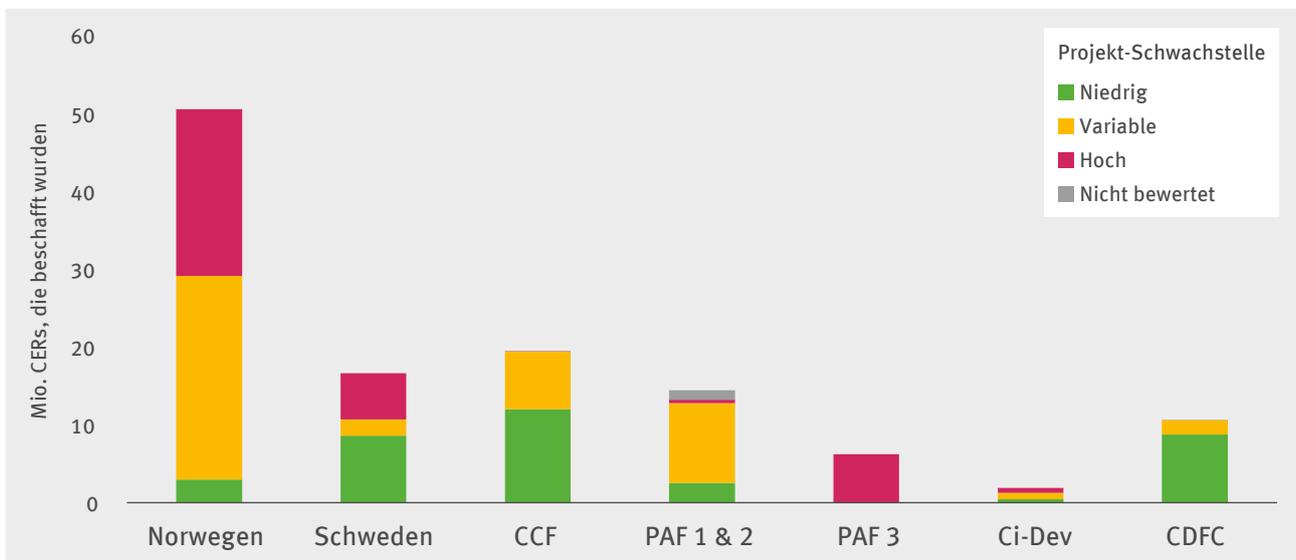
„Zertifikatsaufkaufeinrichtungen“ sind Zweckgesellschaften zum Aufkauf von zertifizierten Emissionsminderungseinheiten, die über einen zentralisierten Beschaffungsprozess entweder als Form der Klima- oder Entwicklungsfinanzierung oder zur Einhaltung von Klimaschutzzielen stillgelegt werden. Sie wurden von multilateralen und nationalen Initiativen gegründet.

In diesem Bericht wird bewertet, ob und wie nationale und multinationale Zertifikatsaufkaufeinrichtungen Clean Development Mechanism (CDM) Projekte unterstützt haben, die gefährdet sind die THG-Reduzierung einzustellen. Dies erfolgt durch den Aufkauf von Certified Emission Reductions (CERs), die unter dem CDM generiert werden. Der Gefährdungsgrad eines Projekts wird für diese Untersuchung auf der Grundlage der Wahrscheinlichkeit definiert, dass ein Projekt seine THG-Minderungsaktivitäten fortsetzen würde, wenn weiterhin keine nennenswerten Einnahmen aus CERs oder weitere Unterstützung verfügbar wären. Frühere Untersuchungen der Autoren ergaben, dass das Ausmaß, in dem CDM-Projekte gefährdet sind die Minderungsaktivitäten einzustellen, je nach Projekttyp und Gastland unterschiedlich ist. Obwohl das maximale potenzielle CER-Angebot aus bestehenden CDM-Projekten für den Zeitraum 2013–2020 4,65 Milliarden CERs beträgt, schätzen wir, dass das potenzielle CER-Angebot aus registrierten CDM-Projekten mit einem hohen Gefährdungsgrad für die Einstellung aus dem selben Zeitraum nur 171 Millionen CERs oder weniger als 4 Prozent der Gesamtmenge beträgt.

Durch ein besseres Verständnis der Auswirkungen, die Zertifikatsaufkaufeinrichtungen auf die Fortsetzung der Emissionsreduktionsaktivitäten gefährdeter CDM-Projekte bisher gehabt haben, können die für die weitere Unterstützung verfügbaren Optionen verbessert werden. Die Analyse liefert weiterhin Erkenntnisse für die Eignung von CERs aus bestehenden CDM-Projekten für neue Emissionsausgleichsmechanismen, indem das verbleibende Volumen des potenziellen CER-Angebots aus gefährdeten Projekten geschätzt wird, korrigiert um den Aufkauf durch die bestehenden Kaufeinrichtungen und ergänzt um eine Einschätzung wie realisierbar es ist, diese Projekte ins Visier zu nehmen.

Die Analyse dieses Berichtes umfasst sechs wichtige Zertifikatsaufkaufeinrichtungen: das norwegische Carbon Credit Procurement Programme (Norwegen), das schwedische International Climate Investment Programme (Schweden), die Schweizer Climate Cent Foundation (CCF), die Pilot Auction Facility for Methane and Climate Change Mitigation (PAF), der Community Development Carbon Fund (CDCF) und die Carbon Initiative for Development (Ci-Dev). Die quantitativen Ergebnisse in diesem Bericht bezüglich des CER-Angebotspotenzials und die resultierenden Auswirkungen von Aufkaufprogrammen auf gefährdete Projekte sind ungefähre Schätzungen, die auf im Rahmen dieses Forschungsprojekts entwickelten Datenbanken und auf der Definition der Projektgefährdung durch die Autoren basieren.

Aufkäufe durch die sechs Kaufprogramme bzw. -einrichtungen summieren sich im Zeitraum 2013–2020 auf rund 120 Millionen CERs. Obwohl die gesamten Auswirkungen dieser Aufkaufeinrichtungen nur 2,5 % des potenziellen CER-Angebots aus allen bestehenden CDM-Projekten im Zeitraum 2013–2020 ausmachen, sind die Auswirkungen für gefährdete Projekte von besonderer Bedeutung: Ungefähr 30 % der CERs, die im Rahmen der Aufkaufeinrichtungen beschafft wurden, stammten aus Projekttypen, die im Allgemeinen als anfällig für Stilllegungen eingestuft wurden, und weitere 28 % stammten aus Projekttypen mit variabler Anfälligkeit. Die Beschaffung aus den sechs Aufkaufeinrichtungen macht 20 % des potenziellen Angebots aus besonders gefährdeten Projekten aus, wodurch sich das verbleibende potenzielle Angebot von 171 Millionen CER auf ungefähr 137 Millionen CER verringert hat.



Legende zu Zertifikatsaufkaufeinrichtungen: das norwegische Carbon Credit Procurement Programme (Norway); das schwedische International Climate Investment Programme (Sweden); die Schweizer Climate Cent Foundation (CCF); die Pilot Auction Facility for Methane and Climate Change Mitigation (PAF); der Community Development Carbon Fund (CDFC) und die Carbon Initiative for Development (Ci-Dev)

Abbildung 1: CER-Aufkauf durch Zertifikatsaufkaufeinrichtungen im Zeitraum 2013–2020

Abbildung 1 zeigt, dass die Unterstützung für gefährdete Projekte durch die sechs Aufkaufinitiativen je nach dem für die CER-Beschaffung gewählten Ansatz, zwischen den einzelnen Initiativen erheblich variiert. Dies liefert Erkenntnisse, wie diese Ansätze am effektivsten repliziert und skaliert werden können. Um die verbleibenden hoch gefährdeten Projekte zu unterstützen, die eine potenzielle Emissionsminderungen von etwa 137 MtCO<sub>2</sub> bewirken bedeuten, könnten die Auswirkungen von Aufkaufinitiativen durch folgende Maßnahmen weiter verstärkt werden:

- Replikation bestehender Fazilitäten und Erhöhung der Nachfrage: Angesichts der Tatsache, dass die von uns analysierten bestehenden Zertifikatsaufkaufeinrichtungen für den Zeitraum 2013–2020 eine Menge von etwa 120 Millionen CERs aufkauften, müsste etwa dasselbe Volumen erneut repliziert und dann ausschließlich auf gefährdete Projekte ausgerichtet werden, um die Lücke für das verbleibende potenzielle CER-Angebot aus gefährdeten Projekten von ungefähr 137 Millionen CERs zu schließen.
- Eingrenzung des Fokus der Fazilitäten speziell auf gefährdete Projekttypen: Der Anteil des Aufkaufs aus Projekttypen mit hoher oder variabler Gefährdung variiert erheblich zwischen den Zertifikatsaufkaufeinrichtungen und liegt zwischen etwa 17 % und 94 %. Die gefährdeten Projekttypen, auf die diese bestehenden Bemühungen am meisten abzielen – Salpetersäure und effiziente Kochherde – stellen nach wie vor das größte verbleibende Potenzial für die Ausweitung und Replikation dar.
- Reduzierung von Zugangsbarrieren zu Zertifikatsaufkaufeinrichtungen für die am stärksten gefährdeten Projekte: Einige Aufkaufeinrichtungen führen bereits Maßnahmen durch, um den Zugang für die am stärksten gefährdeten Projekte zu verbessern. Beispielsweise stellen bestimmte Einrichtungen Ressourcen für den Kapazitätsaufbau und die Sensibilisierung zur Teilnahme an den Programmen zur Verfügung. Aufkaufansätze, die von den Projektbesitzern im Voraus Kapitalinvestitionen erfordern, wie zum Beispiel für Geldeinlagen oder den Kauf von Put-Optionen, zielen dagegen mit geringerer Wahrscheinlichkeit auf die am stärksten gefährdeten Projekte ab.

Die Erfahrungen der Zertifikatsaufkaufeinrichtungen zeigen, dass es schwierig sein wird für neue Quellen von CER-Nachfrage, die sich auf bestehende CDM-Projekte beziehen, nur gefährdete Projekte zu erreichen. Keine der von uns analysierten Zertifikatsaufkaufeinrichtungen hat ausschließlich CERs aus Projekten aufgekauft, die wir als anfällig für die Einstellung der THG-Minderungsaktivität einstufen, obwohl in einigen Fällen gezielte Anstrengungen unternommen wurden, um die Zulassung der Projekte einzuschränken und das Bewusstsein und den Zugang zu Finanzmitteln bei kleineren Projekten zu verbessern. Dass Zertifikatsaufkaufeinrichtungen Schwierigkeiten hatten, sich ausschließlich auf gefährdete Projekte zu konzentrieren, ist nicht nur eine wichtige Berücksichtigung für zukünftige replizierte oder hochskalierte Aufkaufeinrichtungen, sondern vor allem auch für andere Quellen der CER-Nachfrage, wie potenzielle neue Programme zur Kompensation von Treibhausgasen.

Sowohl technische als auch politische Schwierigkeiten bei der Definition und Identifizierung bestehender Projekte, bei denen das Risiko der Einstellung der Minderungsaktivität besteht, beeinträchtigen die Umweltintegrität künftiger Nachfragequellen, die die Verwendung von Ausgleichskrediten aus bestehenden Projekten ermöglichen. Der Kauf von Emissionsminderungseinheiten aus bestehenden Projekten, die ohnehin die THG-Minderungsaktivitäten fortsetzen, kann zu einem Nettoanstieg der THG-Emissionen führen, wenn keine Maßnahmen ergriffen werden, um diesen Einfluss zu kompensieren.

# 1 Introduction

Credit purchase facilities, which have been established by multilateral and national initiatives, are special purpose entities which procure CERs either to be cancelled as a form of climate or development finance, or for compliance with climate change mitigation targets, via a centralised procurement process. This paper assesses the impact of national and multinational credit purchase facilities for vulnerable projects under the Clean Development Mechanism (CDM).

Previous research carried out by the authors assessed the extent to which CDM projects are at risk of ceasing their GHG abatement activities due to the lack of prospects for significant certified emission reduction (CER) revenues (Warnecke et al., 2017). This research found that many CDM projects likely had a low risk of discontinuing their activities, often because the financial revenues and cost savings associated with the continuation of the activity, excluding CER revenues, made this a more rational pathway than the project's discontinuation. Subsequent analysis on the potential supply of CERs from different projects in the 2013–2020 period considered the current status of these projects and their ability to continue GHG abatement and seek issuance of CERs (Schneider et al., 2017b): we found that just 4% of the potential supply of approximately 4.65 billion CERs between 2013 and 2020 comes from projects that are assessed to have high vulnerability to discontinuation, with another 15% of the potential supply from project types with variable or uncertain vulnerability (Schneider et al., 2017a). This finding is not an indication that these projects do not need CER revenues to fulfil their original business model, and is not a reflection of the additionality of projects at the point of project inception.<sup>1</sup>

This analysis on project vulnerability was not available in the literature until recently, yet several major national and multinational credit purchase facilities have been established in the past years with the intention to support vulnerable CDM projects. By comparing the reported activities of credit purchase facilities with the new information on CDM project vulnerability, it can be assessed to what extent credit purchase facilities have had an impact to support the continuation of vulnerable CDM projects.

An improved understanding on the impact that credit purchase facilities have had in this regard can inform the available options for further supporting vulnerable projects in the pre-2020 period. It can also provide further clarity on the suitability of pre-2020 CER supply from existing CDM projects for new carbon emission offsetting programmes, by estimating the remaining volume of potential supply from vulnerable projects after adjusting for the CER procurement from credit purchase facilities.

Three key sets of questions are addressed by this paper to bring further clarity to these issues:

1. To what extent do the major ongoing credit purchase facilities target the projects most at need of continued financial support to continue mitigation activities? (section 3 and section 4.1)
2. How could credit purchase programmes be most effectively upscaled to target more of these vulnerable projects? (section 4.2)
3. What are the implications for the remaining potential CER supply from vulnerable projects and the general suitability of pre-2020 CER supply for other sources of demand for carbon emission offset credits? (section 4.3)

Section 2 of this paper describes the methodology, section 3 provides details on the credit purchase facilities and their impact in supporting vulnerable projects, while section 4 provides further analysis and implications related to the three questions listed above. Finally, we offer conclusions in section 5.

<sup>1</sup> A large portion of costs for these projects were irreversibly sunk in upfront costs, and the 2015 survey shows that the majority of projects have not made a positive return on their investments. However, the net financial flows for these projects in the present situation are more favourable in the case that the mitigation action continues.

## 2 Methodology

This research required the collection of information on credit purchase facilities, and analysis for their implications on CER supply potential, as described in sections 2.1 and 2.2, below.

In line with the overall research project, the analysis covers supply and vulnerability of existing projects in the Clean Development Mechanism up to 2020; the supply and vulnerability of other crediting programmes is not assessed in this paper.

### 2.1 Information collection for credit purchase facilities

For the purpose of this paper, credit purchase facilities are defined as special purpose entities which procure CERs either to be cancelled as a form of climate or development finance, or for compliance with climate change mitigation targets, via a centralised procurement process.

In order to assess the impact of credit purchase facilities for CER supply potential from vulnerable projects, credit purchase facilities are most relevant for inclusion in the analysis if they:

- ▶ have the objective to target projects which are most in need of support to continue GHG abatement activities; and
- ▶ account for a significant volume of CER demand in the 2013–2020 period.

A list of six credit purchase facilities was identified for analysis by the authors based on literature review and the project participants' judgement on the relevance of the programmes for the research objectives:

- ▶ The Norwegian Carbon Credit Procurement Programme
- ▶ Sweden's International Climate Investment Programme
- ▶ Switzerland's Climate Cent Foundation (CCF)
- ▶ The Pilot Auction Facility for Methane and Climate Change Mitigation (PAF)
- ▶ The Community Development Carbon Fund (CDCF)
- ▶ The Carbon Initiative for Development (Ci-Dev)

For these credit purchase facilities, we collected information on the following aspects, through a combination of desk-based research and interviews with administrators of the purchase facilities:

- ▶ Up-to-date details on the aggregate committed and procured CER demand volume for emission reductions in the 2013–2020 period
- ▶ Quantitative and qualitative information on the host countries and project types targeted, and any additional eligibility criteria for selecting projects.
- ▶ Specific information on the actual and planned procurement of CERs from specific projects.
- ▶ Information on the modalities and procedures for CER acquisition.

The information collected for each of the credit purchase facilities is summarised in sections 3.2 to 1.1. The data collected was used for further analysis, as described in section 2.2.

## 2.2 Analysing the impact of credit purchase facilities and implications for CER supply potential

The starting point for our analysis is a bottom up model which calculates the potential supply of CERs at the project level for all years over the period from 2013 to 2020 based on CDM project information in April 2017. This modelling framework has been used by the authors in previous studies, which describe the methodology for estimating the supply potential in detail (Fearneough et al., 2018; Schneider et al., 2017b). The model uses information on projects and their issuance from publicly available databases, combined with survey information on CDM projects' status and prospects from Warnecke et al. (2015a) to estimate a realistic potential supply of CERs for registered CDM projects.

In order to assess the extent to which this supply potential is reduced by demand from credit purchase facilities we add to the model information collected for these facilities on their demand for CERs, using information extracted from the websites of the credit purchase facilities, or from interviews with programme representatives. For most of the facilities that we analyse we were able to identify project level information on the number of CERs purchased, or expected to be purchased in the future, corresponding to emission reductions in the period 2013–2020. For the PAF and the Climate Cent Foundation, we were only able to identify demand for CERs according to the project type (e.g. wind energy, energy efficiency, methane avoidance, nitric acid, etc.). This information allows us to estimate the demand for CERs from each credit purchase facility and to determine the type of projects that the CERs are purchased from as well as the vulnerability of the projects to discontinuing GHG abatement. For the latter, we use our assessment of project vulnerability within the supply potential from the authors' previous analysis (Warnecke et al., 2017). In the cases that we only know the demand for CERs at the project type level, we apply the categorisation of vulnerability that most closely represents all projects of that type amongst registered CDM projects.

Within the model we then estimate, for each project type and categorisation of project vulnerability the absolute quantity of CERs demanded by credit purchase facilities and the share of this demand relative to the potential supply of CERs, calculated in previous studies. From this, we also derive the remaining supply potential of CERs from projects with variable and high vulnerability to discontinuing GHG abatement. This allows us to determine the additional potential for credit purchase facilities, or other sources of demand, to drive further emission reductions from existing projects that are unlikely to occur in the absence of additional demand.

Procurement across the facilities we analyse has been carried out at different points in time and from projects at different stages of their development. For example, some facilities directly supported the registration of a number of projects. Providing support at this early stage, along with guarantees to purchase the CERs generated by the projects, likely created the necessary conditions for these projects to be developed. Such support is therefore targeted at promoting new projects, which by definition would not have been vulnerable at the time a procurement contract was offered. In contrast other facilities provide support to existing projects, many or all of which had been physically implemented prior to receiving support. These existing projects could have been vulnerable to discontinuing their GHG abatement activities; and this is what we measure in this study.

Our analysis of the breakdown of the supply potential into projects with low, variable and high vulnerability to discontinuing GHG abatement activities is based on analysis of a sample of registered projects (Schneider et al., 2017a). Although the conditions of individual project types may deviate from the usual situation of their project types, our approach provides robust estimates of the potential supply from projects types at the aggregated level classified with different degrees of vulnerability. This means that, for each of the facilities, our estimates of the extent to which they have procured CERs from vulnerable projects may be less accurate in the case that long-term support was agreed from the inception of the project. However, this does not affect the validity of our aggregate-level estimates of the remaining supply potential from projects with different classifications of vulnerability.

It should be noted that the assessment of the impact of credit purchase facilities on vulnerable projects is a specific research question of this paper, and does not necessarily relate to the specific objectives of the individual credit purchase facilities. As such, it is noted that the assessment of impact for vulnerable projects is not an assessment of the success of the programmes against their own objectives.

The quantitative results in this paper related to CER supply potential and the impact of credit purchase facilities for vulnerable projects are approximate estimates. These figures are the direct output of the databases developed under this research project and based on the authors' definition of project vulnerability.

## 3 Impact of credit purchase facilities for vulnerable projects

### 3.1 Overview of credit purchase facilities

Credit purchase facilities have been established by multilateral and national initiatives for different objectives. Some facilities were established with the primary purpose of acquiring CERs for compliance with national emission reduction targets under the Kyoto Protocol. Other programmes were established with the primary purpose to provide project or market-related support. This includes both conceptual support for the piloting and further development of market-based approaches, as well as support to protect project activities and market structures in response to the deterioration of market demand. Some credit purchase facilities have been established to address a mixture of these objectives.

The concept of credit purchase facilities dates back to the introduction of the flexibility instruments under the Kyoto Protocol. Credit purchase facilities can be categorised into global multi-donor funds and single-donor purchase facilities. In the former, a third-party intermediary manages the finance provided by public and/or private donors to purchase credits from emission reduction projects. The first global fund – World Bank’s Prototype Carbon Fund – was set up in 2000. The World Bank and particularly the International Finance Corporation – a private sector arm of the World Bank Group – has been an important actor in the administration of credit purchase facilities, managing contributions to these funds from several governments. Other regional development banks and financial institutions have also been active, but the scale of their engagement has reduced in recent years. In addition to global multi-donor funds, some individual countries have also set up purchase programmes. Some of the earliest ones such as the Netherlands CDM Facility, which financed the first registered CDM project, were also managed by multilateral organisations (World Bank, 2010). Other facilities are managed by the countries themselves, either via public agencies – for example, in Norway and Sweden – or the private sector, for example in Switzerland.

We identified the following credit purchase facilities as particularly relevant for supporting emission reduction activity in the 2013–2020 period:

- ▶ The **Norwegian Carbon Credit Procurement Programme** (section 3.2) was authorised by the Norwegian parliament to procure up to 60 million CERs for the 2013–2020 period. The extent to which CERs should be used for compliance purposes has not yet been determined.
- ▶ **Sweden’s International Climate Investment Programme** (section 3.3) was originally mandated to procure up to 40 million CERs for the 2013–2020 period, with CERs intended to be used partially for compliance purposes.
- ▶ **Switzerland’s Climate Cent Foundation** (CCF; section 3.4) is a public-private partnership which expects to procure approximately 20 million CERs for the 2013–2020 period, partially to be used for compliance towards Switzerland’s 2020 Kyoto Protocol target.
- ▶ The **Pilot Auction Facility for Methane and Climate Change Mitigation** (PAF; section 3.5) is operated by the World Bank, with the purpose to support the development of innovative market-based approaches for climate change mitigation projects. The facility has a total capitalisation target of USD 100 million.
- ▶ The **Community Development Carbon Fund** (CDCF; section 3.6) is a public-private partnership-based carbon fund developed by the World Bank to support disadvantaged potential climate change mitigation activities to participate in market-based approaches.
- ▶ The **Carbon Initiative for Development** (Ci-Dev; section 3.7) was launched by the World Bank to support the participation of low-income countries in market-based approaches for climate change mitigation.

Several, but not all, of these national and multinational credit purchase facilities were established with the intention to target vulnerable CDM projects, although comprehensive empirical research on the vulnerability of different project types in different host countries was not available from the literature until recently. Others have had an impact on vulnerable projects despite not explicitly aiming to do so. The six credit purchase facilities are analysed in sections 3.2 to 3.7. These sections give an overview of the different scopes and approaches employed by the credit purchase facilities. We assess their ability to reach existing CDM projects that we categorise as vulnerable to discontinuation and identify their overall impact for vulnerable project types. This assessment is a specific research question of this paper, and does not necessarily relate to the specific objectives of individual programmes. As such, it is noted that the assessment of impact for vulnerable projects is not an assessment of the success of the programmes against their own objectives.

## 3.2 Norwegian Carbon Credit Programme

### Overview of the facility

The Norwegian carbon credit procurement programme is administered through several different funds including the NEFCO Carbon Fund, the Prototype Carbon Fund, the Carbon Partnership Facility, and the Norwegian Carbon Procurement Facility.

The facility was established in 2007, with the primary objective of compliance with Norway's target in the first commitment period of the Kyoto protocol (2008–2012); during this period Norway signed agreements resulting in total acquisition of about 23 million carbon credits, of which the vast majority were used to meet the target of overachieving Norway's unilateral pledge by 10 per cent (Norway Ministry of Climate and Environment, 2016).

For the second commitment period of the Kyoto Protocol (2013–2020), Parliament authorised the procurement of up to 60 million credits explicitly from new projects or projects vulnerable to discontinuation; it has not yet been decided whether and to what extent these credits would be used for compliance with Norway's target under the second commitment period, or to what extent there will be cancellation of credits procured. So far, the facility has procured a total volume of **50 million CERs for the period 2016–2020** (Norway Ministry of Climate and Environment, 2017a).

Under the funds, proposals were invited from prospective CER sellers, without specific price caps. These proposals were assessed individually and selected according to a combination of price and fulfilment of the facility objectives for targeting new and vulnerable projects. The majority of CERs were procured at a price of between EUR 2 and EUR 4 (Norway Ministry of Climate and Environment, 2017b).

## Ability to reach projects vulnerable to discontinuation

The facility has a mandate to procure CERs from new projects, and projects that are vulnerable to suspending operations without further support (Norway Ministry of Climate and Environment, 2017b). All CDM project types are eligible, except for HFC-23 projects, projects reducing nitrous oxide from adipic acid production<sup>2</sup>, and coal-based energy production without carbon capture or storage. Projects from all host countries are eligible, although there is a focus on regions that are underrepresented in Norway's portfolio of climate-related support programmes. Only emission reductions for the period 2016–2020 are eligible.

Despite the broad eligibility, Figure 2 shows that the approach for the selection of successful proposals led to the majority of credit procurement coming from project types assessed in the authors' previous analysis to have variable or typically high vulnerability to discontinuation (Warnecke et al., 2017). The main project type from which credits are procured is landfill gas, which supply 50% of the facility's demand; these project types are considered to have variable vulnerability, depending on specific local conditions. Nitrous oxide projects from nitric acid production account for the majority of Norway's credit acquisition from highly vulnerable projects, whilst cook stove projects also account for a significant portion. A comparatively small amount of demand is supplied by renewable energy projects (1.4 million CERs), and other projects which may generally have lower vulnerability to discontinuation.

From this procurement volume, the majority (approximately 80%) comes from projects with a start date in or before 2012, whilst for the remainder the facility has played a role to support the start of new projects.

The modalities for project selection and CER acquisition present no major further barriers for vulnerable projects aside from the awareness of the facility amongst these projects and their ability to develop a proposal. These projects, due to their typically smaller size and typically more limited capacities, are more likely to be disconnected from international market developments and are less likely to have the resources and capacities available for the development of proposals. Our interviews with administrators of the facility indicated that the facility administrators experienced difficulties and expense in identifying and reaching out to vulnerable projects.

### Summary of impact for vulnerable project types

The Norwegian facility is the largest in terms of CER demand volume of the facilities included in the analysis in this paper. It is likely to have had a highly significant impact on supporting vulnerable projects, due to the approach to individually assess proposals with an explicit aim to target new or vulnerable projects, and due to the relatively low barriers for accessibility to the facility. In addition, a small proportion of the programme support was dedicated to supporting the development of new projects. Although a small proportion of procurement came from project types that typically have a low vulnerability, this aggregated assessment does not necessarily reflect the situation for every individual project within the project type, so the facility's approach to assessing projects individually may even have led to the entire volume of procurement being used to support vulnerable projects, or it can be that the facilities own determination of project type vulnerability differs from the classification used in this analysis.

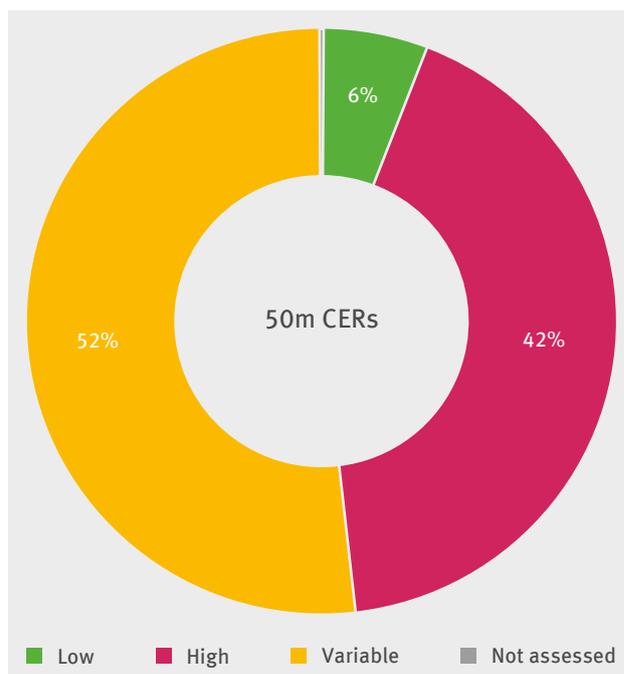


Figure 2: Vulnerability of project types covered by the Norwegian facility; % coverage of total procurement

<sup>2</sup> Projects reducing nitrous oxide from adipic acid production employ different technologies from those reducing nitrous oxide from nitric acid production, and have different conditions; adipic acid projects are excluded from several purchase facilities

### 3.3 Sweden's International Climate Investment Programme

#### Overview of the facility

The Swedish facility focuses both on direct participation in individual projects and on participation in multi-lateral funds. Sweden has bilateral agreements of projects in 29 countries. In addition, it is participating in 9 multilateral funds (Government of Sweden, 2017).

The bilateral project portfolio of the Swedish facility dates back to 2002. The program has a specific objective to further develop the flexible mechanisms to help lay the foundation for continued and expanded international climate cooperation, achieve cost-effective greenhouse gas reductions and contribute to sustainable development in the host countries of the projects.

The Swedish facility was originally mandated to procure up to 40 million CERs, partly for Sweden's national target for 2020 under the Kyoto Protocol (i.e. 40% reduction below 1990 levels) (SEA, 2018), although procurement has been arranged for a total volume of only 17 million CERs for the period 2013–2020, with no plans to for further CER procurement currently.

For direct bilateral agreements, proposals were invited from prospective CER sellers, and assessed individually based on a variety of considerations including the price and perceived quality of the proposal. The setting of the CER price varied by project type and vintage, based on an assessment of multiple proposals to determine price brackets considered to be fair.

#### Ability to reach projects vulnerable to discontinuation

While CERs were procured from a variety of project types, specific project types were explicitly highlighted as priorities. These project types include renewable energy, energy efficiency and waste management, with a geographical focus on Sub-Saharan Africa and South East Asia, underrepresented developing countries and LDCs (SEA, 2018).

Figure 3 shows that approximately one third of credit acquisition from the Swedish facility is from projects types that were classified to have typically high vulnerability in the authors' previous analysis (Warnecke et al., 2017), while over a half of demand is supplied from project types assessed to have typically low vulnerability. The majority (approximately 75%) comes from projects with a start date in or before 2012, whilst the remaining 25% are from newer projects, indicating that the facility has also played a role in supporting the development of some new projects.

The high proportion of demand from project types that generally have low vulnerability is mostly owing to the relatively large share of acquisition from wind and hydro renewable energy projects. The majority of Sweden's acquisition from project types with generally high vulnerability is from cook stove energy efficiency projects.

As in the Norwegian facility, the modalities for project selection and CER acquisition present no major barriers for vulnerable projects aside from the awareness of the facility amongst these projects and their ability to develop a proposal. The previous analysis from the authors' on the vulnerability of CDM projects (Warnecke et al., 2017) also showed that the specific barriers for the continuation of vulnerable energy efficiency and renewable energy (biomass) projects could be overcome by this type of support, without necessarily requiring complementary measures.

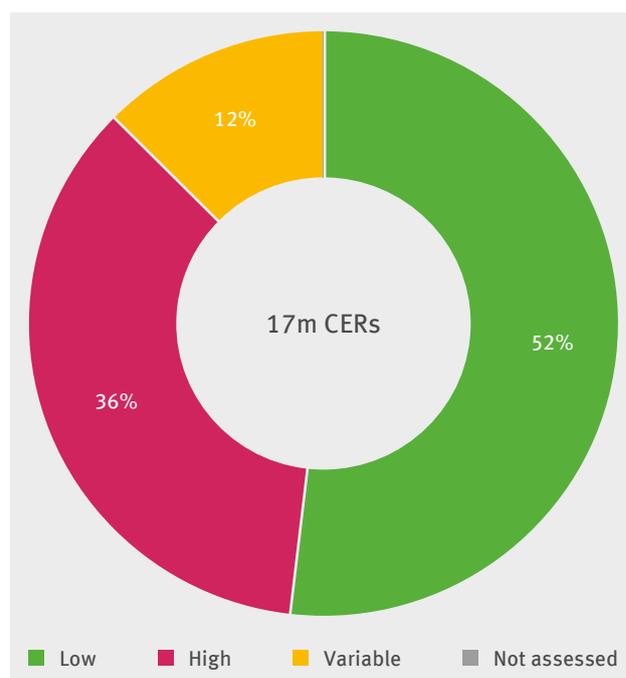


Figure 3: Vulnerability of project types covered by the Swedish facility; % coverage of total procurement

## Summary of impact for vulnerable project types

The Swedish facility, which is the second largest of the facilities assessed in this paper with regards to demand volume in the period 2013–2020, is likely to have had a moderate impact on supporting vulnerable projects. Some of the project types targeted, such as energy efficient cook stoves in particular, have typically high vulnerability and the authors' previous analysis found that purchase facilities can be a suitable channel to overcome the specific barriers of these projects (Warnecke et al., 2017). However, renewable energy projects with typically low vulnerability also account for a high proportion of the portfolio.

## 3.4 Switzerland's Climate Cent Foundation

### Overview of the facility

The Climate Cent Foundation (CCF) is public-private partnership established by four Swiss industry associations. The foundation invests in emission reduction projects abroad, with the CERs transferred to the Swiss Confederation for fulfilment of Switzerland's Kyoto Protocol targets. The CCF was established in 2005 and was funded by a charge of 1.5 cent per litre levied on petrol and diesel imports in the years between 2006 to 2012 (Climate Cent Foundation, 2018a). In addition to CER procurement, part of the CCF funds are used for pilot activities under Article 6 of the Paris Agreement (Climate Cent Foundation, 2018b).

Between 2005 and 2012, over 16 million CERs from registered CDM projects were procured by CCF and transferred to the Swiss Confederation. For the 2013–2020 period, the CCF expects to procure approximately 20 million CERs, with approximately 13 million already having been procured by 2017; in April 2014, the Swiss Federal Council estimated the need for at least 12 million of these CERs over the period 2013 to 2020 to meet their 2020 emission reduction target under the Kyoto Protocol (Climate Cent Foundation, 2018c).

### Ability to reach projects vulnerable to discontinuation

The CCF notes that it sought to procure at least 12 million CERs for the 2013–2020 period as quickly and cost efficiently as possible (Climate Cent Foundation, 2018c). As such, the majority of CER acquisition has come from low-cost renewable energy projects, particularly wind energy in China; the average price paid by CCF for CER procurement for the 2013–2020 period is about EUR 0.50 per CER (Climate Cent Foundation, 2018c). Reflecting this, Figure 4 shows that approximately 62% of the total procurement of approximately 20 million CERs for the 2013–2020 period, is from project types classified by the authors' previous analysis to have typically low vulnerability to discontinuation of mitigation activities (Warnecke et al., 2017).

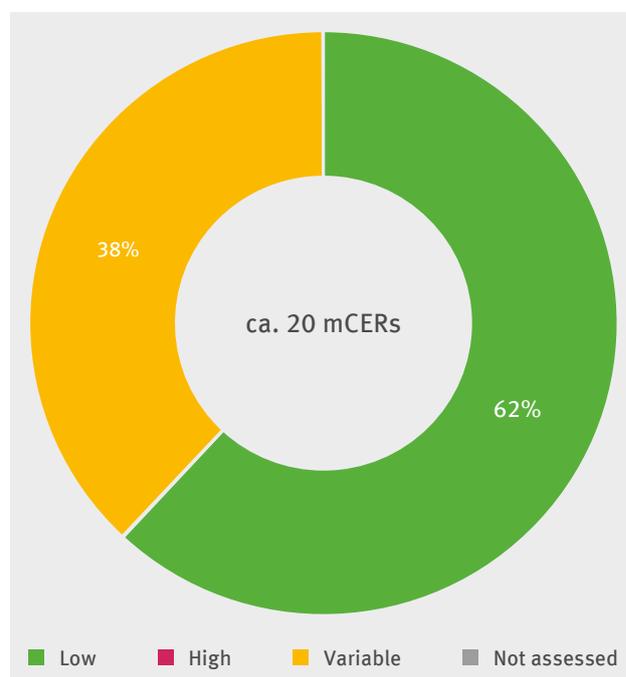


Figure 4: Vulnerability of project types covered by the CCF; % coverage of total procurement

However, the CCF has also sought to engage in support activities for some project types in specific countries where there is perceived to be a higher degree of vulnerability. Whilst it is not stated as an objective of the CCF, it appears that there is a portion of the acquisition which is aimed more directly at new or vulnerable project types. The CCF state, for example, that some of the 2.5 million CERs acquired come from landfill gas projects in Latin America that are at risk shut down or have already shut down due to low market prices (Climate Cent Foundation, 2018d). The authors' previous analysis found the vulnerability of these projects to be variable according to specific national and local circumstances (Warnecke et al., 2017). Other projects supported include small scale microfinancing for renewable energy and energy efficient cook stoves in India and small-scale projects for drinking water treatment in Malawi, Kenya and Uganda.

For the majority of the procurement volume, projects were selected for CER acquisition through a tender process. The tender process may represent a minor barrier for vulnerable projects due to the lower likelihood of these projects to be aware of such opportunities and develop a proposal. A more significant barrier for vulnerable projects is that the tender process was mandated to acquire CERs quickly and cost-effectively; projects with low vulnerability to discontinuation are more likely to be able to supply CERs quickly or cost-effectively than projects that are more vulnerable to discontinuation.

### **Summary of impact for vulnerable project types**

The Climate Cent Foundation has mostly resulted in the procurement of credits from projects with low vulnerability, since no eligibility restriction was placed on CERs for the majority of the procurement volume and the most vulnerable projects will not have been able to compete projects such as wind energy projects in China, which account for a large proportion of the portfolio. However, the most recent activities of the CCF appear to have placed a greater emphasis on the selection of small-scale and innovative projects, some of which are reportedly known to have been vulnerable to discontinuation.

## 3.5 Pilot Auction Facility

The Pilot Auction Facility (PAF) is operated by the World Bank and backed by Germany, Sweden, Switzerland and the United States, with an initially intended capitalisation target of USD 100 million. The PAF is notable for its unique approach for GHG offset credit acquisition, through a mix of auction-based approaches and use of price guarantees for independently verified results, which have been trialled with an aim to develop and share experiences and lessons learnt for replication. The World Bank has held three auctions so far – in July 2015, May 2016 and January 2017. Since the features and implications of the auction rounds vary significantly, these rounds are looked at separately: section 3.5.1 addresses the first and second auctions of the PAF, while 3.5.2 looks at the third auction.

### 3.5.1 First and second auctions

#### Overview of the facility

The key objective of the first and second auction rounds of the PAF, in July 2015 and May 2016, was to demonstrate a new pay-for-performance mechanism to incentivize investment in methane avoidance projects, specifically, noting that approximately 1,200 methane avoidance projects worldwide were either dormant or not fulfilling their full abatement potential (Methane Finance Group, 2018; NERA, 2017).

The objectives of the PAF's first and second auction round were to demonstrate a potentially replicable finance mechanism for methane avoidance projects, on the understanding that many methane avoidance projects are vulnerable to discontinuation; previous research from the authors (Warnecke et al., 2017) shows that many methane avoidance have high vulnerability to discontinuation, but that the vulnerability of this project type group is highly variable depending on the specific project sub-type and local circumstances.

The first auction period made available a total of USD 25 million for CER procurement, with USD 20 million available for the second auction.

Put options – an instrument which gives the holder a right, but not an obligation to sell CERs at a fixed price in the future – were sold for 8.69 million CERs for the 2016–2020 period, in the first auction, and for 5.7 million CERs for the 2017–2020 period, in the second auction (NERA, 2017; PAF, 2016). As such, the PAF auction are selling a price guarantee, which acts as an insurance for the market price of CERs, up to the value of the strike price.

The PAF allocates support via an auction process, where the price per CER is continually decreased through rounds of bidding to the level that maximises the total number of CERs that could be purchased – if all put options are exercised – for the available budget. Different iterations of the process were trialled in the first two auctions. The following process and modalities were trialled in the first auction in July 2015:

- ▶ A reverse auction system was used to determine the price paid by the PAF for CERs. Projects bid for the option to sell their CERs; the final auction clearing price of USD 2.40 per CER was determined by this competitive bidding process.
- ▶ Winning bids had to pay a total of USD 0.30 per CER to purchase “put options”, which guarantee the right to sell CERs issued during the 2016–2020 period. These put options are transferable.
- ▶ Bidders were required to pay a deposit equivalent to USD 0.06 per CER in order to participate in the bidding process.
- ▶ A minimum bid value of 100,000 CERs was set, with a maximum of 2 million CERs.

For the second auction in May 2016, these modalities were adjusted as follows:

- ▶ In a reversal of the approach in the first auction round, a final strike price of USD 3.50 was set, with bidders competing in a forward auction to determine the price of the put options, which was settled at USD 1.41. The bid deposit remained equivalent to USD 0.06 per CER.
- ▶ A minimum bid value of 200,000 CERs was set, with a maximum of 2.5 million CERs.

### Ability to reach projects vulnerable to discontinuation

This section assesses the extent to which the Pilot Auction Facility has supported projects from project types that are defined by the authors as vulnerable to discontinuation. This assessment is a specific research question of this paper, and does not relate to the published objectives of the Pilot Auction Facility. As such this is not an assessment of the success of the programme against its own objectives.

The first and second auctions of the PAF focused on supporting projects that cut methane emissions at landfill, animal waste, and wastewater sites.

Our analysis, represented in Figure 5, finds that more than two thirds of the CER procurement went to project types classified by the authors' previous analysis (Warnecke et al., 2017) to have variable vulnerability, since much of the procurement went to sub-types of methane avoidance projects where the vulnerability is largely dependent on local circumstances<sup>3</sup>, whilst only a small fraction went to project types assessed to have typically high vulnerability. This may be a reflection of eligibility features: firstly, projects from 133 host countries were eligible, although the vulnerability of methane avoidance and landfill gas projects varies considerably between countries (Warnecke et al., 2017); secondly, projects focused primarily on comparably less vulnerable mitigation activities were also eligible as long as they used at least one of the pre-set methodologies related to methane avoidance projects, which were allowed in combination with any other methodologies; thirdly, eligible methodologies included those for large-scale projects, although Warnecke et al. (2017) found that the vulnerability of large scale projects for methane avoidance from manure management and wastewater was considerably lower than for small scale projects.

Although the eligible scope of the PAF first and second auction rounds included project types with variable vulnerability, there are several factors that may have compromised the accessibility of the facility to the genuinely vulnerable projects, within these project types:

- ▶ The rules related to the price of the put option, the minimum bid price and the deposit payment made the facility inaccessible to prospective bidders who did not have significant resources available for investment: purchasing put options for only the minimum bid quantity would require an upfront investment of USD 30,000 in the first auction, and USD 282,000 in the second auction, with a minimum USD 6,000 deposit at the point of bidding.

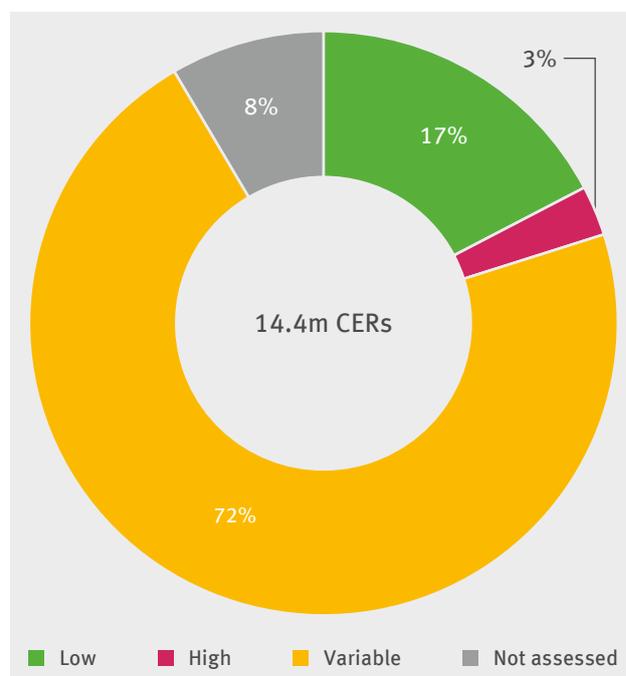


Figure 5: Vulnerability of project types covered by the first and second auctions of the Pilot Auction Facility; % coverage of total procurement

<sup>3</sup> For example, the vulnerability of commercial livestock manure management projects depends very much on local regulations for feeding excess electricity generated back into the grid, and the capacities of local farm owners to continue operating equipment in the case that third-party CDM project owners cease to operate; the situation for palm oil solid waste composting projects is entirely dependent on the state of local markets and competing uses for palm oil solid waste locally (Warnecke et al., 2017).

- ▶ After the price of the put option is taken from the auction clearing price, the effective level of support provided by the auction is USD 2.10 per CER in the first auction and USD 2.09 per CER in the second auction. The CER supply curve analysis in Fearnough et al. (2018) indicates that it is unlikely to be able to address vulnerable projects at this price level.
- ▶ The minimum bid quantities were considerably higher than the maximum potential issuance from the most vulnerable projects: for example, amongst commercial manure management projects in Brazil and Mexico, found by Warnecke et al. (2017) to have particularly high vulnerability, our analysis shows that fewer than 3% of these 158 projects have the ability to issue more than 100,000 CERs in the 2016–2020 period, considering the current operational status of their mitigation activities and monitoring equipment. The minimum allocations could be sliced down to smaller allocations at a later stage in the case that bidders would bid on behalf of multiple projects, but this approach assumes that projects are connected with potential third-party bidders and the increased transaction costs would further reduce the price received.
- ▶ Administrators of the PAF noted that some smaller-scale projects may have lacked capacity to participate in the PAF due to the complexity of the financial mechanism, and the lack of local language guidance documents.
- ▶ The analysis from Warnecke et al. (2017) on the vulnerability of CDM projects showed that the specific barriers facing some methane avoidance projects could not be rectified by enhanced CER demand alone, in the current situation, and that other measures are required to support their continuation. For methane avoidance projects specifically, where many of the most vulnerable projects have already ceased operations due to the closure of business operations from third party project owners, projects that are ready to respond to such enhanced CER demand – such as from credit purchase facilities – are less likely to face these barriers that typically make methane avoidance projects most vulnerable.

The restricted accessibility of the PAF may be reflected in the fact that bids were received from only 28 bidders, despite the large number of projects within the eligible scope. These bidders may include intermediaries that work with multiple projects, but even in this case the most vulnerable projects are unlikely to be included as they are least likely to remain in contact with intermediaries and are also less likely to be able to operate with the lower price level after a share is taken by the intermediary.

### 3.5.2 Third auction

#### Overview of the facility

For the third auction round of the PAF, in January 2017, the focus was shifted to supporting projects that abate nitrous oxide emissions from nitric acid production. The major objective of the facility remained to demonstrate the PAF approach as a new, cost-effective climate finance mechanism for incentivizing private sector investment in climate change mitigation in developing countries.

The third auction period had available a total of USD 13 million in finance for CER procurement. Put options were sold for 6.2 million CERs, for the 2017–2020 period (PAF, 2017).

The third auction returned to the auction approach from the first auction round, which the World Bank determined to be a more suitable approach for ensuring participation and a greater quantity of emission reduction procurement (NERA, 2017):

- ▶ A reverse auction system was used to determine the price of procured CERs; the final auction clearing price of USD 2.10 per CER was determined by this competitive bidding process.
- ▶ Winning bids would have to pay a total of USD 0.30 per CER to purchase “put options”, which guarantee the right to sell those CERs to the PAF if issuance is successfully achieved during the 2017–2020 period. These put options are transferable.
- ▶ Bidders were required to put down a deposit of 20% of the put option price at the time of bidding.
- ▶ A minimum bid value of 100,000 CERs was set, with a maximum of 2 million CERs.

## Ability to reach projects vulnerable to discontinuation

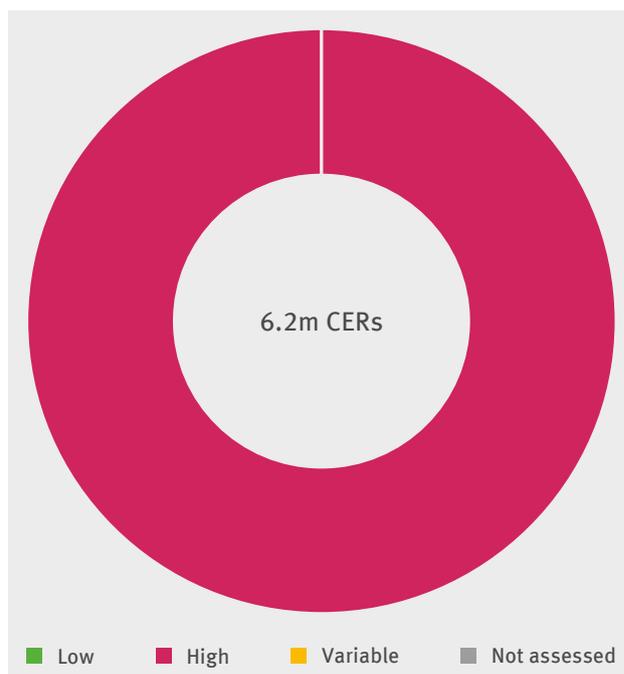
Eligibility for the third auction was restricted to four methodologies for nitrous oxide destruction in nitric acid and caprolactam production plants. Projects related to nitrous oxide from adipic acid production were excluded. Figure 6 shows that through this narrow scope definition, the entire volume of credit procurement went to project types with high vulnerability, since projects for nitrous oxide destruction in nitric acid and caprolactam production plants were found in the authors' previous analysis (Warnecke et al., 2017) to be vulnerable to discontinuation without support in all countries: these projects incur significant costs for the replacement of catalysts or the procurement of fuel for thermal abatement, whilst the abatement activity does not generate any financial benefits.

Another difference between the third auction and the previous auctions, is that for projects with multiple methodologies, all of them must be included in the four eligible methodologies. As such, projects that would be able to generate CERs from other activities outside of the target scope would not be eligible and the auction was restricted to activities in the specifically targeted sector.

Although the modalities of credit acquisition were assessed to result in limited accessibility for vulnerable projects in the first auction round, these issues are less pronounced for nitrous oxide destruction projects, where there is less reason to assume that accessibility was limited for the most vulnerable projects:

- ▶ The typical size of these mitigation projects, the economic operations that they are attached to and the organisations that own them is far larger than for the average methane avoidance projects. It is more reasonable to expect that projects, including those that are vulnerable to discontinuing the mitigation activity, have the resources available to invest in the bid deposit and the put options.
- ▶ The analysis from the authors' previous analysis on the vulnerability of CDM projects (Warnecke et al., 2017) showed that the specific barriers for the continuation of nitrous oxide destruction projects could be overcome by enhanced CER demand, such as through credit purchase facilities, without necessarily requiring complementary measures.

The relatively good accessibility of the facility for the third auction period is demonstrated in the fact that bids were received from at least half of all eligible projects.



**Figure 6:** Vulnerability of project types covered by the third auction of the Pilot Auction Facility; % coverage of total procurement

### 3.5.3 Summary of impact for vulnerable project types from all auction rounds

This section assesses the extent to which the Pilot Auction Facility has supported projects from project types that are defined by the authors as vulnerable to discontinuation. This assessment is a specific research question of this paper, and do not relate to the published objectives of the Pilot Auction Facility. As such this is not an assessment of the success of the programme against its own objectives.

Overall, the outcomes of the Pilot Auction Facility for its impact on vulnerable projects varied between the auction rounds:

- ▶ The first and second auction rounds (full details in section 3.5.1) appears to have mostly achieved the PAF's primary objective of demonstrating a new financial mechanism for supporting methane avoidance projects, but the modalities of these auction rounds mean that it is unlikely to have had a significant impact in supporting the projects most vulnerable for discontinuation. The project types targeted are characterised by high variability in the actual vulnerability of individual projects, and it is likely that the barriers to accessibility were far more possible to overcome for projects with low discontinuation vulnerability.
- ▶ The third auction round (full details in section 3.5.2), with the focus shifted from methane avoidance to nitrous oxide destruction projects, is likely to have had a highly significant impact in supporting projects most vulnerable for discontinuation.

## 3.6 Community Development Carbon Fund (CDCF)

### Overview of the facility

The CDCF is a public-private partnership-based carbon fund developed by the World Bank, managing resources from 24 private and public entities. CDCF purchases emission reductions from CDM projects that support communities in LDCs and other developing countries. The CDCF was established with three main objectives (Ecofys and World Bank, 2017):

- ▶ Delivering emission reductions with community co-benefits. The CDCF aims to purchase and facilitate the generation of emission reductions from small-scale CDM projects which reduce poverty and improve the well-being of local communities through sustainable development co-benefits.
- ▶ Working with priority countries. The CDCF targets LDCs and those eligible for World Bank International Development Association (IDA) loans. It helps to build local capacity to implement emission reducing projects and access carbon finance in regions that would otherwise be largely excluded.
- ▶ Focusing on small-scale projects. The CDCF contributes to the development of new methodologies and approaches for small CDM projects to expand the geographical reach of CDM projects.

CDCF does not set a specific volume of credits to be procured; according to our analysis, the total supply potential of the projects supported in the 2013–2020 period would be in the range of up to 11 million CERs, if all supported projects would continue to supply credits to their maximum potential.

The CDCF supports projects by entering into an ERPA to purchase CERs at a fixed price and also by providing technical assistance and capacity building for the development of projects. Projects that fulfil the facility's objectives are hand selected.

## Ability to reach projects vulnerable to discontinuation

The CDCF targets small-scale projects from Least Developed Countries (LDCs) (Ecofys and World Bank, 2017). The majority of credit acquisition from the CDCF has come from project types and regions classified by the authors' previous analysis (Warnecke et al., 2017) to have typically lower vulnerability to discontinuation. These are mostly renewable energy power generation projects, in various countries, which were evaluated to have typically low vulnerability to discontinuation.

Figure 7 also shows that some of the credit procurement came from project types for which the vulnerability to discontinuation is particularly variable according to national and local circumstances. In particular, a significant volume of procurement is from methane avoidance projects from commercial livestock manure management in China and Nepal: the vulnerability of these projects is largely dependent on local regulations for feeding excess electricity into the grid, and project-site specific circumstances such as the capacities of the local farms to operate the equipment without support.

That the CDCF does not have a significant impact for vulnerable projects, may be a reflection that the main

objective of the facility and the basis for project selection is the potential impact of projects for community-level development, rather than a focus on the mitigation impact and vulnerability of projects.

The majority of projects supported were started in or before 2012, although the programme has combined the provision of support for existing activities with the provision of support for new project development.

### Summary of impact for vulnerable project types

Due to its extensive coverage of renewable energy projects, the CDCF may have a relatively limited impact on supply from vulnerable project types, although the focus on small scale projects and the provision of technical assistance and capacity building may help the facility to reach projects within these generally non-vulnerable types that do still require assistance to overcome barriers for continuation.

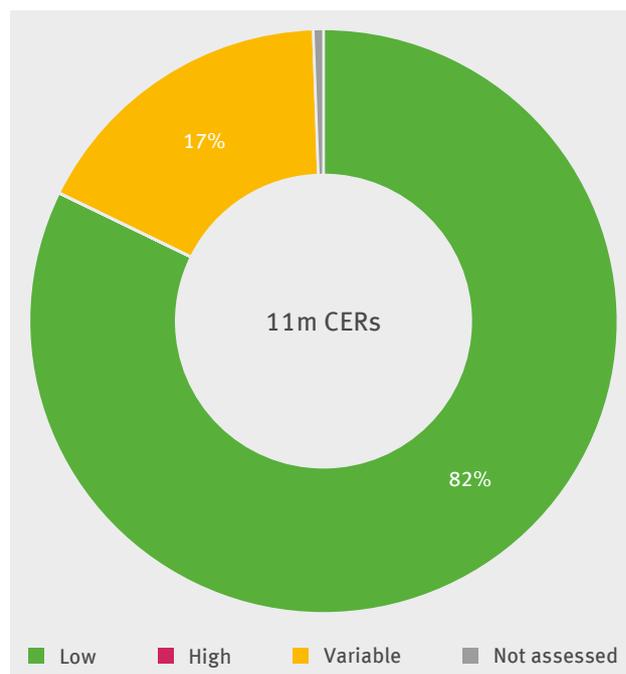


Figure 7: Vulnerability of project types covered by the CDCF facility; % coverage of total procurement

### 3.7 Carbon Initiative for Development (Ci-Dev)

#### Overview of the facility

The Carbon Initiative for Development (Ci-Dev) was launched in December 2011 by the World Bank to build capacity and develop tools and methodologies to assist low-income countries in accessing carbon finance, mainly in the area of energy access. The objectives of Ci-Dev are (Ci-Dev, 2015; World Bank, 2015):

- ▶ To demonstrate that performance-based payments for the purchase of CERs can lead to a successful and viable business model that promotes increased private sector participation and share lessons for replication.
- ▶ To influence future carbon market mechanisms so that low income countries, and especially least developed ones, receive a greater and fairer share of carbon finance, resulting in high development benefits that avoid carbon emissions.
- ▶ To support low income countries in developing standardized baselines and establishing “suppressed demand” accounting standards in key areas such as rural electrification, household energy access and energy efficiency.
- ▶ To contribute proposals to further improve and extend the scope of the CDM for use by LDCs, in particular for POAs.

We estimate the total potential CER acquisition of Ci-Dev in the period of 2016–2024 to be 6.4 million CERs. ERPA have been signed so far for 10 projects, and two are in the pipeline.

Ci-Dev CER acquisition is through a carbon fund that signs ERPA with project developers for a negotiated carbon price. In addition, Ci-Dev includes a Readiness Fund. The Readiness Fund finances capacity building activities to develop standardized baselines and technical assistance for energy access programs. It supports the development of new methodologies and proposals for simplified CDM rules, and dissemination of results. Where needed, it also provides technical assistance to the projects and programs supported by the Carbon Fund.

#### Ability to reach projects vulnerable to discontinuation

Only energy access projects from LDCs are eligible for Ci-Dev funding. The majority of the CER procurement from the Ci-Dev facility is from new project activities, with a registration date after 2016. As such, since these projects were not existing before the facility’s support it is not relevant to assess the discontinuation vulnerability of these new projects that are supported. Of the support that is provided to existing projects, the majority of this support flows to project types with high or variably vulnerability. These include energy efficient cook stoves which were assessed to be highly vulnerable to discontinuation in all countries, and projects for biomass energy and methane avoidance, where the vulnerability of projects is largely dependent on national and local circumstances. Part of the procurement flows to project types classified by the authors’ previous analysis to have typically low vulnerability (Warnecke et al., 2017), although in this case these projects may be exceptions to this general classification, since the facility focuses on projects for rural electrification in LDCs which likely have a higher vulnerability than other renewable energy projects.

There are no major barriers to the accessibility of the facility for vulnerable projects; rather, the construct to combine the carbon fund with a readiness fund greatly improves the accessibility of the facility to projects that might require assistance beyond enhanced CER demand, such as for capacity building and proposal development.

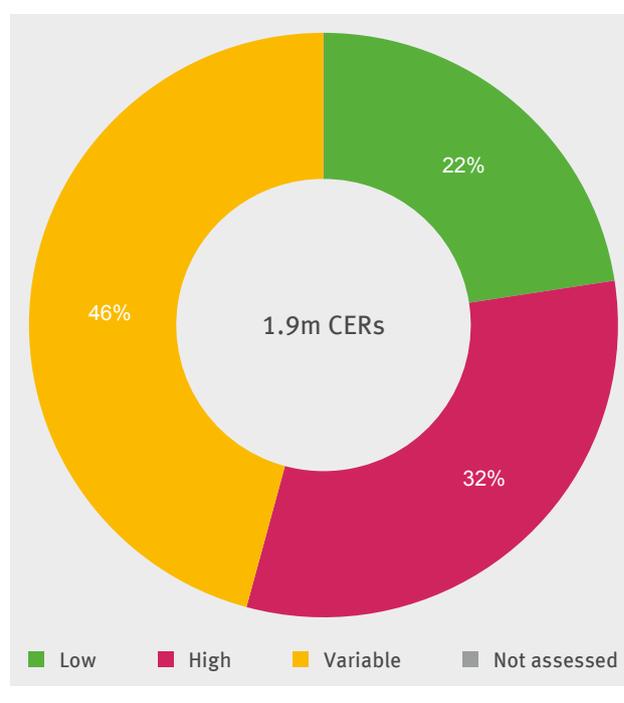


Figure 8: Vulnerability of project types covered by the Ci-Dev facility; % coverage of total procurement

## Summary of impact for vulnerable project types

The facility has only a small volume of demand available to support existing CDM projects but through its careful selection procedure and the activities under the readiness fund, it is likely to be able to target vulnerable projects, even within project types that have variable or typically low vulnerability. The majority of support from the facility comes in support for the development of new projects.

### 3.8 Summary of credit purchase facilities

Table 1 presents a summary of the findings from the credit purchase facilities analysed in sections 3.2 to 3.7. The table shows that the impact of purchase facilities for vulnerable projects varies significantly, between facilities that address exclusively projects from highly vulnerable project types to facilities where highly vulnerable project types are not at all represented. This assessment is a specific research question of this paper, and does not necessarily relate to the specific objectives of individual programmes. As such, it is noted that the assessment of impact for vulnerable projects is not an assessment of the success of the programmes against their own objectives.

A key insight is that the coverage of typically vulnerable project types in a facility's portfolio, does not necessarily lead to vulnerable projects being reached, and vice versa, depending on the facilities features and modalities for project select and CER procurement. Regardless of the typical vulnerability of the project types eligible, facilities with features that constitute considerable barriers for accessibility are less likely to reach vulnerable projects, whilst some facilities actively provide technical support and capacity building to projects to support their participation.

N<sub>2</sub>O destruction from nitric acid, methane avoidance, landfill gas and cook stove projects have been quite regularly targeted by these credit purchase facilities, whilst renewable energy projects account for the majority of projects from less vulnerable project types.

Table 1: Overview of impact of credit purchase facilities for vulnerable projects

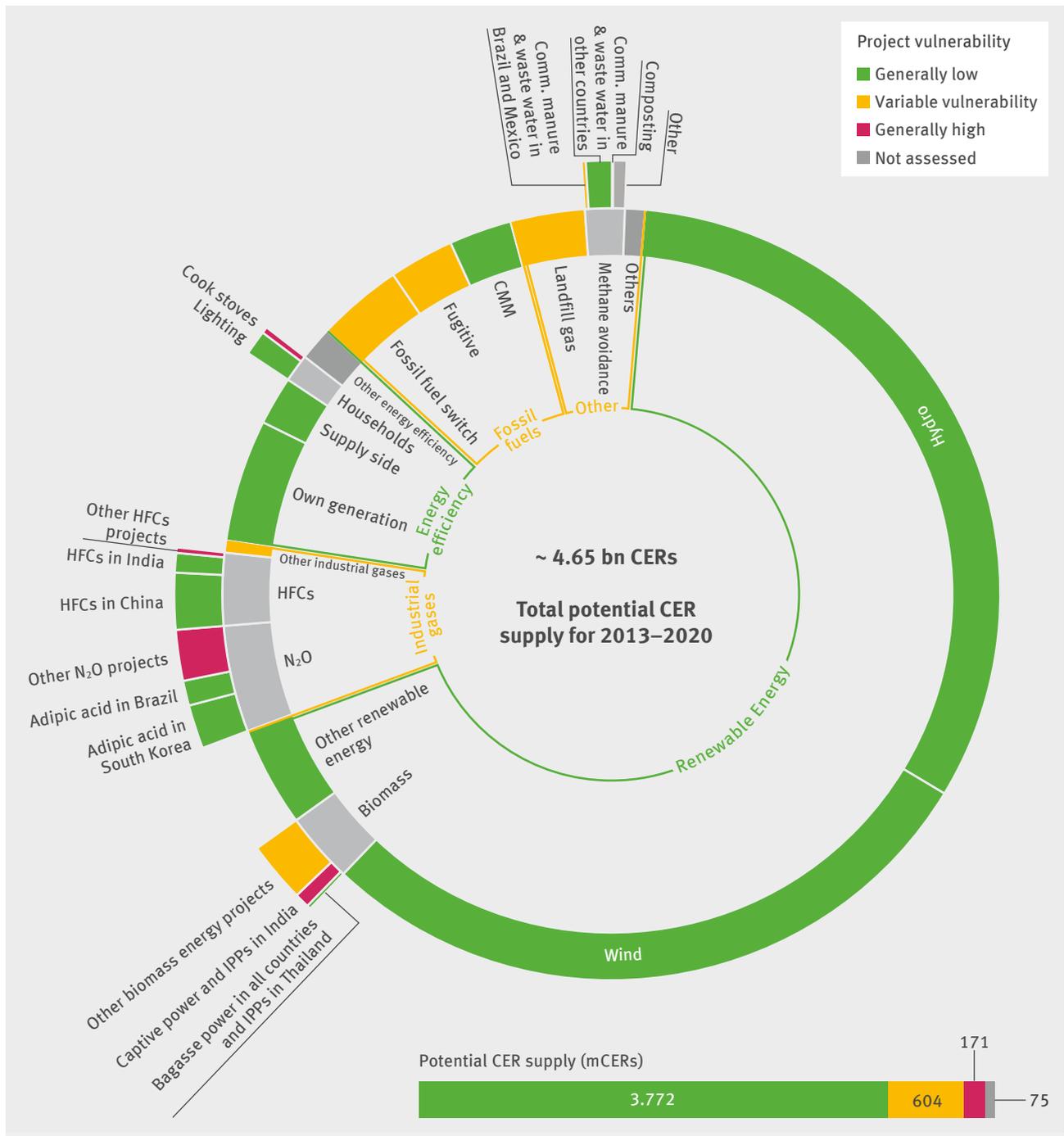
Facility	Credit volume (2013–2020) (mCERs)	Projects targeted	CER procurement modalities and accessibility	Typical vulnerability of project types covered	
				Low ■ Variable ■ High	% high/variable vulnerability
Norway	50	Focus on new and vulnerable projects Significant procurement from N <sub>2</sub> O, cookstove and landfill gas projects	Project proposals assessed individually with no fixed price caps. No significant accessibility disadvantages for vulnerable projects.		94%
Sweden	17	► Variety of project types with focus on LDCs ► Significant procurement from renewable energy and cookstove projects	Project proposals assessed individually with no fixed price caps. No significant accessibility disadvantages for vulnerable projects.		46%
Switzerland	ca. 20	► All projects eligible ► Apparent focus on small scale projects for part of the portfolio ► Exclusively methane avoidance projects	Project proposals assessed individually with no fixed price caps, although a preference for cheaper credits represents an accessibility disadvantage for vulnerable projects.		38%
PAF-1/2	14.4	► Exclusively methane avoidance projects	Expensive put options, bid deposits and high minimum bid amounts represent major accessibility barriers for vulnerable projects. The effective CER price of USD 2.10 is unlikely to be able to support vulnerable projects.		75%
PAF-3	6.2	► Exclusively N <sub>2</sub> O destruction projects from nitric acid production	The put options and bid deposits likely represent less of a barrier for vulnerable N <sub>2</sub> O projects.		100%
CDCF	Up to 11	Small scale projects from LDCs	Project proposals assessed individually and technical assistance available to support vulnerable projects to participate.		78%
Ci-Dev	1.9	Energy access projects in LDCs, including cookstove, biomass energy and methane avoidance projects.	Project proposals assessed individually and a readiness fund available to support vulnerable projects to participate.		17%

Source: Authors' compilation based on analysis in sections 3.2 to 3.9

## 4 Implications of credit purchase facility approaches

### 4.1 Collective impact of facilities for vulnerable projects

Figure 9 provides an overview of potential CER supply from registered projects in the period 2013–2020, according to project types and their vulnerability to discontinuing mitigation action without further support (Schneider et al., 2017b).



based on Schneider et al. (2017b)

Figure 9: Overview of CER supply potential for 2013–2020

The quantitative results in this section related to CER supply potential and the impact of credit purchase facilities for vulnerable projects are approximate estimates. These figures are the direct output of the databases developed under this research project, and based on the authors' definition of project vulnerability. In line with the overall research project, the analysis covers supply and vulnerability of existing projects in the Clean Development Mechanism up to 2020; the supply and vulnerability of other crediting programmes is not assessed in this paper.

Figure 9 shows that credit purchase facilities which seek to procure credits from projects most vulnerable to discontinuation have a relatively limited scope of projects to target. Of the potential 4.65 billion CERs that could be issued for emission reductions in the period 2013–2020, just 171 million CERs come from project types with generally high vulnerability, of which the main project types are biomass energy projects, N<sub>2</sub>O and HFC projects in some countries, and cook stove projects. A further 604 million CERs could be supplied from project types classified as having variable vulnerability, where projects may or may not be vulnerable to discontinuation depending on case-specific circumstances, particularly including projects for fossil fuel switch, fugitive gases, biomass energy and landfill gas.

In general, our analysis shows that most of the credit purchase facilities have had an impact on the most vulnerable project types, to some extent. Figure 10 presents a breakdown of the portfolios of the credit purchase facilities analysed. The total demand of the credit purchase facilities analysed for the 2013–2020 period amounts to approximately 120 million CERs. Approximately two thirds of this procurement comes from project types with high or variable vulnerability. The vulnerability of targeted projects varies between each facility, as assessed in section 3.

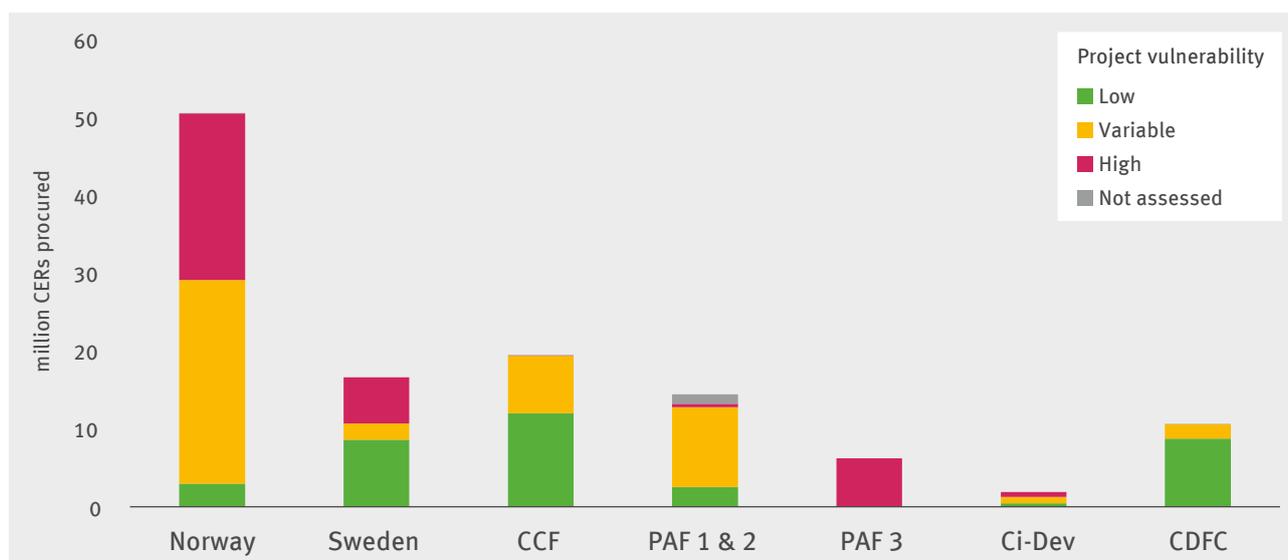


Figure 10: CER procurement from credit purchase facilities for the 2013–2020 period

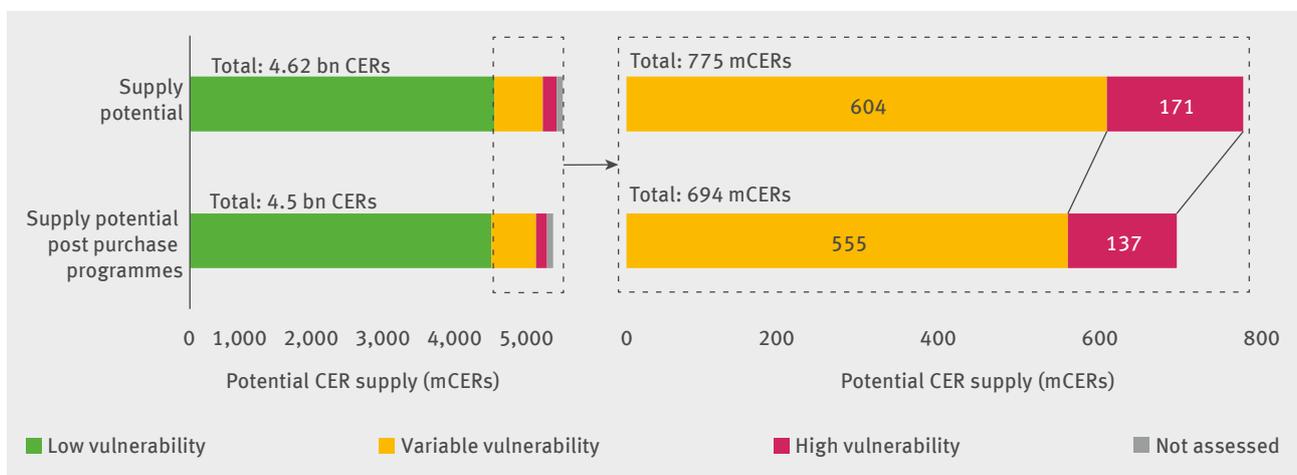
The total impact of the analysed credit purchase facilities for the remaining potential supply of CERs is summarised in Figure 11. While the total impact of the analysed facilities has only a marginal impact on the potential supply in the 2013–2020 period for all project types, the impact on vulnerable project types is much more pronounced:

- ▶ **All project types:** remaining supply potential is reduced by approximately 2.5% from 4.62 to 4.5 bn CERs.
- ▶ **Project types with high and variable vulnerability:** remaining supply potential is reduced by approximately 10% from 775 to 694 mCERs.
- ▶ **Project types with high vulnerability only:** remaining supply potential is reduced by approximately 20% from 171 to 137 mCERs.

This remaining supply potential is difficult to assess; whilst the values above represent a realistic supply potential according to our analysis, there are reasons to believe that the actual potential volume could be lower still:

- ▶ This potential is based on the CER supply potential analysis from an earlier phase of this research project (Schneider et al., 2017a), where the ability of projects to continue abatement and achieve issuance was assessed by the authors based on the status of their mitigation activities and monitoring equipment in 2014 and 2015 (Warnecke et al., 2015a). This potential assumes that projects which were in a position to continue to achieve CER issuance would continue to operate their activities and to monitor emission reductions up to 2020. It is likely that some of the projects considered vulnerable to discontinuation would have permanently or temporarily ceased operation in the time between 2015 and 2018, reducing their potential to supply CERs partially or even to nil.

This remaining supply is likely to be reduced further due to the combined effects of smaller credit purchase facilities not assessed in this report, as well as other support programmes that do not only procure CERs but still target these same project activities: for example, the Nitric Acid Climate Action Group (NACAG) combines both financial and technical support for N<sub>2</sub>O abatement from nitric acid production, including also abatement activities that are registered CDM projects.



Supply from project types with variable and high vulnerability is enlarged to observe the impacts.

Figure 11: Remaining CER supply potential post credit purchase facilities.

## 4.2 Implications for upscaling purchase facilities

Additional or upscaled purchase facilities could continue to extend the impact of the analysed credit purchase facilities and bridge the gap to support the remaining vulnerable projects. The implications presented here are also relevant for offsetting programmes from businesses and government departments, which can also play a significant role to contribute to the continuation of support for vulnerable projects. For example, the offsetting programme for business trips of the German Federal Government scheme accounted for a total volume of approximately 0.8 million CERs between 2014 and 2017, with the explicit objective to support ambitious and high-quality climate protection projects (DEHSt, 2018, 2017).

Figure 12 gives an overview of the credit purchase facilities coverage of 2013–2020 CER supply potential from project types with high and variable vulnerability, showing from which project types credit purchase facilities have procured the most credits and from which project types there remains significant potential for upscaling, to close the gap of remaining potential mitigation action from these projects.

The figure focuses on project types with high and variable vulnerability, since these are the project types that should be targeted to promote emission reductions that would not occur without new demand; in contrast if new demand is targeted at existing projects with low vulnerability to discontinuation, it is unlikely to encourage any further emission reductions. Options for upscaling purchase facilities to address these highly and variably vulnerable project types are assessed in the subsections below.

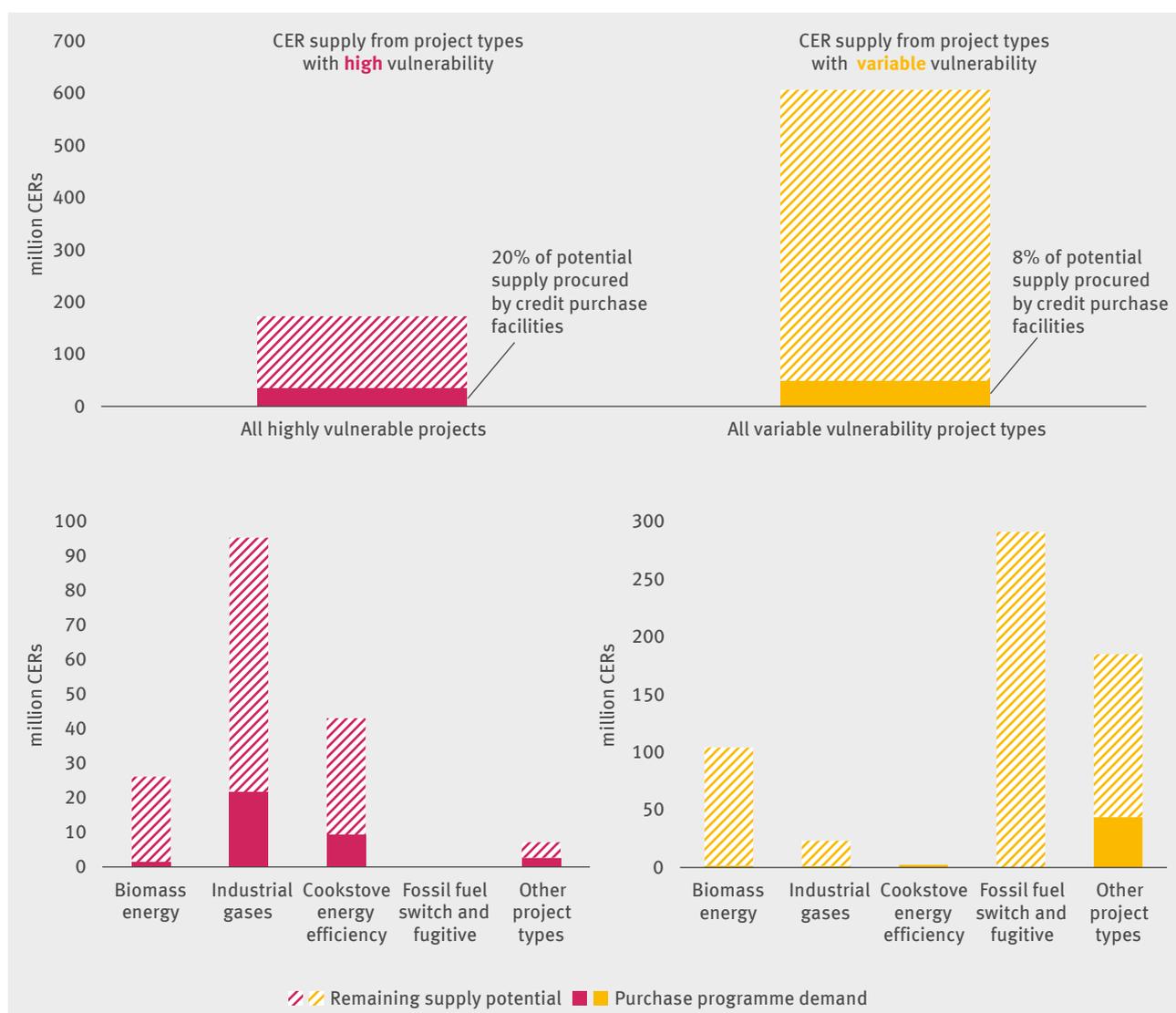


Figure 12: Overview of the 2013–2020 CER supply potential covered by credit purchase facilities

## Bridging the gap for remaining projects from highly vulnerable project types

The credit purchase facilities analysed have a significant impact on highly vulnerable project types, procuring 35 million CERs, or approximately 20% of the total potential supply for emission reductions between 2013–2020 from highly vulnerable projects. **This still leaves approximately 137 million CERs worth of potential mitigation action from highly vulnerable project types which is currently likely to remain unsupported.** This remaining potential supply may actually be lower than this approximate estimate for the following reasons:

- ▶ Some of the highly vulnerable projects may have already irreversibly discontinued their mitigation activities in the time since the status of projects was assessed in 2015, as described in section 4.1.
- ▶ The cumulative effect of smaller credit purchase facilities is not analysed here.
- ▶ There are other sources of demand for CERs which we do not analyse here. These include compliance buying and voluntary cancellation of CERs outside of credit purchase facilities as well as domestic offsetting programmes which accept CERs.

Given that the total demand from the credit purchase facilities analysed for 2013–2020 period amounts to approximately 120 million CERs across all types of CDM projects, these findings indicate that **the potential supply gap from vulnerable projects during the period could be completely bridged if demand from these facilities would be approximately doubled, and if such demand could be targeted exclusively towards high vulnerability project types.** This would need to happen quickly in order to have a significant impact, since, by definition, projects most vulnerable to discontinuation are increasingly likely to have irreversibly discontinued their activities without the prospects of new support.

Figure 12 shows that within the remaining potential supply from highly vulnerable projects, **the largest potential lies in further action to support nitric acid and cookstove projects.** Upscaling action in these areas could be especially attractive and realistic, since these are also the two project types where the credit purchase facilities have the most experience and have procured the most credits, to date. There is also significant remaining CER supply potential from biomass energy projects, many of which have high vulnerability, but have been addressed extensively by most of the major credit purchase facilities; this should be approached cautiously since the authors' previous analysis (Warnecke et al., 2017) found that the climate change mitigation impact from supporting vulnerable biomass projects is not always guaranteed, depending on whether there would be alternative uses of the biomass that would also abate emissions elsewhere.

## Remaining supply potential from projects with variable vulnerability to discontinuation

Beyond the highly vulnerable project types, Figure 12 shows that there also remains a considerable volume of potential mitigation action from project types with variable vulnerability; a significant proportion of this potential mitigation action is likely to be vulnerable to discontinuation without further support, although this depends mostly on project-specific circumstances. A large number of these projects will also have a low level of vulnerability. It is more complex to identify and distinguish between projects with variable vulnerability without further project level analysis. Some of the credit purchase facilities analysed, such as the Norwegian facility, make efforts to do this to the extent possible.

The credit purchase facilities analysed procure approximately 49 million CERs from project types with variable vulnerability in the 2013–2020 period; **this leaves approximately 560 million CERs of further supply potential from project types with variable vulnerability,** as shown in Figure 11. As Figure 12 shows, **the most significant areas of action for this remaining potential are fossil fuel switch, fugitive gases, biomass energy, methane avoidance and landfill gas projects.**

If upscaled credit purchase facilities would address project types with variable vulnerability, but with the objective to support the most vulnerable projects, special modalities for project selection and credit procurement would be required to ensure that the facility is at least equally accessible for the projects which genuinely have higher vulnerability. Projects with lower vulnerability to discontinuation may typically be in a better position to access credit purchase facilities, due to superior resources and connectivity to market players. The analysis of existing credit purchase facilities in section 3 showed that the design features of credit purchase facilities can either worsen or improve this situation for vulnerable projects: the accessibility of facilities to vulnerable projects can be improved by avoiding excessive administrative processes, avoiding requirements for upfront capital investments, through awareness programmes, and through the provision of technical assistance or capacity building to actively support the participation of vulnerable projects.

### 4.3 Implications for future sources of CER demand

Since the remaining potential supply of CER credits from vulnerable project types in the 2013–2020 period represents an emission reduction potential of up to 137 MtCO<sub>2</sub>e, or nearly 694 MtCO<sub>2</sub>e including project types with variable vulnerability, future sources of CER demand including upscaled credit purchase facilities and new offsetting schemes should target CERs from these projects if they want to ensure that their support leads to emission reductions that would not otherwise happen.

The analysis of credit purchase facilities and their support for vulnerable projects however shows that this will be a difficult exercise: even for the credit purchase facilities where supporting vulnerable projects was identified as a key objective and/or eligibility criteria, all of the facilities' CER procurement portfolios include CERs from project types with a typically low vulnerability to discontinuation, and for most of the facilities this volume was at least as large as the amount of procurement for project types with typically high vulnerability. The Norwegian Credit Procurement programme, which appears most successful in supporting vulnerable projects, achieved this at a cost, with programme administrators noting the difficulties faced in identifying and reaching out to vulnerable projects. This is true even for facilities that dedicated resources for awareness raising and technical assistance to improve accessibility participation, such as the CDCF and Ci-Dev facilities.

These experiences suggest that it will be challenging for future sources of CER demand from existing CDM projects to exclusively target vulnerable projects, even with tight eligibility criteria and measures to boost accessibility. Consideration of these experiences is particularly relevant for new offsetting schemes that consider using CER demand from existing CDM projects (such as the Carbon Offsetting and Reduction Scheme for International Aviation (CORSIA) but also including any other national or international policy that allows offset credits for compliance). New demand sources for emission offset credits must lead to either the development of new mitigation activities, or must support the continuation of mitigation activities that would otherwise have high vulnerability to discontinue activities without such support, to ensure environmental integrity – that is, to ensure further emission reductions beyond those which would have happened without further action. If new offsetting schemes are not able to exclusively target new and vulnerable projects, then the environmental integrity of these schemes will be compromised, and these schemes will lead to a net increase in GHG emissions, unless precautions are taken to over-compensate for these impacts.

## 5 Conclusions

### 5.1 Summary of findings

The analysis has shown that credit purchase facilities can have an impact to reduce the potential supply of CERs from existing CDM projects that have a high vulnerability to discontinue mitigation activities, but that there remains a significant potential for further action to build on these efforts. Some conclusions and insights are substantiated by this new information:

#### 1. Credit purchase facilities have often made efforts to support vulnerable projects, and have made a significant impact in this regard

The majority of the credit purchase facilities analysed in this paper make efforts to support projects perceived to be at risk of discontinuation; for some, this is a key objective of the facility.

Whilst the overall scale of CER demand from the credit purchase facilities at 120 m CERs accounts for a comparatively small 2.5% of the total potential volume of CER supply in the 2013–2020 period, the impact has been much more pronounced for project types with a high vulnerability to discontinuation: CER procurement from these project types has amassed to 20% of their total potential supply.

#### 2. Credit purchase facilities could be improved, and replicated or scaled-up to double their demand volume, to enhance their impact

Emission reductions from existing CDM projects of up to 137 MtCO<sub>2</sub> are at risk of not being realised without further support to bridge the gap for the remaining potential credit supply from highly vulnerable projects.

Since the total demand from the credit purchase facilities analysed in the period is 120 million CERS, these efforts would need to be repeated through replication and/or upscaling to double demand and potentially close the remaining gap in support requirements from high vulnerability project types. This would require that new support be targeted at the most vulnerable projects, and with features that support their participation rather than impose accessibility barriers: project types targeted through existing efforts – nitric acid and efficient cookstoves – still represent the greatest remaining potential for upscaling, whilst biomass projects in specific countries remain a relatively untapped and highly significant source for credit purchase facilities.

An enhanced impact on vulnerable projects could also be realised if the design of credit purchase facilities would learn from previous experiences to minimise the accessibility barriers for vulnerable projects. Section 3 identified several design features from credit purchase facilities which would represent barriers to vulnerable projects, and also found examples of credit purchase facilities that were designed in a way to ensure these barriers were minimised or overcome.

#### 3. New sources of CER demand that look to existing CDM projects may find it challenging to exclusively target vulnerable projects

Experiences from the credit purchase facilities show that it has not been possible to exclusively target vulnerable projects, even in the case of significant efforts to restrict project eligibility and improve awareness and accessibility. This is not only an important consideration for future replicated or upscaled purchase facilities, but even more so for other sources of CER demand such as new offsetting schemes, since an inability to exclusively target vulnerable projects would compromise environmental integrity and lead to a net increase in GHG emissions if precautions are not taken to over-compensate for this impact.

## 5.2 Outlook: Developing criteria for effective credit procurement

The development of more specific guidance or criteria for credit procurement would be beneficial for businesses and credit procurement programmes. Despite interest to procure high quality credits, buyers face considerable difficulties in identifying the project activities that carry most certainty regarding the emission reduction and offsetting outcomes in a market situation that is for several years characterised by oversupply. New support provided to existing projects does only under specific circumstances lead to additional emission reductions that would not occur without such support. This paper has shown that even where considerable efforts and expenses are made to identify such projects, challenges have persisted.

However, our findings also indicate that the development of guidance or criteria that can guarantee buyer certainty in the emission reduction impacts of their procurement may not be feasible. The identification of vulnerable projects is highly challenging due to variable conditions of individual project activities, even within project types and countries that are assessed to be typically more vulnerable. There is therefore likely to remain a degree of uncertainty in the climate impact associated with the procurement of credits.

Guidance should seek to raise awareness amongst buyers that certainty regarding the climate impact of purchasing offset credits cannot be guaranteed, and should focus on allowing buyers to make informed decisions on what degree of certainty or uncertainty they can expect from different procurement choices.

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