CCAP Submission on Development of a Framework for Market Mechanisms that Avoids Double Counting of Effort and Achieves a Net Decrease in Greenhouse Gas Emissions

March 5, 2012

CCAP makes this submission in response to the invitation [paragraph 81 of the Draft decision [-/CP.17] Outcome of the work of the Ad Hoc Working Group on Long-term Cooperative Action under the Convention] for parties and admitted UNFCCC observer organizations to submit to the secretariat, by 5 March 2012, their views on the matters referred to in paragraphs 79 and 80. Paragraph 79 emphasizes that market approaches must meet standards that deliver real, permanent, additional and verified mitigation outcomes, avoid double counting of effort, and achieve a net decrease and/or avoidance of greenhouse gas emissions. Paragraph 80 requests the AHWG-LCA to conduct a work program to consider a framework for market approaches.

Executive Summary

The Kyoto Protocol market mechanisms have helped developing countries gain access to finance for various types of climate mitigation projects and have offered an avenue to technology transfer while supplying developed countries with a low cost source of credits to meet their compliance obligations. However, with the prices for emissions allowances dropping in the Kyoto compliance markets, the incentive to undertake project-based actions has been greatly diminished. Further, as many developing countries have pledged their own emission reduction targets, they are interested in retaining access to the low cost mitigation opportunities for themselves. Additionally, the UNFCCC has articulated an alternative approach to achieve emissions reductions in developing countries, specifically, use of nationally appropriate mitigation actions, or NAMAs, that are implemented in return for international financial, capacity and/or technological support. The notion of NAMAs has catalyzed interest from a number of developing country governments seeking bilateral and multilateral financial support to initiate broad based policies and measures that meet sustainable development and GHG mitigation objectives.

As the Ad Hoc Working Group on Long-term Cooperative Action considers the framework for new market mechanisms (NMMs), it will be critical to specifically address the relationship between NMMs and NAMAs. In CCAP's view, a clear "bright line" distinction between NAMAs and NMMs is needed to: avoid double counting and ensure that both of these new mechanisms achieve a net decrease of GHGs towards the global abatement goal; ensure fairness in terms of developing country access to their own low cost mitigation opportunities; prevent GHG measurement and accounting problems; and to align

private sector incentives with the broader mitigation and development interests of developing countries. If the international framework blurs the distinction between supported NAMAs and offsets, there is the potential to damage the supported NAMA concept, while at the same time the offsets generated and sold to developed countries would no longer be additional.

This submission describes CCAP's concerns with a framework that allows both approaches to proceed in an uncoordinated manner, and presents a specific solution that will enable both mitigation approaches to contribute additional emissions reductions to the global climate solution. Under CCAP's proposed framework, developing countries would begin by implementing NAMAs, thereby retaining access to the lower cost mitigation actions within their own borders to implement the pledges made in Copenhagen and Cancun. As needed, the NAMAs would be incented with international financial, technological and capacity support, and the emissions reductions expected to result from NAMAs could not be sold as offsets in the carbon market. Only emissions reductions achieved in excess of a negotiated crediting threshold—set to go beyond the ambition level expected from the supported NAMA—could be sold to support compliance in developed countries.

Double Counting of NMMs and NAMAs Impedes Achievement of Global Mitigation Goals

Scientists estimate we need to limit emissions to 44 GT per year by 2020 to make it "likely" we will limit global temperature increases to 2 degrees Celsius (2°C).[1] According to the most recent estimates by UNEP, which is based on analyses of national pledges by 13 different research groups, with business-as-usual emissions in 2020 projected to be 56 GT (55-59 GT) per year, a total of 12 GT of reductions are needed globally, from both developed and developing countries. In fact, a shared effort between developed and developing countries will ultimately be needed; rapid economic and emissions growth projected for developing countries means that developed country actions alone—even if such actions meant that developed country emissions were reduced to zero—will be insufficient to reduce global emissions by 50 percent below 1990 levels by 2050.

Pledges made at Copenhagen and Cancun are expected to reduce emissions by between 6 and 1 GT per year by 2020, depending on whether countries strive to meet their "high ambition" pledges (or stick to "low ambition" goals) and the stringency (or leniency)[2] of the accounting rules. The 6 GT per year reduction level assumes that the commitments made by each country are additive, and that no double counting occurs. UNEP estimates that double counting of reductions could mean that 1.3 fewer GT per year of emissions are reduced.[3] Regardless of the scenario, maintaining a high likelihood of limiting

[1] Rogelj, Joeri et al, *Emission pathways consistent with a 2°C global temperature limit*, letter, Nature Climate Change, published online October 23, 2011.
http://www.nature.com/nclimate/journal/v1/n8/full/nclimate1258.html

[2] According to UNEP, under "strict" accounting rules, for example, countries would not be allowed to count reductions from land use, land use change and forestry.

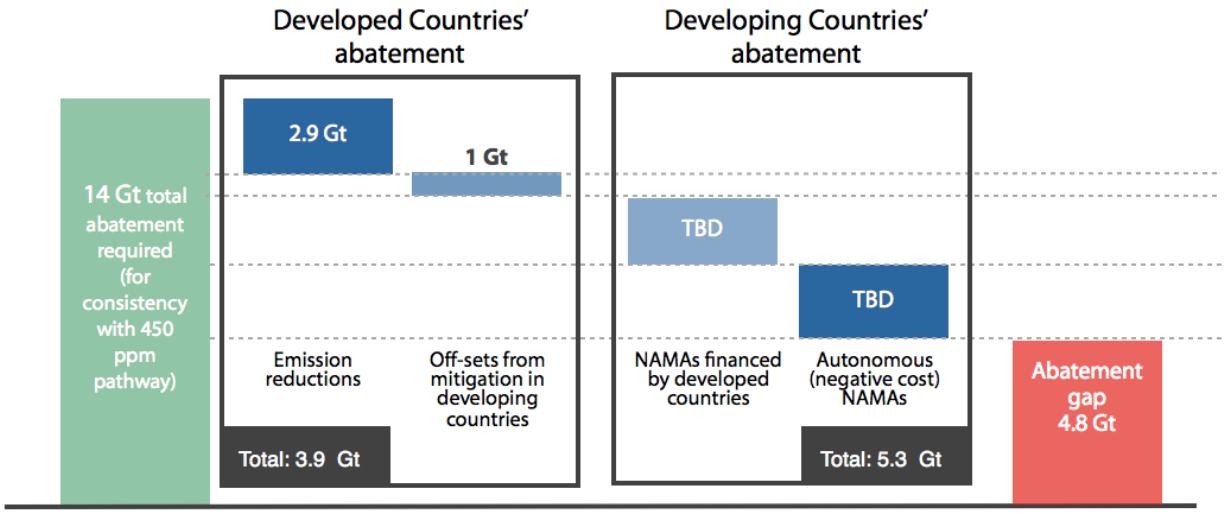
[3] Höhne, Niklas et al., ***UNEP Bridging the Emissions Gap***, Chapter 2: The Emissions Gap – An update, November 2011. http://www.unep.org/publications/ebooks/bridgingemissionsgap/

temperature increases to within 2°C will require commitments in the next few years to considerably higher levels of ambition by all nations.

Analyses by McKinsey and others find that most lower-cost mitigation opportunities are in developing countries, and many developed countries anticipate using offsets generated in developing countries to lower the cost of meeting their own compliance obligations. Additionally, through unilateral and supported NAMAs, developing countries are hoping to use many of the lowest cost reduction opportunities to achieve their own mitigation commitments. Regardless of where the emissions reductions take place, who pays for them, and who takes credit, the bottom line is that emissions reductions on the order of 12 GT per year by 2020 are needed to maintain a 66% or better chance of keeping the 2°C temperature increase "in play" (Hohne, 2011). While other scenarios for meeting the 2°C target based on more modest reductions in the 2020 timeframe are also possible, they would require a steeper decline in emissions—and higher costs—after 2020.

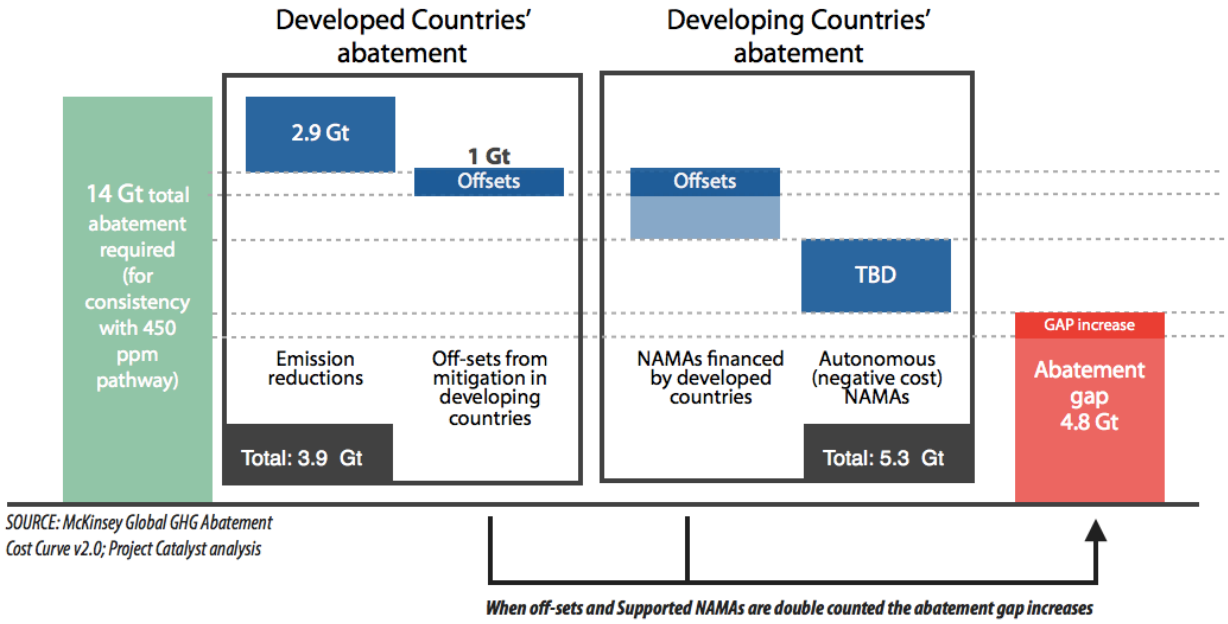
Alternative scenarios (shown with and without double counting) for how developed and developing countries might contribute to achieving emissions reductions in 2020 are illustrated in Figures 1 and 2, below. Figure 1 shows the preferred approach, where there is a strict separation between supported NAMAs and offsets, and all emissions reductions contribute to the global abatement goal. Figure 2 presents a scenario where some of the emissions reductions resulting from the supported NAMA are also sold as offsets, resulting in a reduced contribution to the global abatement goal (and a larger gap that must still be made up through additional emissions reductions).

Figure 1. Preferred Scenario Where All Mitigation Contributes to the Global Solution



SOURCE: McKinsey Global GHG Abatement Cost Curve v2.0; Project Catalyst analysis

Figure 2. Scenario Where Offsets and Supported NAMAs are Double Counted



NOTE: Figures 1 and 2 are based on findings from a single research group (Project Catalyst/McKinsey), so the numbers differ from those reported in UNEP's meta-analysis, which combined results from 13 different groups.

The Old Way for Developing Country Participation: CDM

Under the first phase of the Kyoto Protocol (2008-2012), developing countries are not subject to any compliance obligations, but can opt to participate in the Clean Development Mechanism, or CDM. Under the CDM, developing countries undertake individual projects that reduce greenhouse gas emissions, or multiple mitigation projects of the same type. The resulting emissions reductions, based on monitoring results and calculated against an approved baseline, are validated according to strict accounting rules, registered with the CDM executive board, and then sold as offsets to developed countries seeking to meet their emissions reductions obligations. Different sectors and countries have been more or less successful in attracting CDM investments, depending on the scale and cost of their mitigation opportunities and the degree to which a given project concept can meet the strict accounting protocols.

Under the Kyoto Protocol policy framework, the entire mitigation burden is placed on developed countries. And until recently, developed countries have had access to all the mitigation opportunities, including low cost options in developing countries that opt to generate offsets for sale.

The Kyoto Protocol CDM mechanism has provided a source of finance for a range of developing country projects that reduce greenhouse gas emissions, and has also provided an avenue for technology transfer. However, the CDM has not met the additional promise of encouraging private sector investments in underlying assets (such as windmills). Moreover, with the prices for emissions allowances dropping to around €7 per ton in the Kyoto compliance markets (due to the recent economic contraction and long compliance positions of companies in the EUETS), the incentive to undertake

project-based actions has been greatly diminished. In fact, barring a tightening of the EUETS emission limit or unexpectedly high rates of economic growth, the demand for offsets in Europe—the largest buyer of offset credits over the last several years—seems unlikely to grow substantially over the coming decade because European companies already have enough allowances and emissions credits banked to cover their compliance through 2018, and possibly longer.[4] Further, the EUETS, has indicated it will no longer accept CDM offsets from middle- and higher-income developing countries in the next commitment period. Instead, there is a growing interest by European countries in supplying financial, technological and capacity support for NAMAs—a mechanism that seeks to leverage private sector investments in systems that meet GHG reduction and sustainable development goals.

While the climate change negotiators in Durban agreed to extend the Kyoto Protocol and the CDM beyond 2012, pressure has been mounting for the higher income and higher emitting developing countries to assume some of the responsibility for reducing global emissions. At the same time, many developing countries have announced pledges in association with the Copenhagen Accord and the Cancun Agreement, and a number of them have already begun to develop policies and measures that will result in significant (unilateral) reductions in greenhouse gas emissions.

New Market Based Instruments

The Durban Platform calls for a decision on new market mechanisms to be achieved by the end of this year. So far two types of mechanisms seem to be prime candidates for implementation under a future international climate agreement (though no specific options were included in the Durban Platform because of continuing disagreement among the negotiators):

- **A sectoral crediting mechanism:** This mechanism allows the generation of offsets if certain sectors in a developing country (or country on the road to industrialization) perform better than a sectoral baseline which is set in advance. This mechanism is comparable to what is called sectoral CDM. A main difference with the CDM is that the mechanism is not project-based; it is aimed at sector-wide or sub-sector wide policies. As such, the crediting baseline would require the sector or sub-sector as a whole to reduce emissions below an ex ante agreed crediting threshold (that would be set below the business-as-usual sectoral baseline). A sectoral crediting mechanism could involve domestic regulation requiring the target be met, but doesn't have to. (However, establishment of domestic regulation to achieve the target would make crediting investments more attractive to the private sector than not having such regulation, as there would be greater assurance that emissions reductions in excess of the target would generate credit.) It must be noted that if the performance of the sector falls short of the crediting baseline, there are no penalties for non-compliance, but no credits are generated either.

- **A sectoral trading mechanism:** The main difference with the crediting mechanism described above is that a sectoral trading program sets a mandatory emissions cap or intensity standard in

[4] See Wyns, Tomas, "The EU allowance surplus problem in Europe's Emissions trading system," European Climate Policy Blog, CCAP Europe, February 1, 2012. http://europeanclimatepolicy.eu/?p=27.

advance of a trading period. Non-compliance is regulated by the host country. A tradable intensity standard has several important advantages over a cap-and-trade program: it permits industrial and economic growth so long as the emissions intensity declines; it imposes lower costs on firms; and it avoids the need to develop accurate estimates of aggregate business-as-usual emissions, which can be particularly difficult in a fast-growing economy. Either way (under an emissions cap or intensity target), surplus allowances could be sold to other covered entities in the country, sold as offsets to international carbon markets, or banked into future (more ambitious) trading periods. More details on tradable intensity standards can be found in a CCAP paper, *A Tradable Intensity Standard for Sector Crediting*[5] that is attached.

It is likely that other new or similar mechanisms will be explored on a bilateral basis in the near future. The European Union will be developing its own proposal that will likely be implemented unilaterally in the absence of an international agreement on climate action. We believe it will be critical for the new market mechanisms to be aligned with the NAMA framework, discussed below, particularly through development of sufficiently ambitious crediting baselines, or thresholds.

CCAP's Vision for a Robust Framework for Market Approaches and NAMAs

Nationally appropriate mitigation actions, or NAMAs, an idea that was introduced in the Bali Action Plan, present an opportunity to create a new framework for developing country participation in global climate change mitigation in which developing countries assume responsibility for reducing emissions below their business-as-usual levels. Many developing countries have now pledged to undertake domestic actions in return for financial, capacity and technological support that has been promised by developed countries.

While the NAMA concept is still being fleshed out in the UNFCCC negotiations, CCAP's vision is that supported NAMAs are fundamentally different from CDM credits or other offsets in that the emissions reductions are credited against the developing country's own mitigation goals, and are not sold to help a developed country meet its compliance obligation. In this way, supported NAMAs will help in reaching individual developing country emissions reduction goals, and more broadly, developing country contributions to the global climate solution. NAMAs are also broader in scope than CDM projects, typically involving development of policies and measures that apply to one or more sectors within the developing country. And because emissions reductions from supported NAMAs are not sold as credits, the door is open to mitigation actions where precise measurement of emissions reductions is a challenge, such as smart growth measures in the transportation sector. A final key distinction is in who receives the developed country funds: NAMA funds typically go to the government, whereas revenues from credit sales typically go to the private sector. However, it should be noted that supported NAMAs are designed to improve the economic feasibility of the underlying green investments and hence their profitability, so the private sector in developing countries may stand to gain more from investing in the underlying projects (e.g. wind farms) than they would from the carbon credit transactions.

[5] Whitesell, W. and Ned Helme, A Tradable Intensity Standard for Sector Crediting, Center for Clean Air Policy, November 2, 2009. http://www.ccap.org/docs/resources/805/Tradable_Intensity_Standard.pdf

We envision three distinct types of NAMAs, described below, and shown in Figure 3:

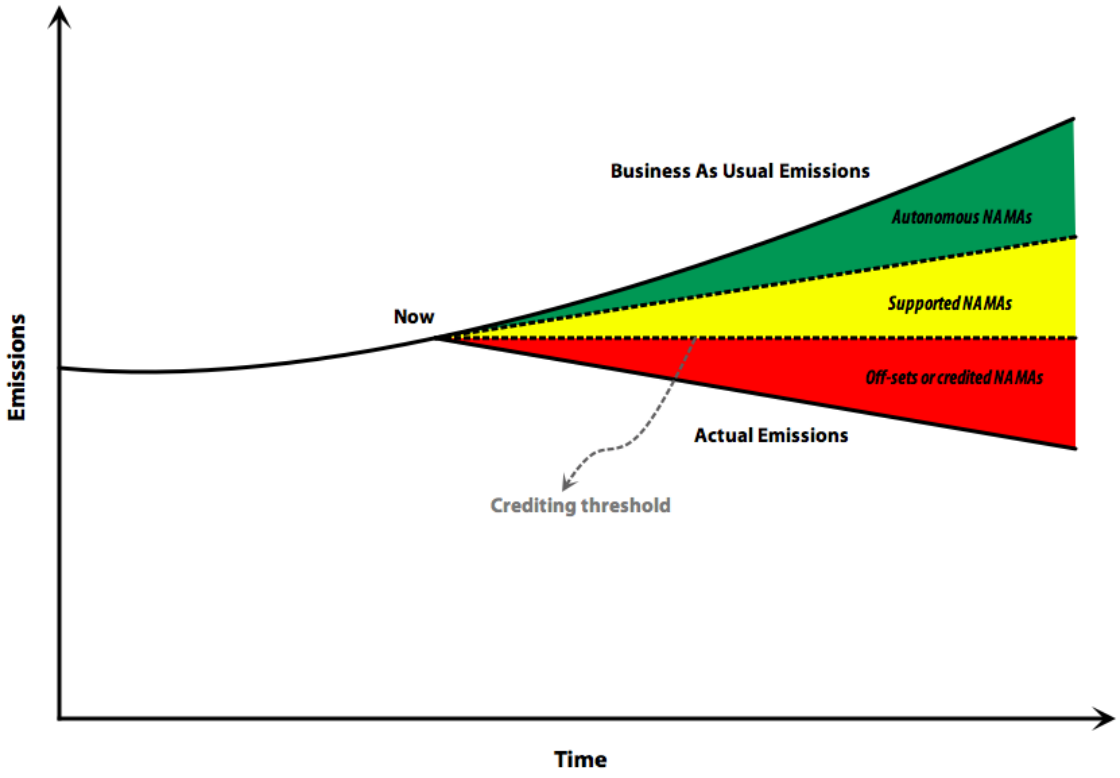
- ***Unilateral*** – The developing country takes autonomous action to reduce emissions below business-as-usual levels without outside support. Unilateral NAMAs are measures that are free (e.g., efficiency measures that lead to energy savings) or low cost, and may also achieve considerable co-benefits.
- ***Supported*** – Some part of the developing country's action is conditioned upon international support (financing, technology or capacity building). Supported NAMAs take advantage of mitigation opportunities that cost more than what the developing country can support unilaterally. Supported NAMAs can also help in overcoming barriers to implementation.
- ***Credit-generating*** – The developing country earns credits that can be sold on the international carbon market for taking actions that reduce emissions below an agreed crediting threshold. The negotiated crediting threshold would be set at a level that requires going beyond the reduction path expected to result from supported and unilateral NAMAs in the sector, and would be expected to entail higher marginal costs. (Note that while credit-generating NAMAs were part of the original concept of NAMAs, they are not included as a specific type of NAMA in the Cancun Agreement or in the Durban Platform. The Durban Platform's support for development of a new market mechanism by COP 18 makes no mention of a credit-generating NAMA concept.)

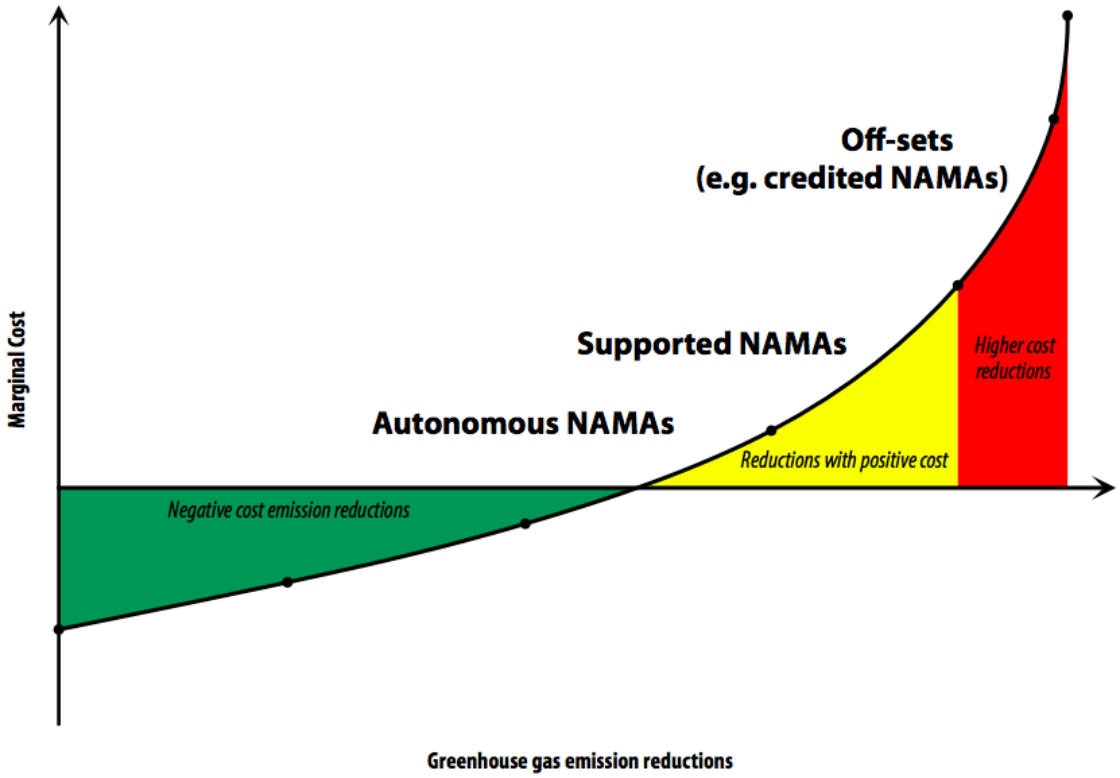
To encourage developing countries (other than LDCs) to assume domestic mitigation goals and shift to a sector-wide framework, the European Union member states voted to place new restrictions on the offsets it will accept for compliance with the European Union Emissions Trading System (EUETS). Specifically, after 2013, credits from new CDM projects (those registered after 2012) from middle- and higher-income developing countries will no longer be accepted. While these types of restrictions may not be politically viable in the UNFCCC process, the European Union is using its power as the major credit buyer to encourage fundamental changes in the way developing countries join the international climate policy solution.

At the same time, other stakeholders have suggested that supported NAMAs and CDM could "co-exist".[6] We strongly disagree, because this would result in an important double counting issue, leading to lower global greenhouse gas mitigation, and would also fundamentally disrupt the NAMA concept. We come back to these points in the next sections.

[6] Linacre, Nicholas et al, State and Trends of the Carbon Market 2011, the World Bank Environment Department, Washington, DC, June 2011. P.15

Figures 3a and 3b. The role of NAMAs in meeting developing country mitigation goals.





What can go wrong if NAMAs, CDM, and new (poorly designed) market mechanisms co-exist?

Double counting of emission reductions

If CDM, new market based mechanisms, and NAMAs are allowed to co-exist in an unsystematic way, the market based mechanisms—where reductions are sold to support compliance in developed countries—could also be counted towards meeting a developing country's NAMA goals. For example, with international financial support, a developing country could decide to implement a feed-in tariff to increase the share of domestic power generated by renewable energy. If a wind farm project in the same developing country was permitted to earn offset credits, the wind farm would help meet the goals of the feed-in tariff, while at the same time the quantified emissions reductions would also be sold as offset credits to help meet a compliance obligation in a developed country. In other words, absent a firewall that strictly separates the use of these approaches, the emissions reductions associated with the wind farm could be counted twice: once towards a developed country target, and again in helping to meet a developing country target. If this happens, the emission reduction achievements from the developed and developing countries cannot be added together towards the international emissions reduction goal (e.g., the first bar in Figure 1). Looked at another way, double counting of emissions reductions could mean that developed countries are paying for the same reductions twice: once through NAMA support, and again via offset purchases. Correct greenhouse gas accounting makes it necessary to subtract the offsets generated from the wind farm that were sold to meet developed country obligations from the total emissions reductions scored for the supported NAMA.

Double counting of financial support

We note there is also a need to ensure that international finance promised by developed countries, some of which must be dedicated to climate mitigation in developing countries, is not double counted with the developed countries' own compliance obligations. If we assume that the main goal of purchasing offsets by developed countries is to meet their GHG reduction obligation, we also must conclude that the financial flow towards developing countries associated with the purchase of those offsets cannot be counted as financial support for developing country GHG mitigation. As such, developed countries cannot count this money as being part of the financial support promised under Fast Start Finance or towards the $100 billion per year developed country contributions by 2020. However, private sector investments in the underlying wind farms that are incentivized by the feed-in tariff could be counted toward that $100 billion per year funding target.

Developing countries could be stuck with higher cost mitigation opportunities and incentives for the private sector could work at cross purposes

Beyond the critical concern about double counting, another key issue is one of fairness in terms of access to low cost mitigation opportunities. As noted previously, developing countries have agreed to take on their own commitments to action (assuming the availability of financial, technical and capacity support) in association with the Copenhagen Accord and the Cancun Agreement. The Durban Platform further calls for the negotiation by 2015 of legally binding action by developing countries that would take effect by 2020.

One of the main advantages of supported NAMAs over CDM for developing countries is supported NAMAs allow developing countries to utilize the lowest cost mitigation actions towards meeting their own mitigation targets. This would be an important change from the CDM approach, where the market has been successful at finding the lowest cost mitigation options (e.g. the abundance of HFC reduction projects under the CDM) and providing them to developed countries and/or private companies in those countries to help with low cost achievement of developed country obligations under the Kyoto Protocol. This model made great sense in a world where only developed countries took on climate obligations, but in the world of the Cancun Accords and the Durban Platform where key developing countries will take on actions, this is a questionable model.

If CDM projects or new market mechanisms are permitted in the same sectors as NAMAs without careful design, the low-hanging fruit is likely to be taken up by the private sector via offset mechanisms, largely for use by developed countries. This is particularly the case when credits from low cost mitigation actions can be sold for a much higher international market price. The clear incentive for the private sector will be to continue to pursue CDM projects where profits are greater (assuming, of course that the global carbon price does not collapse due to lack of demand). Blurring the distinctions here will also increase pressure from the private sector on developing country governments to encourage continued CDM projects as well as supported NAMAs. This would leave developing countries with the higher cost mitigation actions as the major path to achieving their reduction pledges and hence, a much bigger political challenge in meeting their mitigation goals. Further, developing countries may have a harder time attracting private sector investments to supported NAMAs when there is a competing CDM or other market opportunity.

Risk of poor accounting

As in the case of REDD+, there are advantages to a "learning by doing" phase to prove out the NAMA concept, including development of appropriate methods to construct baselines and estimate emissions reductions from unilateral and supported NAMAs. Ideally such methodological issues would be settled before trying to develop a crediting baseline, where there is more at stake if baseline projections and emissions measurements are inaccurate. For developing countries, a "learning by doing phase" in the early years of supported NAMAs would provide space for them to build capacity on the relative cost of various emissions reduction options, and enable them to design their policies so that lower cost options are available to the domestic market and higher cost options can be sold to the international market. In addition, allowing credits to be generated in a haphazard way alongside NAMAs makes it more difficult to estimate the benefits from NAMAs and to reconcile the approaches used, and there would be less confidence in any credits that are generated.

Recommended Solutions

The new framework for engaging developing countries in climate action should focus on developing good policies first, with credits coming at a later stage. Blurring the distinction between supported NAMAs and market mechanisms at this early point in NAMA development could be quite harmful, resulting in double counting problems (and fewer global emissions reductions), fairness concerns in terms of access to low cost mitigation opportunities, and basic GHG measurement and accounting

problems. It could also send mixed signals to the private sector, making the private sector a competitor for low cost mitigation actions.

With the concurrent development of NAMAs and new market mechanisms, the international community has an opportunity to help create a coherent system that supports the policy actions being proposed by developing countries to meet their own mitigation targets while also generating credits for developed country compliance.

Some parties favor market mechanisms and private sector interests over development of a coherent and robust system. While pressures for emphasizing private sector profit-making opportunities will undoubtedly continue, the international community should take a strong stand on this issue by instituting an approach that enables the national policies needed to help meet the goal of limiting global temperature increases to 2°C and avoids a rush to carbon credits. We know the globe cannot reach this goal solely with developed country emission reduction targets – we must also have substantial reductions in developing countries that are not sold as offsets to developed countries. Therefore, the framework for engaging developing countries in the global climate solution must ensure that emissions reductions achieved by the new market mechanisms are clearly distinct from those achieved by supported NAMAs. This will ensure that developing country reductions contribute to the global climate solution, and not to simply meeting inadequate Annex I targets.

Below we suggest approaches to addressing existing CDM projects, new CDM projects, and new market mechanisms to best support a robust NAMA framework.

NAMAs and the CDM

For the existing CDM projects, the cleanest option is to put these projects and the associated emissions reductions into the business-as-usual baseline for the NAMA, so that they are not factored in to estimates of emissions reductions expected by the NAMA. Ideally, existing CDM projects would not be a factor in choosing the level of ambition of the supported NAMA. Alternatively, it is also possible to "wall off" existing CDM projects, so that they are not counted as part of the NAMA. Walling off a CDM project would mean that it does not appear in the NAMA baseline and is also not considered when assessing a country's success in achieving its NAMA goals or targets.

For new CDM projects or other poorly designed new market mechanisms that target the same actions covered by the NAMA, the cleanest approach is to prohibit such mechanisms in the sector(s) covered by the NAMA. This is consistent with the CDM requirement that emissions reductions must be additional. Simply walling off *new* CDM projects (as discussed above for existing CDM projects) will not work because it maintains incentives for the private sector to continue to pursue CDM projects and compete with developing countries for low cost mitigation options and private sector investment.

NAMAs and new market based instruments

If we move away from the "project based" CDM into more comprehensive "sectoral" or "policy" mechanisms, other options are available to deal with double counting. For example, it is possible to design the NAMA to allow for credit generation once a negotiated benchmark is reached. Under such "credit-generating NAMAs," credits would be granted for actions that go beyond the level of ambition that warrants international support, not for the same actions being implemented with international

support. Key design features that support credit-generating NAMAs include development of a clear legal requirement and associated MRV requirements in the developing country that assure the goals of the supported NAMA will be met and that emissions reductions that exceed the benchmark can be readily quantified. This option could, if designed and implemented correctly, do away with the double counting issues we identified before while ensuring that the developing country is able to benefit from its low cost mitigation options.

For a new credit generating NAMA market mechanism to work well, there needs to be a market for higher cost offsets, and the credits themselves need to be based on a robust emissions benchmark and good measurement. To create these conditions, the demand side of the carbon market needs to be strengthened, with developed countries assuming more ambitious emissions limits and with tighter rules on the types of offsets that would be accepted. Without a significant push from the demand side, emissions reductions from crediting NAMAs will be too expensive for the carbon market. In addition, the credits arising from the credit generating NAMA must be seen as additional to the supported NAMA. In other words, they need to result from a sufficiently ambitious crediting benchmark and a thorough MRV framework.

The role of the international community

The international community has the opportunity to prevent double counting among NAMAs, market mechanisms and financial support, and more generally to establish an effective framework for developing country participation in global climate change mitigation. Specifically, the UNFCCC should codify a framework for market approaches and NAMAs that prevents double counting, and sets up a system to review and approve crediting thresholds proposed by developing countries, including development of standardized rules for the establishment of such thresholds and for monitoring, reporting and verification. The UNFCCC should also establish standardized approaches for integrating existing CDM projects into the business-as-usual baseline calculation for NAMAs. Further, the UNFCCC should provide guidance to the Global Climate Fund to ensure that NAMA support is not provided for developing country actions that earn credits (unless those credits are earned for exceeding a UNFCCC-approved crediting threshold).

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A TRADABLE INTENSITY STANDARD

FOR SECTOR CREDITING

THE CENTER FOR CLEAN AIR POLICY

November 2, 2009

ACKNOWLEDGMENTS AND DISCLAIMER/LEGAL NOTICE

This paper was written largely by William Whitesell, Research Director, Center for Clean Air Policy (CCAP). Special thanks are extended to Ned Helme, President of CCAP, for his extensive comments on drafts of this paper.

The work is a result of activities carried out supported by the Competitiveness and Innovation Framework Programme of the European Commission. That agreement involved activities conducted by staff from CCAP-Europe, CCC, CEPS, IDDRI and ZEW together with sector and country experts.

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Executive Summary

An international framework for developing countries (DCs) to earn credits from Nationally Appropriate Mitigation Actions (NAMAs) and sectoral programs is under discussion. This paper addresses some issues that will need to be addressed to implement NAMA and sector crediting. It discusses cap-and-trade programs for DCs, international linkages for such programs, emission caps for DC sectors through "trading" programs, and No-Lose approaches. It highlights some of the key advantages at the present time of employing a tradable intensity standard to implement a “No-Lose” approach to sector crediting in DCs.

Procedural issues affecting NAMA and sector crediting include measurement periods, cumulative crediting baselines, and the interaction of NAMAs with sector crediting. Because of long delays in obtaining emission data, it is advisable to avoid further long delays that would occur with a multi-year emission measurement period. An annual measurement period would speed up crediting, improve incentives, and accelerate the testing of compliance procedures. Although emissions would fluctuate from one year to the next, those fluctuations could be addressed in part by using a cumulative crediting baseline. Cumulative crediting would provide a disincentive for an industrial sector to go way above an emission baseline when it becomes clear that it will miss the baseline in a given year. To avoid other complications, it is advisable to discontinue credits for individual NAMAs within a given sector when a crediting program is implemented for the entire sector.

A DC could potentially establish a domestic emission trading system (ETS) and link it to the ETS of advanced economies. In that case, the DC would be able to create domestic allowances. If in sufficient supply, those allowances would be purchased by firms in the linked foreign ETS and therefore act as a substitute for offset credits. The amounts of allowances that could be created by each party in a linked ETS would of course be subject to negotiation. Linked ETS would be a way to move toward a uniform global carbon price, which would provide a cost-effective means of achieving a global emission reduction goal. However, it may prove difficult to create ETS in many DCs and harmonize them enough to be able to link them any time soon. Some DCs may be reluctant at present to impose a compliance requirement on firms for their full greenhouse gas emissions at the world carbon price.

A "Sector Trading" approach is similar to a linked ETS framework. In this case, a DC accepts an internationally enforceable emissions cap for a sector or group of sectors. The DC government receives international allowances up to the cap level. It can distribute those allowances (for free or by auction) to the domestic sector. Domestic firms would have to surrender an allowance to the government for each ton of emissions. If a firm needs additional allowances, it can buy them from other domestic firms or from the international market. Thus, the domestic carbon market is an extension of the international market. When firms meet their obligation to the DC government, the government obtains the allowances it needs to surrender to the international enforcement body. If the government withholds some of its initial allowances from domestic firms, it can sell those allowances to boost public revenues.

A sector trading program fits naturally with an absolute emission cap, but it could conceivably be implemented with an intensity baseline for crediting. With an intensity baseline, agreements would be needed on forecasts of intensity and output to help determine the initial allotment of allowances to the DC. Under Sector Trading with an intensity baseline, the compliance obligation of the DC could vary substantially. With absolute caps, the risk of creating “hot air” by setting too high a cap level is substantial given the wider swings in economic growth in DCs as compared with advanced economies.

Under an alternative, "No-Lose" approach, a DC government has no international obligation but can earn credits if its domestic sector beats a baseline level of emissions or emission intensity. The DC could implement an intensity-based program by passing through a no-lose approach to its domestic firms. Firms that beat the baseline would gain a pro rata share of the credits earned by the sector. In that case, however, firms would not have the incentive of the full international carbon price signal if the intensity of some firms was expected to exceed the crediting baseline. Firms would also have a reduced incentive to over-comply because of the greater uncertainty of whether and at what level they might be rewarded with tradable credits. Finally, because the credits received by a firm would depend on the performance of other firms in the sector, it would be especially difficult for firms to secure private financing in advance for emission abatement projects.

The full price signal *would* pass through if a DC implements a tradable intensity standard using international credits as the enforcement instrument. In this type of No-Lose approach, a firm with lower intensity than the baseline receives an international credit from the government for each ton by which it beats the baseline. Firms that exceed the intensity baseline need to buy credits from other domestic firms or from the international market to meet their compliance obligations to the DC government. The DC government also receives the net credits earned by the sector from an international credit issuing body. Adding those credits to the credits received for compliance from domestic firms, the DC government would have just enough credits to reward the winning firms for each ton by which they beat the baseline. The intensity standard is a No-Lose approach for the country because the country as a whole has no external obligation if the sector fails to meet the baseline.

A tradable intensity standard using an international credit instrument would pass the international price signal through to firms without requiring those firms to purchase an allowance for each ton of their emissions. Thus, the overall burden of the program to domestic firms would be lower than if the DC implemented a cap-and-trade program.

A tradable performance standard that is not linked to an international market may suffer from wide swings in the net supply and prices of compliance instruments. With linkage and use of an international credit for compliance, however, a tradable performance standard can operate with a more stable source of instrument supply and compliance costs; it can offer firms certainty regarding the amount of tradable credits they will receive for beating the intensity standard.

I. SECTOR PROGRAMS AND NAMAs

Introduction

The Global Sectoral Approaches study was initiated in May 2008 to provide a "proof of concept" of how sectoral approaches could work in a post-2012 international framework for the mitigation of climate change. The study initially investigated three broad types of approaches that had already emerged in international discussions: a transnational approach in which all countries faced similar benchmarks, a bottom-up approach with financial and technology assistance from advanced economy countries (AECs) to help developing countries (DCs) meet specialized "no-lose" targets, and a carbon finance approach emphasizing sector credits from DCs (see, e.g., Schmidt, Helme, *et al*., 2006). During the course of the study, it was found that the bottom-up and crediting approaches had the most promise. In international forums, those two approaches tend to be combined. The Bali Action Plan of December 2007 and subsequent negotiations have highlighted a potential future role for sectoral approaches (see UNEP, 2009). In addition, the Nationally Appropriate Mitigation Actions (NAMAs), originally articulated in the Bali Plan, have been discussed in the framework that was originally developed for sectoral programs. In particular, the bottom-up sectoral approach is reflected in the idea of unilateral and supported NAMAs. With unilateral NAMAs, DCs move emissions below business-as-usual (BAU) levels through their own voluntary efforts. With supported NAMAs, they move emissions lower still with financial and technology assistance from AECs. NAMAs beyond the unilateral and supported level may be eligible to earn credits. NAMAs for credits would thus involve actions further up the supply curve, where emission abatement costs are higher.

During the course of the sectoral study, two leading methods for implementing sectoral approaches in DCs have emerged. One involves intensity targets and the other is based on technology goals. Technology goals are straightforward to implement and could be combined fairly readily with a NAMA framework, as discussed in an earlier paper (Klein, Helme, et al., 2009). Intensity goals could be implemented through a variety of mechanisms. One alternative would be a domestic cap-and-trade program in a DC. This paper discusses cap-and-trade and other implementation approaches for sector programs in DCs and their relationship to possible post-2012 international architectures.

NAMAs, Credits, and Post-2012 Architectures

As mentioned above, international discussions have identified three categories of NAMAs: unilateral, supported, and crediting. Unilateral NAMAs are actions undertaken by a DC without international support. Supported (or cooperative) NAMAs are actions by DCs that are undertaken with assistance from AECs. Crediting NAMAs are actions that earn international credits which can be sold as offsets in AEC markets. NAMAs could include capacity building, technology goals, intensity targets, efficiency objectives, reductions in deforestation, more comprehensive low-carbon programs, or other types of actions. A single NAMA could cover one full economic sector, a component of a sector, activities that cut across several sectors, or a comprehensive program covering all emissions from multiple sectors. A cap-and-trade program could be a single NAMA, whether it is limited to a particular sector or includes many economic sectors. A system of tradable credits—without a comprehensive emission cap—could also be used to implement a performance standard (such as an energy efficiency goal) or a technology goal (such as the share of electricity output from renewables).

International negotiations (at Copenhagen and thereafter) are expected to lead to specification of criteria for supported and crediting NAMAs. Supported NAMAs may include several types of windows

and the criteria may differ depending on the window. Criteria for crediting would also differ from those for supported NAMAs.

The international architecture for the post-2012 period is uncertain at present. However, supported NAMAs will probably be a central element of any agreement, along with the necessary functions of matching such NAMAs with financing from advanced economies. Unilateral NAMAs and credits for both NAMAs and sector programs will also likely play a key role. A forthcoming CCAP paper provides a more complete background discussion of unilateral, supported, and crediting NAMAs.

Sector and NAMA Crediting Procedures

Assuming that some centralized international approach emerges for NAMA and sector crediting, a number of procedural issues would need to be resolved. They include: the length of the crediting interval, cumulative crediting, and the effects of supported NAMAs on crediting baselines.

If a DC implements a sectoral program through technology goals, international funders may require measurements of the extent of adoption and use of specified technologies. This would allow a DC to avoid the burden of measuring emissions in an entire economic sector and getting those measurements verified to meet crediting requirements. However, difficult benchmarking issues may need to be resolved to determine the actual emission reductions attributable to a given technology. The extent to which the technology is actually used, rather than just put in place, may also need to be measured and verified.

If a sectoral program is designed around a baseline for absolute emissions or emission intensity, the GHG emissions of the entire sector would need to be measured and verified to earn credits. Delays in collecting the emissions data could be fairly long for some sectors, which raises issues regarding the measurement period for crediting.

Measurement Period

If credits are granted on an ex post basis, measuring actual emissions would delay the receipt of credits by the DC. It may take a couple years to measure and verify the actual emissions of a given year. If the interval to be measured was itself two or three years in length, it would take for four or five years before the first measurement was completed and verified and the DC could begin to receive credits. This long wait would weaken the incentive that the crediting program was intended to provide to reduce emissions. To avoid long delays, an annual measurement period is preferable to a multi-year period.

As discussed later, credits could also be provided ex ante, with some kind of compliance "true-up" at the end of a measurement period. For instance, at the end of a period, a DC may be required to buy additional credits if its actual emissions exceed the credits it holds. A delay of four or five years before completing the first true-up would weaken the compliance function of the system. For this reason also, it would be best to complete the process as soon as the measurement of emissions in a given year was completed.

Cumulative Baselines

Emissions from a sector are likely to vary from one year to the next. Indeed, a typical business downturn can last up to two years. If an absolute emission baseline is used for sector crediting, the

credits earned would vary substantially from year to year with economic growth. If an intensity baseline is used instead, crediting could still vary somewhat with the growth of sector output, but not as much as in the case of an absolute baseline. In addition, numerous temporary factors, such as unusual weather or spikes in oil prices, could alter energy use in a given year or two. These effects would also cause variations in the sector credits that a DC earns in a particular year.

A longer measurement period would smooth out some of these annual fluctuations in credits, but—as discussed above—a long delay before earning credits or completing a true-up is not advisable. An alternative is to grant sector credits annually but calculate the credits earned using a cumulative baseline.

For instance, emission intensity in the power sector might depend on the amount of switching between coal and natural gas, and that could vary from one year to the next depending on the relative prices of the fuels. Suppose the crediting baseline for a country's power sector is an intensity of 0.60 (in tons of CO2 per MWh) and its performance in the first three years of the program is as shown in Table 1. In the first year, say, the country's actual intensity turns out to be 0.59 and its output is 100 million MWh. It earns (0.01*100 mn) = 1 mn credits. In the second year, its intensity is 0.61, which is above the baseline, so it earns no credits. Its output is 110 mn MWh the second year. In the third year, its intensity is 0.58 and its output is again 100 mn MWh. In the third year, with a cumulative baseline approach, the country would have to make up its excess emissions from year two before earning credits. Therefore, its credits in year three would be:

(0.02*100 mn — 0.01*110 mn) = 0.9 mn credits.

Table 1: Performance Relative to an Intensity Baseline of 0.60

	Intensity	Output (mn)	Credits (mn)
Year 1	0.59	100	1
Year 1	0.61	110	0
Year 1	0.58	100	0.9

A cumulative crediting baseline creates a disincentive for a DC industry to exceed an intensity target by a large amount once it is clear that the target will be missed in a given year.

NAMAs Within and Across Sectors

Other procedural issues could arise because of the interactions of sector crediting with NAMAs. In general, a crediting baseline would be below a BAU level. In addition, if there are unilateral and supported NAMAs in the sector, the crediting baseline for the sector would be set at or below the intensity level achieved with those NAMAs. If the supported NAMA financing did not materialize as expected, there would not be an automatic adjustment in the baseline intensity for crediting. As noted above, the criteria for setting the crediting baseline would likely differ from those for a supported NAMA.

For individual policy NAMAs in a sector, crediting should be discontinued if the sector begins to earn credits based on its overall emissions or intensity. For instance, credits for a NAMA on electricity generation through renewables should be discontinued if the entire electricity sector becomes eligible for international crediting. Otherwise, a complicated netting procedure would be needed and prices would differ for different emission reduction projects within the sector, raising the costs of the program.

II. CAP-AND-TRADE IN DEVELOPING COUNTRIES

A decentralized structure in which countries and regions develop GHG emission trading systems (ETS) and then link those systems to create a global carbon market could provide a least-cost solution to the world's climate challenge. Linking of national and regional systems would be one means of creating a uniform carbon price. With a common price signal, emission abatement projects anywhere in the world would be implemented if they cost less per ton than the market price of carbon, while higher cost projects would be avoided. Economic efficiency would be achieved through the equalization of marginal abatement costs around the world.

In the absence of a global ETS, a common global carbon price could be achieved through linked national and regional ETS. Partial linking can occur through a shared offset program, but with limits on offset use, a uniform carbon price would not be achieved. Partial linkage could also involve limited acceptance of allowances from outside ETS. However, unrestricted mutual acceptance of emission allowances across systems (full linkage) would be needed to ensure commonality of the price signal.

Linked Emission Trading Systems

If DCs established domestic cap-and-trade programs, those programs could in principle be linked to the ETS of AECs. For linking to occur, there would need to be harmonization (or mutual acceptance) of the design details of each ETS by the other party (see, e.g., Jaffe and Stavins). For full linking, each party would need to agree on the amount of allowances that could be created by the other party. Also, agreement would be needed on cost-containment features, as they are shared when ETS are linked. For instance, if one system establishes a price ceiling (through a safety-valve or well-stocked allowance reserve), that same ceiling would apply to both systems after linking. In addition, each linking party would need to be assured of the other's measurement and enforcement procedures. Finally, the distribution of free allowances may need to be harmonized to avoid effects on relative competitiveness.

Such ETS features are of great concern to domestic stakeholders. Therefore, it may be difficult in some cases to modify systems to meet the requirements for external linking. Even if the design features are harmonized, parties may need to observe the measurement and enforcement performance of another ETS for some years before agreeing to a full link.

If the problems with linking can be resolved, it would be possible to arrange for financial transfers from AECs to DCs through linked ETS. The mechanism would be similar in some ways to an offset credit mechanism. The DC would need to have a softer emission cap than an AEC, meaning that the DC's ETS would have a lower carbon price in the absence of linking. Thus, the DC would implicitly over-issue allowances, relative to the allowances issued by AECs. On linking, AEC firms would buy allowances from the DC system. That would lower the price of allowances in the AEC system and raise the price in the DC system. Thus, the DC would sell its allowances rather than offset credits. AECs would supplement their domestic emission reductions through the purchase of allowances from DCs.

The raising of prices in the DC's ETS because of linking would increase revenues for the DC government, if it auctions allowances, and increase profits for any DC entities that receive allowances for free in excess of their emissions. It would imply greater costs for DC firms that need to buy allowances to meet compliance obligations.

Sector Trading

In the context of sectoral programs, an idea similar to linked ETS has been called "Sector Trading" (see, e.g., Baron et al.). In this approach, a DC accepts an internationally binding compliance obligation for the absolute level of emissions in a particular economic sector. An international body issues allowances to the DC and collects allowances from the DC at the end of a measurement period for compliance purposes (see, e.g., Schneider and Cames). The DC government thus accepts an emission cap equal to the international allowances it receives in advance. It can then implement a variety of programs to reduce emissions in the sector. However, the expectation is that the DC implements a domestic cap-and-trade program using the international allowances rather than create its own domestic allowances.

The DC government may distribute the allowances it receives to its domestic industry for free or through auctions, or even retain some allowances itself and impose a tougher cap on the domestic industry. At the end of the compliance period, DC firms would surrender an allowance to the government for each ton of emissions. If a firm could not find enough allowances on the domestic market, it would be able to buy them on the international market.

The DC government would also need to surrender allowances to the international enforcement body for each ton of emissions in the sector. If the sector reduces emissions below the initial allotment of international allowances, the DC government or firms in the sector could sell the excess allowances on the international market. If the sector emits more than the initial allotment, the firms in the sector would need to buy allowances from the international market and surrender them to the DC government. The DC government would then return those allowances to the international enforcement body.

Differences with Linked ETS

The Sector Trading approach differs in some ways from linked cap-and-trade systems. One difference is semantic: Sector Trading need not be limited to one economic sector, but could involve a broad program covering many sectors in the DC. A linked ETS could also be limited to a particular sector or include multiple sectors.

A more substantive difference is in the handling of allowances. With either a linked ETS or Sector Trading, the creation of allowances at the beginning of the program would be a matter of negotiation. However, with Sector Trading, the allowances would be issued by an international body rather than the DC government itself. A key difference would also occur at the end of a compliance period. With a linked system, a DC government would be expected to enforce compliance on its domestic firms. The ultimate remedy for its failure to enforce compliance would presumably be an end of the link. With Sector Trading, the DC government accepts an obligation to surrender allowances to an international enforcement body at the end of a compliance period.

Absolute Emissions and Uncertain Growth

For DCs, an absolute emissions cap may pose a key difficulty for acceptance of either a linked ETS or Sector Trading framework. The growth rates of DC economies tend to be higher than those in advanced economies because higher rates of return on investment are possible while DCs are catching up to advanced economy living standards. In addition, many DC economies rely heavily on manufacturing and commodities which are more sensitive to the business cycle than service sectors. For these reasons,

economic and sector growth rates are more variable in DCs than in AECs, and more difficult to predict. This poses a special problem for absolute emissions caps, as total emissions vary more than emission intensity. With sector trading based on an absolute cap, the amount of allowances that a DC will need to surrender in any period could be quite difficult to predict. Relative to an intensity standard, an absolute cap carries with it a greater risk of either creating "hot air" (if growth is less than expected) or an unduly stringent cap (if growth is more than projected).

Intensity-based Trading

An absolute emission cap is more fitting than an intensity target for Sector Trading. It would be possible, but challenging, to devise Sector Trading programs with intensity caps. For instance, a DC could get an initial allotment of allowances and have a compliance obligation only if the sector misses a given intensity level. If the sector's emissions intensity is better than the compliance level, the DC has no obligation to surrender allowances. The DC (and its firms) could then sell the initial allotment of allowances on the international market.

If the sector's intensity exceeds the compliance level, the DC would need to surrender an amount of allowances equal to its output times the difference between the sector's actual intensity and the baseline level.

With intensity-based Sector Trading, the initial distribution of allowances would depend on forecasts of both sector output and sector intensity. Thus, allowances would be granted in advance only to the extent to which the sector, on average, was expected to miss the compliance intensity level.

If a DC government does accept an international "Sector Trading" obligation based on an intensity level, it could implement that program with a tradable intensity standard, as discussed in a later section.

Acceptability of Linking or Sector Trading to DCs

While many countries have shown some interest in creating ETS, following in the footsteps of the European Union, it may be some time before such programs are actually implemented in many DCs. Linking such programs to ETS in AECs, or adoption of Sector Trading frameworks, may take longer still.

Indeed, DCs that establish cap-and-trade systems may prefer to keep the domestic carbon price below international levels for some time. That would reduce the burden on the DC's domestic firms that need to purchase allowances to meet compliance obligations. It would also reflect the concept of differentiated national responsibilities and capabilities for emission mitigation. Of course, cap-and-trade programs can be specified in widely differing ways, and there may be a design that DCs would find acceptable and that would also qualify for linking or Sector Trading.

Aside from design details, however, a DC would most likely want to be assured that it had a generous over-allocation of allowances so that it could be a seller of allowances even if its economy grew at a very rapid rate. The prospects for a linked ETS thus may hinge on negotiations over the amount of allowances that the parties could create. Similarly, the prospects for a Sector Trading program would likely depend on negotiations over the initial allotment of allowances to a DC. The difficulties of reaching agreement on these important issues could delay implementation of either of these approaches for some time. A No-Lose approach, discussed next, might be implementable with less delay.

III. NO-LOSE APPROACHES TO SECTOR CREDITING

In a No-Lose approach, a DC government accepts no international compliance obligation. It earns credits at the end of a measurement period if the sector beats the crediting baseline. No credits or allowances are distributed in advance. Unlike the case of Sector Trading, the DC has no obligation if the crediting baseline is exceeded. Under a No-Lose approach, the baseline for sector crediting could be an absolute emission level. In the negotiations over an acceptable absolute emission baseline, forecasts of sector output would be involved. An intensity baseline for a no-lose target would be more convenient as it would require no forecasts of output and, as noted earlier, would be less susceptible to the adverse impacts of variations in economic growth. This is different from intensity targets under Sector Trading, which would require output and intensity forecasts to determine the amount of allowances or credits to provide ex ante.

With international credits granted on a no-lose basis, a DC government has a variety of possible domestic implementation alternatives. It could select mandates, standards, or trading systems. It could also choose how closely it links its domestic program to the international crediting framework.

Passing through the No-Lose Approach

One alternative would be for the DC government to extend the no-lose approach to its own firms. Firms with intensity higher than the baseline would incur no penalty. Firms that beat the baseline would be eligible to earn international credits.

The DC government itself would earn credits based on the average performance of its sector. It could pass through these credits to firms that beat the baseline on a pro rata basis. Unless all firms in the sector beat the baseline, a winning firm would then get less than one credit for each ton by which it beat the baseline.

For instance, suppose a DC has a sector program for the cement sector and the crediting baseline is an intensity of 0.70 tons of CO2 per ton of cement in a given year. Say, also, there are three firms with intensity and output levels as given in Table 2. One firm exceeds the baseline with an intensity of 0.72. The other firms beat the baseline with intensities of 0.62 and 0.66. The winning firms are assumed to have 2.5 million tons of output, half the output of the firm that failed to beat the baseline.

Table 2: Pro Rata Crediting
(baseline = 0.70)

	Intensity	Output (mn)	Credits "Earned"	Credits Received
Firm 1	0.72	5	0	0
Firm 2	0.62	2.5	200,000	133,000
Firm 3	0.66	2.5	100,000	67,000

The number of tons by which the two winning firms beat the baseline (the credits implicitly "earned") is calculated as:

Firm 2: (0.70 — 0.62)*2.5 mn = 200,000

Firm 3: (0.70 — 0.66)*2.5 mn = 100,000.

The average intensity of the sector is 0.68, so the total credits earned by the sector is:

(0.70 — 0.68)*10 mn = 200,000.

The pro-rata shares of credits received by the two winning firms thus turns out to be (with rounding):

Firm 2: 200,000*2/3 = 133,000

Firm 3: 200,000*1/3 = 67,000.

With pro rata distributions of the credits earned by a sector, the full carbon price signal does not pass through to individual firms. If the sector average fails to beat the baseline, "good" firms earn nothing. Even if the sector average is sure to beat the crediting baseline, if some firms will fail to do so, a firm's calculation of the expected benefit from reducing emissions below the crediting baseline would be lower than the world carbon price.[7] Thus, a firm has a weaker incentive to undertake emission reduction investments than if it faced the full carbon market price.

Alternatively, the DC government could promise to grant credits to winning firms, ton for ton. In that case, the government itself could buy the extra credits needed from the international market. However, given the demands on DC government budgets, this seems unlikely. The DC government could instead impose a compulsory program on its domestic industry. Two options would be a domestic cap-and-trade program or a tradable intensity standard, as discussed below.

Domestic Cap-and-Trade with Bonus Credits

Under no-lose international crediting, a DC government could implement a compulsory domestic cap-and-trade program for firms in the sector that is eligible to earn credits. The domestic program could potentially include multiple sectors, each of which might have its own crediting baseline. The DC government could issue domestic allowances and rely on the price signal provided by its own ETS to achieve the emission reduction goals without any linkage to international markets. The DC government itself would earn international credits if any of the sectors in the program beat their crediting baselines. The DC government could then sell those credits on the international market, thereby adding to public revenues. Alternatively, it could pass credits through as bonuses to good performing firms in its ETS.

Passing credits through to the good performing firms could raise complications. Consider first a case where the cap-and-trade program includes only a single sector. If the DC government passes credits to firms that beat the international baseline, those credits would be a bonus on top of the advantage to such firms of avoiding the need for domestic allowances. As discussed above, with pro rata

[7] The expected fractional reduction in the carbon price, given that the sector earns some credits, would reflect the extent to which "bad" firms missed the baseline divided by the extent to which "good" firms beat it:

$$\Sigma_+[(I_i - I_b)Q_i] \,/\, \Sigma_+[(I_b - I_i)Q_i]$$

where Σ_+ is a sum only over positive values, I_i is the intensity of firm i, I_b is the intensity of the crediting baseline, and Q_i is the output of firm i.

distributions, firms would not get a credit for each ton by which they beat the baseline. Nevertheless, with pass-through credits, the actual carbon price signal equals the domestic price plus the expected portion of the international price that could be earned. If a sizable share of the industry is expected to beat the intensity baseline, the carbon price signal for domestic firms could exceed the international price level. If so, there would be an incentive to implement more expensive emission mitigation projects in the DC than are undertaken elsewhere in the world. That would impair the cost-effectiveness of a common price signal.

The DC could also implement a multi-sector cap-and-trade program which includes some sectors that are eligible to earn international credits. A multi-sector program has the advantage of providing incentives across a wider range of possible emission mitigation activities within the country. With a multi-sector program, individual sectors may have their own intensity baselines for international crediting, as it would be impractical to create a common intensity baseline for sectors with different types of output.

If the DC government passes international credits through to the firms that beat the baseline in a given sector, price signal distortions would emerge relative to other economic sectors in the cap-and-trade program. The international credits would add to the domestic allowance price signal observed by a particular sector. Other sectors would have different expectations about the pro rata shares of credits they could earn, and some sectors may not even be eligible for international crediting. The divergence in incentives caused by differing price signals across sectors within the cap-and-trade program would undermine the benefits of a common carbon price within the country and therefore imply higher costs than necessary for the DC economy to achieve its given level of emission mitigation.

If a DC links its domestic ETS with foreign systems, special adjustments would be needed if sector crediting was still in place. If one sector then reduced emissions below the baseline, it would have extra domestic allowances to sell to the linked ETS. In addition, the DC would earn credits for those same emission reductions. Thus, the international community would pay twice for the same emission reductions. To avoid such outcomes in a linked system, the net foreign sales of a DC's domestic allowances could be deducted from the international credits it would earn. These complications could be avoided if sector crediting was discontinued when the ETS were linked. As discussed above, a DC would no longer need international credits if it could sell its own domestic allowances in the international market.

IV. TRADABLE INTENSITY STANDARDS

A DC government could use a Tradable Intensity Standard to implement either a Sector Trading program or a No-Lose Approach that uses an intensity baseline for crediting. With a Tradable Intensity Standard, each firm in the domestic sector is required either to meet the intensity standard or, if they exceed that intensity, to submit an allowance or credit to the government to cover the excess emissions. Firms that beat the intensity standard earn tradable allowances or credits. A key feature is that the instrument used for compliance with the domestic standard is traded in an international market that is much larger than the DC's internal carbon market.

Tradable Intensity Standard with a No-Lose Approach

In the case of a No-Lose approach, a DC government would agree on a crediting baseline for the sector, through international negotiations, represented by a given level of emission intensity. The DC

government would then set the domestic intensity standard equal to the international crediting baseline. The intensity standard would be applied to each firm in the sector. If a firm failed to meet the standard, it would need to buy credits from other domestic firms or from the international carbon market and surrender them to the government. The international credit-issuing agency would give to the DC government the credits earned if the sector on average beat the intensity baseline. The DC government would then have two sources of credits, the total of which would exactly equal the credits "earned" by the winning firms. Thus, the winning firms would get a credit for each ton by which they beat the baseline. The result is that firms in the sector would face the full international carbon price signal to motivate emission reductions. Each firm would have certainty about the amount of credits it would receive for beating the intensity standard, and that certainty would make it easier to secure up-front private financing for emission abatement projects.

The DC government would not itself incur any payment or compliance obligation. It would enforce the intensity standard on its domestic firms, collect credits from firms that missed the standard, and pass credits on to winning firms. It could conceivably set a little tighter standard than the international crediting baseline in order to recoup its administrative costs. If average sector intensity exceeds the international crediting baseline, the DC government would gain revenue. Firms that exceeded the baseline would then surrender more credits to the government than the government would have to return to firms that beat the baseline. After making a distribution to winning firms, the government could sell the remaining credits in the international marketplace and boost public revenues. The DC government would have the option of using such revenues to improve emission performance in the sector.

Note that firms with intensities above the baseline would have to pay for the tons of emissions by which they missed the baseline, but not for their entire emissions. For each extra ton of output, these firms would need to purchase additional international credits, not for the entire emissions from that ton of output, but only for the portion by which those emissions exceed the baseline intensity level. The effect would thus be similar to a small output tax. However, the incentives affecting production are not as onerous as those facing firms subject to a cap-and-trade program without free, output-based allowances. With cap-and-trade, an allowance must be surrendered for all emissions, not just the emissions in excess of baseline intensity.

For the same reason, introduction of a Tradable Intensity Standard raises the domestic price of output less than with a traditional cap-and-trade program, as the compliance obligation for an extra ton of output is lower with a tradable standard. Nevertheless, while the production incentives differ between a tradable standard and cap-and-trade, the incentives to reduce emissions for any given level of production are the same as long as firms face the same carbon price. Using international credits as the compliance instrument does`1 pass the world carbon price to a DC's domestic firms.

Firms with intensity below the baseline would pay nothing for their emissions. For each extra ton of output, these firms would earn international credits equal to the portion by which they beat the baseline intensity level. The effect would thus be similar to a small output subsidy. Thus, within the domestic industry, the relative competitive effects would favor additional production at the firms that beat the intensity baseline. This would be a gain for the country and for the environment. Note that, while the production incentives differ between "good" and "bad" firms, the incentive to reduce emissions for any given level of production is the same for the two types of firms: it equals the international carbon price.

The international competitive effects of a tradable intensity standard depend on the circumstances for firms in other countries. If other countries have cap-and-trade programs with no free allowances, the firms in those countries bear a greater disincentive to incremental production, as they must purchase allowances to cover all emissions from another unit of output. By contrast, the firms with tradable emission standards either earn credits with extra production (if their intensity is below baseline) or are required to purchase credits for only the portion of their extra emissions that exceed the baseline.

Tradable Intensity Standard with Sector Trading

A tradable intensity standard could conceivably be used to implement a Sector Trading program that was based on an intensity measure. In this case, the DC government would receive an initial distribution of allowances from an international administrative body.

If the sector on average beat the baseline, the DC government would have no obligation to surrender allowances to the international organization. As for the case of the No-Lose approach, the DC government could then distribute allowances from its initial allotment to the winning firms. Firms with intensity above the standard would need to buy allowances from other domestic firms or from the international market and surrender them to the DC government. Those allowances may also be needed to distribute to winning firms. However, unlike in the case of a No-Lose approach, it is unclear whether the allowances distributed to winning firms would exactly match the initial allotment to the DC plus the allowances received from the firms with excess emissions. If they fell short, the DC government could potentially be required to purchase allowances itself from the international market and distribute them to winning firms.

If the sector on average failed to beat the baseline, the DC government would have an obligation to surrender allowances to the international body. It would receive allowances from the firms that failed the baseline, which would be more than the allowances it needed to distribute to winning firms. The difference would exactly equal the obligation of the DC government to surrender allowances to the international administrative body for the period. Thus, the DC government would be able to comply internationally and still sell its entire initial allotment of allowances for the period. The DC government needs the initial allotment of allowances only to cover successful performance by the sector. Those allotments would be the subject of negotiations.

Advantages of International Linkages

A DC government also has the option of implementing a Tradable Intensity Standard, equal to the international crediting baseline, without using international credits as an enforcement instrument. The DC government could issue domestic credits to firms that beat the baseline and allow firms with intensity above the standard to buy those domestic credits. This is the traditional approach for a domestic tradable performance standard.

A Tradable Intensity Standard that is not linked to international markets has several operational drawbacks, however. On one hand, firms that beat the standard may not earn enough credits to make up for the amount that failing firms miss the standard. In that case, the price of the domestic performance credit would rise to meet the penalty for noncompliance, which might be quite high. Even then, some firms would not get the credits they need and would fail to comply.

On the other hand, firms that beat the standard may earn more credits than those needed by firms that fail to meet the standard. In that case, the price of the domestic performance credit would fall quite low. (If credits could be "banked" for use in a later period, the credit price would have some support unless the excess of credits was expected to continue, year after year.)

If a domestic credit is used to enforce a Tradable Intensity Standard, it would be a rare coincidence that the credits earned by winning firms would exactly equal the performance shortfalls of other firms. In any case, the domestic price of tradable performance credits would likely differ, and perhaps substantially in one direction or another, from the world market price of carbon. Thus, the cost-minimization effects of a common carbon price would not be achieved. Moreover, because the net supply of credits to the domestic market could vary considerably from one year to the next, the domestic price of credits would likely fluctuate over a wide range. Uncertainty about future credit prices would dampen the incentive for investments in emission abatement in the sector. These problems would not arise if the credits used for domestic enforcement of an intensity standard came from a liquid international carbon market.

In sum, a Tradable Intensity Standard using international credits as a compliance instrument would allow emission reductions to be motivated by the full international carbon price signal while minimizing the compliance obligation of DC firms and avoiding an external compliance obligation for the DC government. Even with a No-Lose approach for the country, it would allow firms to have certainty about the credits they would earn if they beat the international crediting baseline, which would facilitate raising private funding in advance for emission abatement projects. A Tradable Intensity Standard could be a useful transitional approach to the eventual development of cap-and-trade programs in DCs.

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