The market impact of a CDM capacity fund
Contents

1 Introduction .......................................................................................... 9
2 A fund for existing projects ............................................................... 12
3 A fund for new projects ................................................................. 26
4 Consideration in choosing a fund for existing or new projects ...... 38

References ............................................................................................................ 42
Annex: Methodology ........................................................................................... 43

This report was prepared with the financial support of the Secretariat of the United Nations Framework Convention on Climate Change and its Kyoto Protocol (“UNFCCC Secretariat”). The views expressed herein are those of the authors and do not necessarily reflect the views of the United Nations or the UNFCCC Secretariat.
Executive summary

The CDM is in crisis. Registrations of new projects have fallen significantly, prices of credits have fallen to record lows of around €0.30, and there are regular reports of companies, skills and expertise leaving the market. Writing more than six months ago, when prices were considerably higher, the High Level Panel on the CDM Policy Dialogue talked of carbon markets ’collapsing with potentially devastating consequences’.

A number of commentators have recommended the establishment of a fund to support the CDM. The stated advantages of such a fund include:

– to provide an appropriate price to stimulate new mitigation action in developing countries and hence ensure the trust of these countries in market-based mechanisms to promote low-carbon investment;
– to ensure the viability of existing projects – and their emission reductions and sustainable development impacts – that may be threatened by low prices;
– to maintain carbon market infrastructure including, for instance, monitoring, reporting and verification capacity; and
– to protect the progress that the CDM has made towards a global carbon market and steer the future development of this market.

This report analyses the market impact of different designs of a ‘CDM capacity fund’. It is split into three sections:

– a review of the market impact of a fund purchasing credits from existing projects;
– a review of the market impact and the different design options for a fund purchasing credits from new, yet-to-be-developed, projects; and
– an assessment of the factors that would make an existing-project fund or a new-project fund more appropriate.

An existing-project fund

A €500m fund will have a significant impact on the quantity of CERs used, but will do little to increase prices. In the base-case scenario, a fund might allow an additional 1.4–1.7 billion Certified Emission Reductions (CERs) to be used, depending on the level of prior CER demand from the European Union Emissions Trading System (EU ETS), Australia’s carbon pricing mechanism and sovereign demand. However, prices are unlikely to be significantly affected; our analysis suggests prices would remain below €0.4/CER.

A fund of this size would deliver some of the benefits expected, but leave other potential benefits unrealised. The use of a large number of additional CERs will create a continued demand for monitoring, reporting and verification capacity which may otherwise be lost. It may also allow for some projects to continue to operate that would otherwise be unviable, although this effect is likely to be small: the main beneficiaries are likely to be projects that will continue to operate regardless of CER revenues. However, the
modest price changes will not create a strong price signal for new mitigation investment in developing countries, nor help retain project origination capacity.

A larger fund, of around €2.5–€3.0 billion, could boost both CER use and CER prices, if the fund also practised price discrimination. A fund of this size could largely eliminate the current CER overhang and hence lead to a fundamental adjustment of CER prices. In turn, this would allow the fund to achieve a wider range of benefits including providing a price signal for new investment, sustaining project origination capacity and helping to restore market confidence in the CDM. To be effective at this level of capitalisation the fund would need to offer different prices for different CERs. This would require an auction mechanism.

Selective purchasing could focus the price and quantity impacts of a fund on certain parts of the market; this may be desirable but also carries risks of market fragmentation. The choice of the credits that the fund purchased would need to be chosen carefully. Assuming a small amount of demand for CERs from the EU ETS, Australia’s carbon pricing mechanism and sovereign demand, then if a €500m fund were prevented from purchasing credits only from large hydro and industrial gas projects then there would be only a small difference in the price it might achieve for eligible credits and from not being at all selective (around €0.03 per CER). At the other extreme, if the fund focussed only on credits from LDCs then it would struggle to spend €500m and would generate very substantial price differences between eligible and ineligible credits (a differential of around €15 per CER). A fund which did not purchase credits from any industrial gas or energy projects would have an intermediate impact: the price for eligible credits might rise to around €0.70/CER.

This analysis considers the impact of a CDM existing-project fund in the current market context; there are a number of other possible changes to that market context that could also help address the supply–demand imbalance. These would allow a smaller fund to have a more significant market impact. For example, the development of new emissions trading schemes may lead to an increase in the demand for CERs. It could also result in some of the current potential supply of credits being withdrawn from the CDM so that they may be used domestically. Other commentators have discussed the possibility of supply-side regulatory measures to help reduce the future supply of credits or to restrict the eligibility of ERUs within existing schemes so as to boost the demand for CERs. Although the assessment of the combined impact of a CDM capacity fund with these other developments has not been an explicit part of this study, they may mean that a smaller fund could have a more significant impact on market prices.

A new-project fund

It is difficult to assess the market impact of a fund for credits from yet-to-be-registered projects. This is because any fund will be the only material source of demand for such credits in the next few years and also because it is difficult to be specific about opportunities for the development of new projects. However, it is clear that there would be more than ample credit supply forthcoming at prices of less than €20 per tonne to satisfy the demand of any reasonably sized fund.
A new-project fund may need to focus on purchasing credits from project types and projects in locations that differ from those that have typically been seen in the CDM to date. For instance, the proportion of future abatement opportunities in Africa appears to be much higher than the proportion of current CDM projects in Africa, while there is likely to be a much higher proportion of credit generation opportunities in energy efficiency, agriculture and carbon capture and storage (CCS) projects than indicated by the proportion of these project types in the existing portfolio of CDM projects. A new-project fund could help develop the expertise in delivering credits from these project types and geographies.

A fund that offered a guaranteed minimum off-take price may offer the most resilient design given the uncertainties in credit demand. It is important to design a fund that is robust to the uncertainties over future CDM demand. In the context of significant demand uncertainty, a ‘price-floor’ fund – compared with a fund which bought credits at a range of prices, or one which committed to purchase a given number of CERs – would provide more market size certainty. It would also have the desirable property that the amount of sovereign resources expended would decline as demand (determined by possibly some of the same sovereigns) increased. This could be designed with an absolute cap on the amount of resources expended. This analysis could also apply in relation to the creation of any fund which bought credits from a ‘New Market Mechanism’.

Choosing between an existing-project or new-project fund

Given a wide range of competing demands for climate finance, there are unlikely to be sufficient resources available to buy credits from both new projects and existing projects while making a material difference in both segments of the market. The most preferable option depends on a small number of key factors. The most important factors include:

- expectations on future demand and the mechanism through which this demand may be channelled (CDM, New Market-based Mechanism or other);
- the impact of the current supply overhang on long-term market dynamics and the ability of a fund to affect this;
- the importance of carbon revenues to underlying project viability and the ability of a fund to affect this; and
- the skills and capacity that are difficult to replace.

Either fund concept can be applied when there is confidence about long-term future demand – an existing-project fund may still be relevant even without this expectation. An existing-project fund can work as a bridge to higher future demand, by helping to absorb the supply overhang. However, it could also be used when there is no expectation of future demand but the negative ramifications of low carbon prices need to be avoided for the duration of the projects affected. By contrast, a new-project fund should be adopted only if policymakers are confident that, in the long term, new demand (other than that from the fund) will materialise. Without the prospect of higher demand in the future, there would be little case for stimulating new projects generating carbon credits.
Both fund models could also be used as a ‘bridge’ to a different mechanism for delivering emissions reductions in developing countries, should this be agreed upon by the Parties. The decisions reached at the United Nations climate change conference in Doha in December 2012 included an agreement on the framework elements of a New Market-based Mechanism (NMM). Some see this as a long-term alternative to the CDM. Among the features of the NMM discussed in the Doha decision is that it will allow for net emission reductions rather than being just an offset mechanism, and that it may consider sectoral approaches as well as buying credits from individual projects. Either fund model could steer the market in this direction. For instance, an existing-project fund could commit to purchasing credits only from (advanced industrialising) countries that had shown interest in this vision – perhaps, as indicated by involvement in the World Bank’s Partnership for Market Readiness programme. A new-project fund might trial the purchase of credits that, through discounting or through the choice of crediting baseline, delivered net emission reductions.

The extent to which the current supply overhang is likely to contaminate long-term market development should also inform the decision. The analysis in this paper shows that an existing-project fund could help eliminate a significant proportion of the current supply overhang. This is particularly valuable if this supply overhang would otherwise have a damaging impact on long-term market development (either through the existing CDM, or an NMM). A damaging impact from the supply overhang is more likely when barriers to entry into the carbon market are high, as the likely exit of capacity from the market would be difficult to replace. An existing-project fund would also be valuable if project origination takes a long time as in this case the current low prices will affect the future project pipeline, although this is a material consideration only if an existing-project fund is sufficiently large to increase prices. If these factors are not in place then a new-project fund may be preferable, as relatively little is lost by not supporting existing projects.

The importance of carbon revenues at current credit prices to underlying project viability will influence the decision. If many projects can be made viable by modest (increases in) carbon revenue streams, an existing-project fund may be preferable. In this case a large number of projects would continue to operate and deliver emission reductions and sustainable development objectives that might otherwise be lost. By contrast, if many existing projects either need no carbon revenue to continue or require a price that is impossible for a fund to deliver, the existing-project fund’s resources would be spent with relatively little impact on projects at the margin of viability. In this case, a new-project fund may be preferable. The analysis in this paper suggests that an existing-project fund in the region of €2.5–€3.0 billion would be required to have a material impact on CER prices.

Finally, an assessment of which skills and capacity are most difficult to replace should be taken into account. Where the most important skills and capacities are those related to monitoring and verification, a fund for existing projects would be the preferred choice. If the greater concern is about project origination skills, then a new-project fund is more appropriate. Again, this should be linked to an assessment of the relative barriers to entry in these different activities.
List of tables

**Table 1.** A €500m fund could result in a significant increase in the use of CERs but would be unlikely to materially affect prices..........................17

**Table 2.** If the fund made purchases at the market clearing price then €12 billion may be required to raise the CER price to €2.5 per tonne 18

**Table 3.** Price discrimination between different projects would imply a significantly lower required fund endowment ....................................21

**Table 4.** If the fund did not buy credits from any energy and industrial gas projects then there may be a threefold difference in prices between eligible and ineligible credits .........................................................22

**Table 5.** €200m boosts the market price by 20 per cent in all three designs.....33

**Table 6.** Four key factors may influence the choice between different fund design options .................................................................41

**Table 7.** There is likely to be a sufficient surplus of ERUs and already-issued CERs that could eliminate demand for CERs issued after 2012.......45

**Table 8.** Future CER issuance success varies substantially across project types and regions.................................................................................48

**Table 9.** Annual monitoring, verification and certification costs vary substantially across project types and geographies.........................50

List of figures

**Figure 1.** The price of secondary CERs has fallen to almost zero .................9

**Figure 2.** The median marginal cost of issuance of CERs for most projects is less than €2 per tonne.................................................................14

**Figure 3.** Without further interventions, the supply of CERs is substantially greater than any likely demand for CERs ........................................16

**Figure 4.** The ‘flat’ supply curve means that extra demand results in substantially more CERs being used but with little impact on prices.17
Figure 5. With price discrimination, a €500m fund could purchase around 20 per cent more credits.

Figure 6. A price-discriminating fund could also achieve a greater price impact.

Figure 7. A fund focusing on CERs from projects in LDCs would purchase very few credits.

Figure 8. The weighting to credits from China may fall if the fund did not purchase credits from hydro and industrial gas projects.

Figure 9. The median abatement costs of many common project types are less than €20 per tonne.

Figure 10. There are significant identified developing country abatement opportunities between €0 and about €20 per tonne.

Figure 11. The activities on which the CDM has focused to date are quite different from where much of the future developing country abatement potential is thought to lie.

Figure 12. The percentage of future abatement potential in Africa is much higher than the percentage that the CDM has tapped to date.

Figure 13. Each fund design could have the same market expansion impact for the same resources.

Figure 14. If demand is lower than expected, the price-floor fund leaves the largest market.

Figure 15. The market size under the price-floor fund is greater than the other options when demand is low, and smaller when demand is high.

Figure 16. The size of the commitment that sovereigns have to make to a price-floor fund is greater than to the other design options if demand falls, but smaller if demand is higher than expected.

Figure 17. Fund resources spent per euro of market size will be lower for a price-floor fund if demand is greater than expected.
1 Introduction

This report reviews the market impact of a CDM fund

The Clean Development Mechanism (CDM) has been a major success of the international climate change architecture. One of the three ‘flexible mechanisms’ established under the Kyoto Protocol, it provides a globally recognised structure for registering projects that reduce emissions in developing countries and for issuing credits corresponding to emission reductions that these projects achieve. These credits, known as certified emission reductions (CERs), may then be acquired and used by countries, emitters, or individuals to meet their emission reduction targets. Since its inception in 2001, the CDM has credited more than one billion tonnes of emission reductions in developing countries. Despite some well-recognised opportunities for further improvement, the recent High Level Panel on the CDM Policy Dialogue concluded that: ‘The CDM has helped combat climate change by creating a global culture for action and by mobilizing the private sector through markets’ (High-Level Panel on the CDM Policy Dialogue, 2012:2).

However, the future of the CDM is imperilled. From over €20 per tonne in 2008, CER prices plunged by more than 95 per cent to around €0.30 per tonne by late 2012. This is largely the result of the limited emissions reduction ambition by developed countries. Figure 1 shows the decline in credit prices.

![Figure 1. The price of secondary CERs has fallen to almost zero](image)

<table>
<thead>
<tr>
<th>Date</th>
<th>CER price, €</th>
</tr>
</thead>
<tbody>
<tr>
<td>11/08/2009</td>
<td>25</td>
</tr>
<tr>
<td>11/09/2009</td>
<td>20</td>
</tr>
<tr>
<td>11/10/2010</td>
<td>15</td>
</tr>
<tr>
<td>11/12/2010</td>
<td>10</td>
</tr>
<tr>
<td>11/02/2011</td>
<td>7</td>
</tr>
<tr>
<td>11/08/2012</td>
<td>5</td>
</tr>
<tr>
<td>11/02/2013</td>
<td>0</td>
</tr>
</tbody>
</table>

*Note: Prices are for December 2012 delivery to 18th December 2012, thereafter for December 2013 delivery*

*Source: Point Carbon*

In response to these challenges, a number of reports have advocated the creation of a fund to boost demand for international credits, including CERs. Most notably, the CDM High Level Panel on the CDM
The market impact of a CDM capacity fund

Policy Dialogue recommended to: ‘investigate the establishment of a new fund and/or enable existing or emerging funds to purchase and to cancel part of the current overhang of CERs’ (High-Level Panel on the CDM Policy Dialogue, 2012:5). Likewise, a recent Center for American Progress report suggests a possible ‘bridge fund’ for the CDM to increase demand for credits and/or for the Green Climate Fund (GCF) to purchase credits originating from global carbon market projects (Purvis, Grausz, & Light, 2013). Philips, Razzouk, & Haefeli-Hestvik (2013) make a similar call. The idea was also discussed at the ministerial level at the United Nations climate change conference in Doha in December 2012.

Advocates identify a number of advantages for such a fund. These include:
- to provide an appropriate price signal to stimulate new mitigation action in developing countries and hence ensure the trust of these countries in market-based mechanisms to promote low-carbon investment;
- to ensure the viability of existing projects – and their emission reductions and sustainable development impacts – that may be threatened by low prices;
- to maintain carbon market infrastructure including, for instance, monitoring, reporting and verification capacity; and
- to protect the progress that the CDM has made towards a global carbon market and steer the future development of this market.

The resources for a fund could come from a range of sources. Some of the most likely candidates include the following:
- As identified above, a number of commentators have identified that the GCF (ultimately receiving its resources from sovereigns) could both support and provide an institutional home for such a fund. This reflects expectations that the GCF may acquire substantial resources and that this body would easily have available the necessary technical capacity to manage such an intervention in the CER market;
- Sovereigns may alternatively choose to support a CDM fund directly, in other words, not intermediated by the GCF;
- There are ongoing discussions in both the maritime and aviation sectors about how these sectors could provide greater support to climate change mitigation efforts. A number of the proposals put forward in both sectors have considered international offset purchases.\(^1\)

The fund is not seen by its advocates as a permanent solution but aims to address what is hoped to be a temporary shortfall in the market. These advocates recognise that the challenges faced by global carbon markets can ultimately be rectified only by a substantial increase in demand, particularly by developed countries, for emission reductions that are achieved in developing countries. They suggest that the fund can act as a temporary solution to realise the stated advantages.

This report aims to support further discussion on the concept of a CDM capacity fund by providing an analysis of its potential market impact. To support meaningful discussion on the merits of such a fund it is

necessary to understand what its market impact might be, and how this might change depending on how it is
designed. The report is split into three further sections:

– section 2 provides an analysis of the potential impact on the market for CERs of a fund which focusses
on the purchase of credits from CDM projects that are already registered;

– section 3 analyses the potential impact of a fund which purchases credits from ‘new’ projects, in other
words those not currently registered. Such projects could, in principle, be brought forward either under
the CDM or through some other process, such as the New Market-based Mechanism\(^2\) (NMM);

– section 4 compares the advantages and disadvantages of a fund focussed on existing versus new
projects.

\(^2\) The definite form of the New Market-based Mechanism has not been decided yet, but will likely emphasise mitigation across broad
segments or sectors of national economies rather than the CDM and Joint Implementation’s project-based approach.
2 A fund for existing projects

A €500 million fund will significantly increase CER use but have only a modest impact on prices; a fund of €2.5–€3.0 billion would be needed to affect prices

This section presents an analysis of the market impact of a fund for existing projects. The analysis focusses on the demand for, and supply of, CERs in the period from 2013 to 2020. It looks at two basic options for a fund purchasing credits from already-registered projects:

- a ‘universal fund’ in which credits may be purchased from any project that meets the existing qualitative restrictions applied by the European Union Emissions Trading System (EU ETS) and those that will be applied when Australia’s carbon pricing mechanism allows CER purchases from 2015; and
- a ‘selective purchase fund’ in which the fund further restricts its purchases.

The methodology underpinning these analyses requires a number of assumptions and should be interpreted carefully. As explained further below, supply is modelled based on information from the CDM Project Design Document (PDD) database maintained by IGES Japan (2013), complemented by a survey on costs and project performance among project developers and an in-depth analysis of a selection of PDDs. To produce meaningful results in a short space of time, various simplifications have been necessary. These include grouping by project types, relying on average values, ignoring some intermediary fees, and assuming simple contractual relationships. Furthermore, our results are reliant on the quality and representativeness of the survey responses received. Given this, the resulting price forecasts that emerge from this analysis should therefore be interpreted as broadly indicative rather than specific. Short-term price fluctuations are not captured; nor are factors which might make CERs from certain projects realise higher or lower prices than those for standard ‘commodity’ CERs as quoted on exchanges. The methodology is elaborated in detail in the Annex to this report.

The section is divided into three sub-sections. Section 2.1 describes the current market conditions; section 2.2 describes the possible impact of a universal fund; and section 2.3 describes the possible impact of a selective purchase fund.

2.1 Current supply and demand conditions

The supply curve is based on an estimate of the additional costs that need to be covered by each project generating credits between 2013 and 2020, expressed on a per-CER basis. It is assumed that credits will be issued when the forward-looking revenues to be earned from issuance exceed the marginal costs of issuance: the costs of prior capital investment are assumed to be sunk and to make no difference to the issuance decision. The marginal costs of issuance are made up of a number of ongoing costs including:

- monitoring, verification and certification costs per project type and geography, based on a survey among project developers;
The market impact of a CDM capacity fund

The costs of crediting period renewal per project type and geography, based on a survey among project developers;

- issuance fees, as stipulated in the CDM rules; and

- operating costs for projects that have no other revenue stream than CERs, as extracted from PDDs.

Furthermore, we assume that a profit margin of 12.5 per cent will be required to make issuance worthwhile. The quantity of CERs estimated in the project PDDs is adjusted for issuance success rates as estimated by project developers in the survey. Furthermore, the Adaptation Fund levy is deducted from projected issuance numbers for all projects not located in a Least Developed Country (LDC).

This analysis shows that there is considerable variation in the costs that need to be recovered from issuance within and between different categories of projects. The median, 10th percentile and 90th percentiles of the costs of issuance per project type are depicted in Figure 2. Projects that generate the most credits tend to have the lowest marginal costs, including hydro power, wind power and fuel switch projects. By contrast, the costs for energy efficiency projects and biomass projects that apply the ACM0006 methodology are considerably higher. It can also be seen that, for all project types, the distribution of issuance costs is skewed, with little difference between the 10th percentile and median cost, but with a long tail of projects with significantly higher issuance costs.

---

3 The distribution reported in this chart relates to the distribution of projects in each project category, not the distribution of credits. As the projects that generate more credits will also tend to have lower costs per credit, the distribution of issuance costs per credit in each project category would look different.
We develop three different demand schedules to account for the uncertainty over demand for CERs in the period 2013–2020. The most predictable sources of demand for CERs are the EU ETS, the Australian carbon pricing mechanism and European sovereigns under the Effort Sharing Decision (ESD). However, all three sources of demand may, subject to certain restrictions, also use Emission Reduction Units (ERUs) from Joint Implementation projects as an alternative to CERs. As ERUs are currently trading at prices that are even lower than CERs, this may reduce demand for CERs. To account for this, and as explained in more detail in the Annex, all of our scenarios start from a calculation of the total demand for CERs and ERUs that might arise from these three sources. We also make an adjustment for those CERs and ERUs that have been issued but not yet used. We then deduct from this gross amount differing amounts of ERUs to leave a residual net demand for CERs in the period 2013–2020. We consider three scenarios for the amount of ERUs netted out and hence the resulting demand for CERs.

---

Note: The vertical bars show the 10th to 90th percentiles with blue triangles denoting the median. ACM0006 is the consolidated methodology for electricity and heat generation from biomass.

Source: Vivid Economics
– **Zero net residual demand for CERs.** In this scenario, all of the gross demand is met by ERUs alone. This scenario is consistent with the recent rapid expansion in ERU supply from Ukraine and Russia (in particular) in recent months. The analysis in the Annex shows that EU ETS-eligible ERUs issued to May 2013 plus those expected from the existing pipeline of projects in Ukraine in the period May 2013 to March 2015 (which will be eligible under the EU ETS if they relate to emission reductions achieved before December 2012) will likely be more than sufficient to meet all demand for CERs and ERUs. If the rate of increase in ERU issuance continues at the same pace then the European sovereign demand to 2020 could also be met from these units alone.

– **Medium net residual demand for CERs.** In this scenario, we assume that all of the European sovereign demand for CERs and ERUs, assumed to be 750 megatonnes (Mt), is met by CERs alone. This is consistent with concerns over the environmental integrity of ERUs which leads European sovereigns to meet their ESD obligations through CER purchases alone.

– **Low net residual demand for CERs.** This is an intermediate scenario where we assume that there may continue to be 375 Mt of residual CER demand.

In all three scenarios, we assume that any resulting demand for CERs does not vary (is inelastic) regardless of the CER price. This assumption is entirely valid with respect to demand from the EU ETS and Australia’s carbon pricing mechanism as these sources of demand are likely to use CERs to the maximum extent allowable under the rules of these schemes, so long as the price of CERs remains below the domestic allowance price. With respect to European sovereign demand, CER demand will depend on CER prices relative to the cost of other means of reducing emissions. It has not been possible to assess this as part of this study, although at a low CER price it seems likely that this will be an attractive way of meeting commitments under the Effort Sharing Decision.

These scenarios aim to capture a range of possible demand scenarios and are not specific predictions. Rather they are intended to illustrate the extent to which the possible market impact of a fund is or is not robust to different future scenarios for CER demand.

**All three demand scenarios illustrate that there is currently very significant over-supply of CERs.** This is shown in Figure 3 below. All three of the demand scenarios are very substantially below the estimated 5 billion tonnes of CER potential in the CDM pipeline. The estimated market clearing prices in all three demand scenarios are all in the region of €0.2/CER.
2.2 A ‘universal’ fund

2.2.1 A fund that pays market clearing prices

A fund of €500m that paid market prices for credits could substantially increase the number of CERs that are used, but would be unlikely to elevate prices significantly. Depending on the existing prior demand, a fund of €500m would result in the use of between 1.4 million and 1.7 million additional CERs, but equilibrium prices would be unlikely to rise above €0.4/CER. These results reflect the large number of CERs that can be issued at relatively low marginal costs: the low marginal costs mean that the fund can purchase significant numbers of credits; the large volume of credits available at low marginal costs means that the estimated price impact is relatively low. The results for the three demand scenarios are presented in Table 1 below, while Figure 4 illustrates the change in the supply and demand situation of a €500m fund in the low initial CER demand scenario.
The market impact of a CDM capacity fund

Table 1. A €500m fund could result in a significant increase in the use of CERs but would be unlikely to materially affect prices

<table>
<thead>
<tr>
<th>Initial CER demand</th>
<th>Total CERs used (billions)</th>
<th>Additional CERs used as a result of the fund (billions)</th>
<th>Estimated resulting CER price</th>
</tr>
</thead>
<tbody>
<tr>
<td>No other CER demand</td>
<td>1.74</td>
<td>1.74</td>
<td>0.29</td>
</tr>
<tr>
<td>Low CER demand</td>
<td>1.95</td>
<td>1.57</td>
<td>0.32</td>
</tr>
<tr>
<td>Moderate CER demand</td>
<td>2.16</td>
<td>1.41</td>
<td>0.36</td>
</tr>
</tbody>
</table>

Source: Vivid Economics

Figure 4. The ‘flat’ supply curve means that extra demand results in substantially more CERs being used but with little impact on prices

Source: Vivid Economics, IGES Japan (2013)
This change in market conditions would help to retain additional capacity but would be unlikely to create a price signal for further developing country mitigation ambition. As noted in the introduction, commentators advance a number of different arguments in support of a CDM fund. This analysis suggests that a fund design of this type could realise some of these benefits, but not others. In particular, the significant increase in the number of CERs used would help to retain capacity in the monitoring, reporting and verification of emission reductions from CDM projects. However, the marginal change in prices means that it is unlikely that new mitigation action in developing countries would be made attractive as a result of this form of intervention. Consistent with this, it is unlikely that much CDM project origination capacity would be retained, and it is questionable whether it would do much to increase the trust of developing countries in market-based mechanisms to promote low-carbon investment. The small change in prices is also unlikely to have a material impact on the viability of existing projects.

Achieving a more substantial price impact, and hence a wider range of benefits, would require a larger fund. Table 2 provides an estimate of the fund sizes needed in each of the three demand scenarios to reach a possible price level. It also reports the additional CERs that would be purchased in each case.

<table>
<thead>
<tr>
<th>Target CER price (€)</th>
<th>No other CER demand</th>
<th>Low (375 Mt) CER demand</th>
<th>Medium (750 Mt) CER demand</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Estimated credits purchased by fund (bn)</td>
<td>Estimated credits purchased by fund (bn)</td>
<td>Estimated credits purchased by fund (bn)</td>
</tr>
<tr>
<td>0.5</td>
<td>1.7</td>
<td>3.4</td>
<td>1.5</td>
</tr>
<tr>
<td>1</td>
<td>4.2</td>
<td>4.1</td>
<td>3.8</td>
</tr>
<tr>
<td>1.5</td>
<td>6.7</td>
<td>4.5</td>
<td>6.1</td>
</tr>
<tr>
<td>2</td>
<td>9.2</td>
<td>4.6</td>
<td>8.4</td>
</tr>
<tr>
<td>2.5</td>
<td>11.7</td>
<td>4.7</td>
<td>10.8</td>
</tr>
</tbody>
</table>

| Source: Vivid Economics |

On this basis, a fund may need around €10–€12 billion to raise prices to €2.50 per tonne. At this level of capitalisation, a very substantial increase in CER use would be obtained, with an extra 4–4.7 billion CERs likely to be used. The required fund size increases by roughly €2 billion for each additional €0.50 per CER targeted.
2.2.2 A price-discriminating fund

A fund design that allows for price discrimination could significantly increase value for money. In the ‘simple’ example above, the fund would, for instance, buy CERs through regular exchanges following a pre-announcement. This would result in significant producer surplus, or a transfer of rent into the market, as many projects would be able to issue credits at a marginal cost that is lower than the market clearing price. To mitigate this, the fund could attempt to pay different prices for different CERs according to their marginal costs of issuance. This might be best achieved through some form of auction where projects bid for prices at which they are willing to issue CERs. A degree of sophistication could be added to this auctioning mechanism if objectives other than cost minimisation were important for policymakers. The additional institutional complexity associated with regular auctions could represent an additional justification for the creation of a dedicated fund.

Price discrimination would result in both more CERs being used and the fund being able to achieve a higher CER price. Figure 5 and Figure 6 show, in turn, the additional CERs that could be purchased and the higher prices that could be achieved by a €500m fund which practised price discrimination in each of the three demand scenarios.

Figure 5. With price discrimination, a €500m fund could purchase around 20 per cent more credits

Source: Vivid Economics
Even with price discrimination, the main market impact would still be on market quantities rather than market prices. Price discrimination would allow an increase in the number of CERs used by a further 20 per cent. This would take the overall number of CERs used, including demand from other sources, to around 2 billion. However, even with price discrimination, the price impacts of a fund are likely to be modest; in all three scenarios, the highest price paid by a fund that was maximising the number of credits purchased would be €0.4/CER. As discussed above, this would allow some of the potential benefits of a fund to be realised – primarily around preserving monitoring, reporting and verification capacity. However, many of the other hoped-for benefits of a fund, especially around creating incentives for new investment, would not be realised.

The effectiveness of price discrimination increases as larger fund sizes are contemplated; with price discrimination, a fund of less than €3 billion would be sufficient to exhaust excess supply. With price discrimination, a fund of less than €3 billion would be sufficient to exhaust excess supply. Table 3 presents, for different fund sizes, a comparison of a simple fund with a fund that price-discriminates in the ‘low demand’ CER scenario. It shows in particular that a fund size of around €2.5–€3.0 billion that chose to price-discriminate might be able to largely eliminate the current supply overhang (as shown by the number of credits bought by the fund converging to around 4.6 billion). The associated price increases could be achieved with around 80–90 per cent fewer resources than if the same market impact were sought through a fund that chose not to price-discriminate.
Table 3. Price discrimination between different projects would imply a significantly lower required fund endowment

<table>
<thead>
<tr>
<th>CER price (€)</th>
<th>Credits purchased (bn)</th>
<th>Estimated needed fund size without price discrimination (€ bn)</th>
<th>Estimated needed fund size with price discrimination (€ bn)</th>
<th>Percentage saving</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.5</td>
<td>3.0</td>
<td>1.5</td>
<td>1.0</td>
<td>33</td>
</tr>
<tr>
<td>1</td>
<td>4.0</td>
<td>3.8</td>
<td>1.5</td>
<td>59</td>
</tr>
<tr>
<td>1.5</td>
<td>4.3</td>
<td>6.1</td>
<td>1.9</td>
<td>69</td>
</tr>
<tr>
<td>2</td>
<td>4.4</td>
<td>8.5</td>
<td>2.2</td>
<td>74</td>
</tr>
<tr>
<td>2.5</td>
<td>4.5</td>
<td>10.8</td>
<td>2.4</td>
<td>78</td>
</tr>
<tr>
<td>3</td>
<td>4.6</td>
<td>13.1</td>
<td>2.5</td>
<td>81</td>
</tr>
<tr>
<td>3.5</td>
<td>4.6</td>
<td>15.4</td>
<td>2.6</td>
<td>83</td>
</tr>
<tr>
<td>4</td>
<td>4.6</td>
<td>17.6</td>
<td>2.6</td>
<td>85</td>
</tr>
<tr>
<td>4.5</td>
<td>4.6</td>
<td>19.9</td>
<td>2.7</td>
<td>86</td>
</tr>
<tr>
<td>5</td>
<td>4.6</td>
<td>22.1</td>
<td>2.7</td>
<td>88</td>
</tr>
</tbody>
</table>

Note: If CER prices began to exceed domestic allowance prices (currently trading at around €3 per tonne in the EU ETS) then any private demand for CERs would fall. CER price rises would therefore be very difficult to sustain. CER prices above current domestic allowance prices are included to account for possible increases in domestic allowance prices.

Source: Vivid Economics

2.3 Selective purchase fund

Any fund may wish to impose restrictions on the sort of credits it purchases. The analysis in Section 2.2 assumes that, aside from the existing qualitative restrictions that the EU ETS and Australian carbon pricing mechanism impose, the demand created by the fund will be met by whatever credits can be supplied at lowest cost. However, those providing resources to a fund may dictate that the fund be more selective in its purchasing behaviour in order to meet a variety of other objectives. We look at three possible scenarios as regards the credit types the fund may not purchase:

- credits from hydro and industrial gas projects, reflecting concerns over the sustainable development benefits of these projects;
- credits from all energy generation projects and industrial gas projects, reflecting both sustainable development concerns (in some instances) as well as the fact that energy generation projects have non-

5 Following the classification of projects used in the IGES database, we define energy projects as biomass, fuel switching, hydro power, other renewable energies and wind power projects.
carbon-related revenue streams and hence will not rely on the carbon revenues for their continued operation, and
– credits from any country apart from those classified as an LDC, in order to concentrate financial resources on projects which may have the greatest sustainable development benefits.

Depending on the criterion used, this could lead to a significant boost in the price for eligible credits. This is shown in Table 4 for a €500m fund that does not price-discriminate in the low CER demand scenario. The analysis illustrates, for instance, that while a fund might raise CER prices to €0.32/CER without any restrictions, if it excluded credits from energy and industrial gas projects then the price for eligible credits might more than double to above €0.7/CER. If restrictions to purchase credits only from LDCs were introduced then this would very significantly boost the price of these credits, to around €13. However, there would be virtually no difference in prices for eligible and ineligible credits if the fund excluded only all industrial gas and large hydro projects.

Table 4. If the fund did not buy credits from any energy and industrial gas projects then there may be a threefold difference in prices between eligible and ineligible credits

<table>
<thead>
<tr>
<th>Scenario</th>
<th>Prevailing price for eligible credits</th>
<th>Prevailing price for ineligible credits, €</th>
<th>Number of credits excluded as a result of purchasing rules (billion)</th>
<th>Number of credits bought by fund (billion)</th>
</tr>
</thead>
<tbody>
<tr>
<td>No restriction in fund purchase</td>
<td>0.32</td>
<td>NA</td>
<td>0</td>
<td>2.0</td>
</tr>
<tr>
<td>Fund does not buy hydro and industrial gas credits</td>
<td>0.39</td>
<td>0.20</td>
<td>1.5</td>
<td>1.3</td>
</tr>
<tr>
<td>Fund does not buy energy and industrial gas credits</td>
<td>0.74</td>
<td>0.20</td>
<td>3.8</td>
<td>0.7</td>
</tr>
<tr>
<td>Fund buys only from LDC projects</td>
<td>13.4</td>
<td>0.20</td>
<td>4.8</td>
<td>0.04</td>
</tr>
</tbody>
</table>

Note: The earlier caveat regarding the relationship between CER and domestic allowance prices remains. Note that in the base case, it is assumed that the fund would have the same qualitative restrictions as in the EU ETS and Australian carbon pricing mechanism. The final column reports ineligible credits in addition to this.

Source: Vivid Economics

The higher prices achieved for eligible credits through selective purchasing could help meet a wider array of objectives, but this also carries risks. By increasing prices for eligible credits, beneficiary projects

---

6. Note this does not mean that such projects are not additional. Carbon revenues may be of critical importance in determining whether a project initially proceeds without influencing the decision on whether to continue to operate an already-registered project.
which may otherwise become unviable could be preserved, along with the associated emission reductions and sustainable development benefits. However, this benefit would not be associated with higher prices for new projects (and stronger incentives for project origination of these types of projects) unless further demand for these project types was forthcoming. There may also be concerns over market fragmentation if the fund led to very substantial differences between CERs from different project types.

The different selective purchasing scenarios may result in a difference in the composition of the purchased CER portfolio in terms of project types and geographies where projects are sourced. An exclusion of hydro and industrial gas might lead to a dominance of wind power projects in the portfolio, as shown in Figure 7. As for geographies, the respective exclusion scenarios would effectively lead to a slight reduction of CERs sourced from projects in China, as shown in Figure 8 (with the exception of a focus only on LDCs which would, inherently, entirely exclude Chinese credits).

Figure 7. A fund focusing on CERs from projects in LDCs would purchase very few credits

Source: Vivid Economics
2.4 Conclusions on the market impact of an existing-project fund

A €500m fund will have a significant impact on the quantity of CERs used, but will only have a modest impact on prices. In the base-case scenario, the fund might allow an additional 1.4–1.7 billion CERs to be used, depending on the level of prior CER demand from the EU ETS, Australian carbon pricing mechanism and sovereign demand. However, prices are unlikely to be significantly affected; our analysis suggests that prices would remain below €0.4/CER.

This will help in the delivery of some of the benefits expected of a fund, but leave other potential benefits unrealised. The use of a large number of additional CERs will create a continued demand for monitoring, reporting and verification capacity which, it is feared, may otherwise be lost. It may also allow for some projects to continue to operate that would otherwise be unviable, although this effect is likely to be small. The main beneficiaries would be projects that need CER revenues to cover only the marginal costs of issuance; projects that require higher CER prices would be unlikely to be competitive without selective purchasing (see below). However, the modest price changes will not create a strong price signal for new mitigation investment in developing countries, or help retain project origination capacity.

A larger fund, of around €2.5–€3.0 billion, could boost both CER use and CER prices, if it undertook price discrimination. A fund of this size could largely eliminate the current CER overhang and hence lead to a more fundamental adjustment of prices in the market. In turn, this would allow the fund to achieve a wider range of benefits including providing a price signal for new investment, sustaining project origination...
capacity and helping to restore market confidence in the CDM. To be effective at this level of capitalisation would require the fund to be able to offer different prices for different CERs, requiring some form of auction mechanism.

Selective purchasing could focus the price and quantity impacts on certain parts of the market; this may be desirable but also carries risks of market fragmentation. In the low-CER-demand case, if a €500m fund were prevented from purchasing credits only from large hydro and industrial gas projects then there would be only a small difference in the price it might achieve for eligible credits and from not being at all selective (around €0.03 per CER). At the other extreme, if the fund focussed only on credits from LDCs then it would generate very substantial price differences between eligible and ineligible credits (a differential of around €15 per CER). A fund which did not purchase credits from any industrial gas or energy projects would have an intermediate impact: the price for eligible credits might be around twice that achieved if the fund was not selective.

This analysis has considered the impact of a CDM existing-project fund in isolation; there are a range of factors that could help address the supply–demand imbalance and allow for a smaller fund to have a more significant market impact. For example, a wide array of countries are planning carbon pricing mechanisms (World Bank, 2013). These may lead to an increase in the demand for CERs and/or result in some of the current potential supply of credits being withdrawn from the CDM so that they may be used domestically. Other commentators have discussed the possibility of supply-side regulatory measures to help reduce the future supply of credits (Hermwille, 2013) or to restrict the use of ERUs so as to boost demand for CERs. Although the combination of a CDM capacity fund with these other options has not been part of this study,7 they could allow a smaller fund to have a more significant impact on market prices.

---

7 With the exception that the analysis above shows that when there is greater initial demand for CERs from the market as a result of a lower use of ERUs, the same size fund will result in a higher market price.
3 A fund for new projects

A fund offering a price floor can provide greater market certainty

This section describes the implications of a fund design that would exclusively focus on purchasing credits from yet-to-be-registered projects.

The market impact of a fund with a focus on purchasing credits from new projects needs to be assessed differently from that of a fund with a focus on already-registered projects, given the much greater uncertainty over the supply of, and demand for, new credits. The information in the PDDs of CDM projects provides a relatively reliable source of data on the basis of which a plausible range of future supply can be estimated. Demand for these credits can also be specified in detail given the established eligibility rules for CER and ERU use in the EU ETS and Australia’s carbon pricing mechanism (and, to a lesser extent, European sovereign demand). By contrast, the wide range of future low-cost abatement potential in developing countries makes definitive analysis of the future supply of credits from yet-to-be-registered projects difficult to analyse. Similarly, on the demand side, in the short run the only source of demand for credits from new projects may well be from the fund – hence the fund’s purchasing decisions would effectively constitute its market impact – while in the medium/long term it is much more difficult to predict whether there will be much demand and, if so, how much.

Given these characteristics, we proceed in two stages. Section 3.1 describes the potential purchasing options for any fund, and Section 3.2 elaborates how a fund may be designed to cope with the medium- to long-term uncertainty in demand.

This analysis could equally apply to credits generated through the CDM or through other market mechanisms. Because of the higher level of generality surrounding the analysis in this section, it could apply equally to a fund that focussed on new credits from any crediting mechanism, including – should it develop at the necessary speed – from the NMM.

3.1 Purchasing options for a new-project fund

A significant number of new projects that would tap into the abatement potential in developing countries would have abatement costs of less than €20 per tonne, including transaction costs. Figure 9 shows an estimation of median, low and high abatement costs of a number of common project types, based on an analysis of existing projects in the CDM pipeline, including estimates for transaction costs. These can be interpreted as a proxy of the price needed to incentivise investment in a project. Additional conditions may determine whether such projects would actually be developed, including project-specific risk premiums required and the ease of doing business in different countries.
efficiency supply-side projects are both relatively costly, but many other project types typically have costs of less than €20 per tonne.⁹

The negative costs that are observed for some projects do not imply that such projects are non-additional. Negative costs would imply that the project is profitable without revenue from the sale of CERs. The project can still be additional under CDM rules if under the baseline project scenario with CER revenues the project is more profitable. If the alternative without the abatement project is more attractive, even if costs are negative, the project can still be additional. There may also be other barriers, such as access to capital, which may restrict project implementation, thus making the project additional even though it is profitable (UNFCCC, 2012).

Figure 9. The median abatement costs of many common project types are less than €20 per tonne

Note: Calculations based on abatement cost estimates of existing projects from UNFCCC, weighted by the existing proportion of fixed crediting period projects and with transaction costs estimated using average CERs per project type.

Source: Vivid Economics, UNFCCC (2012), and Ecofys.

Identified abatement opportunities at a cost of less than €20 per tonne amount to more than 4,000 Mt per annum in developing countries. Figure 10 presents an extract from the Energy Research Centre of the Netherlands Non Annex I Marginal Abatement Cost curve, based on the abatement potential that has been estimated by various institutions and authors (ECN, 2013). More than 4,000 MtCO₂e per annum is available

⁹ Importantly, these calculations assume that crediting periods will be renewed with the same baseline and projected emissions reductions. In the absence of this happening, the realised mitigation cost will be higher (UNFCCC, 2012).
at an abatement cost of less than €20 per tonne. The actual abatement potential is likely to be considerably higher than that captured by these identified projects.

The future potential for projects may be in project types somewhat different to those which have been captured to date. Figure 11 presents data on expected annual emissions reductions per project type, as compared with the identified future abatement potential in developing countries. Hydro and wind power opportunities have been tapped extensively under the CDM and have not been identified as large sources of future abatement potential. Methane avoidance and energy efficiency present a significant opportunity for future abatement, which has been captured only in part by the CDM. Agriculture, carbon capture and storage (CCS) and avoided deforestation projects each present substantial abatement opportunities, but are virtually absent from the CDM at present.

Figure 10. There are significant identified developing country abatement opportunities between €0 and about €20 per tonne

Note: Underlying source reports abatement costs in US dollars. This is converted to Euros at an exchange rate of $1:€0.8 for consistency with the remainder of the report.

Source: ECN (2013)
The market impact of a CDM capacity fund

Figure 11. The activities on which the CDM has focussed to date are quite different from where much of the future developing country abatement potential is thought to lie


The geographic distribution of future abatement potential may also differ from the existing distribution of CDM projects, with a pronounced underrepresentation of current projects in Africa compared with the continent’s future abatement potential. Figure 12 presents data on the distribution of projects across Asia, Africa and Latin America. The bulk of credits from CDM projects currently originate in Asia, with the remainder accounted for by slightly over 10 per cent in Latin America and a mere 4 per cent in Africa. By contrast, the ECN data suggests that, among projects with mitigation costs of between €0 and €20/tonne, Asia accounts for just over half of future abatement potential, with Africa and Latin America accounting for roughly a quarter each.
In conclusion, this analysis suggests that there is plenty of potential available for any fund focussed on purchasing credits from new projects, although it may need to focus on different project types and in different geographies from those where the CDM has traditionally been strong.

3.2 Designing a fund that is robust to future uncertainties

There is considerable uncertainty about the future market conditions for the credits from developing countries. As explained above, it is this uncertainty that makes detailed analysis of the sort presented in Section 2 impossible. However, it does raise the question as to whether different options for fund design may be more or less robust in the context of these considerable uncertainties. We explore this question in this section.

There are three basic design options available for a new-project fund, offering differing degrees of resilience against future changes in market conditions. These options are:

- option 1 ‘revenue-commitment fund’: the fund commits to use a certain amount of resources to purchase as many credits as possible at the prevailing market price(s);
- option 2 ‘price-floor fund’: the fund commits to purchase (an unknown number of) credits at a certain minimum floor price; and
- option 3 ‘quantity-commitment fund’: the fund commits to purchase a certain number of credits at an (unknown) price(s).
Options 2 and 3 could be combined with a maximum spending commitment, which is given by definition in option 1. In all fund design options, purchases could be restricted to credits from certain project types.

**If future market conditions could be predicted perfectly, then each option would have the same market impact and require the same fund capitalisation.** This is graphically shown in Figure 13. Without a fund, the market clears at \((Q_1, P_1)\) where the demand curve, made up of demand from emissions trading schemes and other sources such as sovereigns, intersects with the supply curve. Under any fund design, and with equal fund endowments, the market size and clearing price and quantity could be the same \((Q_2, P_2)\) despite the different shapes of the three demand curves. A revenue-commitment fund would effectively shift the demand curve outwards as it will buy additional credits at any given price. The price-floor fund commits to a price and therefore ensures that at any given quantity the price is at a minimum equal to \(P_2\). The quantity-commitment fund commits to purchasing a certain quantity of credits, implying that at any given price the quantity demanded is at least equal to the quantity that the fund commits to buy (but possibly higher if there is also private demand).

![Figure 13. Each fund design could have the same market expansion impact for the same resources](https://example.com/figure13.png)

*Source: Vivid Economics*

**If demand turns out to be different from anticipated, the different fund design options will have different impacts.** For example, when non-fund demand falls relative to that which was originally expected, the resulting market size differs under the three fund design options, as shown in Figure 14. The quantity-commitment fund would purchase its committed quantity \(Q_q\) at price \(P_q\), which is lower than the quantity purchased and market price under a revenue-commitment fund design \((Q_r, P_r)\). Only under a price-floor fund design would the quantity and price remain equal at \((Q_p, P_p)\), thus retaining the largest markets for carbon credits.
To further illustrate the trade-offs, actual data is used in a loose calibration exercise that considers the impact of fund design when there is demand and cost uncertainty. This analysis is only indicative and aims to make the previous results more meaningful; the underlying analysis would be robust to different specifications. A supply curve is drawn up using data from the MACC provided by ECN (ECN, 2013) and data from Ecofys on CDM project transaction costs. The demand curve is calibrated to give an expected demand of 360 Mt per annum. Three fund design options with endowments of €200m each are then modelled, which by design yield the same market outcome as shown in Table 5 (a quantity of 456 Mt, a price of €2.40 and a total market size of €1,100m). Crucially, the analysis then continues to take into account what happens if demand or costs are different from those when the fund is first designed.
Table 5. €200m boosts the market price by 20 per cent in all three designs

<table>
<thead>
<tr>
<th>Variable</th>
<th>Initial market</th>
<th>Revenue-commitment fund</th>
<th>Price-floor fund</th>
<th>Quantity-commitment fund</th>
</tr>
</thead>
<tbody>
<tr>
<td>Price (€/CER)</td>
<td>2.06</td>
<td>2.41</td>
<td>2.41</td>
<td>2.41</td>
</tr>
<tr>
<td>Quantity (Mt per annum)</td>
<td>363</td>
<td>456</td>
<td>456</td>
<td>456</td>
</tr>
<tr>
<td>Market size (€m)</td>
<td>749</td>
<td>1,100</td>
<td>1,100</td>
<td>1,100</td>
</tr>
<tr>
<td>Fund resources (€m)</td>
<td>0</td>
<td>200</td>
<td>200</td>
<td>200</td>
</tr>
<tr>
<td>Floor price (€/CER)</td>
<td>n/a</td>
<td>n/a</td>
<td>2.36</td>
<td>n/a</td>
</tr>
<tr>
<td>Quantity commitment (Mt per annum)</td>
<td>n/a</td>
<td>n/a</td>
<td>n/a</td>
<td>85</td>
</tr>
</tbody>
</table>

Source: Vivid Economics

When demand is uncertain, the analysis shows that a price-floor fund provides greater certainty and would result in a market size that never falls below a certain threshold, even if there is no other demand. This is illustrated in Figure 15. For example, in a case in which realised demand is less than expected at the time when the fund was designed than under a price floor, the market size never falls below €1 billion. By contrast, under the quantity- and revenue-commitment funds the market size falls significantly when demand is less than expected. In the alternative, if demand exceeds expectations at the time of designing the fund, the price-floor fund would quickly cease to buy credits, as the minimum price floor is already exceeded, and market size would be the same as if there were no fund. By contrast, in this scenario the quantity-commitment and basic funds would sustain their purchasing under high-demand scenarios, leading to market sizes larger than under the quantity-commitment fund. As the market size is relatively large when demand is low, but relatively low when demand is high, the price-floor fund provides greater certainty about the future market size than either the quantity-commitment fund or revenue-commitment fund.
Under a price-floor fund design, demand-side risk is passed to the fund, some of whose contributors may be best placed to control that risk. A corollary of the price-floor fund providing greater market size certainty when demand varies is that this risk is passed to those capitalising the fund. This is depicted in Figure 16. This shows that the price-floor fund requires by far the greatest amount of resources to deliver on its commitments when demand is lower than expected, but very little or no resources if demand is greater than anticipated. This may be an appropriate transfer of risk to the extent that those providing resources to any fund may be among those who are in a position to affect the future level of demand in the market. Furthermore, it should be noted that it would be possible to cap the fund size explicitly, although this cap would have to be at a level greater than the amount that is ‘expected’ to be spent in order for the fund to be effective at providing greater market size certainty.
The market impact of a CDM capacity fund

Figure 16. The size of the commitment that sovereigns have to make to a price-floor fund is greater than to the other design options if demand falls, but smaller if demand is higher than expected.

Source: Vivid Economics

A price-floor fund offers better value for money than other options if demand is greater than expected, but if demand is less than expected it may offer less value for money. Figure 17 shows the fund resources expended per euro of market size given varying levels of demand. This can be interpreted as a measure of the degree of value for money. Most notably, the price-floor fund is a comparatively inexpensive option if demand rises slightly above expectations or if it falls dramatically. However, if there are modest falls in demand then a quantity-commitment fund may be more cost-effective.
By contrast to the previous analysis, when the costs of supplying credits differ from those expected, the results are very different; a simple fund or quantity-commitment fund may be better. When the costs of credit provision are highly uncertain, a quantity-commitment or basic fund would provide more certainty over market size. The basic fund also gives government certainty over the revenue requirement. In this case, the price-floor fund offers the best value for money if costs are lower than expected but less value for money if costs are higher than expected. This leads to the conclusion that under uncertain costs of supply, a basic or quantity-commitment fund may be preferable.

The future CDM market is likely to be subject to more demand-side than supply-side uncertainty, which suggests that a price-floor fund should be investigated further. There are significant uncertainties on both the supply and the demand side of the CDM. Paramount on the demand side is the level of ambition to reduce emissions, and the extent to which these ambitions are to be met by credit-supplying countries. On the supply side, the uncertainty lies in potential future developments such as sectoral crediting, and other regulatory changes that could lead to changes in the costs of credit supply. On balance, however, the greater uncertainties appear to be on the demand side. It follows from the above analysis that a price-floor fund may be more helpful under the current market conditions and international policy context.

3.3 Conclusions on the market impact of a new-project fund

The market impact of a new-project fund is more difficult to analyse than that of an existing-project fund. This is because any fund will be the only material source of demand for such credits in the next few
years, and also because it is difficult to be specific about opportunities for the development of new projects. Nonetheless, it is clear that there would be more than ample credit supply forthcoming at prices of less than €20 per tonne to satisfy the demand of any reasonably sized fund.

A new-project fund may need to focus on purchasing credits from project types and projects in locations that differ from those that have typically been seen in the CDM to date. For instance, the proportion of future abatement opportunities in Africa appears to be much higher than the proportion of current CDM projects in Africa, while there is likely to be a much higher proportion of credit generation opportunities in energy efficiency, agriculture and CCS projects than indicated by the proportion of these project types in the existing portfolio of CDM projects. A new-project fund could help develop the expertise in delivering credits from these project types and geographies.

A fund that offered a guaranteed minimum off-take price may provide the most resilient design given the uncertainties in credit demand. It is important to design a fund that is robust to the uncertainties over future CDM demand. In the context of significant demand uncertainty, a ‘price-floor’ fund – compared with a fund which bought credits at a range of prices, or one which committed to purchase a given number of CERs – would provide more market size certainty. It would also have the desirable property that the amount of sovereign resources expended would decline as demand (determined by possibly some of the same sovereigns) increased. This could be designed with an absolute cap on the amount of resources expended. This analysis could also apply in relation to the creation of any fund which bought credits from a ‘New Market-based Mechanism’.
4 Consideration in choosing a fund for existing or new projects

Choosing between the two options involves a careful assessment of the trade-offs

The decision on whether to target new or existing projects with a CDM capacity fund depends on various factors. Given competing demands for climate finance, and especially in the context of scarce fiscal resources in many countries, it is likely that a choice will need to be made between a fund to purchase credits from existing projects and one which focusses on credits from new projects. This section provides a brief outline of some of the key factors that policymakers may wish to take into account as they deliberate this issue.

4.1 Factors influencing the choice between a new- and existing-project fund

At least four key factors influencing the decision of which fund type to choose can be distinguished. These factors include:

- expectations on future demand;
- the impact of the current supply overhang on long-term market dynamics;
- the importance of carbon revenues to underlying project viability; and
- skills and capacity that are difficult to replicate.

First, policymakers may want to consider the likelihood that demand for carbon credits will arise in the long run. An existing-project fund can work as a bridge to higher future demand by helping to absorb the supply overhang. However, it could also be used when there is no expectation of future demand but the negative ramifications of low carbon prices need to be avoided for the duration of the projects affected. By contrast, a new-project fund might make sense only if policymakers are confident that more demand will materialise at some point in the future, as there would be no long-term case for projects generating carbon credits otherwise.

Both a new-project fund and an existing-project fund could be used as a bridge towards an alternative vision for global carbon markets in a world with higher demand. The decisions reached at the United Nations climate change conference in Doha in December 2012 included an agreement on the core elements of an NMM, which some see as a long-term alternative to the CDM. Among these elements are that it will allow for net emission reductions (rather than just being an offset mechanism), perhaps especially among advanced industrialising countries, and that it may consider sectoral approaches as well as a project-based approach. Complementary to the thrust of this initiative is the World Bank’s Partnership for Market Readiness (PMR), which aims to promote market-based approaches for emission reductions in participating countries such as China and Brazil. In different ways, either an existing-project fund or a new-project fund could support this trend, as explained further in Box 1.
Both an existing-project fund or a new-project fund could support momentum towards an NMM, if designed appropriately

One option available to a new-project fund would be to trial some of the ideas contained within the NMM concept. In particular, the fund might focus only on credits that could be shown to be generated in relation to a baseline that was more stringent than Business As Usual (BAU). An alternative would be for the fund to purchase credits delivered at a sectoral level (possibly also against a baseline more stringent than BAU). However, this approach would require the fund to develop, potentially alongside other stakeholders, the methodologies and other market infrastructure necessary to realise these innovations. This may be a challenge to deliver in a short timescale. There may also be concerns over whether the credits generated from a sectoral crediting approach may quickly exhaust the resources of the fund (Vivid Economics, 2012).

An existing-project fund could support a similar focus by agreeing to purchase only existing credits from (advanced industrialising) countries that could demonstrate progress towards the introduction of domestic market-based mechanisms. This might be indicated, for instance, by participation in the World Bank’s PMR programme. The key challenge with this approach is that purchasing credits from projects originating from a particular country may not lead to direct financial benefit to that country, especially if the credits have already been transferred from the original project.

It is also possible under either fund design that some advanced industrialised countries could contribute towards the capitalisation of the fund, in recognition of the benefits that they may receive from the continuing availability of carbon market infrastructure, as well as the higher prices that projects based in their countries may receive as a consequence. However, this may be politically challenging, particularly in the context of an existing-project fund.

A second factor to consider is the impact of the current supply overhang on long-term markets. The analysis in Section 2 shows that an existing-project fund could help eliminate a significant proportion of the current supply overhang. This would be particularly desirable if the impact of this supply overhang on the longer-term development of the market is substantial. This is more likely if barriers to entry into the carbon market are high as the potential exit of capacity from the market would be difficult to replace. An existing-project fund would also be valuable if project origination takes a long time, as in this case the current low prices will affect the future project pipeline – although this is a material consideration only if an existing-project fund is sufficiently large to increase prices enough to stimulate new project origination. On the other hand, if origination can be done swiftly and barriers to market entry are low, a new-project fund may be preferable from this perspective, as relatively little is lost by not supporting existing projects.

Third, the importance of carbon revenues at current credit prices to underlying project viability will influence the decision. If many projects can be made viable by modest carbon revenue streams, an existing-project fund may be preferable. The existing-project fund would in this case allow a large number of projects to continue to operate and deliver emission reductions and sustainable development objectives that might otherwise be lost. However, if a low number of projects is affected by small amounts of carbon revenue, for example because they need no carbon revenue or because
they require too high a price, the existing-project fund’s resources would be spent with relatively little impact on projects at the margin of viability. In this case, a new-project fund may be preferable, which may be able to incentivise a broader set of entirely new projects rather than improve sufficiently the financial baseline of only a small number of existing projects. Section 2 suggests that an existing-project fund in the region of €2.5–€3.0 billion would be required to have a material impact on CER prices.

Finally, skills and capacity that are difficult to replace are a factor to take into account. Where the most important skills and capacities are those related to monitoring and verification (and origination if that takes a long time), a fund for existing projects would be the preferred choice. Such skills and capacity are encapsulated in the CDM institutions around projects in various forms, including but not limited to:

- **project participants** are involved in managing projects, including the ongoing monitoring of the project activities according to the methodology chosen in the PDD;
- **designated operational entities** are responsible for the periodic verification that the emission reductions that are claimed to be attained in the monitoring reports submitted to them by project participants are in accordance with the rules of the methodology, after which the emissions reductions can be certified; and
- **the UNFCCC Secretariat and CDM Executive Board** receive a request for CER issuance from the designated operational entity, which is checked for completeness and vetted, charging an issuance fee to the project participants.

Where revenue streams for these institutions dry up as a result of the decision of project managers that CER issuance is financially unattractive, these institutions may lose human and physical capital.

Project origination skills and capacity will be stimulated most by a fund that focusses on new projects. Such skills and capacity have been built into institutions including, but not limited to:

- **project participants** who are identifying project opportunities and develop projects, assuming the risk involved in project development;
- **designated national authorities**, the host country institutions that are responsible for clearing project proposals and the issuance of letters of approval in the CDM project cycle;
- **designated operational entities** that provide independent evaluations of PDDs and validate them;
- **intermediaries**, which include consultants in host countries that help Annex 1-based project developers identify project opportunities, and financial intermediaries providing capital or brokering emission reductions purchasing agreements in Annex-1 markets; and
- **the UNFCCC Secretariat and CDM Executive Board**, responsible for the process of project registration.

The continued existence of these institutions would be at risk were the pipeline for new projects to dry up.

### 4.2 Conclusions

Table 6 summarises the related arguments for a fund targeting existing or new projects.
### Four key factors may influence the choice between different fund design options

<table>
<thead>
<tr>
<th>Factor</th>
<th>Existing-project fund</th>
<th>New-project fund</th>
</tr>
</thead>
<tbody>
<tr>
<td>Expectations on future demand</td>
<td>Can work either as a bridge to higher future demand or as a 'work-out' mechanism</td>
<td>Makes sense only if confident about higher future demand</td>
</tr>
<tr>
<td>Impact of current supply overhang on long-term markets</td>
<td>High because origination takes a long time and/or barriers to entry into market are high</td>
<td>Low because origination can be done quickly and barriers to entry into market are low</td>
</tr>
<tr>
<td>Importance of carbon revenues (at current prices) to underlying project viability</td>
<td>Existing-project fund can have a material impact on prices and many projects can be made viable by small amounts of carbon revenue</td>
<td>Existing-project fund has little impact on prices or fewer projects affected by small amounts of carbon revenue (either because they need no carbon revenue or because they require too high a price)</td>
</tr>
<tr>
<td>Skills and capacity that are difficult to replace</td>
<td>Predominantly monitoring and verification but also origination (if origination takes a long time)</td>
<td>Project origination</td>
</tr>
</tbody>
</table>

Source: Vivid Economics
References

ECN. (2013). Non-Annex 1 MACC. *Energy Research Center of the Netherlands*.


UNEP Risoe Centre. (2013). JI Pipeline Analysis and Database.


Annex: Methodology

Demand

The assumptions underlying the estimate of demand are based on the EU ETS and Australian carbon pricing mechanism, as well as European sovereign demand. Potential demand from Japan, as well as new emissions trading schemes in countries including China, Korea, and Ukraine, is excluded as at the time of the research none of these had made a solid commitment to purchase CERs.

Residual demand for CERs and ERUs from the EU ETS in the period 2013 to 2020 is around 580 Mt. Point Carbon analysis estimates that the limit on offset use in Phases II and III of the EU ETS is 1641 Mt. This number includes the new sectors that are scheduled to enter the scheme. It also includes the impact of the installation-level upward adjustment of offset allowance for those installations that were allowed to use offsets for less than 11 per cent of their respective Phase II caps, if they did not exhaust their quota in Phase II. Actual CER and ERU use in the period 2008 to 2012 was 1059 Mt, reducing the estimated residual demand to around 580 Mt (582 Mt).

The maximum demand for CERs and ERUs from the Australian carbon pricing mechanism over the period from 2013 to 2020 is estimated to be around 190 Mt. The cap on Australian emissions at the start of the emissions trading system in 2015 will be 299 Mt, with actual emissions slightly higher than that. The cap on CER use is 12.5 per cent per annum. Assuming that emissions are broadly aligned with the cap, this implies that maximum demand amounts to five years of CER and ERU use of 12.5 per cent of the cap, or 187 Mt.

This leads to a total CER and ERU credit demand from the EU ETS and Australia’s carbon pricing mechanism over the period 2013–2020 of around 770 Mt.

It is plausible that this demand for CERs and ERUs from the EU ETS and Australian carbon pricing scheme could be met without using any CERs issued from 2013. Table 7 shows that, apart from the 1.2 billion CERs that have been issued until the end of 2012, around 800 million ERUs were issued to the end of 2012, the vast majority of which are likely to be eligible in the EU ETS. There are greater restrictions on the use of ERUs issued since the end of 2012 but, crucially, ERUs from Ukraine continue to be eligible until the end of the Kyoto true-up period, so long as they relate to emission reductions/removals achieved before the end of 2012. UNFCCC data shows that a further 120 Mt of Ukrainian ERUs were issued between January and May 2013 while analysis of the UNEP Risoe JI pipeline (UNEP Risoe Centre, 2013) suggests that a further 260 Mt may be issued from already-registered projects between June 2013 and the end of the Kyoto true-up period (adjusting for historical issuance success rates). When account is also taken of various estimates of CERs that have been used by sovereigns and other actors to date, it would appear that there is a potential surplus of existing CERs and ERUs, as well as ERUs yet to be issued from Ukraine, of more than 950 Mt. This is significantly more than the 770 Mt of CER and ERU demand from the EU ETS and the Australian carbon pricing mechanism.
These calculations may underestimate the surplus of ERUs. Although there may be other sources of demand not accounted for in Table 7, there is also a likelihood of significant further increases in ERU issuance, much of which will be eligible for use in the EU ETS and Australia’s carbon pricing mechanism. At the time of writing, the UNEP Risoe JI pipeline reports that there are a further 45 Ukrainian projects at determination with estimated emission reduction potential of 70 Mt. This may increase further in future, while it is also possible that ERUs from projects in Russia may seek verification from an independent auditor that they relate to emission reductions achieved before 31st December 2012. This would make them eligible for use in the EU ETS.

As well as demand from the EU ETS and Australian carbon pricing schemes, there may also be demand for CERs and ERUs from European sovereigns under the EU Effort Sharing Decision (ESD). The period from 2013 to 2020 could see a demand of up to 750 Mt of CERs and ERUs. The European Environment Agency estimates that this may be as much as 750 Mt (EEA, 2012). Although this demand may also be met by ERUs, some sovereigns may be reluctant to use ERUs given concerns about the environmental integrity of some of these units. Therefore, as described in the body of the text, we include a scenario in which the entirety of this demand is met through new CER purchases.
Table 7. There is likely to be a sufficient surplus of ERUs and already-issued CERs that could eliminate demand for CERs issued after 2012

<table>
<thead>
<tr>
<th>Variable</th>
<th>Value</th>
<th>Source</th>
</tr>
</thead>
<tbody>
<tr>
<td>CERs issued up to end 2012</td>
<td>1,207,774,406</td>
<td>IGES Japan (2013)</td>
</tr>
<tr>
<td>ERUs issued up to end 2012</td>
<td>797,714,083</td>
<td>UNFCCC (2013)</td>
</tr>
<tr>
<td>Ukrainian ERUs issued January–May 2013</td>
<td>121,666,373</td>
<td>UNFCCC (2013)</td>
</tr>
<tr>
<td>Ukrainian ERU issuance potential from projects in pipeline. (June 2013- end of Kyoto true-up period)</td>
<td>264,267,788</td>
<td>Analysis of JI pipeline maintained by UNEP Risoe Centre (2013)</td>
</tr>
<tr>
<td><strong>Total issued CERs &amp; ERUs and EU ETS eligible supply from Ukraine</strong></td>
<td>2,391,422,650</td>
<td></td>
</tr>
<tr>
<td>Estimated potential CER demand 2008–2012, EU sovereigns</td>
<td>240,000,000</td>
<td>Estimate based on discussion with industry representatives</td>
</tr>
<tr>
<td>Estimated CERs &amp; ERUs used by Norway</td>
<td>22,523,077</td>
<td>Estimate based on World Bank (2012)</td>
</tr>
<tr>
<td>CERs &amp; ERUs used by Japan Keidanren</td>
<td>68,250,000</td>
<td>Estimate based on World Bank (2012)</td>
</tr>
<tr>
<td>Estimated CERs &amp; ERUs used by Government of Japan</td>
<td>25,000,000</td>
<td>Maeda (2010)</td>
</tr>
<tr>
<td>Estimated CERs &amp; ERUs used by Switzerland</td>
<td>12,750,000</td>
<td>Estimate based on World Bank (2012)</td>
</tr>
<tr>
<td><strong>Total estimated CERs &amp; ERUs used</strong></td>
<td>1,427,232,843</td>
<td></td>
</tr>
<tr>
<td>Surplus supply</td>
<td>964,189,807</td>
<td></td>
</tr>
<tr>
<td>CER and ERU demand from EU ETS and Australia’s carbon pricing mechanism</td>
<td>770,000,000</td>
<td></td>
</tr>
</tbody>
</table>

Source: Vivid Economics, various sources cited in table.
Supply

The supply curve is based on a project-by-project analysis of project types that are eligible under the EU ETS and Australian carbon pricing mechanism, with the marginal costs of CER issuance estimated through a survey among market participants. Annual CER supply per project over the period from 2013 to 2020 is taken from the CDM databases maintained by IGES Japan (2013), which sources the data from CDM Project Design Documents (PDDs) available from the UNFCCC CDM website. This includes both regular CDM projects and Programme of Activities (PoA) projects. The model focuses on CER generation by projects that have already been registered, ignoring projects that are still in the validation stages of the project cycle.

The CER supply projections from the PDDs are then adjusted for market participants’ expectations of future issuance success; likewise, costs per issued CER are based on market participants’ expected monitoring, certification and verification and crediting period renewal costs. A survey of market participants was carried out to collect estimates of future issuance success from projects in 21 project type categories and across five geographies, the results of which are presented in Table 8. In the same survey, market participants were asked to provide their estimates of annualised monitoring, verification and certification costs, which are presented in Table 9. Where more than one respondent provided a cost estimate, we took the median. Respondents also provided estimates of one-off costs associated with each crediting period renewal. All of these costs are converted into per CER costs by dividing the annual monitoring, verification and certification costs by annual expected issuance. Renewal costs are assumed to be spread pro rata to the number of credits issued in each year for which credits are issued should renewal proceed.

In addition to monitoring, verification and certification costs, project-specific operating and maintenance (O&M) costs that must be covered by CER revenues are taken into account for N₂O, decomposition and a selection of landfill gas projects. There is a range of project types that incur O&M or running costs that need to be covered by CER revenues, as these projects do not generate income other than from CER sales. The most notable examples of such projects are the installation of catalysts for the decomposition of N₂O,¹⁰ and landfill gas flaring and recovery and utilisation,¹¹ all incurring significant O&M costs.¹² This can be derived from the analysis in Table 11 in Spalding-Fecher et al. (2012:61), which shows that the majority of projects applying simple cost analysis (the additionality tool under the CDM that can be used only if the project has no revenue streams other than CERs) are in these categories. To account for O&M costs in N₂O projects, data from 67 PDDs of registered projects that apply a simple cost analysis (following AM0028 and AC0034 methodologies) is extracted, along with data from 28 PDDs that apply other additionality tests (following AM0021 and ACM0019 methodologies). Less than half of the PDDs that apply simple cost analysis provide O&M cost data. This data is used to find the costs per CER of running a

¹⁰ Methodologies for N₂O decomposition are AM0021, AM0028, AM0034, and ACM0019.

¹¹ This category covers methodologies ACM0001, ACM0008, AM0083, AMS-I.D., and AMD-III.G.

¹² There are likely to be other projects that have similar characteristics and would fit in this category, but data availability issues render it impossible to account for these.
The market impact of a CDM capacity fund catalyst and is applied to the remainder of the 95 projects, which amounts to around €0.50. This number is derived by running a bivariate ordinary least squares (OLS) regression on the available data rather than taking a simple average, which allows for a distinction between fixed and variable operating costs. The same method is applied to find data for 73 landfill gas projects; however, in this case the focus is only on projects that apply simple cost analysis, as there is a wider variety of projects within this category that may generate revenues from sources other than CER sales, such as projects that recover gases to generate electricity. The application of simple cost analysis is a fairly reliable indicator that the project does not generate income other than from CERs. However, it is recognised, both in relation to other landfill gas projects and other project categories, that there will be other projects that have O&M costs that might be covered only by CER revenues that are not captured in this analysis as a result of data limitations.

Finally, we take account of the Adaptation Fund levy, the Administration Share of Proceeds, and an allowance for a profit margin on CER sales. The Adaptation Fund levy is a levy of 2 per cent of CER issuances, with the exception of CDM projects in LDCs, which are forwarded to a separate account and are monetised for the benefit of the Adaptation Fund. The share of proceeds for Administration Share of Proceeds is a payment of US$ 0.1 per CER for CER generation up to 15,000 per annum, and US$0.2 for CER generation over 15,000 per annum which we convert to a euro amount based on an exchange rate of €0.8 per dollar. Industry representatives suggest that a profit margin of between 5 and 20 per cent is generally sought by investors; hence we allow for the midpoint of 12.5 per cent profit margin over CER sales.
Table 8. Future CER issuance success varies substantially across project types and regions

<table>
<thead>
<tr>
<th>Project type</th>
<th>Africa/Middle and Near East</th>
<th>Asia</th>
<th>China</th>
<th>Latin America</th>
<th>Others</th>
</tr>
</thead>
<tbody>
<tr>
<td>HFC reduction/avoidance</td>
<td>0.85</td>
<td>0.85</td>
<td>0.77</td>
<td>0.85</td>
<td>0.85</td>
</tr>
<tr>
<td>N₂O decomposition</td>
<td>0.85</td>
<td>0.85</td>
<td>0.77</td>
<td>0.85</td>
<td>0.85</td>
</tr>
<tr>
<td>PFC reduction and substitution</td>
<td>0.85</td>
<td>0.85</td>
<td>0.77</td>
<td>0.85</td>
<td>0.85</td>
</tr>
<tr>
<td>Transportation</td>
<td>0.55</td>
<td>0.65</td>
<td>0.95</td>
<td>0.55</td>
<td>0.55</td>
</tr>
<tr>
<td>Afforestation &amp; reforestation</td>
<td>0.55</td>
<td>0.55</td>
<td>0.55</td>
<td>0.55</td>
<td>0.55</td>
</tr>
<tr>
<td>Hydro power</td>
<td>0.85</td>
<td>0.85</td>
<td>0.98</td>
<td>0.85</td>
<td>0.85</td>
</tr>
<tr>
<td>Other renewable energies</td>
<td>0.85</td>
<td>0.85</td>
<td>0.99</td>
<td>0.85</td>
<td>0.85</td>
</tr>
<tr>
<td>Fuel switch</td>
<td>0.85</td>
<td>0.85</td>
<td>0.9</td>
<td>0.85</td>
<td>0.85</td>
</tr>
<tr>
<td>ACM0006</td>
<td>0.85</td>
<td>0.85</td>
<td>0.8</td>
<td>0.85</td>
<td>0.85</td>
</tr>
<tr>
<td>Biomass</td>
<td>0.85</td>
<td>0.85</td>
<td>0.8</td>
<td>0.85</td>
<td>0.85</td>
</tr>
<tr>
<td>Wind power</td>
<td>0.85</td>
<td>0.85</td>
<td>0.98</td>
<td>0.85</td>
<td>0.85</td>
</tr>
<tr>
<td>Cement</td>
<td>0.75</td>
<td>0.75</td>
<td>0.5</td>
<td>0.75</td>
<td>0.75</td>
</tr>
<tr>
<td>Biogas</td>
<td>0.85</td>
<td>0.85</td>
<td>0.99</td>
<td>0.85</td>
<td>0.85</td>
</tr>
<tr>
<td>Methane avoidance</td>
<td>0.45</td>
<td>0.6</td>
<td>0.86</td>
<td>0.55</td>
<td>0.55</td>
</tr>
<tr>
<td>Methane recovery &amp; utilisation</td>
<td>0.45</td>
<td>0.6</td>
<td>0.86</td>
<td>0.55</td>
<td>0.55</td>
</tr>
</tbody>
</table>
### The market impact of a CDM capacity fund

<table>
<thead>
<tr>
<th>Project type</th>
<th>Africa/Middle and Near East</th>
<th>Asia</th>
<th>China</th>
<th>Latin America</th>
<th>Others</th>
</tr>
</thead>
<tbody>
<tr>
<td>Energy efficiency</td>
<td>0.8</td>
<td>0.8</td>
<td>0.98</td>
<td>0.8</td>
<td>0.8</td>
</tr>
<tr>
<td>Waste gas/heat utilisation</td>
<td>0.8</td>
<td>0.8</td>
<td>0.9</td>
<td>0.8</td>
<td>0.8</td>
</tr>
<tr>
<td>SF6 replacement</td>
<td>0.85</td>
<td>0.85</td>
<td>0.77</td>
<td>0.85</td>
<td>0.85</td>
</tr>
<tr>
<td>Leak reduction</td>
<td>0.8</td>
<td>0.8</td>
<td>0.9</td>
<td>0.8</td>
<td>0.8</td>
</tr>
<tr>
<td>Material use</td>
<td>0.8</td>
<td>0.8</td>
<td>0.9</td>
<td>0.8</td>
<td>0.8</td>
</tr>
<tr>
<td>Biofuels</td>
<td>0.85</td>
<td>0.85</td>
<td>0.99</td>
<td>0.85</td>
<td>0.85</td>
</tr>
</tbody>
</table>

**Note:** The numbers in this table represent rates of expected issuance per projected CER issuance in the PDD.

**Source:** Vivid Economics
Table 9: Annual monitoring, verification and certification costs vary substantially across project types and geographies

<table>
<thead>
<tr>
<th>Project type</th>
<th>Africa/Middle and Near East</th>
<th>Asia</th>
<th>China</th>
<th>Latin America</th>
<th>Others</th>
</tr>
</thead>
<tbody>
<tr>
<td>HFC reduction/avoidance</td>
<td>30,000</td>
<td>31,250</td>
<td>27,500</td>
<td>40,000</td>
<td>32,187.5</td>
</tr>
<tr>
<td>N₂O decomposition</td>
<td>30,000</td>
<td>31,250</td>
<td>27,500</td>
<td>40,000</td>
<td>32,187.5</td>
</tr>
<tr>
<td>PFC reduction and substitution</td>
<td>30,000</td>
<td>31,250</td>
<td>27,500</td>
<td>40,000</td>
<td>32,187.5</td>
</tr>
<tr>
<td>Transportation</td>
<td>35,000</td>
<td>23,500</td>
<td>22,500</td>
<td>23,500</td>
<td>26,125</td>
</tr>
<tr>
<td>Afforestation &amp; reforestation</td>
<td>50,000</td>
<td>22,500</td>
<td>22,500</td>
<td>22,500</td>
<td>29,375</td>
</tr>
<tr>
<td>Hydro power</td>
<td>36,250</td>
<td>28,000</td>
<td>22,500</td>
<td>48,625</td>
<td>33,843.75</td>
</tr>
<tr>
<td>Other renewable energies</td>
<td>33,250</td>
<td>34,666</td>
<td>20,000</td>
<td>39,750</td>
<td>31,916.5</td>
</tr>
<tr>
<td>Fuel switch</td>
<td>25,000</td>
<td>37,500</td>
<td>27,500</td>
<td>41,250</td>
<td>32,812.5</td>
</tr>
<tr>
<td>ACM0006</td>
<td>160,000</td>
<td>160,000</td>
<td>160,000</td>
<td>160,000</td>
<td>160,000</td>
</tr>
<tr>
<td>Biomass</td>
<td>33,250</td>
<td>34,666</td>
<td>20,000</td>
<td>39,750</td>
<td>31,916.5</td>
</tr>
<tr>
<td>Wind power</td>
<td>36,250</td>
<td>28,000</td>
<td>22,500</td>
<td>48,625</td>
<td>33,843.75</td>
</tr>
<tr>
<td>Cement</td>
<td>25,000</td>
<td>30,000</td>
<td>27,500</td>
<td>30,000</td>
<td>28,125</td>
</tr>
<tr>
<td>Biogas</td>
<td>33,250</td>
<td>34,666</td>
<td>20,000</td>
<td>39,750</td>
<td>31,916.5</td>
</tr>
<tr>
<td>Methane avoidance</td>
<td>30,000</td>
<td>33,250</td>
<td>27,500</td>
<td>48,000</td>
<td>34,687.5</td>
</tr>
<tr>
<td>Methane recovery &amp; utilisation</td>
<td>30,000</td>
<td>33,250</td>
<td>27,500</td>
<td>48,000</td>
<td>34,687.5</td>
</tr>
<tr>
<td>Project type</td>
<td>Africa/Middle and Near East</td>
<td>Asia</td>
<td>China</td>
<td>Latin America</td>
<td>Others</td>
</tr>
<tr>
<td>------------------------------</td>
<td>-----------------------------</td>
<td>------</td>
<td>-------</td>
<td>---------------</td>
<td>--------</td>
</tr>
<tr>
<td>Energy efficiency</td>
<td>15,000</td>
<td>36,666</td>
<td>22,500</td>
<td>41,250</td>
<td>28,854</td>
</tr>
<tr>
<td>Waste gas/heat utilisation</td>
<td>33,250</td>
<td>36,666</td>
<td>22,500</td>
<td>41,250</td>
<td>33,416.5</td>
</tr>
<tr>
<td>SF6 replacement</td>
<td>30,000</td>
<td>31,250</td>
<td>27,500</td>
<td>40,000</td>
<td>32,187.5</td>
</tr>
<tr>
<td>Leak reduction</td>
<td>33,250</td>
<td>36,666</td>
<td>22,500</td>
<td>41,250</td>
<td>33,416.5</td>
</tr>
<tr>
<td>Material use</td>
<td>33,250</td>
<td>36,666</td>
<td>22,500</td>
<td>41,250</td>
<td>33,416.5</td>
</tr>
<tr>
<td>Biofuels</td>
<td>33,250</td>
<td>34,666</td>
<td>20,000</td>
<td>39,750</td>
<td>31,916.5</td>
</tr>
</tbody>
</table>

Note: The numbers presented are annualised costs in euros based on a survey of industry participants. Where multiple values were submitted, an average is reported. Where no submissions were received from respondents, the average of the values submitted for other regions in the same project category is reported.

Source: Vivid Economics
Company Profile

Vivid Economics is a leading strategic economics consultancy with global reach. We strive to create lasting value for our clients, both in government and the private sector, and for society at large.

We are a premier consultant in the policy-commerce interface and resource- and environment-intensive sectors, where we advise on the most critical and complex policy and commercial questions facing clients around the world. The success we bring to our clients reflects a strong partnership culture, solid foundation of skills and analytical assets, and close cooperation with a large network of contacts across key organisations.