SEI STOCKHOLM ENVIRONMENT INSTITUTE

POLICY BRIEF

Potential for International Offsets to Provide a Net Decrease of GHG Emissions

Key Findings

- **Several crucial questions still need to be answered about what the Parties to the United Nations Framework Convention on Climate Change (UNFCCC) meant when, at COP17 in Durban, they called for new market mechanisms – and, more broadly, "various approaches, including markets" to "achieve a net decrease and/or avoidance of greenhouse gas emissions".**
- **Achieving a net decrease in global GHG emissions requires an ability to do all of the following: generate offsets for which additionality is relatively certain; produce more GHG abatement than is credited (surplus reductions); avoid double counting of emission reductions; and ensure that surplus reductions do not count towards the host country's mitigation pledge.**
- **Approaches to achieving a net decrease are currently available to policy makers, such as unit discounting or cancellation, some of which are already in use.**

International greenhouse gas emission offsets are a central piece of most climate policy architectures. By allowing flexibility in the location of emission reductions, they make it possible to reduce the overall costs of GHG abatement. The Clean Development Mechanism (CDM), created under the Kyoto Protocol, has issued over one billion offset credits to date.

While the potential to reduce costs may lead to more ambitious climate targets, in principle, offsets provide no net benefit to the atmosphere. However, analysts have proposed ways in which offset projects could offer a net benefit, by reducing emissions by more than the offsets issued. At COP 17 in Durban, the Parties to the United Nations Framework Convention on Climate Change (UNFCCC) embraced this approach, calling for new market mechanisms, and more broadly, "various approaches, including markets" to "achieve a net decrease and/or avoidance of greenhouse gas emissions". This policy brief, based on SEI Working Paper No. 2013-06, explores what it means to achieve a net decrease of emissions through offsets, how it might be achieved, and what it might deliver.

Defining 'net decrease and/or avoidance of GHGs'

The Parties at COP 17 did not specify the meaning of a "net decrease". The language they used suggests that each offset is to be associated with more abatement than credited, but the reference point – net of *what*? – is not clear. In particular, *net decrease* could be assessed against two different reference points:

- **From the perspective of an offset instrument or individual offset activity**: *Surplus reductions* can be achieved if actual emission reductions exceed the offset credits issued or used. The surplus reductions could still, for example, count towards the host country's own emission reduction pledge.
- **From the perspective of global GHG emissions**: Under this view, emissions would have to be reduced *beyond* what countries have already pledged, leading to a *net atmospheric benefit*.

It is not clear which reference point the COP17 Parties intended. If the intent was to increase mitigation ambition, then *net decrease* would need to be based on *global* GHG emissions. However, if the intent is to help developing countries meet their pledges, then producing surplus reductions would suffice.

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The Bangui Wind Farm, the first CDM project in the Philippines to generate emission reduction credits.

Net atmospheric benefits could be attained by several means: by producing surplus reductions from offset activities in Least Developed Countries (LDCs), which do not have emissions pledges; by producing surplus reductions of gases or in sectors not covered by a host country pledge; or by cancelling credits instead of applying them towards a pledge. Figure 1 illustrates the key terms and highlights the importance of the GHG emissions accounting rules applied to the host country.

In Case 1, if the host country counts emission reductions from an offset mechanism towards its pledge, there is no atmospheric benefit. If the buyer also uses the offsets to meet its own targets, the emission reductions would be double-counted – potentially *increasing* global GHG emissions.

In Case 2, the host country adds the offset credits issued to its reported emissions, so they do not count towards its pledge – but does count the surplus emissions. A net decrease in global emissions would result if the buyer did not use a fraction of the issued credits. In Case 3, the buyer does not use the credits

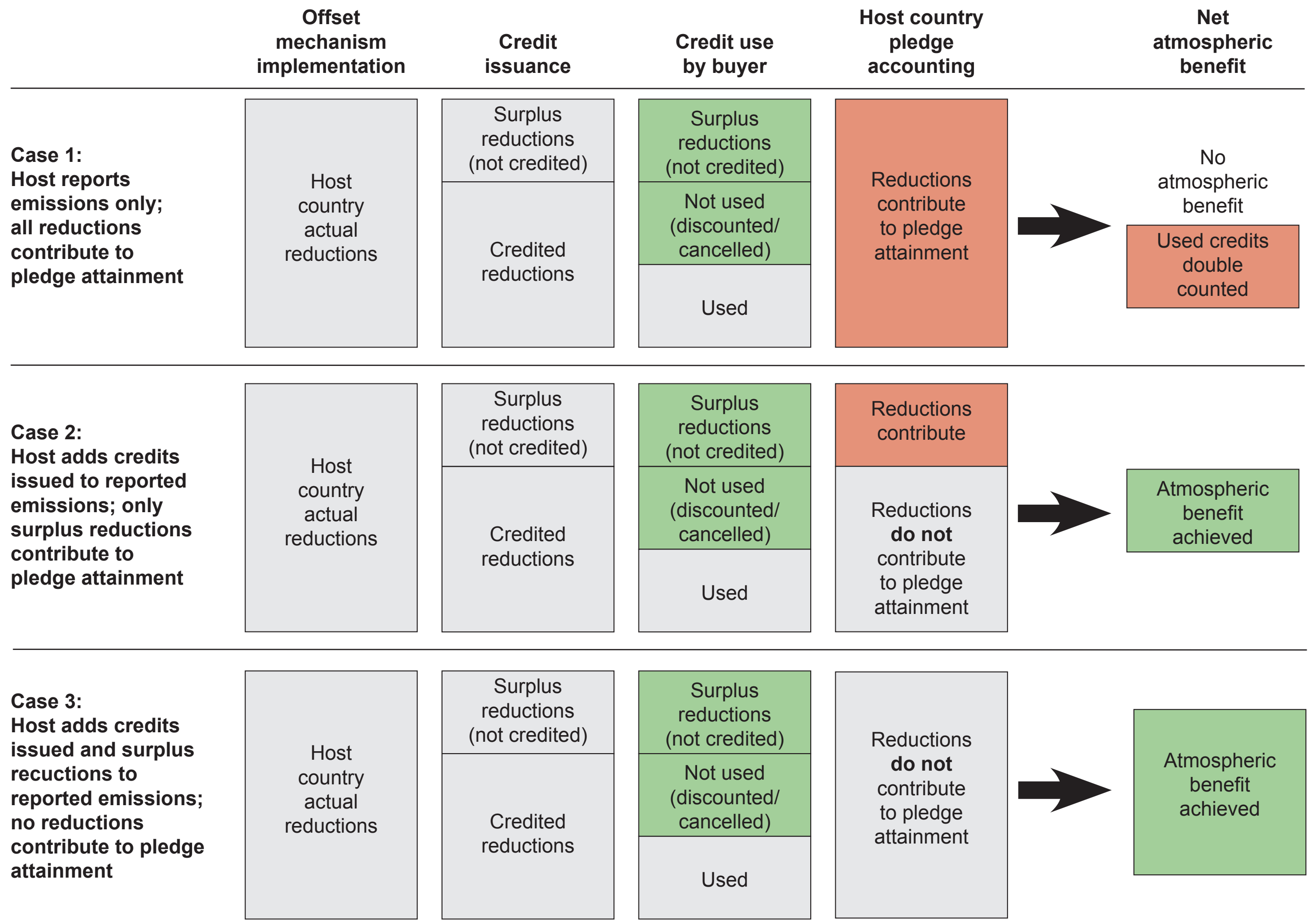

Figure 1: Illustration of sources of net atmospheric benefit.

for pledge attainment and the host country adds emissions for both the sold credits and the surplus reductions to its reported emissions, resulting in the largest net atmospheric benefit.

It is important to emphasize that addressing potential double-counting is a prerequisite to achieving a net atmospheric benefit. Both Case 2 and Case 3 assume that countries would use accounting procedures to avoid double-counting. For instance, if total emissions were 1,000 tonnes CO_2, and offsets worth 100 tonnes CO_2 were issued, the host country would report its total emissions as 1,100 tonnes CO_2. Case 3 would also require procedures to quantify and track the amount of surplus reductions, so the appropriate amounts can be added back as well. In both cases, further work would be needed to develop workable accounting procedures.

Lessons from the CDM

The CDM issues certified emission reductions (CERs) that allow buyer countries to offset their own emissions by the same amount as emissions are reduced in developing (seller) countries. A net atmospheric benefit could be achieved under the CDM if, for example, one CER were issued per two tonnes of actual emission reductions (yielding one tonne of *surplus reduction*) and the host country did not count the surplus reduction towards a target.

A key challenge with the CDM and other offset mechanisms is that credits are assessed relative to the (baseline) level of emissions that would have been expected had the CDM project activity not occurred. Because this "without CDM" baseline can never be known with certainty, the actual emission reductions could be more or less than the credits awarded. Research suggests that baselines have been set artificially high for some power sector projects and for projects that reduce HFC-23 emissions, for example. Emission reductions can also be overestimated if indirect emission effects, referred to as "leakage", are not properly accounted for. This has been a concern with adipic acid plants, for example.

On the other hand, other factors may lead to emission reductions being greater than the number of credits issued. For example, some project types may outlast the limit of the CDM's crediting periods (usually either 7 years, renewable twice, or 10 years without renewal). This may be particularly likely for projects that generate revenues via long-lived capital stock, such as renewable energy projects.

CDM projects could also lead to surplus reductions when their baselines are set lower than expected "actual" emissions. For example, in the most recent version of the methodology AM0001 for calculating HFC emissions, CDM regulators purposefully set a low baseline. In addition, some monitoring methodologies require the use of "conservativeness factors" that effectively discount emission reductions to reflect uncertainties about measurement methods, and to limit the risk of over-crediting.

Quantifying these potential sources of surplus reductions is difficult. One recent analysis estimated that, if all CDM projects were truly additional – if they would not have occurred without the CDM incentive – and all wind and hydropower projects outlasted their crediting periods, then the CDM could yield (on average) up to 1.55 tonnes of emission reductions per credit issued. However, observers have cast doubt on the additionality of many power sector projects. The same analysis also found the emission reductions per credit issued through 2020 could be as low as 0.38 tonnes, if a significant fraction of these projects (those for which CDM provided a more limited financial incentive) were not additional.

Conditions that could lead to surplus reductions

There are conditions that could lead to certain project types yielding surplus reductions:

- **High confidence in additionality**, meaning there is a high confidence that the CDM is causing the implementation of the projects.
- **High confidence that the baseline scenario is realistic for all crediting periods**, meaning there is a high confidence that the baseline is realistic or conservative for the entire length of crediting (up to 21 years for normal CDM projects).
- **High confidence that indirect emission effects (leakage) are appropriately addressed,** meaning that increases in upstream or downstream emissions (outside the boundary of the credited activity) are quantified or avoided.
- **High likelihood that the projects are leading to more actual abatement than credited with CERs.** In the CDM, this condition could hold true in either of two ways: through the use of discounts or conservativeness parameters, or if there is a high likelihood that the emission-reducing activity will continue beyond the project's crediting period.

Project types that may achieve surplus reductions

The discussion above suggests additionality is a key factor in achieving surplus reductions. Analysts have suggested that additionality is relatively certain for projects that reduce emissions from the industrial gases HFC-23 and N_2O, for manure management, and (perhaps to a lesser extent) for projects that capture methane at landfills and coal mines. Moreover, uncertainty discounts used for N_2O reduction projects at adipic acid and nitric acid plants and for emissions at solid waste landfills might lead to under-crediting of emission reductions in these projects by 5% to 10%. However, these discounts are intended to reduce the risk of over-crediting; under-crediting is not assured.

Discounts or other conservativeness parameters could also be applied with the specific intent of yielding surplus reductions. However, for projects to be financially viable and proceed, the discount must not be so great as to reduce revenues below the marginal cost of abatement (including any transaction costs), or else CER revenues will not provide adequate financial incentive to pursue, implement, and operate projects.

Accordingly, discounts are most applicable for activities with marginal costs far below the expected price of offsets. With marginal costs of $1 per tonne or less, industrial gas projects could be particularly well suited to discounts. Costs vary more widely for projects that capture methane at landfills, coal mines, wastewater treatment facilities, and livestock management systems. Because costs can be much higher for these project types, discounting may be less viable.

Other types of mitigation activities outside the CDM may also meet these criteria. For example, discussions of new market mechanisms, sectoral crediting, and REDD+ have in some cases focused on ambitious baselines that would be set below business-as-usual and include an "own country" commitment. If such baselines could be confidently set below business-as-usual, then such mechanisms could meet these criteria.

Measures for achieving net atmospheric benefit

Our review of the CDM suggests the key approaches to achieving *surplus reductions* include:

Stringent baselines, the most-cited method for achieving surplus reductions. To the extent that a BAU baseline can be determined with confidence, it would be relatively straightforward to establish a stringent baseline or crediting threshold lower than this level. This lower-than-BAU crediting threshold is a key part of a new market mechanism design advocated by the European Union to generate surplus reductions.

Pre-issuance discounts: These are easier to apply, as they do not require changes to crediting methodologies; they can be applied (on the supply side) after emission reductions have been estimated and verified, but before issuing offsets.

Shortened crediting periods: As with discounts and stringent baselines, fewer offsets would be issued for a given project. Unlike the other options, shortened crediting periods only reduce offset generation in the later years of a project, thus enabling more "front-loaded" revenue, which can be attractive to developers. However, they are not effective with activities that require continued revenue from carbon market units, such as N_2O abatement in nitric acid plants, which is unprofitable without credits.

Offset purchasing countries have at least two options for achieving surplus reductions *and net atmospheric benefit* on their own: **post-issuance discounts** (on the demand side) or **unit purchase and cancellation**. Buyer countries (or entities within them) can apply post-issuance discounts upon acquiring offsets or applying them to an emission reduction obligation. Similarly, a buyer country or entity – or a host country – can purchase and cancel a portion of the offsets purchased instead of using them for compliance with an emissions target.

Potential scale of net atmospheric benefit

In principle, an offset mechanism could achieve a nominal net atmospheric benefit if it reduced global emissions by just one tonne of CO_2. However, if the Parties' intent is to deepen global emission reductions and help close the emissions "gap", then scale matters. We estimated the potential scale of net atmospheric benefit achievable in the year 2020 by discounting offsets (either pre- or post-issuance) and cancelling the resulting surplus reductions, taking two approaches. In the first, we selected three CDM project types (HFC-23 and two types of N_2O abatement), considered their expected CER issuance, and applied discounts based on the marginal costs and offset prices. In the second, we assumed a more generic offset mechanism that grows at the historically high end of inflow rates to the CDM, assumed that any and all offsets are additional, and applied a discount to all credits.

As shown in Table 2, applying significant discounts to existing CDM project types (so that CER revenue exactly covers

Table 2: Potential net surplus reductions in 2020 attainable by CDM projects[1] See Table 5 in SEI Working Paper No. 2013-06 for sources and several comments and explanatory notes.

Project type	HFC-23 destruction	N_2O decomposition – adipic acid	N_2O decomposition – nitric acid
Expected abatement in 2020 (Mt CO_2e)	98	29	18
Assumed marginal abatement cost (per Mt CO_2e)	\$0.28	\$0.18	\$1.00
Including transaction costs (per Mt CO_2e)	\$0.50	\$0.98	\$5.20
Assumed offset price	\$5 (low) to \$20 (high)	\$5 (low) to \$20 (high)	\$5 (low) to \$20 (high)
Discount (abatement not credited)	90% (low) to 97% (high)	80% (low) to 95% (high)	None (low) to 74% (high)
Potential surplus reductions in 2020 (Mt CO_2e)	88 to 95	23 to 28	0 to 13
Total potential surplus reductions all 3 project types in 2020 (Mt CO_2e)			111 to 136

project costs) could yield potential surplus reductions on the order of 111 to 136 million tonnes CO_2e in 2020 relative to the number of credits issued that year, depending on offset prices (and the extent of the discount possible).

Whether these reductions would contribute to a net atmospheric benefit depends on whether these surplus reductions are absorbed as part of countries' pledges. Based on the portfolio of projects registered in the CDM pipeline, we estimated that about 80% of HFC-23 credits, 50% of N_2O adipic acid credits, and 60% of N_2O nitric acid credits will be issued from projects that are either in countries without pledges or are in China (for which we assumed a literal interpretation of China's pledge to cover CO_2 only). Based on those assumptions, we found that the potential net atmospheric benefit of these CDM projects by a discount alone is about 80 to 100 million tonnes CO_2e. If host countries where pledges cover these gases were to cancel these CERs instead of applying them towards their own pledges, then the mitigation benefit could be the full amount estimated in Table 2.

CER issuance in 2020 is estimated at 300 to 400 million tonnes CO_2e, but some have proposed scaling the offset market to up to 1 billion tonnes CO_2e. Applying a 10% discount to offset usage of 300 million to 1 billion tonnes CO_2e would, to first order, yield surplus reductions of 30 to 100 million tonnes CO_2e and a 40% discount, 120 to 400 million tonnes. As with the CDM, the extent to the surplus reductions result in a net atmospheric benefit would depend on the extent to which they are not applied to an existing pledge by the host country, or they are cancelled by the buyer.

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Policy considerations

- If the Parties to the UNFCCC wish to enable the development of market mechanisms and other approaches to achieve a net decrease and/or avoidance of GHG emissions, they need to define the concept of net decrease – specifically, whether they mean just surplus reductions or whether they expect a net atmospheric benefit.
- International agreement is needed on how to treat offsets in pledge accounting, to ensure that emissions reductions are not double-counted (in both buyer and host country accounts). Such an agreement would enhance the integrity and comparability of emissions pledges; without it, serious discussion of achieving net atmospheric benefits is premature.
- CDM administrators and major buyer countries could make greater use of approaches such as discounts and ambitious baselines to yield net reductions and/or net atmospheric benefits.

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