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Capacity Building for the Data System Foundations of Sectoral Approaches

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Noriko Fujiwara, Christian Egenhofer & Anton Georgiev

Abstract

Sectoral approaches to mitigating climate change depend on setting goals that incorporate performance indicators – such as benchmarks and the effective application of measurement, reporting and verification requirements – supported by well-developed data systems. At the same time, each host country deciding to adopt these approaches needs to develop and demonstrate the ability to implement the scheme. This report briefly introduces the basic requirements for sectoral approaches while drawing lessons from current efforts. It discusses major issues related to the capacities of a host country with a focus on data availability, accessibility and measurability. Finally, the report proposes six operational steps to accelerate capacity building.

This report is a result of the study on "Global sectoral approaches as part of the post-2012 framework" by an international consortium and supported by the European Commission, DG Enterprise and Industry.

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About the study

Global Sectoral Approaches as Part of the post-2012 Framework

The European Commission has awarded this grant to an international consortium led by the Center for Clean Air Policy (CCAP)–Europe together with its partners the Centre for European Policy Studies (CEPS), Brussels; the Institut du développement durable et des relations internationales (IDDRI), Paris; the Zentrum für Europäische Wirtschaftforschung (ZEW), Mannheim; and Climate Change Capital (CCC), London.

Study goals and objectives

- Explore the proof-of-concept and gain experience in formulating and applying industry-based sectoral approaches for climate mitigation;
- Identify financial incentives that would encourage developing countries to take additional sectoral actions;
- Understand the implications of sectoral approaches on international market competition; and
- Provide recommendations for the most feasible approaches including sectoral strategies in the UNFCCC post-2012 framework.

This work consists of both a country-specific dimension, with studies and workshops being carried out in China, India, Brazil and Mexico, and a focus on the electric power, aluminium, cement, and iron and steel sectors. It contains a transnational dimension looking at industry sectors in global context. Other industries and projects are encouraged to make contact and collaborate with the study team.

Disclaimer/legal notice

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Further information: www.ccap.org

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CAPACITY BUILDING FOR THE DATA SYSTEM FOUNDATIONS OF SECTORAL APPROACHES

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NORIKO FUJIWARA, CHRISTIAN EGENHOFER AND ANTON GEORGIEV*

1. Introduction

Although there are numerous models of sectoral approaches to mitigate climate change (CCAP et al., 2008b) that are promoted by different stakeholders, be they governments or industries, they all depend on a distinct number of key building blocks for implementation. These building blocks notably include i) goal setting based on performance indicators, such as benchmarks or other measurable metrics; and ii) effective application of measurement, reporting and verification (MRV) requirements; both of which depend on iii) well-developed systems for data reporting, verification, analysis, security and validation. Goal setting and performance indicators depend on the availability of distinct sets of data, such as those on emissions or energy use (both in aggregate and by sector), the kinds of equipment used and efficiencies, abatement potential and abatement costs. To make these data effective for use, they need to be comparable at either the national, international or industry-sector level. Typically, this requires common approaches on how to present and use the data, for instance concerning sector boundaries or baseline definitions. Many of the issues related to data reappear in the context of MRV. Finally, all this calls for a minimum of institutional capability to both make data available and subsequently handle it (e.g. for developing or developed countries, international organisations like the UNFCCC[1] Secretariat or other bodies, and of course industry). These are the basic requirements for sectoral approaches to get started and keep running.

On the other hand, each country that decides to adopt sectoral approaches needs to prepare itself. It has to demonstrate not only the ability to introduce the scheme with its own resources based on existing infrastructure, such as an emissions inventory, but also the ability to attract and absorb external support and carbon finance. This extends to the ability to manage financial flows in a transparent and accountable way. Many international organisations, including the EU and developed countries, have a record of providing assistance for capacity building, usually to governments or industries in developing countries. Such assistance seeks to develop or upgrade certain skills to perform a given task. The most common approach is technical assistance or cooperation combined with financial support, which can take different institutional forms and

* Noriko Fujiwara is a Research Fellow at CEPS and Head of the Climate Change research unit, Christian Egenhofer is a Senior Fellow and head of the Energy and Climate programme and Anton Georgiev is a Researcher at CEPS. The authors are most grateful for the contributions of Daniel E. Klein from Twenty-First Strategies (McLean, VA) and John Newman, a consultant for the Center for Clean Air Policy (CCAP). The authors are also grateful for country-based information from Mark Houdashelt and Haibing Ma, as well as the constructive comments from Ellina Levina (all from the CCAP). It is acknowledged that this research has built upon the outcomes of stakeholder workshops, country workshops and the interim paper and report that are part of the study for "Sectoral approaches as part of a post-2012 framework" (CCAP et al., 2008a and 2008b). In addition, the authors thank a number of stakeholders and officials for their cooperation on this research.

[1] UNFCCC refers to the United Nations Framework Convention on Climate Change.

modes of delivery. Technical assistance not only promotes the transfer of techniques or best practices, but can often facilitate the transfer of the skills and expertise that are essential in the application of the former – for example through training programmes, the exchange of personnel or twinning schemes. It may involve bilaterally funded entities and a number of stakeholders, including private-sector consulting firms and non-governmental organisations. Especially relevant in this context is the experience of the United Nations Environment Programme and the Dutch-supported programme for capacity building in countries hosting projects on the Clean Development Mechanism (CDM) (e.g. CD4CDM).[2]

This paper briefly introduces the basic requirements for sectoral approaches while drawing lessons from current efforts. It discusses major issues related to the capacities of a host country with a focus on data (e.g. availability, accessibility and measurability). Finally, the paper proposes a number of operational steps to accelerate capacity building.

2. Sectoral approaches: What are they and what is required?

Sectoral approaches still mean different things to different people. This project has primarily pursued two main sectoral models: i) a bottom-up model, and ii) a carbon-finance one. The two models are often jointly categorised as sectoral crediting mechanisms (Baron et al., 2008; European Commission, 2009).

The first of these, the sectoral bottom-up model, is one whereby developing countries adopt voluntary commitments possibly on a 'no-lose' condition. This model can take various forms, such as sector-specific intensity targets, technology deployment obligations or capacity commitments (e.g. for a certain level of renewable-energy installed capacity). Here, a developing country makes a commitment to undertake particular mitigation activities unilaterally (i.e. without assistance) through policies and measures (PAMs) and then negotiates a more stringent no-lose target that is based on the finance and technological assistance that the international community can provide. The emission reductions achieved beyond the target can be sold to developed countries in the carbon market. Thus, the no-lose targets are incentive-based, but they are not internationally binding (although they would be binding under national laws and policies). Sectoral targets, whether no-lose or binding, fall within this category (Ward et al., 2008, Höhne et al., 2008).

The second, the sectoral carbon-finance model, is best understood as an approach to broaden today's project-by-project CDM to encompass an entire sector (or perhaps a sub-sector) within a country. The target baseline would represent some performance better than business as usual. Emission credits would then be generated for reductions below the baseline. Credits could be sold in the carbon market through the EU's Emissions Trading System (ETS) or (potentially) a future US cap-and-trade programme.

Although the models tend to converge or at least use common design elements, they have different levels of requirements. The bottom-up and carbon-finance models that incorporate crediting emission reductions for sale in the (global) carbon market have far higher data-quality requirement[3] – especially for baseline setting and MRV as well as the transparent and accountable management of financial flows[4] – than do other models. The other models include transnational or global sectoral approaches launched by sector-specific industry organisations

[2] CD4CDM refers to Capacity Development for the Clean Development Mechanism. For further information, see the website http://www.cd4cdm.org/.

[3] See also Ward et al. (2008), Baron et al. (2008), Höhne et al. (2008), and Bosi and Ellis (2005).

[4] While the latter is important especially for governments not only handling issuance and sale of credits but also receiving external support, this paper will not address it further.

(e.g. the Cement Sustainability Initiative (CSI) with the World Business Council on Sustainable Development), technology cooperation initiatives (e.g. the Asia-Pacific Partnership, APP) and policy-based strategies (e.g. sustainable development policies and measures, SD-PAMs). At least the latter two of these approaches generally have lower requirements regarding both MRV and the collection and use of data (Höhne et al., 2008).

A precondition for participation in the carbon market is to ensure the integrity of the credit, i.e. assurance that a 'tonne is a tonne'. The establishment of sector baselines requires a lot of data, as discussed in section 3. It is still premature to accurately describe how much detail is needed for data at each stage. Nevertheless, countries participating in a sectoral approach should provide sufficient information to donors of technology and finance along with the buyers of credits, and convince them that a strategy is credible, notably measurable, reportable and ultimately verifiable.

Participating countries should initially concentrate their respective capacity-building efforts on the baseline-setting stage. Cost data are required mostly in the baseline-setting stages of the sectoral approach but are less critical later in the operational ones. The requirements for cost data are lower at the MRV stage (CCAP et al., 2008a).

All of the above would suggest that at a minimum, the implementation of these two main models of sectoral approaches will require

- assessing technical opportunities and negotiating baselines (or some other performance goals);
- monitoring, reporting and verifying sectoral performance to the extent that the benefits of such performance can be quantified and credited in accordance with the pre-determined baselines/goals; and
- collecting data of adequate quality to support the above two points.

In addition, to meet these requirements, a country should be able to adapt existing measurement protocols and data-collection systems to its industry structure and boundary conditions, in a manner that is acceptable to other parties.

Sections 3 and 4 briefly outline the general capacity needs related to data collection under the first two major implementation requirements. In section 5, we explore in more detail the problems with current abilities to provide data.

3. Setting baselines and targets

Both of the sectoral crediting models we have identified involve setting a certain performance level for the sector in a country as a baseline or target beyond which carbon market credits are generated. Such baselines could be expressed in absolute terms, as in the case of greenhouse gas (GHG) emission levels, or relative terms (usually per unit of industrial output) as with emissions intensity (CCAP et al., 2008a; Höhne et al., 2008).

A developing country hosting the sectoral approach, usually represented by its government, constructs a baseline and makes the case for it before all the actors involved in the respective international negotiations. In establishing and documenting the baseline, host governments should be able to quantify the costs and potential emission reductions resulting from certain policy interventions and their combination (Ward et al., 2008). The data should be of a quality acceptable for negotiations among the international partners (e.g. industry and countries) and approval by the bodies governing international negotiations (e.g. the UNFCCC Secretariat or the CDM executive board) (Ward et al., 2008; Bosi and Ellis, 2005). The domestic expertise and skills needed to administer the entire process may be substantial and far greater than for the

current CDM. This latter aspect is especially important for the sectoral bottom-up model, where the baseline or target is usually constructed by taking into account the combined mitigation effects of multiple existing and planned PAMs[5] (Bosi and Ellis, 2005).

Baselines and targets are usually based on benchmarks, such as performance indicators of energy intensity (energy use per unit of output) or GHG intensity. Such indicators enable industry or governments to compare the sector's (or plant's) performance levels with some reference performance levels or standards (CCAP et al., 2008a). They are used as tools to evaluate margins of improvement for existing plants based on international or regional comparisons. Governments and industry need to obtain and process significant data for benchmarking.[6] This process is quite time-consuming.

As a side effect, benchmarking can help identify the costs of abatement for industrial sectors, but can necessitate extra data and expertise.

Regardless of the extent or level of detail to which benchmarking is employed, analysis of sectoral targets requires at least some reliable data of various kinds, e.g. on plant-level performance, technical and cost details, aggregate sector efficiency and output (see also section 4). A reliable GHG emissions inventory (i.e. records of the total emissions originating from all sources within a certain geographical area and time span) is typically mentioned in this regard (Bosi and Ellis, 2005; Höhne et al., 2008) along with energy use. These are usually associated with collecting data from individual installations in a sector.

'Measurement protocols' summarise the systematic means and techniques for collecting data. They constitute the tools, processes and institutions for data reporting, verification, analysis, security and validation. Protocols usually focus on how and what to measure in order to assess plant-level GHG emissions and energy use (Newman, forthcoming). They also encompass data-collection systems and methodologies for the relevant data to determine the respective performance indicators. Among these are frameworks for accounting for GHG emissions, i.e. recording, summarising and reporting the quantity of emissions by sources.

Since the essential capacity needs in host countries for baselines and targets relate to providing reliable data, such needs logically extend to putting measurement protocols in place and the ability to activate them. Thus, the techniques and methodologies are naturally complemented by know-how on the ground. A crucial aspect is organising the processes and institutional set-up to make sure data are available and accessible.

In the case of a sectoral carbon-finance model where individual installations receive carbon market credits directly, the capacity requirements for measurement combined with international negotiations and approval may fall more on the private sector (Höhne et al., 2008; Ward et al., 2008). Yet institutional barriers with respect to data availability and access may continue to depend on the government.

It is important to note that it is not yet clear how much accuracy and detail of data are required for the initial stage of negotiating targets. Benchmarking is usually very data-intensive but it might also be possible to arbitrarily set targeted performance levels prior to the implementation of sectoral programmes. It has been suggested that these 'yardsticks' could possibly be based on very rough estimates, aggregated sector-level data (as opposed to plant-by-plant) or simplified

[5] The institutional and technical faculties needed to develop, implement and evaluate PAMs are not the focus of this paper, however.

[6] Derived from the CSI project, "Getting the Numbers Right", along with Baron et al. (2007), Bradley et al. (2007) and Egenhofer and Fujiwara (2008).

indices.[7] Therefore, GHG inventories may not be necessary for negotiating them. It could be envisaged that the baselines could be recalculated as soon as better data are available. If *ex-ante* compromises have been made prior to implementation, a baseline would need to be recalculated based on *ex-post* parameters – a condition that would need to be agreed *ex ante*.

Nevertheless, it is usually expected to demonstrate at negotiations that it will be possible to track progress, i.e. that performance will be measurable, reportable and verifiable. Thus, it may be sufficient at this stage to start the process of putting in place internationally accepted measurement protocols and data-collection systems or indicate the ability to do so with reasonable capacity-building efforts. The following section elaborates on this further.

4. Measurement, reporting and verification

After a sectoral approach is implemented, there is the stage of assessing progress towards the targets, for instance as against baselines or associated costs. Each country should be able to measure, report and verify emissions, and track the levels of emissions or other variables (e.g. energy use) for individual facilities and their aggregate within a sector (CCAP et al., 2008a). Reliable and accurate data are absolutely crucial (e.g. GHG inventories) along with access to them by international supervisory authorities. A respectively high degree of robustness in the data on the emission reductions achieved, i.e. with a low margin of error, is needed to ensure that a 'tonne is a tonne' for credits sold on the international carbon market.

It is critical to strengthen the host country's ability to administer the respective measurement protocols and data-collection systems. Protocols also need to be put in place in time and be accepted by international partners. Voluntary programmes for reporting GHG emissions already exist, not only as part of global (e.g. CSI) or regional (e.g. APP) initiatives, but also as national programmes in some developing countries, such as the "Program GHG Mexico".[8] In these cases, one aim for capacity building must be to make these programmes more rigorous, comprehensive, mandatory and perhaps comparable with those of other countries.

A country where some data-collection systems are already in place may be considered advanced enough to aim at models of sectoral approaches involving carbon market credits. The gap between its capacity and the requirements for such models would thus be lower. A case study from South Africa reveals an institutional set-up of an SD-PAM for energy efficiency (Ward et al., 2008). Several organisations are involved and teams for on-site measurement and verification have been formed. The same set-up may be possible for MRV and measurement protocols under models with sectoral crediting. It appears that the experience accumulated from less-demanding sectoral approaches and initiatives can contribute to greater existing capacity for MRV.

5. The data conundrum

The case we have made is that sectoral approaches require accurate emissions inventories or databases with data on the levels of other variables such as energy use and estimates of the probable impacts of sectoral programmes. The data likely to be required for sectoral approaches include plant-specific data covering technical features (the location, age and capacity of the plant, the technologies and processes used, fuel sources, etc.), performance (output, fuel consumption, GHG emissions, etc.) and ideally cost details. Also needed are aggregated sector

[7] For instance, at the "Technical workshop on sectoral approaches: Benchmarking, sector boundary and monitoring, reporting and verification issues" in Brussels, 17-18 September 2008.

[8] For further information, see the website http://www.geimexico.org/.

data that cover total production, structure and overall efficiency (e.g. energy or emission intensities per product or sector-wide).

There are a number of general data challenges associated with the two models of sectoral approaches:

- The data required for goal setting or the definition of performance indicators in some instances are confidential, for example, if companies judge that data are proprietary or of strategic importance.
- Even where data may not be considered confidential, the organised reporting and collection of certain information may run afoul of antitrust and competitiveness concerns. Industry-led efforts to collect data are typically limited to non-cost data, and safeguards are usually put in place to limit access to individual company or plant data.
- Benchmarks are snapshots in the context of actual technologies but fail to provide guidance on what future level of mitigation can be achieved. On the other hand, taking new technologies or technological progress into account requires new and more data collection.

In many countries, data are not available or accessible (owing to confidentiality or existing laws, or failure to use the required format). At the same time, data collection is time-consuming and setting up the right format will take years to develop, even where the political will exists. Data collection can also be costly. Furthermore, there is no uniform definition of what constitutes a sector, especially its boundaries. If the sector boundaries are not clear, installations themselves may define how to report emissions from elements that might or might not be within the boundaries. Comparison is not possible without agreed definitions of sector boundaries.

This paper does not pursue the limits of the general data challenges further, but concentrates on the requisites. The above problems associated with the lack of capacity for data collection are interrelated and are examined below, with an emphasis on some specific areas.

Lack of practice or experience

In some cases or countries, there is still no practice of tracking the key technical or performance variables that are essential for establishing and monitoring performance, such as GHG emission levels, GHG intensity, energy use and energy intensity (see also the discussion on sector characterisation below). For example, there is a lack of reliable emissions data at the plant level in China, as accurate sector-wide methodologies or protocols for this have yet to be implemented. In contrast to emissions data, energy consumption data are reliable, as the statistical bureau checks the data from the bottom up at several levels and provides it to the government (Zhang, 2008). Additional efforts to remedy this reliability problem could significantly improve the accurate measurement of mitigation benefits on the one hand, but significantly increase the administrative costs of setting up sectoral programmes on the other.

In some countries and sectors, the necessary data are not yet available in a single source. Again taking the case of China, the plant-level data on various aspects are not being compiled by a single authority or organisation. Separate organisations and government institutions keep track of different aspects depending on the purpose for which they are collected. Yet none of them cover all industrial plants in a sector or the entire economy. For instance, the environment ministry compiles data on certain pollutants from a number of plants, while the statistical bureau and domestic industry associations track other variables, not necessarily from the same plants. Regional authorities may not communicate data from local plants among themselves or to the central government (Wang, 2008).

There is often a significant gap in data availability between modern or large-scale plants and small to medium-sized or obsolete plants in the key sectors of major developing countries (Arima, 2008). Frequently, the largest and newest facilities are built and operated by large multinational companies that are more accustomed to such data reporting. The smaller companies, which tend to be local, may be less experienced in such efforts.

Existing data, even where highly aggregated, are sometimes not publicly accessible. The Chinese central government, for example, has the legal ownership of the data reported to it from the organisations and authorities discussed above. Putting that data together might allow for estimating the overall emissions of a sector. The government, however, publishes a very limited quantity of highly aggregated emissions data in the statistical yearbook – the only source that is open and accessible to the public. There have been some indications of a traditional practice of limiting general public access to pollution and emissions information, which impedes full transparency in the process. In contrast, aggregated data of other types from various sectors are available to the public in statistics, as in the case of energy consumption per sector (Wang, 2008; Zhang, 2008).

It may appear that energy data are more readily available than emissions data at both the plant and aggregate sector levels, based on the Chinese example. But this stems from the unique circumstances related to the above-mentioned practices in that country that constrain availability and accessibility, and practices vary among countries or even sectors. Global data collection under industry association initiatives, such as those of the CSI or worldsteel,[9] have shown that aggregated sector data of both types are usually more readily available and accessible than detailed plant data.[10]

Cost data are the most difficult to obtain. Looking at the cement sector, cost data are unavailable not only in Brazil, Mexico and China but also for many plants in the EU and developed countries. Confidentiality and competitiveness concerns further complicate the collection of cost data. This makes it difficult to estimate costs, especially on a plant basis, which may become the basis for identifying the exact scale of support needed.

Thus, in spite of country-specific variations, the most common problems worldwide remain those associated with detailed plant-level data, particularly cost-related as opposed to aggregate sector data. Taking into account these constraints, there have been attempts to evaluate mitigation options, potential or opportunities in an entire sector (with a corresponding lack of precision), relying to a lesser extent on cost data from individual plants.

Lack of coordination in data collection

In some countries, data are collected by individual plants or companies but not in a coordinated manner within the sector. Moreover, data are not necessarily comparable across countries or across institutions. The APP, International Energy Agency (IEA) or industry-led approaches originally used different data formats. For international comparison, data formats need to be more harmonised, recognising that international differences in industry structure can limit the extent of harmonisation. This has been one of the lessons emerging from the experience of the APP sectoral task forces.

[9] Worldsteel was formerly the International Iron and Steel Institute (IISI).

[10] "Technical workshop on sectoral approaches: Benchmarking, sector boundary and monitoring, reporting and verification issues" in Brussels, 17-18 September 2008.

Lack of coordination in sector boundaries and characterisation

The cement sector has been the most advanced in compiling an international database, as illustrated by the CSI project "Getting the Numbers Right". Even so, the coverage is not complete. For example, Chinese plants are not fully covered for several reasons including regional unevenness. Another limitation of this database concerns the variations among countries or regions in setting the sector boundaries, which is part of sector characterisation.

Among others, sector characterisation needs to describe following aspects:

- Whether and how far to go *upstream and downstream* in the product lifecycle and the industry value chain, or whether to use a process-based rather than product-based method for determining the boundary.
- How to deal with *indirect emissions*, primarily those from electricity consumption. This aspect has connotations for choosing energy use rather than GHG emissions as a performance indicator for certain sectoral benchmarks. The approach to benchmarking by worldsteel includes indirect emissions in order to compare actual impacts, while that by the European Confederation of Iron and Steel Industries (EUROFER) concentrates on direct emissions, as it needs to work with the EU ETS (Weddige, 2008). One of the key issues is the electricity used instead of combusting fuel in certain sectors (e.g. aluminium) and in certain processes (e.g. in the iron & steel sector). Using indirect emissions also has implications for differentiated incentives and possible economic–environmental tradeoffs. Reducing energy intensity is economically efficient, but there is a technological limit beyond which further emission reductions are only possible with increased energy input, as in carbon sequestration. In addition, it is necessary to decide how to reward on-site electricity co-generation, such as combined heat and power or even renewable sources.[11]
- What criteria can be used to assess compatibility with certain regulatory and market instruments, including the future inclusion of a sector in a cap-and-trade system. One possible criterion is to avoid double counting, such as overlap with sectors covered by different policy instruments. Clear sector boundaries are also essential for facilitating the unambiguous regulation and monetisation of emission reductions.

These aspects are largely influenced by the industry structure of a country, which often differs from country to country. The variance across countries in industry structure would hinder joint data-collection efforts. These differences in industry structure combined with the regional and national ones in the way sector boundaries are being set for current regulatory or other purposes (e.g. the EU ETS and the industry-led initiatives like CSI and APP) make international comparisons more difficult. This in return encourages a country to adapt the coordinated or agreed boundary conditions to a national industry structure but to keep these boundaries comparable.

Sector characterisation, including boundaries, also needs to be set in a manner that promotes coordination, avoids double counting and reflects real-world plant conditions. On occasion, the European Commission has emphasised in this respect its preference for not including indirect and offsite emissions, in line with the EUROFER approach that focuses on direct emissions under the specifications of the EU ETS.[12] The manner of sector characterisation should i) be

[11] N. Helme, Chairman's summary comments (oral) on the first day of the "Technical workshop on sectoral approaches: Benchmarking, sector boundary and monitoring, reporting and verification issues" in Brussels, 17-18 September 2008.

[12] "Technical workshop on sectoral approaches: Benchmarking, sector boundary and monitoring, reporting and verification issues" in Brussels, 17-18 September 2008.

consistent with measurement protocols and data-collection systems; ii) be reproducible and acceptable by all parties (Newman, 2008); and iii) not be too costly.[13]

Sector characterisation needs to be compatible with the selected performance indicators, such as those based on energy use and technology penetration. Alternative performance indicators may be used for different countries as a basis for measurable commitment (e.g. performance on technology in China or performance on carbon intensity (taking into account cogeneration) in Mexico). Mexico's cement sector is illustrative, in that the relatively high degree of efficiency of the country's cement kilns offered little opportunity for GHG reductions, while increases in cement blending and the construction of renewable power sources presented more substantial opportunities. In contrast, China's cement industry and planning processes seem quite well-suited for a technology-based approach that sets goals for the replacement of old inefficient capacity, waste heat recovery at newer facilities and increased cement blending using by-products from coal consumption and steel production.

At the least, the measurement protocols and data-collection systems under each separate sectoral programme need to be consistent with the sector characterisation (including sector boundaries) and with the chosen performance standards for calculation methods that are incorporated in the programme design (Newman, forthcoming).

There are internationally recognised methodologies and protocols, such as those developed under global voluntary initiatives in the aluminium, iron & steel and cement sectors (e.g. the CO_2 Accounting and Reporting Standard for the Cement Industry, developed by the CSI).[14] While such protocols hold important lessons and may form the basis for national and global efforts on measurability, it is important that developing countries maintain 'ownership' when implementing the existing protocols in the respective sectors and plants. That is to say that host country actors are likely to fully support only those protocols they believe match their circumstances, as in the selected design features of a sectoral approach. Hence, there will always be an element of adaptation to the national industry structure or sector boundary conditions. The key question will be how much adaptation is acceptable to parties to achieve international comparisons of sectoral performance.

6. Ways forward for capacity building

More than one form of support for capacity building will be needed to implement sectoral approaches, involving a range of activities from developing data-reporting instructions to training local staff in industries in developing countries. The same applies to setting up and managing procedures for data collection and MRV. Therefore, this report has identified six steps for supportive actions.

Step 1. Assessing capacity for data collection

The series of actions would start with *assessing the current level of capacity for data collection and the need for improvement in the reliability and availability of data at technical and institutional levels.* One of the reasons for distinguishing data collection and bringing it to the fore are the different systemic barriers in each country that impede not only data collection, but also the rest of the capacity-building process. These barriers would have to be addressed at an early stage. For example, it is essential to encourage the host country government to support and

[13] This point is not pursued further.

[14] See the World Business Council for Sustainable Development, CO_2 Accounting and Reporting Standard for the Cement Industry (retrieved from http://www.wbcsdcement.org/index.php?option=com_content&task=view&id=53&Itemid=114).

take part in the capacity assessment as well as in the subsequent enhancement of data-collection practices and measurement protocols. Cooperation and trust among all stakeholders from the public and private sector, engaging as many as possible at this stage, would also facilitate data-collection systems and institutions. Domestic and international industrial associations can be important actors with regard to access to certain types of data. To reconcile concerns pertaining to confidentiality with those on transparency by the international community, especially with respect to legal practices, closer collaboration and compromises between the authorities and international associations might help.

Step 2. Testing measurement protocols and the capacity to implement them

The second step is to *test measurement protocols and analyse the capacity for their* successful implementation. Examples include the dissemination of sector proposal templates (Jung et al., 2008) and the diffusion and testing of protocols; however, the application of a 'one-size-fits-all' strategy is not appropriate. As each country has its own unique characteristics, a pragmatic approach may be needed. An example of a pragmatic approach is the extensive use of various tools such as templates and handbooks. For instance, the fourth step of this list suggests modifying the template according to the opportunities targeted. In some situations, a template may be sufficient for data collection and analysis, while in others it may only serve as a starting point. The key capacity-building characteristics of the templates also include exploring data issues, learning about institutional needs and testing the feasibility of metrics, which continue in the third step.

There are examples of the essential role that existing initiatives could play as learning-by-doing instruments for capacity building in the second and fifth steps. These are the APP-type technology cooperation and the industry-led voluntary, global sectoral approaches, both of which entail a number of specific tools. The APP peer-review method, especially if adjusted to capacity-building objectives, is one of them. Others are the compilation of handbooks and templates, including toolkits and guiding documents or spreadsheets, as well as training programmes and workshops.

Step 3. Analysing the applicability of sectoral approaches

The third step is to *analyse the applicability of different kinds of sectoral approaches that would suit certain country-based and sectoral circumstances, including the existing capabilities.* It builds on the assessment in the first and second steps, as well as the opportunities considered in step 4. This should clarify the extent to which countries and sectors are able to implement the various design elements of different sectoral approach models, given a reasonable timeframe to make up for some capacity deficiencies.

Specific models and elements are likely to be suitable for certain countries and sectors while others may not. The choice depends on the ability to deal with the data availability, to implement particular measurement protocols (with their implicit sector boundaries) and to achieve international coordination or acceptance by the negotiating parties (as in step 5). This step especially involves paying increasing attention to determining the suitable performance metric, considering the present capacity and future potential, and other circumstances. Examples mentioned in the previous section include the general differences between China and Mexico, as well as the particular traditions and accuracy in constructing energy-use indicators in China.

Step 4. Ensuring the collection of reliable data

The fourth step is to *ensure the collection of reliable data.* This could be realised through, for example, completing the diffusion of existing protocols for measurement and reporting, and developing a separate set of internationally agreed but relatively rigorous cost standards. It is

crucial here to have a shared understanding about the limitations in collecting all the precise data with complete plant-level coverage and within a consistent boundary. Basing sector baselines or targets on benchmarks in accurate engineering terms may not be feasible or even achievable in a reasonable timeframe. Therefore, the way forward could be to start identifying where the mitigation opportunities are and to concentrate on these. In certain countries and sectors, and for some kinds of sectoral approaches, it may be sufficient to collect data about how much and how far abatement actions can be taken. Thus, 'near-perfect' data levels and estimates may be possible and may still allow for operationalising sectoral approaches. A focus on *opportunities* instead of detailed *data* would enable us to look at an industry's performance as a whole, especially where aggregate data are already available. The focus on opportunities would also inform the choice of the particular design of the sectoral approach to some extent according to circumstances, and consequently it is also important for the third step above.

Step 5. Gaining international acceptance of data-collection systems and measurement protocols

The fifth step is to *gain international acceptance of data-collection systems and measurement protocols*. This could be advanced through, among others, the UNFCCC process and that of the International Organisation for Standardisation/International Electrotechnical Commission (ISO/IEC), aimed at the standardisation of measurement and reporting protocols, simultaneously in collaboration with international organisations like the IEA, which has already developed energy efficiency indicators (Arima, 2008). Here, it is important to involve stakeholders and experts from the public and private sectors of both developing and developed countries. Indeed, the fourth and fifth steps could occur at the same time.

Step 6. Further improving the technical and institutional capacity for MRV

The sixth step is to *further improve the technical and institutional capacity for MRV, depending on the agreed protocols, metrics, benchmarking methodologies, etc.* This step starts before the sectoral approach commences operation. It aims at providing the capacity for the recalculation of the baselines that have been set *ex -ante* and essentially an internationally accepted level of MRV, thus ensuring the verifiable, subsequent issuance of credits. This step is informed by the assessment of capacity-building needs in the previous steps and naturally depends on having agreed on the most suitable and realistically achievable design features for the sectoral approach as identified in the third step. Hence, the remaining specific improvements would be made to bring the targeted technical and institutional environment up to standard to enable the tracking of progress and continuous improvement after the agreed sectoral approach has started operating.

Importantly, sectoral approach models that are less demanding will possibly have been decided upon if the capabilities and circumstances of the host countries or sectors are still too far from the required level. Every initiative or approach put in place contributes to institutional and technical capacity development and provides the basis for the expansion of future actions and mechanisms, as in the case of South Africa. For instance, existing industry-led initiatives could be extended to further regions, countries or plants that have not previously participated.

In principle, it is in the interest of the host country to cooperate with international experts and involve its own to ensure fair identification of the country's conditions and circumstances.

Moreover, the above-mentioned supportive actions for capacity building would incur substantially lower costs than those for technology R&D. For further cost-savings, initial assessment and testing would identify the areas where less effort, resources and spending are required. Adjusting the kinds of sectoral approaches and performance metrics for baselines or benchmarks to country-based or sectoral circumstances is a way to avoid prohibitive costs and timeframes for capacity building. Initially reforming some of the existing institutions to

facilitate the analysis, assessment and testing processes may likewise save some costs. A body could also be established to coordinate the current data-collection and measurement practices of the existing institutions and improve them. These moves could reduce the projected amount of external support needed for guidance and expertise plus observation for implementing the new protocols.

7. Conclusions

There has been significant progress in data collection and MRV efforts led by industry and some developing countries such as Mexico and China. In the course of this process, some outstanding problems or difficulties have crystallised:

- lack of available and accessible data, especially plant-specific data and above all cost data; and
- lack of consistency in the current circumstances and data-collection capabilities among countries and sectors, particularly in relation to sector characterisation under measurement protocols.

These problems require urgent attention. As long as these are technical issues (e.g. lack of initial technical and administrative capacity to implement existing measurement protocols and methodologies or to adapt them to sector characterisation or boundary conditions in developing countries), capacity building can address them. It is clear that capacity building cannot directly address other general data challenges, such as competitiveness and confidentiality.

The use of protocols and methodologies for the measurement of indicators as well as the calculation and reporting of emissions are important for providing the basis of sectoral targets and baselines. They are also essential for assessing progress against the objectives set. Capacity-building efforts will have to be centred around ensuring the successful application of protocols on the ground. It is important to adapt protocols to national sector characterisation or boundary conditions while making certain that they are accepted by the participants in sectoral approaches.

There appear to be differences in the requirements for the accuracy and detail of data between the setting of goals while planning and designing sectoral programmes on the one hand, and the tracking of progress subsequent to their implementation on the other. These requirements are generally higher for the latter, with the exception of cost data. Therefore, the capacity-building process has to start immediately but does not have to be complete prior to implementation.

This paper has identified a need for five immediate supportive actions and a sixth one to build on them:

- assessing capacity for data collection;
- testing measurement protocols and the capacity to implement them;
- analysing the applicability of sectoral approaches;
- ensuring the collection of reliable data;
- gaining international acceptance of data-collection systems and measurement protocols; and
- further improving the technical and institutional capacities for MRV.

A message underlying these steps is to avoid focusing on some ideal situation. Rather, the starting point should be the current capabilities and circumstances, which are likely to vary among countries and sectors. Sectoral approaches should be designed accordingly. It may be wise to select the design features of a sectoral approach (e.g. the kinds of metrics) or initially

less demanding models and to improve capacity through learning by doing. This may be an effective way to ensure timely implementation and lower costs for capacity-building efforts.

One of the conclusions is to first target mitigation opportunities based on sector data rather than plant-specific data. Especially cost data in general is neither available nor accessible, although it is needed to identify the potential for further cost savings that a host country government could largely achieve on its own. At the same time, this constraint might impede the participation of developing countries in the global carbon market, as in such cases MRV is unlikely to be sufficiently robust. Crediting mechanisms – with or without no-lose targets – could still be applied while over time being subject to review as soon as accurate data are available for both baseline adjustment and robust MRV. This would allow additional learning by doing and could even constitute an added incentive to improve capacity to a level whereby full participation in the carbon market becomes possible, i.e. when there is certainty that a 'tonne is a tonne'.

Capacity building on its own is unlikely to require scaling up the finance for developing countries. The more appropriate question would be how to spend the available resources in a smart way. One clue would be to prioritise supportive actions and activities according to a timeframe aligned with the implementation phases of a sectoral approach. Another would be to direct the resources towards the opportunities targeted in specific sectors while mainstreaming the existing institutions of a host country. As there is sufficient space for a host country to develop its own initiatives with its own resources, capacity building could lead to a growing confidence in a host country government and increasing trust in its institutions. Such a development would encourage donor countries to provide further assistance where necessary.

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