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Sectoral and other International Mechanisms Designed to Scale up Offset Supply: An Overview of Key Issues[1]

Background Paper for the EPRI Greenhouse Gas Emissions Offset Policy Dialogue Workshop #7

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I. Background

This paper has been prepared for a workshop to be held by the Electric Power Research Institute (EPRI) on February 25, 2010 in Washington D.C. It is the seventh in a series of workshops sponsored by EPRI in 2008, 2009 and 2010 on the subject of greenhouse gas (GHG) emissions offsets.

The purpose of this paper is to provide background for workshop discussions on sectoral crediting mechanisms and Nationally Appropriate Mitigation Actions (NAMAs) – two evolving and potentially overlapping concepts that could create a framework for future emission reduction efforts at the sectoral level in developing countries. The paper also will briefly address other approaches for scaling-up international offset mechanisms under discussion in international climate change negotiations − standardized baselines in the Clean Development Mechanism (CDM), and Programmatic CDM. In the course of discussing key issues in the design of sectoral mechanisms, it also will provide a (non-exhaustive) discussion on some of the specific proposals that have been made for these mechanisms, including variations intended to facilitate the participation of the private sector.

Topics addressed in this background paper include:

- Definitions of the different mechanisms and frameworks.
- Background information on the status of international discussions and negotiating texts relating to sectoral mechanisms (both crediting and trading mechanisms) and NAMAs in the lead-up to, and in the wake of, the Copenhagen climate change negotiations.
- Various key issues and in the design of these mechanisms:
    - Which sectors and circumstances are conducive to the use of scaled-up flexible mechanisms?
    - How will the baseline be set? Who sets the baseline? Would the entire sector participate? Would the entire sector be required to meet or surpass the target?
    - How would tradable instruments be created? When are they issued? By whom? To whom? Is the host country government or the individual firm liable for achievement of the target?
    - How could CDM crediting continue if a sectoral program is implemented?
- Estimates of potential credit volumes that could be generated by sectoral mechanisms, and related concerns about a potential supply-demand imbalance.

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II. Definitions of the Sectoral Mechanisms (including NAMAs and Scaled-Up CDM Approaches)

A. Scaling-Up the Flexible Mechanisms

The emergence of proposals such as sectoral crediting mechanisms and NAMAs has occurred partly in response to the perception that the flexible mechanisms in the Kyoto Protocol (KP) – CDM and Joint Implementation – are inherently limited in their ability to influence major capital investments in developing countries in the energy, transport and industrial sectors, and thereby deliver the magnitude of emission reductions needed to achieve global climate change objectives. Among other issues and challenges, the project-level scope of these mechanisms and the requirement to demonstrate additionality for each project stand out as factors that make it difficult to scale-up CDM and JI.

In this context, other approaches at the sectoral rather than project level which address sector-wide emissions and do not require project-by-project additionality tests have been viewed as having far greater emission reduction potential. (Section V summarizes recent estimates of emission reduction potential of sectoral mechanisms.) They also have the potential to significantly reduce transaction costs at the project level, although new efforts would be required at the government level to ensure accurate, more comprehensive emissions monitoring for participating sectors, to estimate BAU emissions trajectories, and to propose and negotiate the sector baseline. In addition, some of the proposals have called for such sectoral approaches to set a baseline at a level lower than business-as-usual, and to measure (and in some cases, provide credits for) only those emission reductions achieved below the baseline. This lower baseline provides an additional environmental benefit beyond the current project mechanisms, which are generally understood to set project baselines at approximately BAU levels. It thereby responds to criticism that the current flexible mechanisms only act to offset emissions in developed countries, and do not contribute to global emission reductions.

Evidence of support for the development of approaches to scale-up the flexible mechanisms can be seen in international negotiating texts, and the outlines of potential policy design can be seen in draft texts (see discussion in Section IV). In addition, the European Union has signaled its support for such mechanisms and expectation that they will be available in the Revised Directive for the EU Emissions Trading Scheme, which would allow covered installations access to such mechanisms (subject to the overall credit limits in the Directive).[2] Most importantly for U.S. firms, two pieces of legislation to create an economy-wide cap-and-trade system for greenhouse gases (GHGs) – the American Clean Energy and Security Act (ACES), which passed the House of Representatives in June 2009, and the Clean Energy Jobs and American Power Act (the "Kerry-Boxer" bill), which passed the Senate Environment and Public Works Committee in November 2009 – include provisions to identify sectors and countries that would be appropriate for sectoral crediting, and to allow for the use of credits issued on a sectoral basis.[3]

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[2] Official Journal of the European Union, "Directive 2009/29/EC of the European Parliament and of the Council of 23 April 2009 amending Directive 2003/87/EC so as to improve and extend the greenhouse gas emission allowance trading scheme of the Community, Article 28.3, June 5, 2009, http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=OJ:L:2009:140:0063:0087:EN:PDF

[3] As noted in Aasrud et al., (2009), these bills call for sectoral crediting programs based on absolute emission targets. However, it is often noted that developing countries oppose absolute emission targets at the present time

B. Definitions of the Different Mechanisms and Frameworks for Scaling-Up the Flexible Mechanisms

Definitions of different types of sectoral mechanisms and other approaches for scaling-up the flexible mechanisms sometimes vary in the literature. Of these approaches, a subset seems to have gained currency as providing a potential framework for future mechanisms. For example, as discussed in Section III, **no-lose sectoral crediting** and **sectoral trading** are two concepts that – based on their appearance in the some of the most recent "non-papers" being considered in international climate negotiations − appear to have a fair chance to be elaborated and perhaps implemented in the future. In addition, **Programmatic CDM** is already being implemented, and **standardized baselines** in the CDM could receive further consideration in upcoming negotiating sessions.

Table 1 briefly summarizes the different mechanisms for scaling-up the flexible mechanisms, which are discussed in greater detail below.

The following definitions are intended to illustrate the basic concept of such approaches as NAMAs and no-lose sectoral crediting. Some of the variations on each approach and more detailed formulations that have been proposed in the literature are addressed in Section IV, which considers key issues in the design of these mechanisms.

1. Nationally Appropriate Mitigation Actions

NAMAs are mitigation actions beyond BAU undertaken by developing countries, and can include the entire spectrum of policies that can have emission-reducing effects – capacity building; energy efficiency requirements or incentives; energy and carbon taxes; elimination or provision of subsidies; command-and-control regulations; renewable energy standards, incentives or subsidies (e.g. feed-in tariffs); technology needs assessments, deployment targets, incentives, and transfer; sectoral crediting and trading; other baseline-and-credit trading programs, such as the recently announced tradable energy savings certificate program in India;[4] economy-wide cap-and-trade; and many others. They may be undertaken unilaterally by developing countries, or with financial assistance and support from developed countries. Potentially, "they could be designed to allow for crediting for emission reductions resulting from actions that do not receive developed country support ("tradable NAMAs"). However, such a mechanism would need to overcome difficulties in accurately attributing and quantifying emission reductions from specific policies.

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because they would limit economic growth. Aasrud et al., "Sectoral Market Mechanisms: Issues for Negotiation and Domestic Implementation," Organization for Economic Cooperation and Development/International Energy Agency, COM/ENV/EPOC/IEA/SLT(2009)5, October 2009, p. 14, http://www.oecd.org/dataoecd/3/28/44001884.pdf

[4] Ibid, p. 32.

Table 1: Comparison of Sectoral Mechanisms

Mechanism	Voluntary / Mandatory	Baseline Level (BAU or Below) and Metric	Credit Issuance	Potential for Market Financing?	Advantages	Challenges
NAMAs (non-tradable)	Voluntary	Varies; varies	N/A	N/A (financing is unilateral or from developed country governments)	Flexible, can be tailored to specific needs	Difficult to accurately quantify emission reductions resulting from policy
Tradable NAMAs	Voluntary	Below BAU; varies (but must be converted into absolute emission reductions for crediting)	*Ex-post*	Difficult (host country government is seller, difficult to predict emission reductions)	Flexible	Difficult to accurately quantify or predict emission reductions resulting from policy
No-Lose Sectoral Crediting	Voluntary	Below BAU; emissions intensity or absolute emissions	*Ex-post (ex-ante* possible, e.g. if combined with a Tradable Emissions Intensity Standard)	Moderate, depending on rules	Potentially popular because no liability for government if sector doesn't meet target	Incentives to private sector reduced if government is seller or passes through credits but does not guarantee full crediting
Sectoral Trading	Mandatory (target typically assumed to be binding)	Below BAU; absolute emissions (possibly emissions intensity)	*Ex-ante*	Moderate to high, depending on rules (higher potential if target is binding, government compliance is reliable, and allowances issued by international body)	Firms can finance investments in emission reductions by selling allowances *ex-ante*; target provides environmental certainty	May be too ambitious for many countries
Standardized Baselines ("Sectoral CDM")	Voluntary (and project-based, like CDM)	Approximately BAU	*Ex-post*	Moderate (potentially higher than CDM, given lack of additionality test)	No additionality test; can reduce eligibility risks and transaction costs	May raise concerns about additionality for some projects

As discussed in Section III, in international climate negotiations, NAMA has become an overarching concept that covers such approaches as sectoral crediting and trading. They also may be implemented to facilitate sectoral crediting. For example, as part of a no-lose sectoral crediting program, a developing country that sets its crediting baseline lower than BAU could undertake a unilateral NAMA in order to help that sector with the incremental reductions needed to be able to achieve that baseline. Alternatively, or in addition, a developed country could provide assistance as part of a supported NAMA in order to bring emissions (or emissions intensity) below BAU levels.

It has been noted that supported NAMAs are an attractive approach for developing countries because they are flexible, can be tailored to a country's specific needs, and can be aimed at producing and measuring progress in areas not limited to reductions in emissions or emissions

intensity, such as the extent to which feed-in tariffs are used, or output produced using a targeted technology.[5]

2. No-lose sectoral crediting

Under a **no-lose sectoral crediting approach** − a concept originally developed by the Center for Clean Air Policy (CCAP) – a developing country chooses a sector that it deems appropriate to participate in such a program. The country voluntarily proposes a non-binding emissions target or threshold for the sector that is below BAU, and which is submitted for consideration by the Conference of Parties in international negotiations.[6] Given the opposition of many developing countries to absolute emissions targets, which can constrain economic growth, emissions targets may be defined in terms of emissions intensity – e.g. tCO_2e /MWh or tCO_2e/unit of production. After each sectoral crediting period, the emissions target could be made more stringent in order to make greater contributions to global emission reduction efforts.

If, following the crediting period, the sector as a whole (as it is defined in the program, taking into account such factors as the minimum emissions threshold established for participating firms) has overcomplied with its emissions target (e.g. its emissions intensity is lower than the target), the government will earn credits issued by an international body. No additionality test is applied because additionality has been taken into account at the sectoral level by setting the target below BAU. These credits then could be distributed to or shared with entities in the sector that overcomplied with the target. In the case of an intensity target, the amount of credits is equal to the difference between actual emissions intensity and the intensity target, multiplied by total production (e.g. MWh or tons of steel). If the sector as a whole does not meet the target, there is no liability for the developing country – hence the term "no-lose."

Like Certified Emission Reductions (CERs) from CDM projects, these credits may be sold to buyers in developed countries and used to meet emission reduction requirements. Buyers could include entities covered under a domestic cap-and-trade program, or developed country governments seeking to meet national emission reduction targets under the Kyoto Protocol or a future international agreement.

A no-lose sectoral crediting program can be considered an intermediate step toward the acceptance of more ambitious emission reduction commitments in the future. It would allow for absolute emissions growth (thereby accommodating economic growth) while achieving progressive improvements in emissions intensity and avoiding the lock-in of emissions-intensive technologies in long-lasting infrastructure investments.

One challenge of no-lose crediting as described above is that overall performance − and therefore, the pool of credits – would be diminished by entities that do not meet the target. As a result, firms that reduce their emissions intensity below the sectoral target would receive fewer credits than under a project-based approach which considered performance against their own

[5] Center for Clean Air Policy, "Status of policy findings from the global sectoral study," December 2009, p. 8, http://www.ccap.org/docs/resources/826/Status%20Update%20of%20Sectoral%20Study.pdf

[6] A different approach (transnational sectoral agreements) in which sectoral intensity targets are applied globally is generally not supported by developing countries. Ibid.

baseline. Potential underperformance at the sectoral level, in turn, would create uncertainties and risks for international buyers that contract directly with firms in the developing country.

3. Sectoral trading

In a sectoral trading program, a developing country "accepts an internationally binding compliance obligation for the absolute level of emissions in a particular economic sector."[7] In theory, a sectoral trading program could use intensity-based targets, although the step to sectoral trading is generally associated with absolute emission reductions. In addition, intensity targets would make it problematic to link to cap-and-trade programs, and would complicate ex-ante distribution of allowances, given that production data are not known in advance. (The volume of allowances is calculated by multiplying actual production (e.g. MWh or tons of steel, etc., depending upon the emissions intensity metric) by the emissions intensity target.) Nevertheless, intensity targets have a number of advantages for developing countries, and a sectoral trading program with an intensity target can be designed to allow for domestic trading of allowances and linking to international markets via a crediting mechanism, as discussed in Section IV.

In contrast to credits in a sectoral crediting program, which are issued after over-compliance is demonstrated (i.e. *ex-post*), domestic sectoral allowances in a sectoral trading program would be issued by the host country government to covered entities on an *ex-ante* basis. (Under another formulation, an international body issues the allowances and collects them for compliance.[8]) They could be issued for free (grandfathered) or auctioned or a combination of both. Participating entities would be able to buy domestic sectoral allowances in the market to meet their targets. The government would need to establish liability requirements for entities that fail to meet their targets, and would need to enforce these requirements. In principle, entities also would be able to sell their allowances to buyers in developed countries, as well as purchase compliance instruments in the international market. However, if such trading on the international market were allowed, and if as a result some entities did not comply with their targets, the government would still be responsible for meeting the sector's compliance obligation, and would need to purchase eligible compliance instruments in the international carbon market.[9] Such purchases could be funded in part through domestic penalties imposed on non-complying firms. The risk of overselling on the international market could be partially mitigated through the use of a compliance reserve, in which each seller must keep a minimum percentage of allowances in his account at all times.[10]

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[7] Ibid, p. 16.
[8] Ibid.
[9] Baron, Buchner et al., "Sectoral Approaches and the Carbon Market," Organization for Economic Cooperation and Development/International Energy Agency, COM/ENV/EPOC/IEA/SLT(2009)3, June 2009, p. 7, http://www.oecd.org/dataoecd/8/7/42875080.pdf
[10] See Aasrud et al., "Sectoral Market Mechanisms: Issues for Negotiation and Domestic Implementation," op. cit., and "The Role of Sector No-Lose Targets in Scaling Up Finance for Climate Change Mitigation Activities in Developing Countries," Prepared for the International Climate Division, Department for Environment, Food and Rural Affairs (DEFRA), United Kingdom; editor and convening lead author: Murray Ward; main contributing authors: Charlotte Streck, Harald Winkler, et al.; Climate Focus, Ecofys and GtripleC; May 2008, http://www.sectoral.org/images/presentations/defra_paper%20on%20sector%20no%20lose%20targets_final.pdf

4. Standardized Baselines in the CDM ("Sectoral CDM")

Sectoral CDM[11] would depart from the current project-specific approach of the CDM, and would involve the Subsidiary Body for Scientific and Technological Advice (a UNFCCC technical body) or another body establishing standardized, multi-project baselines for certain categories of activities within a sector or sub-sector. Such baselines could be country-specific, region-specific, or global, as appropriate. Credits could be generated for such activities across the sector, and individual projects would not be subject to an additionality test. Baselines could be defined in terms of emissions intensity or various other metrics. This standardized approach has the potential to significantly expand the magnitude of emission reductions in the CDM, and can be seen as a step toward sectoral approaches.[12]

Some have pointed out that under this approach, non-additional projects could receive credits if they are already emitting below the baseline.[13,14] This issue would need to be considered if standardized baselines will play a role in the CDM. Nevertheless, Parties at Copenhagen adopted a decision requesting that SBSTA recommend "modalities and procedures for the development of standardized baselines that are broadly applicable, provide for a high level of environmental integrity, and take account of specific national circumstances"[15] for consideration at the next major negotiating session in December 2010.

5. Programmatic CDM

Programmatic CDM "allow[s] many project activities to become constituent parts of one large CDM project."[16] These projects must share a common "program of activities." More specifically, the CDM allows that a policy "implemented by a concrete program of activities directly achieving emission reductions that can be measured and verified,"[17] can be submitted as a single CDM project activity. A "program of activities" (PoA) is a public sector measure (voluntary or mandatory) or private sector initiative. Examples of PoAs include: renewable energy technologies that supply individual households (e.g. solar cookers, solar thermal water heaters and dryers); non-biomass grid-connected renewable energy (e.g. hydro power plants, wind farms); demand-side energy efficiency measures in households or facilities; methane

[11] Some authors have pointed out that definitions of Sectoral CDM have varied in the literature. For example, Oko-Institut notes that Sectoral CDM "is sometimes defined as a project-based mechanism that applies baselines established at the sectoral level and sometimes as a mechanism where the entire sector is included in the boundary and overall emissions in the sector are credited against a baseline for the sector (e.g. Figueres 2006). In international negotiations, the "sectoral CDM" has recently been defined as the former: a project based mechanism with sectoral baseline (UNFCCC/KP/AWG/2009/INF.2, pp. 7-8)." Oko-Institut, "A framework for a sectoral crediting mechanism in a post-2012 climate regime," May 2009, p. 7, http://www.oeko.de/oekodoc/904/2009-022-en.pdf

[12] Aasrud et. al, "Sectoral Market Mechanisms: Issues for Negotiation and Domestic Implementation," op. cit., p. 5.

[13] Ward, Streck, Winkler et al., "The Role of Sector No-Lose Targets in Scaling Up Finance for Climate Change Mitigation Activities in Developing Countries," op. cit., p. 27.

[14] Potential solutions to this problem that have been proposed include applying a discount to tons of reductions before credits are earned, and adjusting baselines downward over time. See Center for Clean Air Policy, "Status of policy findings from the global sectoral study," op. cit., p. 7.

[15] http://unfccc.int/resource/docs/2009/cmp5/eng/l10.pdf

[16] Ward, Streck, Winkler et al., "The Role of Sector No-Lose Targets in Scaling Up Finance for Climate Change Mitigation Activities in Developing Countries," op. cit., p. 26.

[17] Figueres and Newcombe, "Evolution of the CDM: Toward 2012 and Beyond," July 2007, p. 5, http://figueresonline.com/publications/Post_2012_CDM.pdf

recovery and destruction; and mass transport systems. Each PoA involves the use of one single approved methodology.

Importantly, the Parties to the Kyoto Protocol specifically noted in the decision text on programmatic CDM that a local, regional or national policy or standard does not qualify as a program of activities.[18] As noted above, NAMAs potentially could be designed to allow for crediting to occur from actions (including implemented policies) that do not receive developed country support. However, this concept has not yet been elaborated in negotiations. In addition, there would be challenges in practice in estimating emission reductions and associated credits attributable solely to a particular policy, although some solutions could be devised (e.g. discounting of credits).

As of February 10, 2010, two PoAs have been registered by the CDM Executive Board. One involves the distribution of energy efficient light bulbs to households in Mexico, and the other involves methane capture and combustion from animal waste management systems in Brazil. Based on their Project Design Documents (PDDs), both projects are expected to achieve approximately 500,000 tCO_2e of reductions annually.[19] In addition to these PoAs, 38 more are in the CDM project pipeline. Two are requesting registration, and the remaining PoAs are in validation.[20]

3. Relationships between the different mechanisms

As noted in the discussion on NAMAs, unilateral NAMAs may be implemented in conjunction with no-lose sectoral crediting in order to bring the sector's baseline to a level below BAU. Different mechanisms can be expected to co-exist. For example, CDM projects that have years remaining on their crediting period may be allowed to continue to generate credits after a no-lose sectoral crediting program has been implemented. (Section IV includes a discussion on some proposals for addressing double-counting of emission reductions in this scenario, and for balancing CDM credit buyers' objectives and an interest in transitioning to full participation in a sectoral mechanism.) Other policies such as Programmatic CDM could also co-exist with no-lose sectoral crediting, as well as supported NAMAs such as capacity-building efforts to help developing countries "graduate" to sectoral trading.[21]

III. Status of sectoral mechanisms and NAMAs in international negotiations and related documents

1. Bali Action Plan

At the thirteenth Conference of the Parties (COP) to the Kyoto Protocol held in Bali, Indonesia in December 2007, the Parties adopted the Bali Action Plan. The Plan established two

[18] http://cdm.unfccc.int/ProgrammeOfActivities/index.html
[19] http://cdm.unfccc.int/ProgrammeOfActivities/registered.html
[20] UNEP Risoe CDM/JI Pipeline Database (February 1, 2010 update), http://www.cdmpipeline.org, (see tab labeled "PoAs")
[21] Ward, Streck and Winkler, et al., (2008) provide an example of a "sectoral umbrella program" that illustrates how different mechanisms could be combined. "The Role of Sector No-Lose Targets in Scaling Up Finance for Climate Change Mitigation Activities in Developing Countries," op. cit., p. 25.

negotiating tracks and associated working groups – the United Nations Framework Convention on Climate Change (UNFCCC) track, handled by the Ad Hoc Working Group on Long-Term Cooperative Action under the Convention (AWG-LCA), and the Kyoto Protocol track, handled by the Ad Hoc Working Group on Further Commitments for Annex I Parties under the Kyoto Protocol (AWG-KP). It set a deadline for achieving a binding agreement on emission reduction targets, financing and various other key issues in Copenhagen in December 2009. Among other topics, the Plan called for the UNFCCC negotiation process to address the following issues:

> "Enhanced national/international action on mitigation of climate change, including, inter alia, consideration of: … (ii) ***Nationally appropriate mitigation actions*** by developing country Parties in the context of sustainable development, supported and enabled by technology, financing and capacity-building, in a measurable, reportable and verifiable manner; (iv) Cooperative ***sectoral approaches and sector-specific actions***, in order to enhance implementation of Article 4, paragraph 1(c), of the Convention; (v) Various approaches, ***including opportunities for using markets***, to enhance the cost-effectiveness of, and to promote, mitigation actions, bearing in mind different circumstances of developed and developing countries;…"[22]

This is said to be the first reference to NAMAs, the concept and details of which were left to be fleshed out in subsequent negotiations.[23] Similarly, sectoral approaches were not defined in the Bali Action Plan. Discussions on these topics continued in the AWG-LCA in 2008 and 2009.

2. Sectoral and NAMA proposals in 200-page bracketed revised negotiating text

In Bonn, Germany, in June 2009, Parties produced a revised negotiating text covering all of the main elements of the Bali Action Plan, but with various alternative proposals included in brackets in a 200 page document. Therefore, the summary that follows should not be understood as a cohesive set of agreed definitions and requirements, but rather as elements of different proposals. Included in this document was the concept of a NAMA as a quantifiable national mitigation commitment included in each developing country's national schedule of mitigation actions.[24] As part of their commitments under the UNFCCC, developed countries would be required to support (through providing financial resources, technology cooperation and transfer, and capacity building) developing countries' NAMAs.[25] These NAMAs would be voluntary, formulated through a country-driven process, recorded in a NAMA registry, and contingent on support by developed countries, although they may be undertaken unilaterally, without support.[26]

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[22] http://unfccc.int/resource/docs/2007/cop13/eng/06a01.pdf#page=3
[23] Center for Clean Air Policy, "Status of policy findings from the global sectoral study," op. cit., p. 7.
[24] UNFCCC, Ad Hoc Working Group on Long-term Cooperative Action under the Convention, sixth session, Bonn, 1–12 June 2009, Revised Negotiating Text, Note by the Secretariat, FCCC/AWGLCA/2009/INF.1, 22 June 2009, http://unfccc.int/resource/docs/2009/awglca6/eng/inf01.pdf, p. 71.
[25] Ibid, p. 10.
[26] Ibid, pp. 86-87.

In addition, they could differ by country depending on national circumstances,[27] and would be recorded in a NAMA registry.[28]

Developing countries could undertake nationally appropriate mitigation commitments and actions under three tiers:

> "(a) Tier One: Actions that are financed domestically, either nationally or subnationally;
> (b) Tier Two: Actions that are financed by international financial and/or technical support, either through bilateral support, support from the Multilateral Fund on Climate Change, or other international financial means;
> (c) Tier Three: Actions that are undertaken over and above those identified in Tier One and Tier Two actions that are based on an emission reduction target and which may be eligible for trading of units."

Among the various potential types of NAMAs identified in the text were sustainable development policies and measures, renewable energy strategies and plans, technology deployment programs or standards, cap-and-trade programs, carbon taxes, the use of project- and program-based CDM, economy-wide or sectoral intensity targets, no-lose sectoral crediting baselines, a REDD program, clean energy commitments or actions; energy efficiency programs, energy pricing measures, and emissions thresholds aimed at protecting and enhancing sinks and reservoirs.[29] Thus, the bracketed negotiating text left many possibilities open for the range of measures that might fall under the heading of NAMAs, including sectoral crediting and trading mechanisms. The latter mechanisms were identified as new flexible mechanisms under consideration.[30] Based on examples provided in the text, sectors that might be selected in some countries for intensity-based emissions targets include but are not limited to aluminum, iron and steel, cement and power generation.[31]

Specific language on a "sectoral crediting mechanism" proposed that thresholds (i.e. sectoral emissions targets) could be absolute or intensity-based (at a level significantly below projected levels[32]), that credits would be issued for reductions beyond the thresholds, and that such credits would be fungible with other instruments such as Certified Emission Reductions (CERs) issued for CDM projects or Emission Reduction Units (ERUs) issued for JI projects.[33] Other elements of sectoral crediting mechanisms that are identified for further elaboration include monitoring, verification and reporting; guidelines for management and allocation of credits; criteria for eligible countries and sectors; the nature of targets (absolute or intensity); results of non-achievement of the target; relationship with CDM activities; and the duration of crediting periods.[34,35] Credits, or "NAMA units," would be issued following the verification of emissions or removals by sinks within the sector boundary relative to the threshold. If emissions are higher

[27] Ibid, p. 93.
[28] Ibid, p. 95.
[29] http://unfccc.int/resource/docs/2009/awglca6/eng/inf01.pdf, pp. 71, 89, 90.
[30] Ibid, p. 134.
[31] Ibid, p. 92.
[32] Ibid, p. 140.
[33] Ibid, p. 137.
[34] Ibid, p. 137.
[35] Ibid, p. 140

than the threshold, no NAMA units would be issued but there would be no further consequences.[36] (This provision is consistent with a "no lose" sectoral crediting mechanism, as described above in Section II.) As suggested by the verification requirement, sectoral programs intended to generate credits would be subject to monitoring, verification and reporting, as would sectoral trading programs.

The text also included proposed language on "sectoral trading," in which developing countries that have sectoral targets and that meet requirements to be developed may participate in international emissions trading. Units issued under a sectoral trading program would be fungible with CERs and ERUs. Additional issues that would receive further elaboration are the number of years in a trading period and the frequency of review of sectoral targets.[37] At the start of each trading period, participating countries would receive NAMA units in an amount reflecting the Party's emissions trading threshold. They would retire NAMA units equal to net emissions within the sector boundary during the trading period. They also would be able to participate in emissions trading (i.e. the selling of NAMA units in international markets), provided that such trading is supplemental to domestic actions by the party.[38]

3. "Non-papers" submitted to negotiators in Copenhagen, and the Copenhagen Accord

Following the development of the bracketed revised negotiating text in June 2009, discussions in the AWG-LCA continued on various elements of the text at meetings in Bonn, Bangkok, and Barcelona. The result of these discussions was a series of "non-papers" – designated as such to connote their provisional status – prepared for negotiators to consider at COP-15 in Copenhagen in December 2009.

As is well-known, negotiators at Copenhagen were unable to reach a binding agreement on the wide-ranging areas of negotiation.[39] However, 188 countries "took note" of the Copenhagen Accord, a non-binding political agreement calling on countries to submit national action plans for reducing GHG emissions by the end of January 2010, with the ultimate goal of limiting global temperature increases to no more than 2 degrees Celsius. The Accord also commits developed countries to provide $30 billion of funding for adaptation and mitigation for the three-year period 2010-2012, and establishes a funding goal of $100 billion per year by 2020. However, many decisions on several key topics − including but not limited to specific and binding targets for individual countries, defined 2020 and 2050 global emission targets, the continuation of the CDM, and the development of new offset mechanisms such as REDD and sectoral mechanisms − were deferred for possible resolution in December 2010, at the next major United Nations negotiating session on climate change.

In the wake of Copenhagen, there are many questions regarding prospects for the United Nations negotiation process. Many fundamental challenges remain, including the need to merge negotiations in the two separate tracks, and various diverging views on whether to extend and

[36] Ibid.
[37] Ibid, p. 138.
[38] Ibid, p. 140.
[39] A comprehensive summary of the Copenhagen negotiations is available from the International Institute for Sustainable Development, http://www.iisd.ca/download/pdf/enb12459e.pdf

revise the Kyoto Protocol, create a new agreement within the UN process, or pursue an agreement outside of the aegis of the United Nations. With these uncertainties as backdrop, existing language and proposals in non-papers and the Copenhagen Accord should be understood as being highly uncertain as well. Nevertheless, they are the best available indicators on the status of discussions on NAMAs and sectoral mechanisms. In general, language on these topics in the non-papers and the Copenhagen Accord was far less comprehensive than the various proposals in the June 2009 revised negotiating text, which provide additional hints on the different directions that future discussions on NAMAs and sectoral mechanisms could take. The Copenhagen Accord states that developing country Parties "will implement mitigation actions," and shall communicate such actions through national communications every two years.[40] NAMAs that are supported by developed countries will be subject to international measurement, reporting and verification, while unsupported NAMAs will be subject to domestic measurement, reporting and verification. Least developed countries and small-island developing states "may undertake actions voluntarily and on the basis of support."

The Accord does not make any direct mention of sectoral mechanisms. It simply notes the decision

> "…to pursue various approaches, including opportunities to use markets, to enhance the cost-effectiveness of, and to promote mitigation actions. Developing countries, especially those with low emitting economies should be provided incentives to continue to develop on a low emission pathway."

Developed countries collectively committed in the Accord to provide up to $30 billion to developing countries during the 2010-12 period, and $100 billion annually by 2020. It notes that "[t]his funding will come from a wide variety of sources, public and private, bilateral and multilateral, including alternative sources of finance." The international carbon market could potentially provide a source of funding, although some developing countries could insist that the funding be separate from and additional to funds provided through the carbon market.

These provisions provide little evidence of progress or common ground on the subject of NAMAs, and even less on the topic of sectoral mechanisms.[41] Slightly more movement can be seen in the non-papers submitted for consideration but not agreed by the Parties at Copenhagen. For example, one non-paper indicated that developing country NAMAs would jointly be aimed at achieving a "substantial deviation in emissions" relative to BAU. It also would establish a mechanism to record both supported and unsupported NAMAs, and to help match financing from developed countries with NAMAs seeking support.[42] Another non-paper proposes (in bracketed text) to establish a program to "promote market-based mechanisms that complement other means of support for nationally appropriate mitigation actions, enhance the cost-effectiveness of mitigation and assist developed country Parties in meeting part of their mitigation commitments."[43] It also requests that SBSTA prepare specific recommendations on

[40] http://unfccc.int/files/meetings/cop_15/application/pdf/cop15_cph_auv.pdf
[41] As noted in Section II, however, some progress was reached in Copenhagen with respect to standardized baselines in the CDM. Parties adopted a decision requesting SBSTA to make recommendations for developing such baselines, and to submit them for consideration at COP-16 in December 2010.
[42] http://unfccc.int/resource/docs/2009/awglca8/eng/l07r01.pdf
[43] http://unfccc.int/resource/docs/2009/awglca8/eng/l07a08r01.pdf

market-based mechanisms for consideration at the next major negotiating session in December 2010. Recommendations would address such topics as ensuring voluntary participation of Parties, ensuring that reductions and removals are additional, promoting technology transfer, and promoting investment by the private sector.

In conclusion, it appears that the concept of NAMAs – both supported and unsupported – has gained a solid foothold in negotiation texts. The concept of standardized benchmarks for CDM projects also appears to have some support among the Parties, as SBSTA has been asked to submit recommendations on developing such benchmarks. Sectoral mechanisms, on the other hand, received no direct mention in either the Copenhagen Accord or the non-papers submitted for consideration at Copenhagen. Only the bracketed revised negotiating text provides an indication that no-lose sectoral crediting based on intensity targets and sectoral trading are receiving serious consideration.

IV. Key Issues in the Design of Scaled-Up Flexible Mechanisms

Given that the different proposed mechanisms have not been defined in any significant detail in international negotiation texts, there remain many fundamental questions regarding how these mechanisms would be designed in practice, and the various implications of different design options. The following discussion aims to identify some of the key issues in the design of these mechanisms, and to briefly describe some of the proposals that have been made by a number of organizations that have provided analysis and recommendations on these mechanisms to date.

A. Which Sectors and Circumstances are Conducive to the Use of Scaled-Up Flexible Mechanisms?

1. Factors for selecting sectors for participation in sectoral mechanisms

Factors for selecting sectors for participating in a sectoral mechanism, rather than a NAMA, include mitigation potential, mitigation cost, ability to measure emissions in the sector, the potential that long-lived capital in the sector will be locked-in, and the international competitiveness implications of not addressing emissions in the sector.[44] To date, sectors that have been frequently mentioned as promising candidates for sectoral mechanisms include electricity (generation), iron and steel, aluminum, and cement – although others have been considered as well. These sectors are characterized by large point sources and homogeneous, or relatively homogeneous, outputs, which facilitates the creation of a single sectoral target or reasonable number of subsectoral targets. Other sectors such as the chemicals sector may have too broad a range of products and emission intensities to establish a manageable number of subsectoral (or technology-specific) emission targets. Similarly, sectors with "complex industrial facilities that produce many co-products, such as refineries," present challenges for defining a reasonable emissions metric.[45] In contrast, the transport sector presents difficulties in determining the emissions impact of a single project, but emissions trends can be measured at the

[44] World Resources Institute, Stockholm Environment Institute, "Overview of Sectoral Crediting Mechanisms and Policies," no date, p. 3.
[45] Oko-Institut, "A framework for a sectoral crediting mechanism in a post-2012 climate regime," op. cit., p. 23.

sector level. These considerations may make the sector a more promising candidate for a sectoral approach.[46]

2. Data requirements

Sectoral approaches require that data on absolute emissions, output, and emissions intensity be available for collection and reliable at the sector level. Accurately estimating sectoral emissions can be more difficult when, for example, fuel consumption is measured at the national, and not the sectoral, level. Data collection must also extend to emission factors, industry structure (technologies, age and production capacity) and key emission drivers (fuel prices and ambient temperatures).[47] Such considerations will play a role in determining coverage and minimum emissions thresholds for the sectoral mechanism, as well as abatement potential. Analyses must also be undertaken to estimate BAU emissions trends, abatement potential and costs in order to develop sectoral baselines. Many developing countries do not currently have sufficient data or data collection capacity to meet these requirements, and significant work – potentially in the form of supported NAMAs − would need to be undertaken to ensure these countries' readiness for a sectoral mechanism.

3. Some advantages and disadvantages of sectoral approaches compared with other mechanisms

Although sectoral approaches require significant capacity building, and are not as flexible as NAMAs, they offer some important advantages. For example, sectoral approaches provide incentives for a large range of emission reduction measures across a sector. In contrast, multiple NAMAs in a single sector can create competing incentives and conflicts (e.g. investments in carbon capture and storage can reduce investments in renewables).[48] In addition, attributing emission reductions that result from implementation of a NAMA involves significant uncertainties, and therefore raises concerns regarding additionality.

One disadvantage of sectoral mechanisms based on emissions intensity targets is that they do not provide incentives on the demand side to reduce consumption or (in some cases) to switch to less emissions-intensive substitutes (e.g. wood instead of steel) because reduced demand would result in fewer credits.[49] However, sectoral mechanisms can be supplemented by NAMAs to address the demand side.

In some cases, developing countries may prefer other policies to sectoral mechanisms. For example, technology diffusion targets are often cited as being popular because of interest in particular technologies or their compatibility with economic development planning and technology transfer objectives.[50] However, estimating BAU levels of technology diffusion can be difficult. Furthermore, if the target is in the form of a tradable NAMA, estimating BAU

[46] Ibid, p. 56.
[47] Ibid, p. 36.
[48] Center for Clean Air Policy, "Status of policy findings from the global sectoral study," op. cit., pp. 8-9.
[49] World Resources Institute, Stockholm Environment Institute, "Overview of Sectoral Crediting Mechanisms and Policies," no date, p. 4.
[50] Center for Clean Air Policy, "Status of policy findings from the global sectoral study," p. 14.

technology mix and emissions intensity − and intensity improvements resulting from the policy − can be difficult, and can raise additionality concerns.[51]

4. Interaction of Private Markets and Sectoral Approaches

One of the key considerations in the design of future sectoral approaches is the extent to which the approach is designed to incentivize private-sector finance and markets. In this respect, a fundamental question in the design of tradable NAMAs and no-lose sectoral approaches is whether the host country government – which would receive credits from an international body for emission reductions beyond the sectoral baseline – would retain the credits and sell them directly, or "pass through" the credits to firms that beat the sectoral baseline. If the government retains the credits and acts as seller, credit transactions may be more likely to be done on a government-to-government basis, although some transactions might involve multilateral organizations and/or aggregators of compliance buyers. This contrasts with the current CDM market, in which a significant amount of market activity is driven by private sector buyers and sellers.

It is difficult to predict in advance all of the various implications of creating a market for sectoral credits that is characterized mainly by large transactions involving governments and multilateral organizations. However, such a market likely would not be as responsive to a carbon price signal as one dominated by the private sector. To meet global emission reduction objectives, trillions of dollars of investments in less-carbon-intensive infrastructure will be needed. Although developed country governments will need to play a role in contributing to these investments, climate objectives and associated investment objectives are unlikely to be met unless sectoral and other policies provide clear and strong incentives to the private sector.

As discussed in subsection C below, another possibility under a no-lose crediting program is that the government would pass through some or all of the credits to firms that beat the sectoral baseline. However, unless there is a guarantee that firms will receive their full amount of credits (rather than facing deductions to compensate for non-performance by other firms in the sector), finance for emission reduction investments may be difficult to obtain.

Other approaches to scaling-up the flexible mechanisms prompt other questions on the participation of the private sector. For example, under a sectoral trading approach, the ability of firms in developing countries to trade allowances *ex ante* to finance investments in emission reductions will be impacted by such considerations as the nature of the emissions target (intensity or absolute), the allowance allocation approach (grandfathering or auctioning or both), and whether the host country government takes on a internationally binding sectoral target or a no-lose target. Decisions on each of these aspects of policy design will affect how and the extent to which the private sector participates in markets for instruments created by sectoral mechanisms.

A sectoral trading program in which the government adopts an internationally binding absolute emissions target for one or more sectors, and provides a reliable guarantee that the target will be met (if necessary, through its purchases of additional compliance instruments), would be among

[51] Oko Institut, "A framework for a sectoral crediting mechanism in a post-2012 climate regime," op. cit., p. 24.

the most promising options in terms of providing the private sector with a clear policy and price signal. In practice, other policy designs such as no-lose crediting approaches may be more likely in the near term.

B. How will the baseline be set? Who sets the baseline? Would the entire sector participate? Would the entire sector be required to meet or surpass the target?

1. BAU or more stringent?

Most proposals for scaling-up the flexible mechanisms (no-lose sectoral crediting, sectoral trading, tradable NAMAs) envision that baselines will be set at a level lower than BAU. Baselines set at this level will require that creditable emission reductions be achieved at a higher point in the marginal abatement cost curve. As a result, sectoral and other programs help address international competitiveness concerns, particularly if baselines are made more stringent over time. In contrast, project crediting approaches like CDM incorporate baselines set approximately at BAU levels, and have a greater impact on competitiveness.[52] Sectoral CDM is also understood to incorporate baselines at approximately BAU levels, and raises concerns about potential overcrediting at the sector level, and additionality at the project level.[53]

2. Who sets the baseline?

Under Sectoral CDM and Programmatic CDM, the CDM Executive Board (with the assistance of such bodies as the Methodologies Panel) would set the baseline. Under no-lose sectoral crediting, sectoral trading, and tradable NAMAs, the developing country would propose the baseline, which would be negotiated and agreed among the Parties to an international agreement.

3. Basis for and design of the baseline

Possible bases for setting a sectoral baseline include mitigation costs and similarity of effort (i.e. setting the baseline at a level at which costs are not unmanageable and effort – measured in terms of cost or emissions intensity or other metrics – is comparable to that in other countries.[54] They can be defined in such terms as percentage points below BAU emissions intensity, or based on the emissions intensity of the plant in the top 20th percentile of performance.[55]

It is frequently noted that emissions intensity baselines are more appropriate for sectoral programs in developing countries at the present time. Future emissions are more difficult to predict in developing countries due to sharper fluctuations in economic growth. This raises the potential for absolute emission targets to restrain economic growth when it is higher than expected, or to result in unearned ("hot air") credits when growth is lower than expected.[56] In addition, as noted above, emissions intensity targets in a sectoral crediting program can be

[52] Center for Clean Air Policy, "Status of policy findings from the global sectoral study," p. 4.
[53] World Resources Institute, Stockholm Environment Institute, "Overview of Sectoral Crediting Mechanisms and Policies," no date, p. 4.
[54] Aasrud et al., "Sectoral Market Mechanisms: Issues for Negotiation and Domestic Implementation," op. cit., p. 16.
[55] Oko Institut, "A framework for a sectoral crediting mechanism in a post-2012 climate regime," op. cit., p. 34
[56] Center for Clean Air Policy, "Status of policy findings from the global sectoral study," p. 10.

coupled with NAMAs that seek to create incentives to reduce demand – thereby recreating the more complete incentives offered by absolute emissions targets. Over time, however, developing countries will need to cap and gradually reduce their absolute emissions in order to meet international climate change objectives.

Other design elements include variation in baselines during a crediting period, and the length of the crediting period. Baselines may be flat (i.e. the same in each year of a crediting period) or sloped. Sloped baselines allow for easier crediting in the first years of a crediting period, providing revenues for further investments in emission reductions.[57] Crediting periods (for which emissions baselines are established in advance) can be made longer, to provide investors with a longer planning horizon, or shorter (particularly for initial periods), to ensure that the mechanism works as regulators intended.[58] Crediting can occur at the end of a multi-year period, based on net performance against the baseline over the period ("aggregate no-lose"), or after each year ("year-by-year no-lose").[59] A different option that represents a shift away from no-lose to a binding commitment is "no-lose until crediting starts." Under this approach, once a country receives its first credit, the baseline becomes binding in the following year, and the country is liable to meet the target and ensure that overselling of credits does not occur.[60]

4. Would the entire sector participate and be required to meet the target?

In Programmatic and Sectoral CDM, participation in the program is voluntary. Firms can seek to earn credits under these programs, or they may opt not to do so. No-lose sectoral crediting proposals assume that crediting will be based on performance at the sectoral level, but typically envision that that some firms may not take action to meet the target, or may fail to meet the target, but will not face any penalty as a result. Variations on the sectoral crediting concept consider penalties for firms that do not meet the target, in order to address the problem that underperforming firms could prevent other firms that overcomply with the target from receiving credits equal to their overcompliance. Under sectoral trading, the entire sector (within the boundaries defined by the program) would participate and would be required to meet the target, whether through emissions abatement or by purchasing allowances in the market. Both sectoral crediting and trading programs would need to consider minimum emission thresholds for participation.

C. How would tradable instruments be created? When are they issued? By whom? To whom? Is the host country government or the individual firm liable for achievement of the target?

For potential compliance buyers, the answers to the questions considered in this section are central to the attractiveness and viability of the various mechanisms. The following discussion

[57] Oko Institut, "A framework for a sectoral crediting mechanism in a post-2012 climate regime," op. cit., p. 40.
[58] Ibid, p. 44
[59] Aasrud et al., "Sectoral Market Mechanisms: Issues for Negotiation and Domestic Implementation," op. cit., pp. 18-19.
[60] Ibid.

will consider these questions in light of some of the different variations on "standard" no-lose sectoral crediting and sectoral trading that have been proposed in the literature.[61]

1. Sectoral crediting proposals

Under the "standard" no-lose sectoral crediting approach described in Section II, credits are awarded by an international body *ex-post* to the host country government if the sector as a whole reduces its emissions intensity below the crediting baseline. Credits would be equal to the difference between the crediting baseline and the sector's intensity, multiplied by the relevant measure of output (e.g. MWh of electricity generation, tons of steel). If the sector does not beat the target, the government is not liable and there is no penalty or requirement to purchase compliance instruments to compensate for missing the target. Firms that do not meet the target will increase the sector's intensity, reducing (and potentially eliminating) the amount of credits that could be passed through to firms that surpassed the target. If the government does not pass the credits through to firms, but instead passes through the revenues earned from the sale of credits, a similar problem arises, as the amount of revenues would be diminished by underperforming firms. Because overcomplying firms in the developing country, and investors in credits, would not have any certainty regarding the volume of credits that would be received, incentives to reduce emissions would be limited and financing would be difficult to obtain.

Proposals to address this problem include an approach in which the government provides a guarantee that firms that surpass their targets will receive a credit.[62] This guarantee could be effectuated by the government purchasing extra credits in the international market to make up the difference between the amount of credits received for the sector's performance and the volume of emission reductions achieved by overcomplying firms. To provide additional assurance, the government could be involved in forward transactions and provide a guarantee to purchase credits in the international market as needed to meet the target and to deliver all earned credits to firms that surpass their targets.[63] If the government provides an effective guarantee, finance for investments in emission reductions could be easier to obtain because the simple crediting procedure, which avoids project-by-project additionality tests, eliminates eligibility risk and regulatory risk associated with project review.[64]

The risk of the government needing to purchase credits under this approach could be reduced if it sets a domestic crediting baseline that is lower than the crediting baseline agreed in international negotiations. Under this approach, reductions achieved beyond the domestic crediting baseline potentially could compensate for the underperformance of firms that do not beat the target.[65] Other approaches envision the government sharing the risk with firms by requiring that a portion

[61] Other options, such as tradable NAMAs, have not been elaborated in the literature to the same extent as sectoral crediting and trading. However, since the concept involves crediting of NAMAs (presumably by an international body after the NAMAs have been implemented), it would appear that the host country government would not be held liable for not fully implementing a NAMA. Under Sectoral CDM and Programmatic CDM, the CDM Executive Board would issue credits to projects, and there would be no compliance obligation for the government.
[62] See IETA, "Thinking through the Design Options for a Sectoral Crediting Mechanism: Three Options to Encourage Discussion," 2010, p. 10.
[63] Baron, Buchner, et al., "Sectoral Approaches and the Carbon Market," op. cit, p. 25.
[64] IETA, "Thinking through the Design Options for a Sectoral Crediting Mechanism: Three Options to Encourage Discussion," op. cit., p. 10.
[65] Baron, Buchner et al., "Sectoral Approaches and the Carbon Market," op. cit, p. 25.

of credits be set-aside in a reserve for any necessary credit purchases, or by imposing a levy on credits. Alternatively, the government could impose penalties on firms that do not comply, but this would change the nature of the scheme from voluntary to mandatory for firms, and (depending on enforcement) could guarantee the sector's compliance with the target.[66] Developing countries that are prepared to take this step would probably benefit from adopting a sectoral trading program instead, since that would allow firms to sell allowances they receive *ex-ante* in order to fund their emission reduction investments.

If the host country government acts as the seller in a sectoral crediting program, it may seek to secure long-term purchase agreements with large-scale buyers in developed countries, such as governments, aggregators of compliance buyers, or multilateral organizations.[67] In practice, the government may need to demonstrate its credit delivery commitment in a purchase agreement by backing it with the state budget.[68] Up-front financing (rather than payment on delivery of credits) could be difficult to obtain, given significant uncertainties regarding an entire sector's performance against a voluntary crediting baseline.[69]

2. Sectoral trading proposals

As described in Section II, sectoral trading may involve a developing country proposing and taking on a binding absolute emissions target (which is below BAU and negotiated internationally, like a no-lose sectoral crediting target), issuing domestic allowances[70] to firms *ex-ante* (based on grandfathering, auctioning, or a combination), allowing trading of allowances to meet targets, and enforcing the targets through penalties. An important advantage of this approach is that firms can sell their allowances in order to finance their emission reductions. If international selling of domestic allowances is allowed, the government would need to compensate for any overselling by purchasing compliance instruments in the international market. This risk could be mitigated in part through a requirement for firms to maintain a minimum percentage of allowances in a compliance reserve at all times.

Some proposals for sectoral trading envision that the target is binding for domestic firms, but is still non-binding, or "no-lose" for the host country government – an option that is typically seen as more attractive to developing countries at this time. For example, one proposal calls for no-lose tradable emissions intensity standards.[71] If the sector beats the intensity baseline, the host country government would receive credits from an international body, which would be passed through to firms that beat the standard. If the sector does not achieve the baseline, there is no penalty for the government. Firms are required to meet their targets by reducing their emissions

[66] IETA, "Thinking through the Design Options for a Sectoral Crediting Mechanism: Three Options to Encourage Discussion," p. 10.
[67] Ibid, p. 5.
[68] Ward, Streck, Winkler et al., "The Role of Sector No-Lose Targets in Scaling Up Finance for Climate Change Mitigation Activities in Developing Countries," op. cit., p. 63.
[69] IETA, "Thinking through the Design Options for a Sectoral Crediting Mechanism: Three Options to Encourage Discussion," p. 4.
[70] Some descriptions of sectoral trading assume that if a developing country takes on an internationally binding sectoral target for a sectoral trading program, allowances would be issued by an international body. Center for Clean Air Policy, "Status of policy findings from the global sectoral study," op. cit., p. 16; IETA, "Thinking through the Design Options for a Sectoral Crediting Mechanism: Three Options to Encourage Discussion," p. 9.
[71] Center for Clean Air Policy, "Status of policy findings from the global sectoral study," op. cit., p. 17.

intensity, buying credits from other domestic firms, or buying compliance instruments in the international market. An advantage of this approach is that firms that did not meet the target would need to purchase credits equal only to their "overage," while under cap-and-trade, firms would be required to hold allowances to cover all emissions. This reduces the economic impact of such a program relative to cap-and-trade. It should be noted, however, that this approach is a baseline-and-credit trading program, rather than an intensity-based cap-and-trade program.

Another no-lose sectoral trading proposal calls for *ex-ante* allocation of domestic allowances, and linking to international markets through a sectoral crediting mechanism.[72] Again, the government receives credits if the sector beats the target, and is not penalized if the target is not met. Under this approach, firms are required to meet their target through internal reductions, domestic allowance purchases, or purchases of other eligible compliance instruments such as offsets or credits purchased in the international market. Firms that submit surplus allowances and compliance instruments at the end of a compliance period would receive an equivalent amount of international credits from the government. One question with such an approach is whether any surplus instruments would be available, because the target would be below BAU, so demand for domestic allowances could exceed the supply of allowances. The ability to purchase other instruments could address this problem, but such purchases would only be made if the instruments were available at prices equal to or lower than domestic allowance prices.

Under another approach, an international body would allocate allowances to a sector in a developing country in excess of its current emission level. This approach would ensure a sufficient supply of allowances, and would provide a way for firms to finance up-front investments in emissions abatement.[73] Others have proposed to create such a source of finance through a levy imposed on all Assigned Amount Units (AAUs).[74]

D. How could CDM crediting continue if a sectoral program is implemented?

Entities involved in existing CDM projects have an economic interest in being able to complete their current crediting period based on their original project baseline. In addition, potential investors need to have certainty regarding the treatment of CDM projects in a given developing country that are registered before the implementation of a sectoral program in that country; otherwise investment in new CDM projects (and their associated emission reductions) will not occur. On the other hand, to ensure the success of new sectoral mechanisms, and to facilitate larger-scale emission reductions, it will be important to provide incentives for firms to participate in sectoral mechanisms rather than CDM projects. Given that sectoral mechanisms are envisioned to incorporate baselines that are more stringent than the (approximately) BAU baselines in CDM projects, these mechanisms are expected to deliver environmental benefits beyond those of the CDM. In short, policies addressing the transition from CDM to sectoral mechanisms will need to try to balance these concerns and objectives.

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[72] IETA, "Thinking through the Design Options for a Sectoral Crediting Mechanism: Three Options to Encourage Discussion," p. 7.

[73] Aasrud et al., "Sectoral Market Mechanisms: Issues for Negotiation and Domestic Implementation," op. cit., p. 30, citing Wagner, Keohane, Petsonk, and Wang, "Docking into a global carbon market: Clean Investment Budgets to finance low-carbon economic development," Environmental Defense Fund, 17 March 2009.

[74] Ibid.

A number of options for transitioning from CDM to the sectoral mechanisms have been noted in the literature, including but not limited to the following (a more detailed discussion on these options and their implications is provided in Baron et al. 2009):[75]

- Let any CDM project registered before the end of 2012 (or before detailed rules governing sectoral mechanisms have been agreed internationally) to be credited through the end of its crediting period. Disallow crediting from all projects that have not been registered by 2013, or by the time detailed rules governing sectoral mechanisms have been agreed internationally.[76]
- Identify sectors and/or countries for which CDM projects would no longer be allowed.
- Discount CERs from all projects registered after detailed rules have been agreed.
- Provide credit to CDM projects with an adjustment of their baseline to align with the sectoral crediting baseline.
- Provide credit to CDM projects without any adjustment of their baseline to align with the sectoral crediting baseline. (Under this and the previous scenario, CDM projects and associated emissions are considered to be within the sectoral boundary, and issued CERs are deducted from credits to be issued under the sectoral mechanism.)
- "Carve out" CDM offsets from crediting under the sectoral mechanism. The sector as accounted for under the sectoral mechanism would not count CDM emissions and offsets within the sectoral boundary. This approach would allow more credits to be issued (but achieve lower net environmental benefits than the previous two options), since neither CDM nor the sectoral mechanism would be deducted to account for the other mechanism. On the other hand, some believe it may be more straightforward to implement.

U.S. climate change legislation envisions a transitioning approach that is more stringent than many of the previous options. The American Clean Energy and Security Act (ACES) requires that the EPA Administrator identify developing countries and sectors that would be appropriate for sectoral crediting, and would disallow the use of any CERs for compliance starting in 2016 from any country and sector that is deemed appropriate for a sectoral approach. The Kerry-Boxer bill also contains this provision. In contrast to this stringent approach, the EU will continue to allow installations covered under the EU Emissions Trading Scheme to use CERs for compliance from 2013-20. (The EU also envisions allowing for the use of sectoral credits for compliance when these are developed.) However, a final decision on which types of CERs will be eligible for compliance may not be made until an international climate change agreement has been reached.

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[75] The following options were provided in Aasrud et. al, "Sectoral Market Mechanisms: Issues for Negotiation and Domestic Implementation," op. cit., pp. 23-27.

[76] A similar option was proposed by the Oko Institut: "For projects which requested registration (or published their PDD through the DOE) before the date of an agreement on a new climate regime, crediting stops after a) the end of the crediting period that was valid at the date when an international agreement was reached, or b) 31 December 2012, or c) the date when the SCM [sectoral crediting mechanism] starts, whatever is later. For projects which requested registration (or published their PDD through the DOE) or which renewed their crediting period after the date of an agreement on a new climate regime, crediting stops after 31 December 2012 or the date when the SCM starts, whatever is later." Oko Institut, "A framework for a sectoral crediting mechanism in a post-2012 climate regime," op. cit., p. 61.

V. Potential Supply of Credits from the Sectoral Mechanisms

A. Crediting Estimates

A review of estimates of emissions mitigation and credits that could be generated by the sectoral mechanisms is provided in a report by the International Energy Agency (IEA).[77] Based on this review, estimates for crediting potential in different sectors vary significantly. This is due to differing assumptions on such considerations as BAU emissions, timing of adoption of crediting programs by different developing countries, the choice of sectors for participation in sectoral mechanisms for each country, impact of mitigation policies on demand for electricity and other commodities, and assumptions on the stringency of intensity-based or fixed targets.[78] (The studies reviewed in the IEA report focus on the level of crediting associated with a particular policy scenario or crediting baseline, and do not specify the marginal cost of abatement or associated carbon price associated with a given level of crediting.)

The range of estimates for crediting from the electricity sector is particularly wide – as much as an order of magnitude. One study that considers eight developing countries, including China and India, estimates annual mitigation potential from the electricity sector in 2013-20, and then estimates annual crediting ranging from 110 to 560 million metric tons (Mt) CO_2e per year based on baselines of varying stringencies.[79] Another study considers the ten highest-emitting developing countries, assumes no-lose intensity targets that reduce emissions intensity by 3% each year, and estimates annual crediting of 1,170 Mt CO_2e per year.[80] The specific assumptions that account for such a wide disparity are not identified in the report, but as noted above, various assumptions can lead to very different results. The IEA estimates crediting for the electricity sector of 465 Mt CO_2e per year, but notes that a more ambitious baseline, as envisioned by the EU, would result in a lower crediting estimate.

Crediting estimates in other sectors reviewed by the IEA varied less than those in the electricity sector. For the cement sector, estimates ranged from 450 Mt CO_2e[81] to 720 Mt CO_2e[82] per year. Two analyses of emissions mitigation potential for Reduced Emissions from Deforestation and Degradation (REDD) arrived at similar estimates – 1,350[83] and 1,400 Mt CO_2e[84] per year. However, these studies did not estimate actual crediting volumes, which could be much lower, depending upon the stringency of the baseline.

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[77] Baron, Buchner et al., "Sectoral Approaches and the Carbon Market," op. cit.
[78] Ibid, p. 10
[79] Ibid, p. 12, citing Amatayakul et al., "Electricity sector no-lose targets in developing countries for post-2012: Assessment of emissions reduction and reduction credits,"CD4CDM Working Paper No.6, December, 2008, UNEP Risoe Centre.
[80] Ibid, p. 12, citing Schmidt et al., "Sector-Based Approach to the Post-2012 Climate Change Policy Architecture," Center for Clean Air Policy, Climate Policy 8 (2008), 494-515.
[81] Ibid, p. 15.
[82] Ibid, citing Ecofys, 2008 (more detail not provided).
[83]Ibid, citing ONF International, "Reducing Emissions from Deforestation and Forest Degradation - Analysis of 7 outstanding issues for the inclusion of tropical forests in the international climate governance," 2008.
[84] Ibid, citing New Carbon Finance, "Waxman-Markey Proposal: Ambitious but with Concessions," North America – Analyst Reaction, 31 March 2009.

B. Comparison of supply and demand

Given that sectoral mechanisms have the potential to create a much larger volume of credits than CDM has to date, there are concerns that these mechanisms could flood the market. If there is a significant oversupply of credits, this would result in lower credit prices and thereby reduce incentives for achieving higher-cost emission reductions and transitioning to a less-carbon-intensive economy in developing countries. On the other hand, sectoral mechanisms are envisioned to set baselines at levels below BAU, and if baselines are sufficiently stringent, they would provide incentives for higher-cost mitigation activities.

Despite the potential of the sectoral mechanisms to generate credits, international offset use limits in U.S. climate legislation – as much as 1,500 Mt CO_2e per year in the ACES bill – likely will not be binding for several years because of insufficient international offset supply. Sectoral mechanisms may not be implemented in many developing countries for some time. Significant capacity building is required to collect and ensure the quality of data, to develop crediting baselines, and to build associated institutional capacity. Experience with the development of the CDM suggests that issuance of sectoral credits will not occur in the near-term. The Kyoto Protocol was ratified in 1997, but detailed rules governing the CDM were not agreed until 2002, the first CDM project was not registered until 2004, and the first CER was not issued until 2005.

Based on EPRI's MERGE model, U.S. imports of sectoral credits will grow from 2012-20, reaching approximately 1,250 Mt CO_2e in 2020 (assuming that reductions in emissions of all 6 Kyoto GHGs in all non-OECD countries will be eligible).[85] In this scenario, U.S. allowance prices are estimated to be approximately \$15/tCO_2e, or approximately one-half of the price estimated for a scenario in which no international offsets are allowed.[86] The model finds that non-CO_2 project-based offsets will still constitute an important part of overall international offset supply, that the electric sector in China and other major countries can produce a large supply, depending on the level of the crediting baseline, and that REDD could play an important role, but perhaps not a dominant one.

One preliminary estimate of the potential supply-demand balance in the post-2012 period is provided by the IEA. It estimates that demand for international offsets (including CDM, sectoral credits and REDD credits) from the EU and the U.S. would average approximately 1,000 Mt per year in 2013-20.[87] Demand from other countries would add to this total. Based on the approximate midpoint of supply estimates discussed in subsection A above, sectoral crediting mechanisms in the electricity and cement sectors alone could be sufficient in themselves to meet average annual international offset demand from the EU and the U.S. in 2013-20. If a REDD mechanism is also created, supply could be much larger, although such a mechanism will require significant time for capacity building, for developing detailed rules, and for implementing projects and creating credits.

[85] "International Energy Offsets in MERGE," Geoff Blanford, EPRI, presentation at EPRI Fall Advisory Meeting, Colorado, October 7, 2009, slide 8.
[86] Ibid, slide 10.
[87] Baron, Buchner et. al., "Sectoral Approaches and the Carbon Market," op. cit., p. 17.

Summary

International negotiations on approaches to scale-up the flexible mechanisms are still closer to the beginning than the end, and many decisions remain to be made regarding the design of such approaches. As a result, very different outcomes are still possible. For example, key countries could choose to implement no-lose sectoral crediting by having the government be the exclusive seller of credits. Under this scenario, contracting for international offsets would be very different from the process in the current CDM market. In addition, if the government does not guarantee full crediting (or full sharing of revenues from credit proceeds) to firms in developing countries that reduce their emissions or emissions intensity below the crediting baseline, incentives to reduce emissions at the level of the firm in developing countries would be undermined. A number of other design considerations will determine whether and how: 1) capital could be mobilized to fund emission reduction efforts in developing countries; 2) compliance buyers in developed countries will be able to access credits from new mechanisms; and 3) the CDM market will continue to deliver offsets as the new mechanisms are being developed and implemented.

Such considerations will be particularly important for U.S. compliance buyers. As illustrated in EPA's (and other organizations') economic modeling of U.S. climate legislation, the availability of international offsets is a critical element of cost containment. At present, there are many uncertainties regarding how the international offsets envisioned in economic modeling will materialize. Nevertheless, approaches such as Programmatic CDM and Sectoral CDM may hold promise to increase crediting volumes in coming years, and no-lose sectoral crediting and sectoral trading hold even greater promise. Credit volumes from the latter two mechanisms may take longer to emerge, however, and will depend on a great amount of capacity building, data collection, baseline development, and international negotiations ahead.

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