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A framework for a sectoral crediting mechanism in a post-2012 climate regime

Report for the Global Wind Energy Council

Berlin, 28 May 2009

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1 Introduction

In the negotiations on a post-2012 climate regime sectoral approaches are discussed under different negotiation tracks. The Bali Action Plan (BAP) refers to "cooperative sectoral approaches and sector-specific actions" in order to enhance mitigation efforts.[1] Based on this reference, several Parties have proposed the introduction of sectoral approaches, including new market mechanisms, in submissions under the Ad Hoc Working Group on Long-Term Cooperative Action under the Convention (AWG-LCA). Sectoral approaches have also been proposed under the Ad Hoc Working Group on Further Commitments for Annex I Parties under the Kyoto Protocol (AWG-KP), as a means for industrialised countries to achieve their mitigation commitments.

Many proposals focus on the introduction of new sectoral carbon market instruments. This includes a sectoral CDM, a sectoral crediting mechanism based on no-lose targets, and emissions trading based on sectoral targets.[2] In addition, the use of sectoral approaches has been proposed to determine mitigation commitments by industrialised countries. Some stakeholders propose transnational voluntary agreements or technological cooperation outside the carbon market. Others suggest global sectoral targets or benchmarks.[3] However, under the UNFCCC discussions on sectoral approaches focus so far on introducing new sectoral carbon market instruments and on quantifying mitigation commitments of industrialised countries.

This report explores a sectoral crediting mechanism (SCM) for developing countries in a post-2012 UNFCCC climate regime. The report explores how a SCM could be implemented in practice. Different options for designing a SCM are identified and their advantages and disadvantages are discussed. Based on this analysis of options, a consistent policy framework for the introduction of a SCM under UNFCCC is proposed. The report focuses on a bottom-up approach where developing countries make proposals for implementing a SCM which are subsequently reviewed and agreed internationally. The report aims at facilitating the negotiation of such a mechanism under the UNFCCC.

In the following, chapter 2 explains briefly how a SCM works. Chapters 3 to 10 explore key issues and design options for a SCM. This includes the scope and coverage of the mechanism (chapter 3), the determination of the sectoral crediting baseline (chapter 4), the start and length of the crediting period (chapter 5), issues around monitoring, accounting and issuance (chapter 6), government arrangements (chapter 7), an assessment of which sectors are best suited for a SCM (chapter 8), linkages to the CDM and transitional issues (chapter 9), and the role of a SCM in the global carbon market (chapter 10). The report puts particular emphasis on the establishment of a sectoral crediting baseline, as this is seen as a major challenge for the implementation of a

[1] Decision 1/CP.13, paragraph 1 (b) (iv)

[2] See FCCC/KP/AWG/2008/INF.3

[3] See Bradley et al. (2007) and Höhne et al. (2008) for an overview

SCM. Finally, a consistent UNFCCC policy framework for this mechanism is proposed in chapter 11.

2 How does a sectoral crediting mechanism work?

The term “sectoral crediting mechanism” has been introduced by Bosi and Ellis (2005). Under a sectoral crediting mechanism (SCM), the reduction of GHG emissions below a defined level is credited for an entire sector. Credits are issued for the difference between actual emissions in the sector and a defined crediting baseline. The credits can be used by industrialised countries to comply with their emission reduction commitments and would therefore have a value in the carbon market. Hence, the mechanism sets an incentive to reduce GHG emissions in a sector below a defined baseline. The mechanism is not binding. If the actual emissions are not reduced below the crediting baseline, no sanctions are applied.

In international negotiations on a future climate regime, “sectoral CDM” and “sectoral no-lose targets” have been proposed as new mechanisms.[4] The definitions for these terms differ in the literature. Under a sectoral CDM the crediting baseline is usually set at the business-as-usual (BAU) emissions level, whereas authors proposing sectoral no-lose targets suggest that the crediting baseline be set below BAU emissions. A 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.[5] The sectoral CDM would thus be implemented by the CDM Executive Board, whereas sectoral no-lose targets would rather be negotiated under the COP or another body.

In this report, we consider a SCM as a mechanism where the entire sector is included in the boundary of the mechanism. Credits are issued if the aggregated emissions from all entities or activities included in the sector boundary are below a sectoral crediting baseline. A SCM is thus not a project-based mechanism where some entities in the sector can participate while others do not. We assume that the establishment of a SCM is proposed by the host countries and agreed between the host country and an international institution, resulting in a “sectoral agreement”.

Figure 1 illustrates how a SCM works. The BAU emissions path in the sector is illustrated with the red line at the top. Through the incentive of the SCM, the actual emissions are reduced below the BAU level in the sector, for example, through the adoption of policies and measures by the government (green line at the bottom). During a defined crediting period, the emission reductions are credited against a “sectoral crediting baseline” (blue line in the middle).

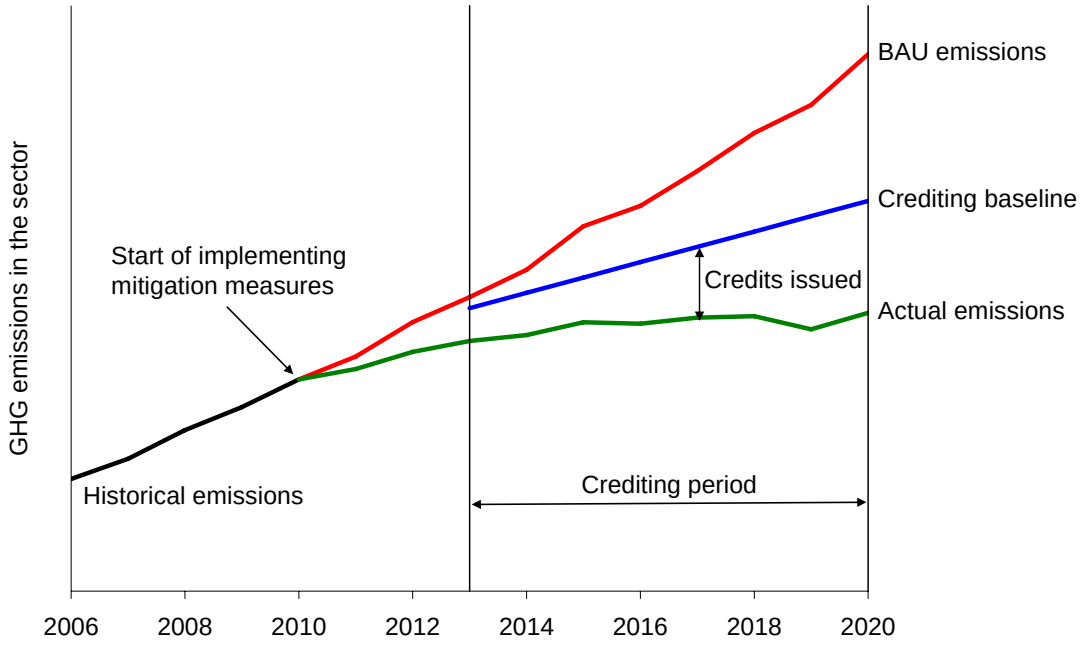
Based on Höhne et al. (2007), the term “sectoral crediting baseline” is used in this report to define the baseline or target which is the basis for issuing credits. This includes

[4] UNFCCC/KP/AWG/2009/INF.2, pp. 7-8 and 8-10.

[5] UNFCCC/KP/AWG/2009/INF.2, pp. 7-8.

the possibility of setting the sectoral crediting baseline at the BAU emissions or below BAU emissions as often proposed under sectoral no-lose targets. In Figure 1, the sectoral crediting baseline is set below the BAU emissions.

Figure 1: Illustration of a SCM



A SCM could be a promising policy option for developing countries in a post-2012 climate framework, for several reasons:

- The participation is not binding. The voluntary nature and the financial incentives of the mechanism could make this instrument interesting for a large group of developing countries.
- Mitigation efforts could be up-scaled beyond levels that are achievable with a project-by-project approach, such as the CDM.
- The mechanism does not require addressing the counterfactual and hypothetical question of whether individual projects are additional which has proven to be difficult to assess with a reasonable certainty.
- The mechanism enables developing countries to get credits from implementing policies and measures or by establishing enabling frameworks for enhanced mitigation, which is not possible under the current rules of the CDM but is a key prerequisite for enhanced mitigation action in some sectors. In this regard, the mechanism could potentially address the perverse incentive under the CDM that governments may be hesitant to implement GHG reducing policies and measures, since this may reduce their CDM potential.

- The mechanism could help developing countries to achieving sector-wide transformations, potentially focusing on sectors that are development priorities for the host country (Sterk and Wittneben 2005).

However, a SCM also faces considerable challenges. Key challenges include collecting reliable data, problems in defining the sector and its boundaries, uncertainty in estimating the sectoral crediting baseline, the division of responsibility and reward between companies in the sector and the national government, and the integration in the current architecture of the carbon market (Bosi and Ellis 2006). Moreover, a SCM has limits in addressing carbon leakage due to international competition given that the participation in the mechanism is voluntary.

A SCM is a relatively new concept. If this mechanism should become part of a new climate regime, a key question is what level of detail needs to be agreed upon in a deal in Copenhagen to ensure that it works effectively and provides for mitigation in developing countries, while ensuring that it is environmentally robust. Given the lack of consistent data, the differences in sectors and countries and other methodological challenges, it seems questionable that the level of crediting baselines can already be agreed upon in Copenhagen. On the other hand, a certain level of detail and certainty about this mechanism will be needed to ensure that it achieves its objectives and to avoid that Parties do not ratify the treaty in time, as was the case with the Kyoto Protocol. A realistic outcome could be the agreement on guidelines that specify key objectives, principles, rules and procedures of a SCM, similar to the “modalities and procedures for the CDM” that were agreed in Marrakech in 2001. A framework for such an outcome, including an example for draft legal text, is proposed in chapter 11.

3 Scope and coverage of the mechanism

This chapter explores how sectors should be defined under a SCM. The definition of a sector boundary encompasses the geographical coverage (section 3.1), a definition of which entities are included in the sector boundary (section 3.2), and a definition of which greenhouse gases and emission sources are considered (section 3.3).

3.1 Geographical coverage

The geographical coverage of a SCM agreement should preferably extend to an entire country. However, under certain conditions it might be more appropriate to include only one or several regions of a country into a SCM agreement or even to aggregate several countries into a joint SCM agreement.

In large countries, there are often several largely independent electricity grids. This could be for technical, political, geographical, economical or historical reasons. The features of these individual grids might be substantially different: whereas one grid may mainly be based on coal power plants, another could be dominated by hydro power. To better address these specific circumstances it could be appropriate to cover both grids in separate agreements with separate crediting baselines or to have just one agreement for the coal based grid while the hydropower dominated grid is not part of any SCM agreement.

In some regions, the electricity grid extends to more than one country. If only one country within a multinational electricity grid would implement a SCM this might result in significant carbon leakage because electricity generation could easily be shifted to plants which are not covered by the agreement. In this case it could be more appropriate if several countries propose jointly one sectoral crediting baseline or if they propose separate crediting baselines with a similar ambition for each country.

Despite the general rule that the entire sector of a host country is in most cases the appropriate geographical coverage, it is difficult to determine upfront in which cases it would be better to deviate from this rule. However, several – partially conflicting – criteria should be assessed for determining the most appropriate regional coverage:

- **Carbon leakage**: The sectoral coverage should, to the extent possible, avoid carbon leakage. Since carbon leakage is often a result of a too narrow geographical coverage this criteria usually points to a rather extended geographical coverage.
- **Monitoring**: A precondition of implementing a SCM agreement is the availability of sound data which is required for establishing the crediting baseline and monitoring emissions. The availability of data might differ between regions of a country or data might only be available at a national level. Sectoral crediting baselines can only be established for regions or countries where the availability of the necessary data and sound monitoring routines can be ensured.

- **Technical configurations of the covered installations**: Large regional differences in the technical configuration of covered installations, such as average age of installations, differences in primary energy input or differences in technologies, could be a reason for establishing sectoral crediting baselines at a sub-national level. However, such discrepancies could also be considered as an economic opportunity to level differences in marginal abatement costs in order to improve the economic efficiency of mitigation.
- **Administration**: Due to underdeveloped or weak administrative structures at regional level it might be more appropriate to cover the entire country. On the other hand, supra-national efforts might also be difficult to implement if administrative structures of the involved countries do not fit together.

These considerations illustrate that usually the most appropriate geographical coverage of sectoral crediting baselines will be the host country. However, under certain conditions, which have to be assessed in the light of the criteria discussed above, it could be more appropriate to determine sectoral crediting baselines for individual regions of a country or jointly for a group of neighbouring countries.

3.2 Coverage of entities

A proper definition of which entities or activities are included in the sector is a key issue for implementing a SCM. For sectors with homogeneous technologies or a few large point sources – such as cement or aluminium – it would be most appropriate to include all installations under a sectoral agreement for implementation of a SCM. In such cases it should be relatively simple to identify all installations. Usually, the sector definition should be consistent with the definition used for national accounts or for national statistics.

However, the definition of the appropriate sector is much more complex for other industries. The chemical industry, for example, usually comprises a wide range of technologies and processes which produce a number of different products. Also in the steel sector, technology differences can usually not be ignored in baseline setting since some installations generate their own electricity while others import it from the grid or apply basic oxygen furnaces. In these cases there might also be substantial difference between the sector definition used for national accounts and statistics and the definition applied for reporting of GHG emissions under the UNFCCC. Such differences should be carefully scrutinised before establishing the sector boundaries for a specific SCM. And even in the electricity sector, which has the most homogeneous output of all sectors, the demarcation of the covered installations could be difficult.

As a general rule it could be argued that the coverage of entities should be as wide as possible and include as many installations or entities as possible. This would facilitate the determination of robust baselines since a larger coverage would level out exceptional emission profiles of some installations. Moreover, a large coverage of entities also improves the economic efficiency of the SCM since it usually would include a wider range of mitigation options with different abatement costs.

However, there are reasons to be flexible with regard to the coverage of entities and to enable sub-sectoral approaches as well.[6] It could be conceivable that a SCM covers only certain sub-sectors or certain technologies on the demand side. A precondition in any case is that the sub-sectoral emissions and mitigation efforts could be thoroughly monitored and reported.

At this stage, it is not possible to provide more detailed guidance for the coverage of entities. Similar to the CDM, the SCM will require some kind of learning by doing approach. More guidance on the coverage of entities will evolve once first experiences with the new instrument have been made. Until then, each proposal for implementing a SCM has to be carefully assessed on unintended consequences or adverse impacts. The following aspects should be taken into account in such analyses:

- The definition of the installation, entity or activity covered by the SCM should unambiguously differentiate between those installations, entities or activities which are covered and those which are not. Therefore it must be clearly described whether the definition depends on the technical features of the installation, the site, the company or a combination of those criteria. Identifying such criteria will not be a problem for most sectors. Nevertheless, some type of installations and sectors might need specific attention.
- To limit transaction costs and make monitoring feasible, a de-minimis rule could be included in a sector definition. Such a rule excludes all installations below a certain size. Thresholds used to define which installations are excluded should refer to capacity rather than to operation or performance data. The use of operation or performance data might result in adverse incentives (e.g. increasing production during data gathering for the determination of a baseline and ceasing or decreasing production after the baseline has been agreed) or may vary from year to year with the result that an installation may then fall only in some years under the SCM agreement.
- To avoid incentives to transfer production form more efficient larger installations to a pool of smaller and usually less efficient installations, several similar installations on the same site should be considered as one installation.
- Cogeneration plants, so called swing plants, and other plants with multiple products need specific attention. These installations can generate more than one product. Adverse incentives might emerge if only parts of the output or emissions are covered under the SCM agreement. For example, if a SCM agreement covers power plants and cogeneration plants but not heat-only boilers, the agreement could provide incentives to produce heat rather in heat-only boilers than in the more efficient cogeneration plants.
- The implementation of SCM agreements in several sub-sectors of the same sector could result in a coverage overlap and double counting. This could be

[6] For example, a country may not be ready to accept including the entire power sector in a SCM but may be willing to take action on lighting or refrigeration.

particularly relevant if the demand side and the supply side of a sector are addressed at the same time. To avoid double counting of emission reductions it would be necessary to either adjust the crediting baseline of the supply or demand side by subtracting the credits which would result in double counting (see section 4.2.4).

- Further graduations of SCM agreements towards a full coverage of the entire economy should be envisaged well in advance. Potential transitional steps, for example from demand side agreements towards an agreement covering both the demand and the supply side, should already be kept in mind while the rules and conditions for the first sectoral agreement are developed.
- It should be ensured that all installations or entities that fall under the sector definition are readily identified and included in the mechanism. For large point sources this should usually not be a problem. However, for disperse emission sources which are spread throughout the country it could be much more difficult to identify all entities. This could particularly be challenging for developing countries with less developed administrative structures. However, omitting a number of installations with significant emissions could result in substantial carbon leakage and, in this way, undermine the entire mitigation effort. Nevertheless, for reasons of administrative simplicity and in order to reduce transaction cost it could be considered to exclude small installations with low emissions by establishing a de minimis threshold.
- In addition to direct carbon leakage, indirect carbon leakage could also be an issue. If, for example, a sectoral agreement on improving lighting would result in reduced expenditures of private households on lighting, the saved budget might be spend on an increased consumption of electronic media such as television. Such rebound effects should be anticipated to the extent possible in order to limit them through appropriate flanking measures. However, such impact cannot always be predicted and may be difficult to monitor. Nevertheless, they could be taken into account with a standardised approach for adapting the baseline accordingly (Geres and Michaelowa 2002).

Not all of these issues will necessarily be relevant for each type of SCM agreement. And some of these considerations could also be at the discretion of the host country and might rather be important for establishing adequate incentives for private entities. However, during the learning by doing phase creative flexibility should be accompanied with an increased attention for potential caveats of each regulation.

3.3 Coverage of gases and GHG emission sources

A SCM could in principle address all greenhouse gases covered under a future climate agreement. Therefore, the whole basket of so called Kyoto gases and any new gases which will be added to the basket could be subject to a sectoral agreement.

Related to the question of which gases could be addressed by a SCM agreement is the question of whether the gases should be covered upstream or downstream. There has

been a large discussion in the literature on this issue (see for example Zhang 1998, Jepma et al. 1998 or Woerdman 2002). There are several trade-offs to be considered. An upstream approach usually results in a larger coverage of emissions but fewer entities involved which limits transaction costs for monitoring and reporting. Downstream approaches, on the other hand, would rather exert more direct incentives to those entities which actually have to decide on mitigation measures.

Furthermore, it depends on the greenhouse gas whether an upstream or a downstream approach is more appropriate. Upstream approaches are only applicable where a clear functional relation between fuel or resource input and GHG emission can be identified. This is the case for CO_2 but usually not for CH_4 and N_2O emissions from fuel combustion.

Since these discussions, several emissions trading schemes have already been implemented or are currently under preparation. Most of these schemes are based on a downstream approach or a combination where downstream is applied to some sectors (energy and industry) while other sectors are covered upstream (transport, households and services).

The coexistence of both approaches in some of these (planned) schemes already illustrates that both approaches can be applied at the same time. Agreements on sectoral targets could also be based on both approaches or might even include a combination of both approaches. However, specifically the combination of both approaches or the coexistence of more than one sectoral target agreement with a different approach could easily result in double counting and carbon leakage (Sterk and Wittneben 2005). Such overlap should be avoided or eliminated through appropriate accounting rules.

The downstream approach is particularly vulnerable to carbon leakage. Biofuels could, for example, become quite attractive under a downstream approach in the transport or electricity sector since they do not emit greenhouse gases at the tailpipe. However, the production of biofuels can be associated with significant upstream emissions, including emissions from cultivation of biomass or the production of synthetic fertilizers. To avoid such carbon leakage it could be necessary to use adapted emissions factors for the use of biofuels in order to take into account upstream greenhouse emissions which are not (yet) covered by any other agreement. The occurrence of carbon leakage is the more likely the less sectors are covered within a country. In the case of downstream approaches, specific attention should therefore be put on measures to avoid upstream carbon leakage.

For the designing phase of a SCM it is important that the long-term implications of upstream or downstream approach should be carefully considered because it may be difficult to change the approach at a later stage. Such long-term deliberations should also envisage transitional steps from a SCM towards the long-term objective of one global carbon market with capped emissions.

4 Determining sectoral crediting baselines

Determining the crediting baseline is one of the most important challenges of a SCM. We first describe these challenges (section 4.1). We then describe different types of sectoral crediting baselines and discuss their advantages and disadvantages (section 4.2) and how they should be agreed upon (section 4.3). Different approaches for defining the ambition of the sectoral crediting baselines are highlighted (section 4.4) and reporting requirements and methodological approaches to support proposals for a sectoral crediting baseline are explored (section 4.5). Section 4.6 discusses whether sectoral crediting baselines should be constant over time or change in each year. Finally, the relation of a SCM to MRV action by developing countries is discussed in section 4.7.

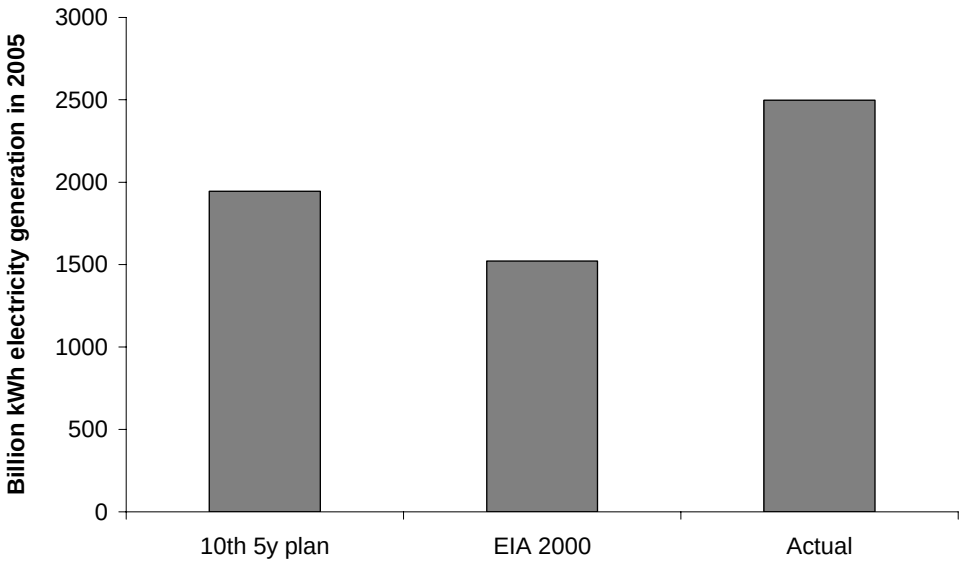
4.1 Challenges in establishing sectoral crediting baselines

The determination of a credible sectoral crediting baseline is a key prerequisite for an effective functioning of a SCM. Determining a credible baseline is very challenging since the future development of GHG emissions and production of a sector are difficult to predict. GHG emissions are driven by many factors, such as economic growth, population growth, international fuel prices, technological innovation, the development of lifestyle patterns, and so forth. These factors can develop differently than one expects today, and so will GHG emissions and production in the sector develop differently than one expects today. A reliable prediction of emission drivers is in most cases not possible, in particular over longer time periods.

In practice, past estimates of future GHG emissions and other relevant sectoral data have often shown to be wrong. The most apparent example is the current financial crisis. The ongoing recession will have considerable impacts on economic growth, GHG emissions and production levels. If sectoral crediting baselines would have been agreed one year ago – before the impacts of the financial crisis became visible – the baselines would most likely have been set using assumptions which are not valid anymore just one year later. International oil prices are another prominent example. Past forecasts of oil prices have often shown to be wrong. However, oil prices are a key factor for investments in energy efficiency and fuel switch activities.

Past projections of future electricity generation in China are an illustrative example for the considerable uncertainty associated with forecasts. Figure 2 compares the projection of electricity generation in China 2005 according to the Chinese 5-year plan and the EIA (2000) with the actual development. Despite the short time frame of five years, both projections considerably underestimated the future electricity generation. Moreover, the estimations by the Chinese government differed substantially from the projections by the EIA.

Figure 2: Projected and actual electricity generation in China in 2005



Source: Ellis (2008), based on EIA (2000), the Chinese 10th 5 year plan and IEA statistics

The use of historical trends to estimate future developments has limits. Although historical data is needed to understand past and future developments, an extrapolation of historical data can sometimes lead to wrong results. The difficulties of using historical data are illustrated in Figure 3, Figure 4 and Figure 5 below. The three figures extrapolate historical data of CO_2 emissions from electricity and heat production in China up to 2020, using data from the International Energy Agency (IEA 2007). Figure 3 extrapolates the historical trend of absolute emissions. Figure 4 extrapolates the historical trend of the CO_2 emissions per electricity and heat production. Finally, Figure 5 extrapolates the historical trend of CO_2 emissions per GDP in the sector.

The figures show considerable variations in the trend over the past 15 years. As a consequence of these variations, the results of the extrapolation depend considerably on how many historical years are used as the basis for the extrapolation. In all three figures, an extrapolation of the trend from the past five years would result in a quite different projection than an extrapolation based on the past ten or fifteen years. In some cases, the difference is enormous: for absolute CO_2 emissions (Figure 3), an extrapolation based on the past 5 years results in an increase of 331% by 2020, whereas an extrapolation based on the past 15 years results in a projected emissions increase of only 148%. The difference between the two extrapolations amounts to 2.6 Gt CO_2 in 2020 – a magnitude that exceeds the emissions from installations covered by the EU ETS. Similarly, a simple extrapolation of the historical trend of the CO_2 emissions per electricity and heat production (Figure 4) from the past five years would result in an increase of the indicator by 56% until 2020, whereas the use of the past ten years as basis for the extrapolation results in an increase by only 11%. An extrapolation of the CO_2 emissions per GDP results even in different trends if different historical timeframes

are used. An extrapolation based on the past 5 years results in a projected *increase* of the CO_2 emissions per GDP, whereas the extrapolation based on the past 15 years would suggest that CO_2 emissions per GDP would *decrease*.

Figure 3: Extrapolation of the trend of absolute historical CO_2 emissions from electricity and heat generation in China

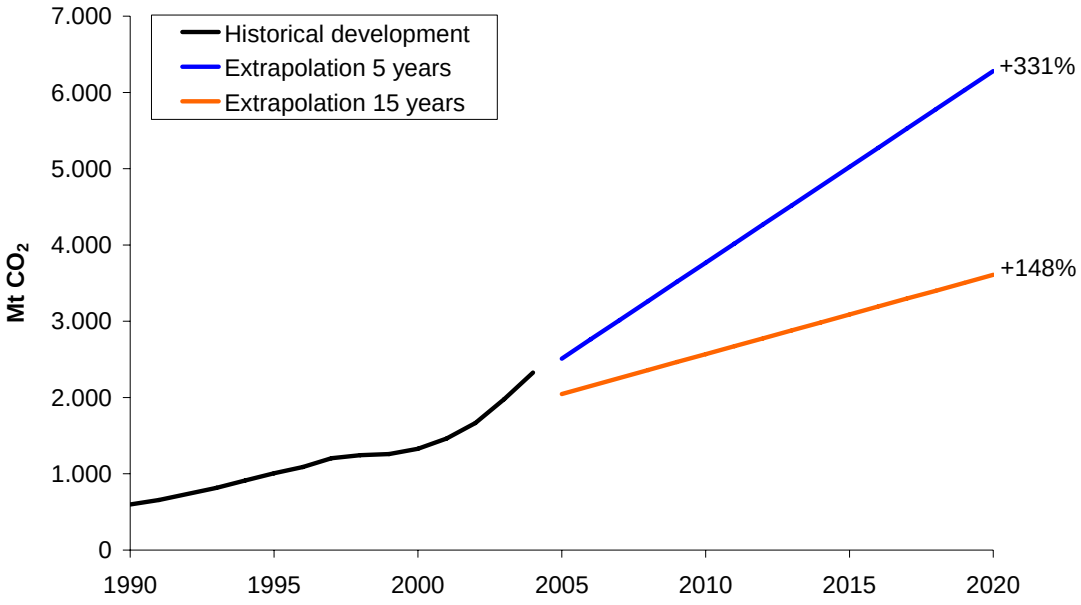


Figure 4: Extrapolation of the trend of historical CO_2 emissions per electricity and heat production in China

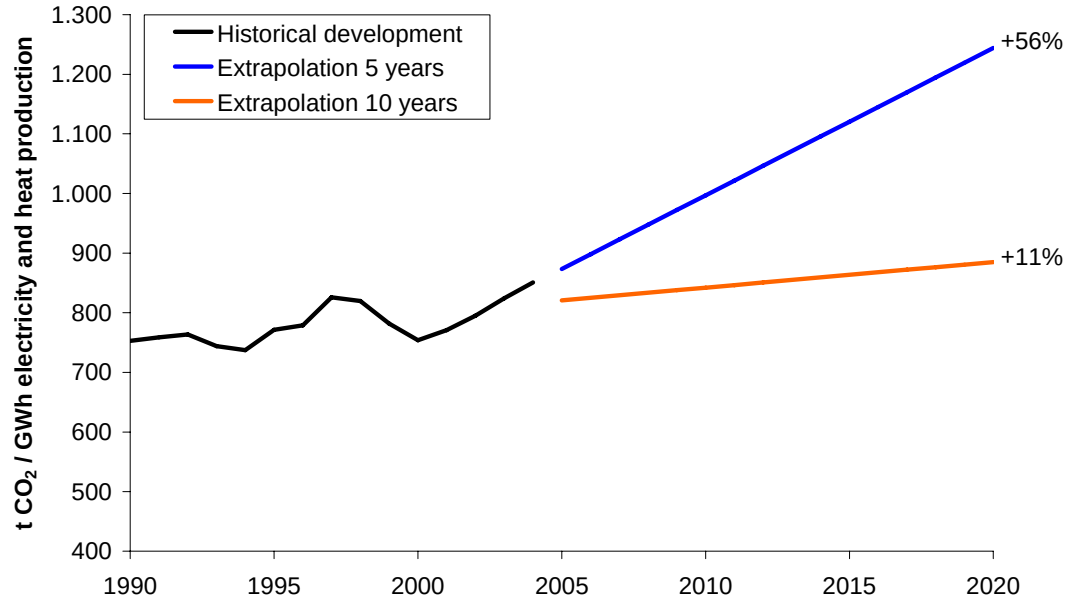
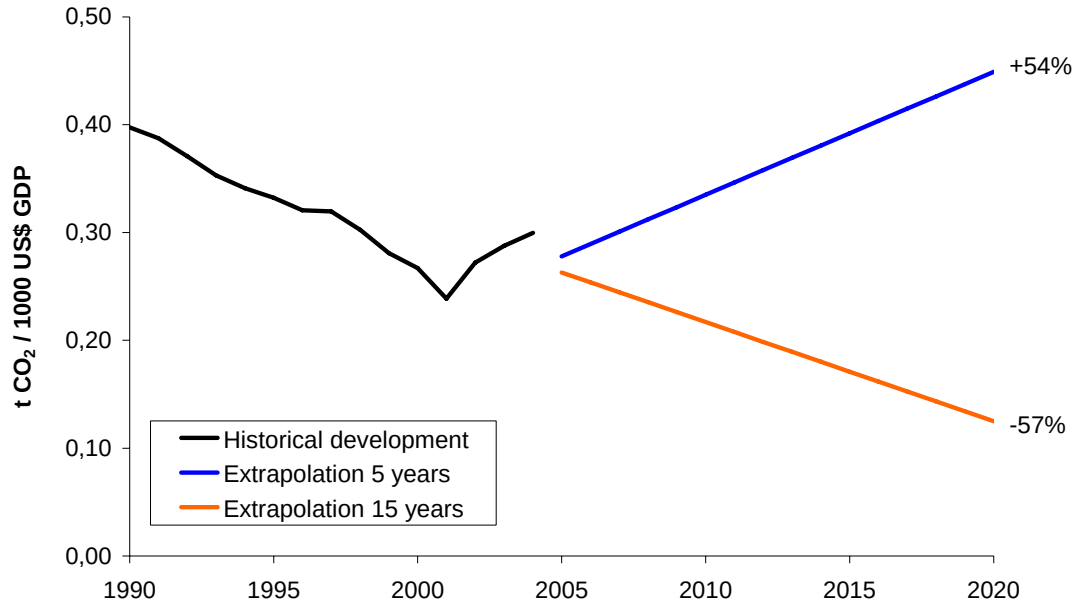


Figure 5: Extrapolation of the trend of historical CO_2 emissions from heat and electricity production per GDP in China



These examples illustrate that any prediction of the business-as-usual development of GHG emissions and production is associated with a considerable uncertainty and that a simple extrapolation of historical trends is not sufficient to establish realistic crediting baselines. The high uncertainty of future developments involves the risk that the crediting baseline is set too high or too low. An overestimation of the crediting baseline could result in crediting considerable amounts of business-as-usual emissions, undermining the environmental integrity of the mechanism and potentially resulting in a collapse of the global carbon market. In the case of an underestimation of the crediting baseline, no credits may be issued despite considerable mitigation action undertaken in the sector. The mechanism would then not set incentives to take mitigation action.

Thus, a key challenge is the establishment of sectoral crediting baselines in a manner that allows distinguishing the signal that should be measured (the mitigation action in the sector) from the noise (other factors that affect GHG emissions). In some cases, the influence of exogenous factors (such as international fuel prices) on GHG emissions may be larger than the effects of the measures undertaken to reduce GHG emissions. In such cases, the quantity of credits issued from the mechanism may depend stronger on the quality of the forecast of key emission drivers (such as international fuel prices) than on the level of mitigation that has been undertaken in the sector.

These challenges also involve the risk that the crediting baseline is inflated by the host country in order to increase its credit revenues. Given that assumptions on the development of GHG emissions drivers (e.g. economic growth, fuel prices) can not be verified in an objective manner but are rather subjective judgments, it may be difficult to assess a proposal for a crediting baseline fully on technical grounds and in an objective manner. For example, projections by the host country on economic growth or interna-

tional fuel prices may differ from projections by international institutions. In such cases it could be difficult to get agreement on key assumptions between the host country proposing the baseline and an international institution reviewing the proposal.

The uncertainty involved with the development of future GHG emissions could also negatively impact the willingness of host countries to agree on ambitious crediting baselines. As the ambition of the crediting baseline depends considerably on uncertain developments, the host country may not be willing to accept an ambitious crediting baseline, which may under a different development of key emission drivers become more restrictive. Whereas the objective of absolute national targets by industrialised countries is to have certainty on the limitation of GHG emissions to a certain limit, the objective of a crediting mechanism is to incentivise and reward mitigation action. In this regard, different approaches than for industrialised countries may be needed.

Another important challenge is the availability and quality of historical sectoral data. In many developing countries, data on production and GHG emissions from sectors is either not available or the quality of the data is uncertain. For example, data on fuel quantities used in the economy is often only available at national level and sectoral break-downs are uncertain – not to mention the adequacy of sectoral definitions for energy statistics and the sectoral definition adopted in the SCM. This makes it challenging to estimate emissions or production at a sectoral level.

In the following sections, different ways of addressing these challenges are discussed.

4.2 Types of sectoral crediting baselines

A sectoral crediting baseline can be established in different metrics. The following generic approaches could be used:

- **Absolute emission baselines.** The crediting baseline is established as an absolute GHG emissions level for the sector.
- **Indexed baselines.** The crediting baseline is established as a function of one or several indexes. In case of a single index, the crediting baseline is typically expressed as the GHG emissions divided by the output of the sector in a physical metric (t, kWh, km, etc) or economic metric (sectoral GDP, etc.) In the power sector, for example, the GHG emissions per electricity generation, expressed in t CO_2e / MWh, could be used as an indexed baseline. However, crediting baselines could also be based on several indexes at the same time, such as a combination of the GDP and ambient weather conditions (see section 4.2.2). Baselines with only one index are often referred to as “intensity baselines”. Based on Bosi and Ellis (2005) we prefer, however, the term “indexed baselines” because the term “intensity” is not clearly defined in the literature and used in many different ways, including various types of indicators (efficiency, productivity, etc). Moreover, the term “intensity” usually excludes the use of several indexes to establish a baseline.

- **Technology penetration baselines.** The crediting baseline is defined as a level of technology penetration. The penetration level could be determined in absolute or relative terms. For example, a technology penetration baseline for wind power penetration could be defined as the power generation from wind power plants (in GWh) or the installed wind power capacity (in MW) or the share of wind power in total electricity generation (as percentage).

In the case of absolute baselines, the absolute GHG emissions in the sector are directly compared to the baseline. Credits are issued for the difference between monitored emissions in the sector and the crediting baseline:

$$\text{Credits} = \text{Crediting baseline} - \text{Monitored emissions}$$

In the case of indexed baselines and technology penetration baselines, the absolute emission level will only be determined ex-post. However, the rules and data sources which are later used to calculate the absolute emissions need to be agreed and fixed *ex-ante*. For example, for an indexed baseline with only one index, the *ex-ante* established emission rate (e.g. t CO_2e / MWh) is multiplied with the *ex-post* monitored activity level (e.g. MWh of electricity produced) to convert the emission rate ex-post into an absolute baseline. The absolute emission baseline is adjusted ex-post according to the development of the index, as follows:

$$\text{Credits} = \text{Fixed baseline emission rate} \times \text{Monitored level of the index} - \text{Monitored emissions}$$

For technology penetration baselines, the difference between the ex-ante established penetration level (e.g. targeted MWh of wind power generation) and the monitored technology penetration (e.g. actual MWh of wind power generation) is multiplied by a GHG emission factor (EF) that expresses the difference in emissions intensity between the targeted technology and business-as-usual technologies used in the sector:

$$\text{Credits} = \left(\text{Monitored technology penetration} - \text{Baseline technology penetration}\right) \times \text{EF}$$

The emission factor could be either fixed ex-ante or monitored ex-post. In the following, the three concepts are discussed and compared.

4.2.1 Absolute emission baselines

Absolute emission baselines are established as an absolute amount of tons of CO_2 equivalent for the sector. This metric is straight-forward: the monitored emissions in the sector can be directly compared to the sectoral crediting baseline and the difference corresponds to the number of credits that are issued.

An important advantage of absolute emissions baselines is that all measures to reduce GHG emissions in the sector can be credited. In the power sector, for example, an absolute emission baseline allows the crediting of measures which decrease electricity demand, reduce transmission and distribution losses or reduce the GHG intensity of power production. This is not always the case for indexed baselines and technology

penetration baselines. An indexed baseline with power generation as index would only allow the crediting of emission reductions from changes in the way power is produced but not from reducing the demand for power or reducing transmission and distribution losses. This is particularly important in sectors with a large potential for demand-side measures, such as the power sector.

An important disadvantage of absolute emission baselines is that the determination of a credible sectoral crediting baseline is particularly demanding. Many uncertain assumptions have to be made about the future development of the sector to arrive at an absolute crediting baseline for the sector. As a result, the integrity and stringency of absolute emission baselines depends heavily on how they are derived and whether the emission drivers actually develop in the expected manner. For example, in the case of an unforeseen recession, a previously established absolute emissions baseline may be above business-as-usual emissions, resulting in crediting of potentially significant amounts of business-as-usual emission reductions. In contrast, if the actual economic growth is higher than predicted, the crediting baseline may not be achieved despite the mitigation action undertaken in the sector.

Therefore, a SCM based on a fixed absolute crediting baseline bears the risk that either credits are issued for effects that are not a result of measures taken to reduce GHG emissions or that no credits are issued despite emission reductions that were achieved through GHG emission reduction measures. One way of reducing this risk could be the use of short crediting periods. For example, the sectoral crediting baseline may only be agreed for a three year period and a new crediting baseline may be determined for subsequent crediting periods. However, short crediting periods would conflict with the long-term perspective which investors are interested in, especially for investments with lifetimes of 20 years and more which are very common in most industrial sectors (see chapter 5).

Although absolute crediting baselines allow for more measures to be credited, developing countries may perceive absolute emission baselines as constraint to their development, even if the mechanism is voluntary and the baseline is set above historical emission levels. For these reasons, it has been argued that absolute emission baselines may be less acceptable for developing countries than indexed baselines (Bosi and Ellis 2005).

4.2.2 Indexed baselines

Indexed crediting baselines are established as a function of one or several indexes.

The simplest form of an indexed crediting baseline is the establishment of an emissions rate that relates the emissions in the sector to one single index. The emissions rate is established and fixed ex-ante, whereas the index is monitored ex-post. The absolute value of the baseline emissions is then established ex-post by multiplying the monitored value of the index with the emissions rate.

However, in many sectors, GHG emissions are driven by more than one driver. Accordingly, the crediting baseline could be based on several indexes. Again, the indexes,

data sources and algorithms to calculate the crediting baseline would be defined ex-ante; however, the actual level of the crediting baseline would be determined ex-post by applying the monitored values of the indexes in the pre-defined algorithm. For example, the baseline heating demand of buildings could be adjusted ex-post for the actual building area constructed and for degree days of the year which express the need for heating and cooling as a function of outside temperature. In this way, both the growth in the building sector and the particular climatic conditions in a year could be factored out from the calculation of emission credits (see box 1 on page 26).

The use of multiple indexes to establish a baseline is already applied in some baseline and monitoring methodologies under the CDM. An example is the baseline and monitoring methodology AM0060 which credits the replacement of existing industrial chillers by new highly efficient chillers. The methodology adjusts ex-post the baseline electricity demand of the replaced chillers according to two parameters that are monitored ex-post: the temperature level at which cooling is requested by the building or industrial facility (reflecting the *service* provided) and the temperature level of the condensing water (reflecting the *ambient conditions*).

A key choice is which indexes should be used to calculate the baseline. At the national level, the GDP or population have been proposed as an index. At the sectoral level, mostly the products or services provided by the sector have been proposed as indexes, such as electricity generation (Bosi and Ellis 2005, Amatayakul et al. 2008), cement production, aluminium production, or vehicle kilometres travelled for the transport sector (Höhne et al. 2007).

A key advantage of indexed baselines is that they factor out changes in the indexes used to establish the baseline. In many cases, the future development of these indexes is difficult to predict and they are often beyond the scope of the measures taken to reduce GHG emissions. For example, an important factor that affects GHG emissions in a sector is the demand for the products (e.g. electricity) or services (e.g. ton kilometres transported) of the sector. An indexed baseline relating the GHG emissions to production enables, to some extent, factoring out one of the most important emissions drivers: the demand for the products of the sector. This improves the accuracy and reduces the uncertainty of indexed baselines compared to absolute emission baselines. In other words: indexed baselines can, to some extent, help factor out the signal (the mitigation action) from the noise (other factors that affect GHG emissions). For the same reason, the CDM Executive Board decided that “output- or product-linked baselines (i.e. CO_2e per unit of output) shall be applied under the CDM”.[7]

It is also argued that indexed baselines are more acceptable for developing countries than absolute emission baselines. Indexed baselines directly acknowledge the possibility of activity growth in the sector and as such do not put any constraints on development (Ward et al. 2008). It is also easier to cope with new entrants to the market (Bosi and Ellis 2005).

[7] Report of EB08, Annex 1

However, the use of indexed baselines can also be challenging to implement and, depending on the indexes used, limit the possibilities for crediting mitigation measures. This applies in particular to indexed baselines that use the production of the sector as index. Such production based baselines work only within sectors that provide only one homogenous product or service, such as the generation of electricity or the production of aluminium. Establishing production based baselines is challenging for sectors with a variety of different services or products (Baron and Ellis 2006). In such cases, it can be difficult to identify one single meaningful metric for the GHG emissions rate of the whole sector. Some sectors, such as refineries or the chemical industry provide many products with different quality features in often rather complex facilities. Defining a reasonable metric to measure GHG emission rates in these sectors is difficult or even impossible. Another drawback of production based baselines is that they can limit the measures that can be credited. An emissions baseline which is based on the production or service of the sector does not allow crediting measures that reduce the demand for the product or service. This is particularly important in sectors where the demand-side measures have a very large and cost-effective mitigation potential, such as in the power sector.

There are several ways to address this issue: Firstly, an indexed baseline with a different metric than the production of the sector could be used. For example, using the GDP as index would allow crediting all mitigation measures in the sector. Another way may be the use of multiple indexes that reflect various emission drivers on both the demand and the supply side of the sector. A third way could be the establishment of several indexed baselines for one sector. This latter approach is further explored in section 4.2.4 below.

Another challenge of indexed baselines is that they require monitoring one or several indexes. In some cases, it can be difficult to monitor such socio-economic data with a reasonable certainty. For example, in the transport sector the passenger kilometres travelled appears a reasonable metric but could be difficult to monitor with a high reliability.

4.2.3 Technology penetration baselines

Technology penetration baselines could be used where the host country envisages measures to promote particular technologies (e.g. renewable power generation). Technology penetration baselines have thus a narrow focus. Not all entities in the sector are included in the baseline but only a particular technology. The strong link to promoting technologies could make this option interesting for countries that are interested in particular technologies.

A disadvantage of technology penetration baselines is that the BAU rate of technology diffusion appears difficult to assess in an objective manner. This applies in particular to technologies at an early stage of development. Future costs of the technology, technological innovation, and barriers can hardly be predicted. Consequently an estimate on technology diffusion under BAU assumptions is rather uncertain. The use of technology penetration baselines should thus mostly cover technologies that are already commer-

cially available but face higher costs or barriers to their broad deployment. Even for these technologies the baseline penetration rate is a relatively arbitrary choice.

Another challenge is the determination of the emission factor that expresses the GHG emission intensity difference between the targeted technology and the business-as-usual technologies in the sector. In some sectors, several technologies are applied. In such cases, it can be difficult to predict which technology mix would have prevailed in the absence of the SCM.

4.2.4 Establishment of several crediting baselines for one sector

A sectoral crediting baseline does not necessarily need to be established for a whole sector but the sector could be divided into several sub-sectors, differentiating between the products or services provided and/or between major factors that drive GHG emissions.

4.2.4.1 Differentiation between products and services

By establishing different crediting baselines for different products or services, the different GHG emissions associated with producing the products or providing the services could be better reflected. This enables factoring out changes in GHG emissions as a result of changes in the mix of products. Separate crediting baselines could be developed for different products and services, for large installations and small installations or for new and existing installations. For example, a country targeting electricity consumption of households could potentially establish separate crediting baselines for separate services for which households consume electricity (lighting, cooling, etc).

However, dividing a sector in many different sub-sectors has the potential for limiting the scope of the measures that can be credited: if credits are only provided for reducing emissions from the production of a product or the provision of a service, measures to reduce the demand of the product or service, e.g. by shifting to less GHG intensive products or services, are not credited. Hence, there is a trade-off between choosing accurate indexes for the GHG emissions of a product or service and the scope of measures that can be credited under the scheme.

An illustrative example for this dilemma is the transport sector. Emissions in the transport sector are driven by a number of factors: the demand for freight and passenger transportation, the modal split, the efficiency of the transport modes and the carbon intensity of the fuels used. An indexed baseline could be established for the overall sector or differentiated in various ways, inter alia:

- **A single crediting baseline for the transport sector.** One option could be to establish an indexed baseline for the whole transport sector based on the most important driver of overall GHG emissions. For example, overall economic growth (e.g. GDP) could be used as index for the crediting baseline. The sectoral crediting baseline would then be established as the level of GHG emissions in the transport sector per GDP of the country. Under this option, a broad range of measures to reduce the GHG emissions in the sector could be imple-

mented, addressing all drivers of GHG emissions (i.e. measures that reduce transport demand, that improve the modal split, that increase the efficiency of vehicles and that switch to less GHG intensive fuels).

- **Differentiating freight and passenger transportation.** An alternative approach would be a differentiation between freight and passenger transportation. For freight transportation, a possible index could be ton kilometres transported. Similarly, for passenger transportation a possible index could be passenger kilometres travelled. These indexes may provide a more accurate metric for the service provided by the transport sector than the GDP, since the overall transport demand may be driven by more factors than the GDP alone. However, these indexes would exclude measures to reduce transport demand from crediting. Besides, both indexes would require data on passenger and freight transportation which may not be available in many developing countries.
- **Differentiating freight and passenger transportation and transport modes.** Sectoral crediting baselines could also be established separately for different transportation modes. Road transportation, navigation, air transportation and railways have quite different characteristics and GHG emissions. To reflect these differences, a baseline could be established separately for each transport mode. However, such an approach would exclude measures from crediting which shift the modal split towards less carbon intensive transport modes. For example, building rapid rail-based transit systems which displace road based transportation could not be credited.
- **Differentiating freight and passenger transportation, transport modes and vehicle types.** As a further differentiation, separate baselines could be established for different vehicle types, such as motor cycles, passenger cars, light duty vehicles and heavy duty vehicles to reflect the different GHG emissions of these vehicle types. Such a differentiation makes sense if the envisaged policies and measures focus on improving the energy efficiency of vehicles, for example, by introducing efficiency standards for new vehicles. However, this would not enable crediting a shift from individual traffic to public transportation.

This example shows that more differentiated baselines can possibly better measure the development of the GHG emission development of the sector. Differentiation can, to some extent, factor out endogenous developments that affect GHG emissions and that are difficult to predict (e.g. demand for freight transportation, development of demand for new passenger cars, etc). However, the differentiation can limit the scope of the measures to reduce GHG emissions.[8]

[8] Differentiating baselines between products and services is already common practice in baseline and monitoring methodologies under the CDM. An example is the baseline and monitoring methodology AM0070 which credits the manufacturing and sale of highly efficient household refrigerators. The methodology establishes about 10 different classes of household refrigerators, differentiating for the size and type of refrigerator. For each refrigerator class, a separate benchmark is used to calculate baseline emissions.

BOX 1: Determining a crediting baseline for new buildings

A country plans to introduce a SCM for new buildings. For this purpose a package of policies and measures is envisaged, including a building code which sets ambitious limits on the energy demand of new buildings, extensive capacity building to implement and enforce the new regulation, and an information campaign about benefits from highly efficient buildings.

In the building sector the heated surface area of the building (in m²) is often used as an indicator for the service provided by buildings. For example, many building codes that regulate the energy efficiency of buildings set limitations on the energy demand per square meter heated surface area. Consequently, the heated surface area of new buildings could also be used as index for establishing an indexed crediting baseline for new buildings. The use of this index would factor out the effect of economic growth and thus avoid making an assumption of how many new buildings will be added to the building stock in the future. Unforeseen developments in the total quantity of heated area added to the building stock would not affect the stringency or accuracy of the baseline but would be factored out. The use of the surface area as an index is also appropriate because the heated surface area of new buildings is not influenced by the measures taken to reduce emissions in the sector.

However, heat losses and cooling demand are not only driven by the heated or cooled surface area. Many other factors play a role. These factors may change over time for reasons that are not related to the measures envisaged to reduce GHG emissions. As a consequence, the baseline emissions may be under- or over-estimated and the crediting baseline may not be set in a meaningful manner if the heated area is the only index used. For example:

- **Surface to volume ratio of the buildings.** Small one-family houses with a high surface to volume ratio have a higher energy demand per area than large building blocks with a low surface to volume ratio. With an increasing income of the population, one-family houses may be preferred over large buildings with many apartments. The mix of new buildings may thus change over time. A trend to smaller houses would result in an increase of the GHG emission per surface area. This effect could be factored out by defining separate crediting baselines for different classes of buildings. This approach is also applied in building codes. On the other hand, it could be questioned whether the trend towards single family houses should be factored out since this may be counterproductive from a mitigation perspective.
- **Annual weather variations.** Annual weather variations and long-term climate change have impacts on the energy demand of buildings. Hotter summers increase the energy demand for cooling, whereas more moderate winters decrease the energy demand for heating. If baselines are established over longer time periods, climate change may play a role. Annual variations could be taken into account by introducing the degree days as a second index in the baseline. The degree days express the need for heating and cooling as a function of outside temperature. With this second index, the baseline would be adjusted ex-post to weather variations and the effect of long-term climate change could be factored out from the achieved emission reductions.
- **Climatic areas.** Buildings in a very cold or hot climate have a higher energy demand compared to buildings in a moderate climate. In large countries with strongly varying climatic zones (e.g. China, Chile), it is important to take into account where new buildings are established. Accordingly, different baselines could be defined for different climatic zones.
- **Fuel prices.** Prices for electricity and fuels influence the demand for heating and cooling. With higher prices, some households in developing countries may have difficulties to afford heating or cooling and may accept less comfort. Higher prices could also increase the demand for more efficient buildings, resulting in autonomous efficiency improvements of new buildings. The elasticity of electricity and fuel demand for heating and cooling services is difficult to estimate. One could try to derive the elasticity from historical data for fuel prices and household energy consumption. If such elasticity factors can be derived, they could be used as further indexes in establishing the baseline. However, this could increase the complexity of the approach considerably.

4.2.4.2 Differentiation between emission drivers

The differentiation of baselines according to emission drivers could be one way to avoid limitations in the measures that are credited. For example, one SCM agreement could focus on the GHG emissions associated with producing a product or providing a service, while another SCM agreement could in parallel focus on reducing the demand for the product or service. Such an approach does not exclude any measures to reduce GHG emissions from crediting while still enabling the use of indexed baselines.

A potential sector for such an approach is the electricity sector: one SCM agreement could be established for power generation and one or several SCM agreements could in parallel focus on reducing electricity demand of particular sectors. On a third level, another SCM agreement may focus on reducing transmission and distribution losses. Thus the emissions in the sector E (t CO_2e) are differentiated by the three drivers, the emissions associated with electricity production P (t CO_2e / GWh of electricity production), the transmission and distribution losses TD (GWh of electricity production / GWh electricity demand), and the electricity demand D (GWh electricity demand per service / service provided), where the entire electricity demand is differentiated by classes of services i (e.g. households, commercial uses, industrial uses):

$$E = P \times TD \times \sum_i D_i \times S_i$$

However, this approach has also a number of methodological challenges. One problem is that the three SCM agreements are not fully independent of each other. If the electricity demand is reduced, this will reduce power generation in plants with high marginal operating costs. In most countries, fossil fuel fired power plants operate at the margin and their operation would first be affected by a reduction in electricity demand, whereas the power generation from renewable resources may not be affected. A reduced electricity demand will thus not only affect the absolute emissions in the power sector but also lower the GHG *emission rate* of electricity production. If this effect is not taken into account, the emission reductions from the three SCM agreements would be double-counted. To address this, the emission reductions from reducing the electricity demand would need to be determined on the basis of the actual GHG emission rate of electricity generation and not the crediting baseline for electricity generation.

4.2.4.3 When should sectors be divided into sub-sectors and when should baselines with multiple indexes be used?

In which cases sectors should be divided into sub-sectors and in which cases one baseline for the whole sector with multiple indexes should be used depends on the context of the sector. Where a sector provides different products and services with a significantly varying GHG emissions rate and where the mix of these products or services may change over time and is difficult to predict, the establishment of crediting baselines for the different (classes of) products and services seems advisable.

Another important factor is the scope of the policies and measures that are envisaged to reduce GHG emissions in the sector. Generally, the scope of the sector should be defined broadly, in order to allow the crediting of many measures and avoid carbon leakage within the sector (see chapter 3). On the other hand, if the policies focus on particular measures (e.g. improving efficiency of cars), the sectoral crediting baseline might also be defined narrowly (e.g. for cars only) and not include the whole sector. As an example of a combination of a differentiation into sub-sectors and the use of multiple indexes, an approach for the building sector is illustrated in Box 1.

4.2.5 Which type of sectoral crediting baseline is best suited?

Which type of sectoral crediting baseline is best suited depends on the context and can not be answered generally. A key advantage of absolute emission baselines or indexed baselines based on GDP is that they allow the crediting of all measures to reduce GHG emissions in the sector. This is particularly important for sectors with an important mitigation potential on both the supply and the demand side, such as in the power sector. Therefore, in considering different types of possible baselines the mitigation potential should be evaluated and the measures envisaged for reducing GHG emissions should be taken into account.

For example, an indexed baseline based on the production in the sector could be used if the mitigation potential in the sector is mainly in the production facilities, if measures to reduce GHG emissions focus on these installations, and if the sector produces homogenous products or services. Conversely, if a large potential to reduce GHG emissions is available for both the supply and the demand of a product, an absolute emissions baseline or an indexed baseline with other metrics than the production level, such as the GDP, are better suited. Using the sector production as index is also difficult in sectors with diverse products and services or complex industries.

A disadvantage of absolute emission baselines is that the establishment of the baseline involves a higher uncertainty compared to indexed baselines which aim at factoring out the signal (measures to reduce GHG emissions) from the noise (other factors that affect GHG emissions). Absolute emission baselines may also be perceived as more stringent by developing countries, as they do not explicitly factor out economic growth.

Technology penetration baselines may be interesting for countries that want to promote particular technologies (e.g. renewable power generation). However, the focus is narrower and thus excludes the crediting of other measures in the sector (e.g. more efficient fossil power generation). If the technology is defined narrowly, the establishment of the baseline level is challenging and more arbitrary. Table 1 below compares the main advantages and disadvantages of absolute, indexed and technology penetration baselines.

Table 1: Comparison of advantages and disadvantages of absolute, indexed and technology penetration baseline

	Advantages	Disadvantages
Absolute emission baselines	• Allows crediting of all measures to reduce GHG emissions in the sector • Easier to implement in sectors with diverse products and services or complex industries • Simplicity	• Higher uncertainty in establishing the baseline compared to indexed baselines => risk of over- or under-crediting • May be perceived as more stringent and thus politically less acceptable than indexed baselines
Indexed baselines	• Lower uncertainty in establishing the baseline compared to absolute emission baseline (better able to factor out the signal from the noise) • May be politically more acceptable than absolute emission targets	• More difficult to apply in sectors with diverse products and services • More complex to implement • Some measures may be excluded from crediting
Technology penetration baselines	• Focus on technology may be interesting for countries interested in promoting particular technologies	• Focus and scope rather narrow • Considerable uncertainty in establishing the baseline for a single technology

4.3 How and when should crediting baselines be agreed upon?

Two approaches for agreeing on a sectoral crediting baseline have been proposed so far:

- **A high-level negotiation.** Sectoral crediting baselines could be negotiated as part of a new climate deal and could be included in an Annex to a new global climate treaty (e.g. proposed by Ward et al. 2008).
- **Bottom-up process.** Developing countries could propose sectoral crediting baselines in a bottom-up process. In this case, a new climate treaty would only specify the principles and institutional framework for proposing sectoral crediting baselines. Under this approach, sectoral crediting baselines would be determined in a process following the new climate treaty.

The key advantage of the first option is that it ensures an early adoption of sectoral crediting baselines. This provides at an earlier stage certainty for Parties and the private sector which may facilitate an early implementation of measures to reduce emissions and the ratification of a new climate treaty.

On the other hand, it is questionable whether developing countries will be ready to agree to ambitious crediting baselines in the absence of precise data from the sector and significant uncertainty regarding future emission developments. Moreover, agreeing on sectoral crediting baseline without having collected the necessary data and without a technical review of any GHG emission projections risks that the crediting

baseline may set in an arbitrary manner. In the worst case, it may be considerably inflated, undermining the environmental integrity of the mechanism.

A technical process to collect relevant data, to prepare emission projections, to assess potential policies and measures to reduce emissions, and to review all information could help to ensure that the crediting baselines are actually meaningful. However, such a process would delay the implementation of a SCM and the outcome depends on the success of the process and on the willingness of developing countries to develop proposals for implementing a SCM.

A way forward could be an agreement in a climate treaty on key principles of a sectoral crediting mechanism, including on principles for the ambition of the baseline (see section 4.4). The final agreements of the sectoral crediting baseline could then be delegated to a technical process. The treaty could also include indicative commitments of developing countries in which they determine the sectors they intend to address with a SCM and the aggregated level of ambition which they intend to achieve.

4.4 Ambition of the sectoral crediting baseline

The ambition of the sectoral crediting baseline is a key parameter for the effectiveness and environmental benefits of a SCM. Most authors propose that the crediting baseline be set below the projected business-as-usual emissions in the sector (Höhne et al. 2008; Ward et al. (2008); Amatayakul et al. 2008). Indeed, this is a key requirement for a SCM to provide a net global mitigation contribution. If the sectoral crediting baseline would be set at business-as-usual emissions, the SCM would be a pure offsetting mechanism in which case each ton of emission reduction achieved through the mechanism in a developing country enables an industrialised country to increase its emissions by one ton above its assigned targets.

The ambition of the sectoral crediting baseline is a key policy question. In agreeing on the ambition of the crediting baseline several issues need to be taken into account. These are discussed in the following.

4.4.1 What ambition is needed from an atmospheric viewpoint?

An important starting point for determining the ambition of sectoral crediting baselines is the overall mitigation efforts necessary for the relevant commitment period to achieve the envisaged global mitigation. The forth assessment report by the IPCC highlights that substantial deviations from business as usual emissions are necessary in developing countries by 2020 in order to limit global warming to 2°C above pre-industrial levels (IPCC 2007, p. 776). In this context, the EU has proposed that GHG emissions in developing countries should deviate by 15-30% from BAU levels in 2020, while industrialised countries as a whole should reduce GHG emissions until 2020 by 25-40% below 1990 levels.

It is important to note that these target corridors for industrialised countries and developing countries have both to be met. This means that the reduction in developing countries can not be achieved with offsetting credits that are used to fulfil the 25-40% emis-

sion reductions. A SCM can thus only contribute to achieving the necessary deviation from BAU emissions in developing countries if the sectoral crediting baseline is set significantly below business-as-usual emission in the sector.

Would a SCM be the only instrument for developing countries to contribute to global emission reductions, a consistent scenario would be that a) the crediting baselines be set 15-30% below BAU emissions, that b) a sectoral crediting mechanisms be implemented in all sectors, and c) that all crediting baselines be achieved by all countries in all sectors. This is certainly an ambitious scenario. In practice, developing countries will use a SCM only in some and not all sectors. Similarly, the crediting baseline may not be met in all sectors. This implies that individual crediting baselines need to deviate even more than 15-30% from BAU emissions to achieve in average a 15-30% deviation in developing countries.

4.4.2 Incentives for developing countries

Very ambitious crediting baselines involve the risk that developing countries do not engage in using the SCM, as the financial incentives from the crediting of emission reductions decrease with the ambition of the baseline. Hence, in determining the ambition of the baseline there is a trade-off between the net atmospheric mitigation contributions and the financial incentives for the developing country to participate in the mechanism. This trade-off could be mitigated if industrialised countries support the reduction of GHG emissions in the sector not only through the carbon market by crediting emission reductions but provide additional financial and technical support to help the country achieving the crediting baseline. Such financial and technical support could help developing countries to committing to more ambitious sectoral crediting baselines (see section 4.7).

4.4.3 Supply and demand in the carbon market

The introduction of SCM on a large scale requires sufficient demand for such credits from industrialised countries. This has to be taken into account when considering the overall ambition of crediting baselines. An oversupply of credits could result in very low carbon prices and thus low financial revenues and incentives for developing countries to achieve or go beyond the baselines. The implementation of a SCM in many countries and sectors could result in a considerable supply of credits. Developing countries have only incentives to reduce emissions if there is reasonable price for credits. Hence, the overall ambition of crediting baselines in a SCM is strongly related to the ambition of targets by industrialised countries. Ways to manage the supply and demand in the carbon market are discussed in chapter 10.

4.4.4 To what extent should sectoral crediting baselines be differentiated between sectors and countries?

In considering the ambition of the crediting baseline for a specific sector, the mitigation potential and the mitigation costs are important aspects. Sectors with a huge mitigation

potential at low costs can take on more ambitious crediting baselines than sectors with a low mitigation potential. The host country may also have political priorities for sectors to focus on. For example, if GHG emission reductions in a sector have large synergies with development objectives the host country may wish to focus efforts on that sector even if the mitigation costs are higher than in other sectors. Setting crediting baselines in different sectors and countries at the same level (e.g. at a fixed percentage below BAU emissions) may therefore not be appropriate.

The ambition of the crediting baselines could also be varied among countries reflecting their different responsibility and capability to contribute to global GHG emission reductions. More advanced developing countries may be able to achieve a more ambitious emission reduction than less advanced countries.

However, a differentiation in the ambition of crediting baselines between each host country and each sector would pose a considerable burden on the mechanism. The negotiation of the ambition of crediting baselines for many countries and sectors may not be feasible from a practical viewpoint. It is also questionable whether a sophisticated differentiation would result in a fairer sharing of efforts and incentives; it could also open the door for preferential treatment of some countries or sectors due to their negotiation power or for other reasons. A differentiation among the group of developing countries is also political very sensitive and difficult to negotiate.

In this context, it seems questionable to what extent differences in the responsibility and capability of host countries to reduce emissions should and can be reflected in the ambition of the sectoral crediting baselines. If a differentiation is introduced, a simple approach would most likely be more feasible and acceptable. The only existing differentiation under UNFCCC among non-Annex I countries with regard their development is the classification of Least Developed Countries (LDCs). As a simple approach, for LDCs crediting baselines could be set at their respective BAU emissions, whereas crediting baselines could be set below BAU emissions for other developing countries.

4.4.5 Consideration of policies and measures

A key question in determining the baseline is how existing, planned and new policies and measures that affect GHG emissions in the sector should be taken into account.

There has been a long debate on how policies and measures should be considered under the CDM. If policies and measures that favour the reduction of GHG emissions are included in the baseline, this could constitute perverse incentives for governments not to adopt such policies and measures, since their adoption would lower the potential for the CDM. For example, tax incentives or a feed-in tariff can make renewable power generation projects economically attractive without the CDM. If these incentives must be considered in establishing the baseline, renewable power projects could not be additional anymore. A government may thus be hesitant to introduce such policies, as it could lower the potential for CDM projects. To avoid such perverse incentives, the CDM Executive Board decided that certain policies and measures that were adopted after 2001 do not need to be taken into account when establishing the baseline of a

CDM project.[9] However, this decision also bears the risk that many projects are registered that would also be implemented without the CDM. Hence, there is a clear trade-off between the objective of avoiding perverse incentives regarding new policies and measures and the objective that only additional emission reductions should be credited.

Similar considerations apply to the SCM. Considering all new or planned policies and measures when determining BAU emissions in the sector would ensure that only emission reductions from additional measures in the sector, incentivised through the SCM, would be credited. However, this could constitute a perverse incentive for countries not to plan or adopt any policies and measures until the crediting baseline is actually fixed. If crediting baselines are not yet established as part of an agreement in Copenhagen in 2009 but determined in a process following such an agreement, there could be a risk that policies and measures are put on hold for some time after 2009, until crediting baselines are ultimately fixed. On the other hand, not considering planned or new policies and measures could result in a rather "lose" sectoral baseline that is above emissions levels that would have occurred without the SCM. Many policies and measures to reduce GHG emissions may not be motivated by climate change but by other reasons, such as reducing the dependency on fossil fuels, reducing air pollution, increasing economic efficiency or the promotion of innovative technologies. Many policies and measures that reduce GHG emissions are currently already introduced by developing countries, even without the credits from a SCM. If such policies and measures were all credited as part of a SCM, this could result in the issuance of a large amount of credits that do not constitute "additional" emission reductions.

Trying to distinguish between different motivations for introducing policies and measures in order to determine which policies and measures were motivated by a sectoral crediting mechanism appears not a promising approach to address this problem. Most policies and measures have several motivations which cannot be clearly distinguished. Besides, a key lesson learned from the CDM is that demonstrating motivation is subjective and arbitrary. This applies, in particular, for decisions of policy makers, which depend on many factors.

One way of addressing this issue could be the introduction of a cut-off date for the consideration of policies and measures in any BAU emission projections, similar as under the CDM, and, at the same time, choosing a more ambitious level for the crediting baseline level that ensures that a large extent of crediting of policies that would have been adopted anyhow is avoided. One potential cut-off date could be the day of an agreement in Copenhagen. This would mean that policies and measures adopted after Copenhagen that result in GHG emissions in the sector would not need to be considered in establishing BAU emissions in the sector.[10] At the same time, the crediting baseline would need to be sufficiently below the calculated BAU emissions in order to

[9] Annex 3 to the meeting report of the sixteenth meeting of the CDM Executive Board

[10] Naturally, the cut-off date would need to be updated for subsequent crediting periods, possibly to the date of the next global agreement.

avoid the crediting of emission reductions that would most likely also have happened through new policies and measures without the SCM.

4.4.6 Basis for determining crediting baselines

The sectoral crediting baseline could be derived based on several different approaches:

- **Deviation from BAU.** The crediting baseline could be based on a politically agreed deviation from BAU emissions, expressed as a percentage deviation from BAU emissions (e.g. 20% below BAU emissions). This option requires projecting BAU emissions. It could be used for absolute baselines and indexed baselines.
- **Mitigation potential and/or costs.** The crediting baseline could be based on the mitigation potential that should be achieved without using the SCM. The target could, for example, be set at the level of the no-regret potential in the sector. This option requires projecting BAU emissions and determining the mitigation potential and costs. It could be used for absolute baselines and indexed baselines.
- **Emission rate based on a reference technology.** In some sectors, the crediting baseline could be based on the emission rate of a reference technology. For example, the GHG emission rate of a state-of-the-art technology could be used as an indexed baseline. In addition to the emissions rate, a projection of the production in the sector would be required in the case of an absolute emission baseline.
- **Emission benchmark based on historical sectoral data.** In some sectors, the crediting baseline could be based on an emissions benchmark that is derived from historical sectoral data. For example, the emissions benchmark approach under the CDM, using the emissions rate of the top 20% performing plants that were constructed during the past five years, could also be used to derive a sectoral emissions baseline. Amatayakul et al. (2008) propose to use the approach to determine the grid emission factor under the CDM also for a sectoral crediting baseline. As for the emissions rate based on a reference technology, a projection of the production in the sector would be required in the case of an absolute emission baseline.
- **Technology penetration scenario.** The crediting baseline could be established based on a defined technology penetration scenario that goes beyond a BAU scenario. For example, a crediting baseline for the power sector could be derived based on a targeted portfolio of new power plant technologies added to the grid. This option requires projecting BAU emissions. It could be used for absolute baselines, indexed baselines, or technology penetration baselines.
- **Policy objectives scenario.** The crediting baseline could be established based on policy objectives in the sector or country. For example, policy objectives for the penetration of renewable power generation, energy efficiency improvements or improved waste management could be used to derive the crediting baseline. Credits would then be issued for efforts that go beyond the established policy objectives. This option could be used for absolute baselines and indexed baselines.

Some of these options derive the crediting baseline from a projection of BAU emissions in the sector. A disadvantage of this approach is that it involves the risk that the emissions projections be deliberately inflated to increase the credit revenue stream. Emissions projections rely on many assumptions which are uncertain and difficult to validate in an objective manner. These assumptions could be made in ways that tend to overestimate the emissions development in the sector. This experience was, for example, made by the EU Commission in assessing National Allocation Plans (NAPs) for the EU's Emissions Trading Scheme. Many NAPs were rather optimistic on the achievable emission reductions in the non-EU ETS sectors and assumed high BAU emission growth rates in the EU ETS sector. Approaches that do not rely on GHG emissions projections, such as the use of a reference technology or a technology penetration scenario, avoid this problem to some extent but pose other challenges.

If the crediting baseline is derived based on the mitigation potential or mitigation costs, the potential for a biased determination of the crediting baseline is even greater. In this case, it is not only necessary to project BAU emissions but also to estimate the mitigation potential and costs. The estimation of mitigation potentials and costs poses similar challenges as the projection of emissions. The results depend heavily on the assumptions and the model used. Although using the mitigation potential and the mitigation costs is conceptually sound, as it reflects well the sectoral circumstances, it is questionable whether its practical implementation will be easy and result in crediting baselines that are significantly below BAU emissions.

The use of policy objectives to derive sectoral crediting baselines appears promising in sectors where such policy objectives have already been established in the past. For example, in China policy objectives established in 5-year-plans for energy efficiency and renewable energy could be used to derive the crediting baseline. However, if policy objectives are not yet adopted in a country or sector this approach could discourage countries to adopt ambitious policy objectives, due to similar perverse incentives as described in section 4.4.5; adopting a less ambitious policy objective would provide higher revenues from the sale of carbon credits for the country. Similarly, one could argue that the use of policy objectives tends to punish early movers, i.e. countries that have adopted ambitious policy objectives already at an early stage, and to favour countries that have not yet adopted such objectives.

The use of a reference technology or an emissions benchmark based on historical data appears only feasible in sectors with clearly defined outputs, such as aluminium or cement. In choosing the technology or calculating the benchmark, it would need to be ensured that the crediting baseline goes clearly beyond autonomous industry trends in the sector. However, the use of historical data has limits, as historical trends do not necessarily reflect what is likely to happen in the future (see section 4.1). Historical data always needs to be interpreted in the context of socio-economic parameters that affect GHG emissions.

Different options to derive crediting baselines could also be combined with the view to provide better safeguards that crediting baselines are actually set reasonably below BAU emissions. To this end, it could be required that different criteria be met at the

same time. For example, it could be politically agreed that the sectoral crediting baselines should be at least X% below BAU emissions, that they should be set at least at an emissions level that reflects already adopted policy objectives, and that they should be set below the no-regret mitigation potential.

To facilitate a comparison of different sectoral crediting baselines and to provide at least a rough estimate on the overall mitigation effort from the mechanism, it is recommended that a projection of BAU emissions is prepared in all cases, even if this is methodologically not necessary for the derivation of the sectoral crediting baseline. Methodological approaches to facilitate a sound determination of BAU emissions and a thorough assessment of a proposed sectoral crediting baseline are discussed in the following.

4.5 Reporting requirements and methodological approaches to support proposals for a sectoral crediting baseline

A thorough analysis of the GHG emission trends and projections and their drivers is a key prerequisite to assess the ambition and appropriateness of a proposed sectoral crediting baseline. A proposal for a sectoral crediting baseline should therefore be accompanied by historical data and information on the sector as well as documentation of assumptions, approaches and models used to arrive at the proposed baseline. For this purpose, a template and guidelines for proposing sectoral crediting baselines should be developed. For example, Höhne et al. (2007) have developed templates for proposing sectoral no-lose targets for different sectors. These templates require reporting background information on the country, on the historical and present situation of the sector, on policies, and on the projections in the sector.

In the following, key principles and choices for such guidelines are explored, with a focus on approaches to estimate BAU emissions and derive the sectoral crediting baseline.

4.5.1 Reporting of historical data

A thorough understanding of historical (emission) trends is important for deriving projections of future developments. Proposals for a SCM should therefore include time series of relevant historical data. This should include:

- data on the GHG emissions in the sector, including all underlying data that is used to estimate GHG emissions, such as fuel quantities, emission factors, models and approaches used to estimate GHG emissions, including any upstream or downstream emissions;
- data on the production of the sector, such as the types and quantities of products and services provided, and the GDP of the sector;
- data on the structure of the industry, such as data on the production capacity, age and technologies of the facilities in the sector;

- data on all key emission drivers in the sector, such as fuel prices, ambient weather conditions or factors that drive the demand of products and services in the sector.

The collection of such data is a key challenge for establishing a SCM. The data is only useful if a longer time series over several years is available. Höhne et al. (2007) propose, for example, that data should be reported from 1990 up to the most recent year. However, in some countries or sectors data over this period may not be available at the required level of detail. In some cases, data can be derived ex-post from related statistical data but in other cases sufficiently detailed statistics may not exist.

Thus, a key question is whether and how a SCM can be implemented if only limited data on the sector is available or if the data has considerable uncertainties. One option could be establishing minimum requirements regarding data as eligibility criteria to participate in a SCM. The collection of key data on the sector would then be a prerequisite for participation in the mechanism. In addition, the quality of the data could be reflected in the ambition of the sectoral crediting baseline. If the data has a high uncertainty the baseline could be conservatively adjusted downwards in order to address the uncertainty. Similarly, if rather accurate data is available, a less conservative crediting baseline could be chosen.

4.5.2 Use of consistent methodological approaches and data sources

In developing the crediting baseline and monitoring actual emissions the same methodological approaches and data sources should be used. This is important in order to ensure that only actual emission reductions are credited. The same approach is taken for GHG inventories of industrialised countries. Apart from a few exceptions, the same methodological approach and data sources are used to estimate GHG emissions in the base year and in the compliance period from 2008 to 2012.

Each data source is collected in a particular manner and has its own uncertainties. However, if the same data source is used for estimating historical emissions, deriving the crediting baseline and monitoring actual emissions, the uncertainty is reduced. A systematic error which results in an over- or under-estimation of emissions then results in a similar over- or under-estimation in both the crediting baseline and the actual emissions, and hence a lower error in the level of emission reductions. Similarly, each methodological approach to derive emission estimates has its own uncertainty. Using the same methodological approach for estimating historical emissions, deriving the crediting baseline and monitoring actual emissions reduces the uncertainty respectively.

A practical challenge could be the lack of sufficiently detailed historical data. In this case, a data collection phase could be established before the crediting baseline is finally determined. For example, detailed data could be collected for the years 2010 to 2012 and be used to derive the crediting baseline from 2013 onwards. This would allow using the same data sources and methodological approaches in the historical reference years and during the crediting period. As three years are usually not sufficient to

understand historical trends, the detailed 2010-2012 data would need to be accompanied by a longer time series of emissions data that is derived from less detailed data, using a different methodological approach.

4.5.3 Identification of emission drivers

The identification of key emission drivers can help in the development of a transparent and verifiable crediting baseline. Emission drivers are factors that are underpinning emission trends in a sector, such as fuel prices, technological developments, economic growth, ambient weather conditions, etc. An analysis of how these factors have influenced GHG emissions in the past helps in projecting future emissions. A projection of future GHG emissions could then be based on a projection of the emissions drivers.

This approach has also been referred to as “decomposition analysis”: A sectoral trend of GHG emissions is divided into its main emission drivers. Analysis of historical developments will help to understand what the key emission drivers are and how they affect GHG emissions. If the crediting baseline is then indexed to the development of the most important emission drivers, the uncertainty about their future development could partly be factored out. A decomposition analysis can thus also help to identify whether and in which way a baseline should be adjusted ex-post to previously defined emission drivers.

The development of some emission drivers, such as international oil prices, is extremely uncertain and thus difficult to project. It could therefore be rather difficult to reach an agreement between the proposing country and an international SCM supervising body on the future development of these factors, as there is no objective basis to value different projections. For example, many national or international institutions estimate the future development of international oil prices, with sometimes strongly diverging results. When deriving a sectoral crediting baseline, it would make sense to build the crediting baselines in different sectors and countries on the same international oil prices projection, as otherwise the crediting baselines would not be comparable and would not treat the countries or sectors in a similar manner. On the other hand, it could be difficult to agree internationally on a common set of data for international emission drivers. In the case of indexed baselines, the oil price projections used ex-ante to estimate the development of the baseline should for the ex-post calculation of the absolute emission baseline in any case be replaced by a predetermined oil price index.

4.5.4 Sensitivity analysis and assessment of uncertainty

A proposal for a SCM should also be accompanied by a sensitivity analysis and uncertainty assessment of the future GHG emissions development in the sector. The sensitivity analysis should include all key emission drivers and vary them by a plausible range. The uncertainty of future GHG emissions could be estimated with a Monte-Carlo-Simulation. Both the sensitivity analysis and uncertainty assessment can help assess the stringency of the sectoral crediting baseline. For example, if the agreed sectoral crediting baseline is lower than the lower bound of the uncertainty range of future

GHG emissions projections, there is a reasonable likelihood that the SCM achieves emission reductions beyond pure offsetting.

4.5.5 Principle of conservativeness

A key principle under the CDM is that baseline emissions should be estimated in a conservative manner. The modalities and procedures for the CDM require that "a baseline shall be established in a transparent and conservative manner regarding the choice of approaches, assumptions, methodologies, parameters, data sources, key factors and additionality, and taking into account uncertainty".[11] This has been further specified by the CDM Executive Board with general guidance and in baseline and monitoring methodologies. Some methodologies apply conservative adjustment factors to parameters with a high uncertainty. In most cases, the adjustment factors are based on the standard deviation, and are thus more stringent with increasing uncertainty. Some methodologies use already conservative default values or introduce conservativeness adjustments by other means.

The same principle could be applied for the estimation of sectoral BAU emissions and determining crediting baselines. In doing so, the uncertainty of the future GHG emissions development could be taken into account, similar as under the CDM. In sectors with a low uncertainty of the future emissions development, the uncertainty may not need to be addressed. In sectors with considerable uncertainty, the sectoral crediting baseline may be adjusted to a lower level in order to reduce the risk that BAU emission developments be credited. The same approach could be applied to the uncertainty with regard to the quality of the data. Where available sectoral data is rather uncertain, it could be interpreted in a conservative manner whereas no adjustments could be applied in those cases in which data with a high quality is available. An overly conservative adjustment, however, could lower the incentives for the host countries to participate in the mechanism, if the level of crediting would be reduced substantially.

4.5.6 Comparison with other countries

A comparison of emission trends among different countries could be a useful tool to understand future developments. Emission trends sometimes change in different phases of development. Historical data from countries that have already gone through a certain development phase might help to estimate the future development in a country that is about to undergo the same development phase. In some cases, other countries with rather similar circumstances may have better statistics or data which is not available in the country proposing the SCM. Using indicators from somehow comparable countries could help to project future emission developments where national data is not available.

[11] 3/CMP.1, Annex, Paragraph 45(b).

4.5.7 Technical review and assessment

The proposed sectoral crediting baseline and all information supporting the baseline should be assessed and reviewed by an independent international technical team under the guidance of an international regulatory body (see section 7.2). This independent review should include an assessment of the accuracy, transparency, conservativeness and appropriateness of the proposal. The procedures could be similar to existing international supervision mechanisms under the Kyoto Protocol and the Convention, such as the expert review teams for review of national communications and GHG inventories or the technical assessment of baseline and monitoring methodologies by the Methodological Panel under the CDM Executive Board.

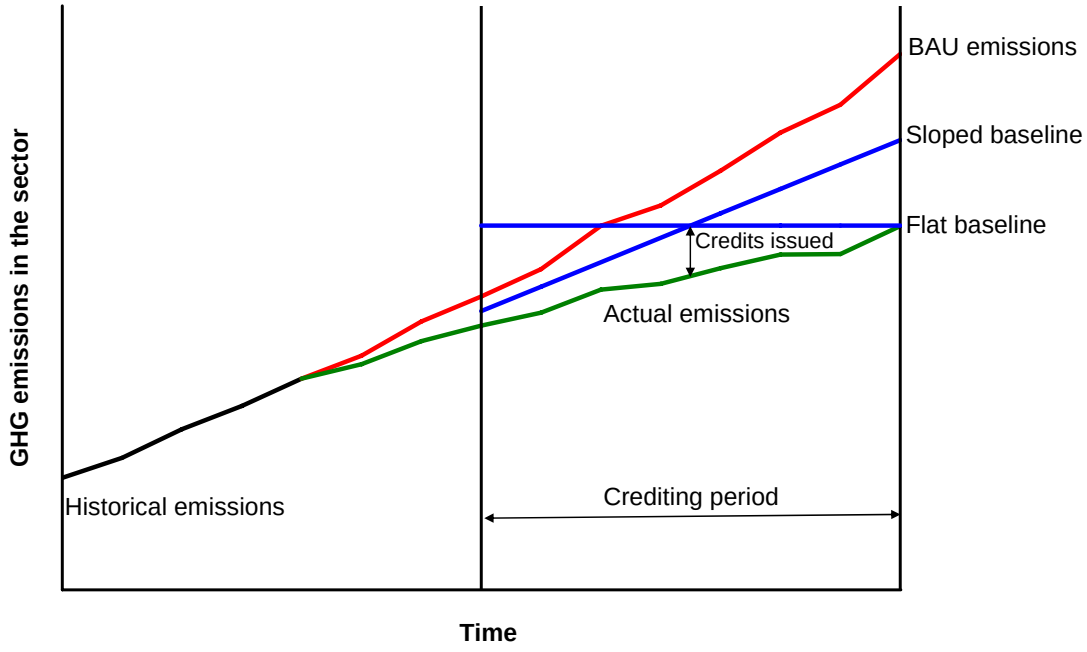
4.6 Flat versus sloped crediting baselines

A sectoral crediting baseline could be either established as a “flat” baseline or as a “sloped” baseline. In the case of a flat baseline, the same value for absolute emissions, emission rates or technology penetration is used as baseline in all years of the crediting period. In the case of a sloped baseline, the value used for absolute emissions, emission rates or technology penetration varies during the period for each year.

The difference between a flat and a sloped crediting baseline is illustrated in Figure 6 below for the case of an absolute emissions baseline. The flat and the sloped baseline are constructed in the figure in such a way that the overall amount of credits issued during the crediting period is equal for both baselines. This means that both baselines have the same ambition. The sloped baseline increases over time, following BAU emission trends in the sector. This ensures that the crediting is in all years largely proportional to the efforts undertaken to reduce GHG emissions. In the case of the flat baseline, the level of crediting decreases during the period. In sectors with growing emissions this can result in the situation that the baseline is above BAU emissions in the first years of the crediting period, as shown in Figure 6.

The question of whether flat baselines can be used is related to the question of whether compliance is assessed on an annual basis or for the entire crediting period. A flat crediting baseline can involve an environmental risk if compliance with the sectoral crediting baseline is assessed on an annual basis and not for the entire crediting period (see section 6 below) and if the host country does not manage to deviate significantly from its BAU emissions in later years of the crediting period. In this case, the issuance of credits would not be associated with actual emission reductions in the first years and the earlier over-issuance would not be compensated in subsequent years. Conversely, this risk is not relevant if the compliance with the sectoral crediting baseline is assessed for the entire crediting period. In this case, any increase of actual emissions above the crediting baseline at a later stage would need to be compensated by the host country by returning earlier issued credits or other credits from the market.

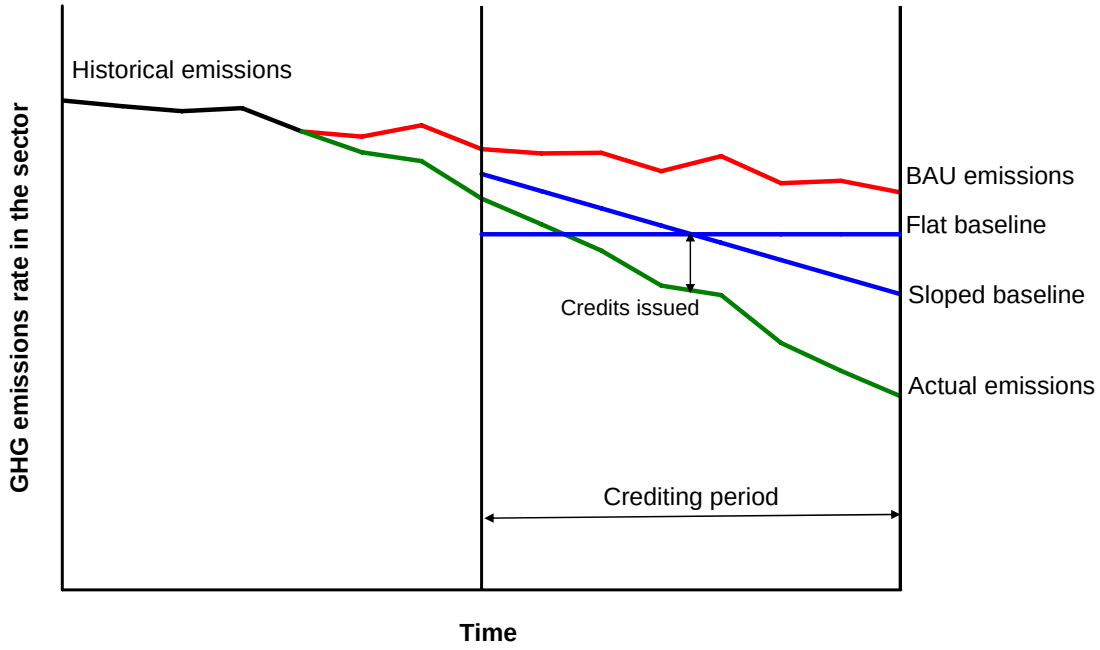
Figure 6: Flat and sloped sectoral crediting baselines with increasing emissions



An advantage of a flat baseline may be that the revenue stream from carbon credits is higher in the first years of the crediting period. This could facilitate the implementation of measures to reduce GHG emissions. In the last years of the crediting period, a flat baseline could also provide strong incentives for the host country to further reduce GHG emissions in order to continue to benefit from credits. On the other hand, a crediting baseline that is more proportional to the efforts made to reduce GHG emissions also has advantages. It reduces the risk of over-issuance and provides continued incentives over time to reduce GHG emissions.

Figure 7 below illustrates the difference between flat and sloped baselines for an indexed baseline and decreasing emission rate. The flat and the sloped baseline are again constructed in such a way that the overall amount of credits issued during the crediting period is equal for both baselines. The sloped baseline decreases over time, following the BAU emission rate in the sector. As in Figure 6 above, this ensures that the crediting is in all years largely proportional to the efforts undertaken to reduce GHG emissions. Different from Figure 6 above, the level of crediting increases over time with a flat crediting baseline. A flat crediting baseline can result in a situation where no credits are issued during the first phase of the crediting period, as the crediting baseline is still below the emissions in the sector. Limited crediting in the first years of the crediting period could exacerbate the achievement of emission reductions, as revenues from the carbon market are mainly realised towards the end of the crediting period.

Figure 7: Flat and annually varying sectoral crediting baselines with a decreasing emission rate



Generally, sloped baselines can better reflect sectoral trends and ensure that the crediting of emission reductions are in each year proportional to the emission reductions achieved. This applies in particular if the emissions or the emission rates are decreasing in the sector. In this case, sloped baselines can ensure that credits are already issued during the first years of the crediting period when they are particularly important to provide the necessary financial revenues for implementing measures to reduce GHG emissions. Flat baselines could be chosen for absolute emission baselines in sectors with still increasing emissions; however, credits should in this case only be issued at the end of the crediting period and not annually, in order to avoid that any over-issuance in the first years could not be compensated in later years.

4.7 Relation to developing and industrialised countries' actions under the Bali Action Plan

The Bali Action Plan requires that developing countries should take nationally appropriate mitigation actions in the context of sustainable development and that such actions should be "supported and enabled by technology, financing and capacity-building, in a measurable, reportable and verifiable manner".[12]

Implementing a SCM could be one way of implementing this objective of the Bali Action Plan. If sectoral crediting baselines are set below BAU emission levels the mechanism achieves a global GHG emission mitigation from action taken in developing countries.

[12] Bali Action Plan, decision 1/CP.13, paragraph 1 (b) (ii)

At the same time, this action is (partly) financed by industrialised countries through the purchase of credits.

An important question is whether additional technological, financial and capacity-building support, beyond the purchase of credits, should be provided to help the country achieving the sectoral crediting baseline. Providing such additional technical and financial support could have several advantages:

- Credits from the mechanism are only issued ex-post if actual emission reductions are achieved. This implies that the country would need to provide considerable upfront resources to mitigate emissions. It could be difficult for developing countries to make such upfront financing available.
- Proposing a SCM requires considerable technical knowledge and efforts for data collection. Developing a proposal for a SCM agreement could be facilitated considerably by capacity building.
- Additional financial support and technology cooperation could enable deeper emission cuts in the sector. This could also encourage the country to propose a more stringent sectoral crediting baseline, thereby providing additional global mitigation efforts. Conversely, without further support from developed countries, sectoral crediting baselines may be set at a less ambitious level.

In conclusion, it seems advisable that industrialised countries provide additional financial, technological and capacity-building support for planning and implementing SCMs.

5 Start and length of the crediting period

With regard to the length of crediting periods there is one fundamental trade-off which has to be dealt with: From an investor's perspective it is important to have a long planning horizon. This is particularly true for investments in installations in the industry or energy sectors which usually have an economic lifetime of at least 20 years and more (IEA 2007). Short crediting periods would create regulatory or political uncertainty (Buchner 2007; Sullivan, Blyth 2006) and thus increase the risks associated with an investment. Higher risk would limit the technical mitigation options to those which could be implemented and refinanced in shorter crediting periods. This could also increase the aggregated mitigation costs because some of the long-term investment might be economically more efficient than those which can be refinanced in shorter crediting periods.

On the other hand, regulators often prefer shorter periods, specifically at the beginning of the implementation of a new instrument when experiences with the new mechanism are not yet available. Despite thorough impact analysis when designing the mechanism, the effects of the new mechanism might be different than expected and the instrument might even completely miss its objectives. This could harm the credibility of the new mechanism and fundamentally undermine the effectiveness of a future climate treaty. Similarly, there is a risk that crediting baselines are over-estimated when the mechanism is introduced for the first time. To reduce the implications, it is important that the regulatory body and the COP/MOP have an opportunity to adapt the new mechanism on the basis of the experiences made in the early stage. This requires shorter crediting periods or at least predetermined opportunities to adapt the mechanism, if necessary, in order to allow for some institutional learning. Moreover, shorter crediting periods may also be preferred in order to facilitate an early graduation to other mechanisms, such as, for example, emissions trading based on binding sectoral or national targets.

One option to balance these conflicting interests could be that crediting periods would be shorter at the beginning but could be extended after experiences with the new instrument have been gained.

Basically there are two concepts for defining the length of the crediting period: the crediting period could either last a certain number of years conceivably with a renewal or update option like under the current CDM or the duration of the crediting period could be directly linked to the duration of commitment periods. Both options have advantages and disadvantages:

- **Harmonised with commitment periods**: the charm of this option is that it would avoid or at least limit the necessity of transitional periods when a country moves to a different mechanism, such as a sectoral or national target, in a subsequent commitment period. A new mechanism or a target would usually start to apply at the beginning of a new commitment period. If this coincides with the end of a crediting period, no specific transitional arrangements would have to be developed. However, in some cases, such an approach could also result in a

cyclical investment and carbon market. If the private sector directly receives the incentives from the carbon market, there may be a tendency to make investments at the beginning of a crediting period in order to earn the total marginal return available in the respective crediting period. Investments commissioned at a later stage of a crediting period would earn only a share of the available gross margin and would face a risk of less attractive refinancing conditions in the subsequent period. Therefore investors could tend to postpone their investment to the beginning of the next crediting period.

- **Certain number of years**: Cyclical behaviour could be avoided if crediting periods always last a certain number of years independently whether the SCM agreements were established at the beginning or sometime during an ongoing commitment period. Investors would also have the incentive to commission their investments at the beginning of a commitment period. However, if not all agreements on implementing a SCM would start at the same time, these incentives would be spread over the entire commitment period and not be concentrated at the beginning. A disadvantage of this approach is, however, that it might require a number of transitional arrangements when countries move to different mechanisms or to targets. Another disadvantage is that the submission of proposals for implementing a SCM may be delayed if they can be submitted at any time.

The avoidance of complex transitional arrangements seems to be more important since the transition towards a more integrated global carbon market with targets is not a vision for the distant future but rather a process which needs to be started soon.

Another important question is, whether SCM agreements can be renewed or not. If renewal of SCM agreements would be enabled, the crediting baselines should be reviewed and adapted before the crediting period for a sectoral agreement is renewed. Recent technological, organisational or institutional developments should then be taken into account in order to avoid that the credibility of the mechanism is undermined through inflated baselines. However, a renewal option could rather impede the transition towards sectoral or national targets if countries prefer to continue their SCM agreements instead of accepting more integrated mitigation approaches. Moreover, the existence of a renewal option could rather constitute an entitlement for renewal of the agreements. In practice this could result in only weak and lukewarm adjustment of the crediting baselines. An option to avoid such outcome would be to disallow renewal of SCM agreements. Countries who nevertheless wish to continue a SCM agreement for a second commitment period would than have to include all required in-depth analysis and background documents in a new application.

6 Monitoring, issuance and accounting

To determine the emission reductions achieved in the sector, data on the sector has to be collected during the crediting period. This includes all data that is necessary to determine the GHG emissions from the installations covered in the sector definition as well as data to estimate any leakage or up- and downstream emissions. In the case of indexed baselines, it also includes data for the ex-post determination of the baseline, such as, for example, data on production quantities in the sector.

The collection of all necessary data should be documented in monitoring reports. The monitoring reports should be the basis for the issuance of credits. As under the CDM and for GHG inventories, it is recommended that monitoring reports be reviewed by an independent institution for verification purposes. After resolution of any questions, the international body supervising the mechanism could issue the credits into a registry.

Monitoring plans

As under the CDM, a monitoring plan should be developed ex-ante and submitted along with the proposal for a SCM. The monitoring plan should specify the institutional arrangements made for data collections, the type of data that will be collected, the procedures for data collection, the measurement methods and quality assurance and quality control measures applied, and the equations needed to calculate emissions and indexes used in the case of indexed baselines. In developing the monitoring plan it is important to ensure consistency in the methodological approaches used to determine the sectoral crediting baseline and to monitor emissions of the sector, in order to reduce any bias associated with the use of different methodological approaches to estimate emissions.

Reporting and issuance intervals

It is recommended that reporting of all data and issuance of credits occurs on an annual basis, using calendar years. Most national and international statistics provide annual data for calendar years. Shorter or longer monitoring periods would exacerbate any cross-checks of reported data with national and international statistics. Longer monitoring periods would also delay the issuance of credits to the host country and could reduce the incentives from the mechanism.

Compliance assessment

An important question is whether the compliance with the sectoral crediting baseline should be assessed on an annual basis or for the entire crediting period. An assessment on an annual basis means that credits are issued for those years in which actual emissions are below the crediting baseline and no compensation is required for any years in which the actual emissions are above the baseline. An assessment for the entire crediting period would imply that credits are only issued for the net difference between actual monitored emissions and the crediting baseline as observed in sum over the entire crediting period. This means that either the issuance of credits occurs only after the end of the crediting period or that credits are issued annually but the host country would need to compensate for increases of actual emissions above the credit-

ing baseline in later years if credits were already issued in earlier years. For example, if 100 credits have been issued in the first three years but actual emissions are 10 units above the crediting baseline in the fourth year the host country would need to return 10 of the earlier issued credits to the registry or compensate the emissions increase above the baseline with other units in the carbon market.

Another option could be that any increase of emissions above the crediting baseline does not need to be compensated immediately but is subtracted from the amount issued in the subsequent year(s). In this case, the debt of 10 units from the fourth year would be subtracted from any issuance in the fifth year. This way of compensation works only if the host country manages to reduce emissions below the crediting baseline in subsequent years. This option has been implemented under the CDM.

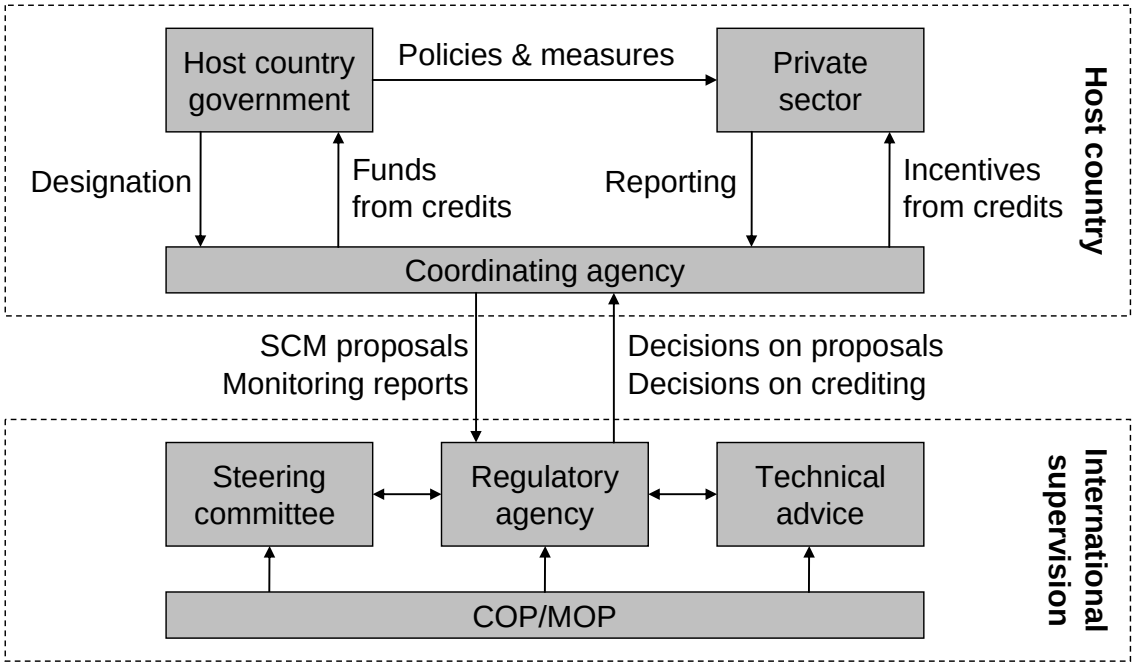
The three options have all advantages and disadvantages. An assessment of compliance for the entire crediting period provides certainty that credits are only issued for the net emission reduction that occurred over the entire crediting period. This reduces the risk that credits are issued that are not associated with efforts to reduce GHG emissions but result only from natural annual variations in the emissions level. For example, varying climatic conditions may result in varying annual emissions in a sector. With an annual compliance assessment, credits may be issued only in years with favourable climatic conditions, while no compensation would be necessary for years with unfavourable climatic conditions. In an extreme case, there could be no emission reductions on average for the entire crediting period, but still credits would be issued in single years where climatic conditions lowered GHG emissions below the average. On the other hand, the possibility that earlier issued credits have to be returned to the registry bears a considerable risk for the host country. It could also make it more difficult to sell credits and ensure sufficient funding to implement the measures to reduce GHG emissions in the sector. A system where credits may have to be returned appears complex and not very attractive for host countries.

Therefore, the subtraction of any previous over-issuance from the amount to be issued in subsequent years may be a reasonable intermediate approach. It avoids the risk for the host country that credits have to be returned to the registry. And it provides for a compensation mechanism if emissions exceed the baseline in some years of the crediting period. However, it does not provide a guarantee that over-issuance in the past is actually compensated, as the emissions could also in subsequent years remain above the baseline.

7 Governance arrangements

The introduction of a SCM requires strong governance arrangements within the host country and at international level. Within the host country, several entities may be involved in proposing and implementing the SCM. At the international level, the mechanism needs to be supervised and regulated. Procedures for the approval of proposals, for the monitoring of implementation and for the issuance of credits have to be developed (Baron and Ellis 2006). Figure 8 illustrates an example for institutional arrangements within the host country and at the international level.

Figure 8: Example for institutional arrangements for the implementation of a sectoral crediting mechanism



7.1 Arrangements within the host country

7.1.1 A national coordinating agency

The host country is responsible for proposing, implementing and monitoring the SCM. For this purpose, several different institutions and stakeholders need to be involved. It seems advisable that one entity takes the responsibility of co-ordinating all activities, including the development of a proposal for a SCM, the collection of relevant data, the monitoring of emission reductions and the co-ordination of all measures with the government, the private sector and other stakeholders. The coordinating agency could also be the formal contact point at the international level.

An assignment of a coordinating agency is thus a first key step to make a SCM operational. The late assignment of Designated National Authorities (DNAs) under the CDM has caused a considerable delay in the implementation of the CDM in some countries.

A timely start of work of a coordinating agency is thus important, in particular because the collection of relevant data and development of a proposal for a SCM will consume considerable time. In order to ensure a timely implementation of a SCM, an international climate agreement could request developing countries to propose sectors for a SCM and assign coordinating agencies by a particular date.

The coordinating agency could be a public authority, a private sector organization or a research organization. In all cases, it is advisable that a steering committee supervises the work of the coordinating agency. The steering committee could include government representatives and important stakeholders from non-governmental organizations (NGOs), such as industry representatives from the sector and environmental NGOs. A key challenge is that the coordinating agency should preferably have knowledge in different fields, including technical and policy knowledge on the sector involved but also knowledge on national policies and regulation, data collection, the estimation of GHG emissions and international climate policy.

To facilitate the effective and timely planning and implementation of a SCM, it is important that the agency has sufficient financial resources. A lack of resources to coordinate and implement a SCM could result in considerable delays. National budgets in developing countries are often tight and it may be difficult to make considerable resources available on a short notice. The national coordination of a SCM could therefore be supported internationally, either through bilateral or multilateral official development aid (ODA) or through a dedicated fund that becomes part of an international climate agreement. Countries proposing a SCM by a certain date could then benefit from access to international funds for developing proposals for a SCM.

7.1.2 Development of a proposal for a SCM

A first key task of the coordinating agency is the development of a proposal for a SCM. This may include various activities, such as the collection of sector specific data, the identification of the mitigation potential and costs in the sector, the development and planning of policies, measures and mechanisms to provide incentives for the sector to reduce emissions, and an evaluation of the potential emission reductions from these instruments. This will require technical studies and a process which ensures active participation of various stakeholders, e.g. through a series of workshops.

Based on this work, a template for proposing the SCM needs to be filled in. The host country government needs to approve the participation and the proposal. The proposal could then be submitted to the international regulatory body for review and approval (see section 7.2.2).

7.1.3 Incentives for the private sector

A SCM will only be successful if the private sector has strong incentives to reduce emissions. A key question is how the SCM can create such incentives. Most authors proposing a SCM do not provide a clear picture about how the private sector will participate in the mechanism.

Incentives for the private sector could in principle be created in two ways (see, for example Ward et al. 2008):

- **Policies and measures.** The host country adopts policies and measures that provide incentives to the private sector to reduce emissions. The host country receives the credits from the achieved emission reductions and may use the credits to support the sector in reducing the emissions.
- **Direct distribution of credits to entities in the sector.** The host country forwards credits from the mechanism directly to private entities in the sector which can sell the credits on the carbon market.

Both options can be implemented in different various ways. The adoption of policies and measures has a number of advantages over the direct distribution of credits. Firstly, the most suitable policy instruments can be used to encourage emission reductions. In some sectors, a regulation (e.g. banning the use of an outdated technology) has low transaction costs and results in considerable (cost-effective) emission reductions. For example, end-user energy efficiency can be improved considerably by banning outdated technologies (e.g. incandescent light bulbs) or introducing efficiency regulations (e.g. for refrigerators). A direct distribution of credits to many different entities or even households would not work well in practice. In other sectors, subsidies for low carbon technologies could be introduced and re-financed through credits from the mechanism. For example, a feed-in tariff for renewable energy could (partly) be financed through a SCM. The first approach also allows combining different policies and measures in the same sector. For example, policies to promote energy efficiency could be combined with policies to promote renewable energy.

A direct distribution of credits to entities in the sector has several disadvantages. The most important disadvantage is that an individual entity would not have certainty whether credits will actually be issued since the issuance of credits does not only depend on its own performance but on the average performance of all covered entities. For example, if only half of the companies have reduced their emissions below the crediting baseline whereas the remainder may be above the crediting baseline, the average emissions of all entities could easily be at or even above the crediting baseline. This would imply that no credits are issued to the sector as a whole. Those companies who have reduced their emissions below the crediting baseline would not be able to benefit from the mechanism. An entity in the sector would thus only benefit from credits if the sector as a whole meets the crediting baseline.[13]

A second disadvantage is that the credits are only issued ex-post. The private entities would therefore need to rely on uncertain future revenues when investing in GHG

[13] A carbon market mechanism that credits individual entities against a sectoral baseline can be rather considered as a project based mechanism with a sectoral fixed emissions baseline. This approach has already been introduced in the CDM where some baseline and monitoring methodologies use a sectoral benchmark as baseline. Nevertheless, such a project based mechanism is sometimes also referred to as sectoral mechanism (FCCC/KP/AWG/2008/ INF.3, I.E).

emission reductions. In contrast, policies and measures can, if implemented and enforced, provide a more certain framework for investments.

An interesting option to directly involve entities in the sector in the carbon market could be the combination of a national GHG emissions trading scheme with an international agreement on a SCM. The host country government could implement a national GHG emissions trading scheme where the overall cap of the scheme is set at the level of crediting baseline of the SCM. This would ensure that the crediting baseline is exactly met. The host country could then allow entities in the sector to exchange national emission allowances against credits from the SCM. The exchanged national emission allowances would need to be surrendered in a national cancellation account and could hence not be used anymore on the national market. This would ensure that each exchanged allowance results in an emission reduction below the crediting baseline. Entities would have an incentive to exchange domestic allowances against SCM credits as long as the price of credits is higher than the price of allowances. Such a mechanism would interlink the national GHG emissions trading schemes with the global carbon market. While this approach seems promising, it has also some challenges because under the SCM credits are issued only ex-post. This problem could be solved in at least two ways: private entities could on the one hand provide futures on those allowances at a reduced price which would later be exchanged with the real SCM credits once they are issued. On the other hand, host country governments could borrow internationally recognised units which are to be exchanged against domestic allowances on the global carbon market and later settle their emission debts by providing a corresponding amount of SCM credits. However, both options would require the internalisation of carbon prices risks and thus result in a lower carbon price on the domestic than on the global carbon market.

Countries which intend to establish a domestic cap-and-trade system might therefore consider accepting an internationally binding sectoral target that corresponds to their domestic cap. This would allow the ex-ante allocation of internationally recognised allowances to entities in the private sector which could then sell these allowances directly on the international carbon market. A domestic cap-and-trade system could thus be implemented under both a SCM and a binding sectoral target but could be simpler to implement under a binding sectoral target. However, this would be a substantially different instrument which is not further discussed in this report.

Another challenge is to ensure consistency between the data reported by the entities participating in the national ETS and sectoral data reported internationally for issuing credits under the SCM.

The introduction and enforcement of policies and measures to reduce GHG emissions requires strong governance capacities in the host country. Thus, a sectoral crediting mechanism may not work in countries where policies are regularly not enforced or implemented. In these cases, it may be more promising to ensure a direct participation of the private sector in the international carbon market. However, in this case, a project based mechanism, such as the CDM seems more suitable than a SCM, for the reasons outlined above.

7.1.4 Monitoring

Finally, the coordinating agency needs to monitor the achieved emission reductions. Monitoring reports can then be submitted to the regulatory body. Following a technical review of the monitoring report, credits can be issued.

7.2 International supervision

7.2.1 Assigning a regulatory body

The host country and the global community have different interests in a SCM. Host countries have the incentive to set the crediting baseline as high as possible, in order to generate more credits and associated revenue (Baron and Ellis 2006). The global community has an interest that the crediting baseline is not inflated and set in an ambitious manner in order to ensure the environmental integrity of the mechanism and to achieve a net benefit to the atmosphere.

Thus, international institutions need to supervise and regulate a SCM, as it is the case for the CDM, for JI under its second track, and for domestic offsetting schemes. The implementation of a SCM in a country and the issuance of credits should be subject to the approval of an international authority.

The international supervision of the SCM can occur at different levels. The ultimate supervision of the mechanism should be with the COP/MOP, as it is the case for other flexible mechanisms under the Kyoto Protocol. The COP/MOP could periodically review the rules governing the mechanism and could provide further policy guidance on its implementation. The technical assessment of proposals for implementing a SCM or for issuing credits should be delegated to a *regulatory body* which draws upon the necessary technical expertise.

There are multiple options regarding which institution should be assigned as the regulatory body and how it should operate. Several lessons learnt from the governance arrangements under the CDM should be considered in establishing a new mechanism:

- **Sufficient financial resources.** The regulatory body needs to be equipped from the very beginning with sufficient financial resources. In the first years of the CDM, the financial support to the CDM Executive Board was very limited, with voluntary financial pledges by Annex I countries being the main source of funding. Only after registration of many CDM projects and making operational the administrative share of proceeds on the issuance of CERs the Board became self-financing.
- **Relevant experience.** The regulatory body should preferably be an existing institution that has the necessary experience and knowledge to regulate a global market mechanism. Building up a new institution and building the necessary capacity would most likely take more time and hence delay the implementation of the mechanism in host countries. The institution should have regulatory experience, economic and technical knowledge to assess proposals by host countries, legal ex-

pertise and should be aware of the positions of the different Parties to the UNFCCC and act accordingly in politically balanced manner.

- **Institutional structure.** The technical assessment and/or review of proposals for implementing the SCM and of requests for issuing credits should mainly be undertaken by professional full time staff. This is particularly important to ensure consistency in the technical assessment. External technical experts may assist the regulatory body but the main work should be undertaken by permanent staff. Key policy decisions should be taken by a political steering committee and/or the COP/MOP. However, technical work and assessments should be delegated to full-time technical staff. In selecting the steering committee, it is important that members have the necessary qualifications and background and the necessary resources to dedicate time to their commitment. This may need to be considered in the procedure for electing members of the steering committee.
- **Immunity.** Members of the steering committee and the permanent staff of the regulatory body should have the necessary immunity.

7.2.2 Procedures for consideration of proposals for a SCM and issuance of credits

A SCM will only be credible and accepted if it is transparent and fair. For this purpose, transparent procedures and a due process for consideration of proposals for a SCM are important. The following elements should be considered in developing procedures for the consideration of proposals for a SCM:

- Proposals for a SCM should be submitted in a structured form, using a template and guidelines that should be developed by the regulatory body. Proposals should be supported by relevant data, studies, etc. Proposals and accompanying material should be made publicly available.
- A thorough technical assessment of the proposal should be foreseen, ensuring that sufficient resources and technical knowledge are available and that the technical team assessing a proposal is independent and has no conflict of interest. The results of the assessment should be made publicly available.
- Public stakeholders should have sufficient opportunities to participate in the process. This should at least include the possibility to submit written comments and to observe meetings of the supervisory committee.
- A due process must be ensured, with clear timelines, the possibility of written questions and answers and possibility for an appeals procedure for the case that due process was not ensured. The final decision by the regulatory body should be substantiated and justified.

8 Suitability of sectors for a SCM

In assessing whether a SCM is a suitable approach for a sector, a first key question is which alternative policy instruments could be used to reduce GHG emissions in this sector. The following alternative approaches are discussed in international climate negotiations:

- A **project-based CDM**, possibly reformed to a mechanism beyond offsetting by discounting emission reductions or using ambitious benchmarks below BAU emission levels (see Chung 2007; Schatz 2008; Schneider 2009);
- A **programmatic CDM**, where several activities are bundled under a programme, as established by COP/MOP-1 (possibly also reformed to a mechanism beyond offsetting);
- **Sectoral binding targets**, possibly combined with **company-based emissions trading**;
- **Policies and measures** by the host country, outside the carbon market, but possibly financially and technically supported by industrialised countries.

In assessing these alternatives, a number of different – partially conflicting – criteria should be taken into account (Bradley et al. 2007):

- **Carbon leakage:** Some sectors with relatively high GHG emissions compared to the value of their product, such as iron and steel or aluminium, are exposed to international competition. The introduction of cap-and-trade systems covering theses sectors in *some* countries would result in carbon leakage if the production is directly or indirectly shifted from covered installations towards installations in countries without any GHG regulation. Whether a SCM would alleviate or aggravate such carbon leakage depends on its design. Carbon leakage from countries with a cap-and-trade system to countries with a SCM would be reduced or eliminated if the SCM is implemented through a regulation or a tax which imposes additional costs on the companies in these sectors. However, a SCM could also increase such carbon leakage if the affected companies receive credits for their mitigation efforts and if the value of these credits is larger than their mitigation costs. Under such circumstances, the SCM would reduce the costs of production in the country hosting the SCM. As a result, the incentive for carbon leakage from countries with a cap-and-trade system to countries with a SCM would increase. Sectoral targets implemented as a company-based cap-and-trade system which is fully linked to the global carbon market would much better address such carbon leakage, since it would induce the same mitigation incentive to all covered installations. Sectoral targets with a company-based cap-and-trade system are therefore much better suited to address carbon leakage than the SCM.

  Carbon leakage could also occur from countries implementing a SCM to countries without a SCM or cap-and-trade system. Such carbon leakage could be increased if the companies in the sector face additional costs and/or if the CDM

continues in the same sector in other countries. Again, such leakage can only be avoided if all countries with exposed industry have in place similar instruments with a similar level of ambition.

- **Effectiveness of carbon market instruments:** The effectiveness of different carbon market instruments (CDM, SCM, sectoral targets) in activating the mitigation potential differs between sectors. In the case of the CDM and sectoral targets with company based emissions trading, the private sector receives incentives to reduce GHG emissions directly through the carbon price signal. Under a SCM, incentives to reduce emission can also be achieved indirectly through the adoption of policies and measures by the host country (see section 7.1.3). This makes a SCM interesting in sectors where a carbon price signal does not effectively activate the mitigation potential. The building and the transport sector, for example, has many dispersed emission sources and many dispersed investors and users. The introduction of an upstream emissions trading scheme would increase the price of fuels and electricity. However, in the building sector, higher fuel and electricity prices may not necessarily trigger the huge mitigation potential, due to barriers, such as the investor-user-dilemma. Moreover, the CDM may not be effective due to considerable transaction costs. In this sector, emission reductions may be achieved more efficiently through the introduction and enforcement of ambitious building codes. Similar considerations apply to the power or the transport sector where significant demand-side emission reduction potentials could be activated, for example through a more efficient design of appliances or policies which trigger a modal-shift towards more climate friendly transport modes. A SCM indirectly allows rewarding governments for adopting and enforcing policies which is not an eligible activity under the CDM. A SCM could therefore be an interesting option for sectors in which the adoption and enforcement of policies and measures – and not just a direct carbon price signal – is the most effective instrument to reduce emissions. The CDM or company-based emissions trading could on the other hand be a more effective instrument for those sectors in which the carbon price signal alone activates the full mitigation potential.
- **Technological development:** In developing countries, some sectors are technologically relatively advanced whereas other are still less advanced. For example, in the cement sector the average emissions rate of cement production in Brazil, China and India is either below the world average or only slightly above. In these sectors, sectoral targets with company-based emissions trading could be more acceptable for those countries. If the same benchmarks would be applied globally for companies in the sector for allocating emission allowances, the industry in these countries would not have a disadvantage over the industry in industrialised countries - or may even have competitive advantage if it has a lower GHG emissions rate. Sectoral targets with company-based emissions trading could thus be a promising approach in such sectors.

- **Monitoring of GHG emissions and establishing baselines:** In some sectors, it is very difficult to monitor GHG emissions or to establish credible project-based baselines or sectoral crediting baselines. This applies to sectors with complex industrial facilities that produce many co-products, such as refineries. Several efforts to develop baseline and monitoring methodologies for these sectors have failed. Similarly, a sectoral crediting baseline would be very difficult to establish. Potentially, the inclusion of such sectors in a larger company-based emissions trading scheme could be easier, in particular if allowances are auctioned. In other sectors, a crediting baseline is very difficult to establish at the project level but could be established more easily at the sectoral level. This may, for example, apply to the transport sector where it is very difficult to factor out the effect of single projects from general developments in the sector, but where sectoral trends may be more predictable. Finally, in some sectors, such as reducing emissions from deforestation and degradation (REDD), uncertainties in quantifying emission reductions are very high. Therefore, these sectors should be excluded from the carbon market. GHG mitigation incentives could rather be achieved through instruments outside the carbon market such as policies, regulations or subsidies.
- **Share in global emissions:** Some authors propose that sectors with a large share in global emissions should be included in sectoral approaches (Bradely et al. 2007). Indeed, it generally makes sense to prioritise GHG reduction efforts on sectors and countries with particularly large GHG emissions. However, even in sectors with large reduction potentials it might not be feasible to establish a sectoral approach for one of the above mentioned difficulties. A sector's share in global emissions should therefore not be a criterion to select a particular instrument but rather a criterion for focusing GHG reduction efforts in general – independently of the type of instrument.

Besides these criteria for assessing the suitability of a SCM for different sectors, it is important to bear in mind that a SCM requires a very active and strong role of the host country government in organising and implementing the SCM. The instrument may therefore not be well suited in countries with limited regulation capacities. Based on these considerations, Table 2 provides an initial assessment of the most suitable instrument for selected sectors, highlighting the key rationales for the choice.

According to this rough assessment, the SCM seems to be specifically suited for sectors which cover a large number of emission sources, such as for some demand-side measures, as long as emissions can be monitored with reasonable certainty and data on historical trends is available. Industrial sectors with large point sources and/or with a high potential for carbon leakage seem to be more suited for sectoral targets. However, countries which are not yet prepared to take binding sectoral targets might investigate whether the SCM could be applied in some of these sectors as well.

Table 2: Policy instruments for different sectors

Sector	Preferred instruments	Rationale
Power generation	SCM, ST	Point sources, sector with high priority for many developing countries
Iron & steel	ST	Carbon leakage, point sources
Cement	ST	Point sources, advanced sector in many developing countries
HFC-23, N_2O from nitric or adipic acid production	ST, CDM	Carbon leakage, point sources, few installations
Electricity consumption	SCM, PAMs	Policies and measures key for demand side measures, project based approach not efficient
Buildings	SCM, PAMs	Policies and measures key to reduce emissions, project-based approach not efficient
Road transportation	SCM, PAMs	Policies and measures key to reduce emissions, project-based approach not efficient and methodologically difficult, dispersed emission sources
Waste	CDM	Point sources, carbon price signal important (CH_4)
LULUCF, Agriculture	PAMs	Methodological difficulties in establishing baselines and monitoring GHGs, policies and measures are key to reduce emissions, project-based approach not efficient

SCM = Sectoral crediting mechanism, ST = sectoral targets potentially with company-based emissions trading, PAMs = policies and measures outside the carbon market

A more profound assessment of the suitability of sectors is beyond the scope of this study. Besides, it will be difficult to determine the most suitable instrument for each sector since this might differentiate between countries: One country might, for example, prefer the SCM to address GHG emissions from electricity generation, while another country might favour sectoral targets or project-based approaches. The appropriateness of the available instruments for individual sectors might, however, emerge during the learning by doing phase in which developing countries provide proposals for implementing a SCM which are then scrutinised and assessed by the regulatory body (section 7.2.1). This analysis will later reveal which instruments are most suited for which sectors and could provide useful insights for countries which are still in the process of developing proposals for implementing a SCM.

9 Linkage to the CDM and transitional issues

The introduction of a SCM in a post-2012 climate regime would complement the three existing flexible mechanisms: the CDM, Joint Implementation (JI) and international emissions trading (Articles 6, 12 and 17 of the Kyoto Protocol). A SCM can have considerable overlap with the CDM. To avoid double counting of emission reductions, the linkage to the current CDM and the transition from the CDM to a sectoral crediting mechanism needs to be addressed carefully. This includes in particular the treatment of previously (or newly) registered CDM projects in the same sector and the interplay between a SCM and CDM projects in other sectors. In particular, the following questions need to be addressed:

- whether CDM projects can co-exist in the same sector where a SCM is implemented and, if not, for how long previously registered CDM projects should continue to be credited after introduction of a SCM;
- how CDM projects in other sectors could affect a SCM and, vice versa, how a SCM could affect CDM projects in other sectors;

These issues are explored in the following.

9.1 New CDM projects in the same sector

A sectoral crediting mechanism is generally viewed as an alternative mechanism to the CDM. For this reason it is suggested in the literature that no new CDM projects can be registered in sectors that are subject to a sectoral crediting mechanism (Baron and Ellis 2006, Höhne et al. 2007). Indeed, a co-existence of new CDM projects and a SCM would make the mechanism very complicated. In order to avoid double counting of emission reductions, a reserve of the credits accruing from the SCM would need to be set aside for new CDM projects. However, as the SCM is a crediting mechanism where credits are only issued ex-post after verification of emission reductions, it is uncertain how many credits will be generated. A credit reserve for new CDM projects could thus only be established ex-post and no ex-ante guarantee for crediting could be provided. The generation of credits would thus be very uncertain.

A way of continuing a project-based mechanism in the same sector could be a green investment scheme (GIS) where credits generated from a SCM are used to motivate further emission reductions beyond the crediting baseline through a nationally established project-based mechanism. In this case, the host country would forward (a part of) the credits from the SCM to the private sector for implementing projects that further reduce the emissions in the sector. If these projects are additional, i.e. if they would not be implemented anyhow, the host country would benefit from additional emission reductions in the sector and would accordingly receive additional credits through the SCM.

9.2 Previously registered projects in the same sector

A key question is whether previously registered projects in the same sector should continue to be credited and, if yes, for how long they should be credited and how the credits should be issued. Höhne et al. (2007) suggest that previously registered projects in the same sector should continue to be credited. The emission reductions from existing CDM projects should be reflected in the sectoral baseline. The sectoral crediting baseline would then be chosen at a level that is below the emissions in the sector with the existing projects. Under this setting, CERs from existing projects in the same sector could continue to be issued by the CDM Executive Board. Double counting of emission reductions is then avoided as long as the sectoral crediting baseline is below the emissions level with CDM projects. If the sectoral crediting baseline would be set a higher level than the emissions level with CDM projects, the emission reductions would be double counted, as credits from CDM projects and the SCM would be issued for the same emission reductions.

In considering for how long existing CDM projects should continue to be credited, several aspects need to be considered:

- **Certainty for investors.** Public or private entities investing in CDM projects have expectations on the CER delivery of their investments. Most investors use models that assess the likelihood to which a CDM project actually delivers CERs, depending on the various risks (country, sector, project type, specific project features, policy issues, etc). Currently, post-2012 CERs have no market value or a significantly lower market value compared to pre-2012 CERs, meaning that the market believes that it is yet uncertain whether post-2012 CERs will exist and have a significant value. This means that CDM investments are mainly made on the basis of the credit revenues up to 2012 (or they are made anyhow and the CERs are a nice subsidy on top). Nevertheless, providing investor certainty for the market beyond 2012 is important, as otherwise the development of projects may increasingly become unattractive towards the end of the first crediting period. This bears also the risk that mainly non-additional projects are developed for which the actual value of post-2012 CERs does not play a role.
- **Incentives to move to a SCM.** The rules governing the continued crediting of existing CDM projects should not discourage countries to make use of a SCM but should provide incentives to move to a SCM.
- **Possibility to adjust the climate regime in the future to meet the necessary global GHG mitigation.** Rules governing the CDM need to be periodically reviewed in the light of the development of the market and the need for global GHG mitigation. The continued crediting of a large number of CDM projects for all three crediting periods could make it more difficult to achieve the necessary global mitigation level, given that the CDM is a pure offsetting mechanism and that a significant number of projects are likely not to be additional.
- **Carbon leakage.** If the same project types in a sector have different eligibility to crediting, this can result in carbon leakage within the sector. Production may be

shifted from plants without crediting to plants with crediting. This results in additional issuance of CERs that do not correspond to additional mitigation (if both plants apply the same mitigation).

These objectives are partly conflicting. For example, the objective of investor certainty conflicts with the objective to enable adjustments to the climate regime. Long-term investor certainty would require that rules are fixed for 20 years or more. However, this would make adjustments to the current architecture very difficult if not impossible and could exacerbate the achievement of the necessary global mitigation level. Hence, a balance needs to be struck between these different objectives in the light of the needs for global GHG mitigation.

There are several generic options at which point in time any changes in the rules to crediting should apply to already registered CDM projects. In identifying different options for how long existing CDM projects should continue to be credited under a SCM, the following time points could be reasonable triggers or dates for rules on how long crediting should continue:

- **The renewal of the crediting period.** Projects participants can either choose a single crediting period of 10 years or a renewable crediting period of 7 years which can be renewed twice (up to 21 years of crediting). For afforestation and reforestation crediting projects, the single crediting period is 30 years and the renewable crediting period is 20 years. The single crediting period provides more certainty, whereas the renewable crediting period has the chance of longer crediting but the risk that the crediting period is not renewed or that the level of crediting changes. The CDM Executive Board decided that at the renewal of the crediting period, projects have to use the latest version of a methodology. In some cases, this can imply considerable changes in the level of CERs from the project. Thus, uncertainty towards the level of crediting for subsequent crediting periods is already an accepted rule. In addition, a crediting period may under certain circumstances not be renewed, for example, if the update of the baseline scenario shows that the project is the most plausible baseline for the second crediting period. Hence, the renewal of the crediting period is not granted. If the renewal of the crediting period would be granted, all project participants would request crediting for 7 years. In practice, about half of the projects choose a single crediting period of 10 years and half of the projects choose a renewable crediting period of 7 years.
- **Commitment period.** Another important point in time is the end of the commitment period on 31 December 2012. It is obvious that the rules for subsequent commitment periods may be different from the current rules.
- **Start of crediting under the SCM.** Crediting of CDM projects could stop when crediting under the new SCM starts.
- **Date of agreement on a new climate regime.** Finally, from the perspective of investor certainty, the date when a new agreement is reached is important. Once the agreement is reached, the market can estimate the value of post-2012 CERs. For example, a project that is developed after an agreement can consider whether it is

still worthwhile to develop the project with the rules that will govern the CDM and a SCM after 2012. In contrast, a project that was developed immediately before an agreement is reached had considerable uncertainty on the value of post-2012 credits.

From these three possible points in time, three options are derived for how long existing CDM projects should continue to be credited in a sector in which a SCM is applied:

Option A: **Start of SCM.** Crediting stops for all projects when the crediting under the SCM starts.

Option B: **Combination with agreement date.** 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 starts,

whatever is later.

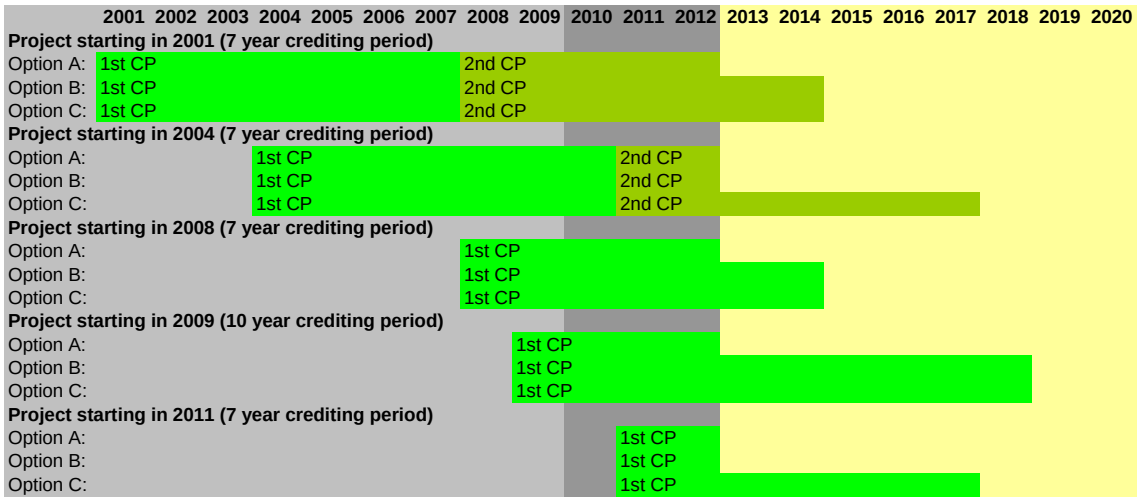
For projects which requested registration (or published their PDD through the DOE) or which renewed their crediting period after the date of an agreement on a new climate regime, crediting stops after 31 December 2012 or the date when the SCM starts, whatever is later.

Option C: **Combination crediting period + commitment period.** Projects that were registered before 1 January 2013 can continue to be credited until the end of the crediting period of the project that was valid on 31 December 2012. From 1 January 2013 onwards, no new projects could be registered in sectors in which a SCM is applied.

Figure 9 below illustrates for these options approximately how long existing CDM projects could continue to be credited, assuming that a sectoral crediting mechanism would start in the sector on 1 January 2013. Under Option A, crediting stops for all projects on 1 January 2013. Under option B, the length of crediting depends on when the project started and importantly, whether or not the crediting period is renewed in the years after an international agreement. Under option C projects that come in the pipeline or renew their crediting period after an international agreement but before 2013 can still receive credits after 2012.

Option B appears a fair balance among the objectives laid out above. Under this option, investor certainty on the rules governing the investments is always provided for at least one crediting period. For example, in 2010, an investor in a CDM project has certainty on the rules that would apply until the end of 2012 and the rules that would apply from 2013.

Figure 9: Implications of different options for continued crediting of existing CDM projects



An argument for option A is that current investments in the CDM are largely based on the income from CERs until the end of the first commitment period in 2012. Ending crediting after 2012 would not yet have major negative implications on the market, as long as certainty on the rules is provided with the agreement on a post-2012 climate regime. Similarly, one can also argue that EU companies and governments face anyhow a major uncertainty on the future carbon market until an international agreement is reached and clarity on the EU ambition (20% or 30%) is provided. Moreover, option A avoids carbon leakage within the sector of the host country, as all plants in the sector have the same rules. A counter-argument to option A is that it does not encourage host countries to move to a sectoral crediting mechanism, as the existing projects would not generate credits anymore.

Option B may have some limits if the rules governing the new climate regime are not sufficiently clear by the date of adopting an international agreement. This may apply, if the agreement only lays down principles or if it is yet unclear in which sectors some developing countries will move to a SCM. In this case, the selection of another date (e.g. the adoption of a Marrakech Accord type agreement) or option C may be an alternative approach.

9.3 Interplay between CDM and a SCM

Sectoral crediting mechanisms are most likely only introduced in some and not all sectors of the economy. This means that the CDM and a SCM could be implemented in parallel in different sectors. Even if the two mechanisms are implemented in different sectors, there will be some interplay between them.

Baseline and monitoring methodologies under the CDM consider upstream and downstream emissions of project activities if these are significant. In some cases, CDM projects mainly reduce upstream or downstream emissions. For example, CDM projects improving the energy efficiency of electrical appliances reduce GHG emissions from power plants in the electricity grid. If a country establishes a SCM for of power genera-

tion, the emission level under the SCM would be influenced by CDM projects that reduce the demand for power.

Several CDM projects also include some (minor) emission sources that occur in other sectors. For example, projects in the power sector or industry sector that are transporting fuels, feedstocks or materials affect GHG emissions in the transport sector. Vice-versa, a SCM agreement may impact the baseline or project emissions of CDM project activities. A SCM addressing the GHG emissions of electricity generation will influence the emission reductions of projects that consume electricity under the project activity or in the baseline scenario. Thus, the co-existence of CDM and a SCM in different sectors requires provisions to avoid double counting of emission reductions. However, this challenge is not fundamentally different from the current CDM where CDM projects are also implemented in different sectors and influence each others emission reductions.

10 The role of a SCM in the global carbon market

A SCM would most likely be only one instrument in the global carbon market. Binding caps on GHG emissions are the backbone of a global carbon market. These can include national targets by countries, national sectoral targets by countries or even global sectoral caps for sectors such as international aviation and maritime transport. Crediting mechanisms that complement caps may not only include a SCM but also the current CDM, or other new crediting mechanisms. For example, the crediting of policies and LULUCF activities is discussed under the AWG-KP.

Any crediting mechanism only provides incentives to reduce emissions if there is a reasonable global carbon price. A reasonable price is only ensured, if the demand for mitigating emissions (i.e. the mitigation required to meet the national or sectoral targets) is larger than the supply of credits and allowances in the market. In other words: there needs to be sufficient demand for the potential supply of allowances and credits. If the supply exceeds the demand, carbon prices can fall close to zero, as observed in the first phase of the EU ETS. Ensuring a reasonable demand for allowances and credits is therefore important to provide incentives for developing countries to reduce emissions.

This is particularly challenging in the case of a SCM. For the CDM, the credit supply from registered or planned projects can be predicted with a reasonable certainty. Some projects have over-performed, others have under-performed. However, the overall supply from credits is relatively close to the estimations in the PDDs. This allows an observation of the market. A key challenge of a SCM is that the supply of credits from such a mechanism is very uncertain. Firstly, it is not clear how many countries and sectors will use the mechanism. Secondly, the ambition of the crediting baselines will impact considerably the supply of credits. And thirdly, even after an agreement has been reached which countries and sectors will participate in the SCM, it is uncertain whether the countries will meet the crediting baselines and, if they do, to what extent they will be able to lower their GHG emissions below the crediting baseline. Thus, whatever is decided in a new climate treaty, considerable uncertainty will remain with regard to the actual supply of credits. Therefore, some safeguards should be included in a new climate treaty in order to avoid a collapse of the carbon market.

The global carbon market could be regulated on the supply side and/or demand side and with short-term and long-term measures. Several proposals directly or implicitly introduce price floors. On the demand-side, potential measures include the establishment of a “carbon bank” that sells or purchases allowances to ensure a certain carbon price level, the introduction of a minimum price for auctioning allowances, or the cancellation or banking of any allowances reserves hold by Annex I countries (e.g. for new installations) (Point Carbon 2009).

Another measure could be a cap on the use of credits. Such a cap has already been introduced in the Kyoto Protocol for tCERs and lCERs from afforestation and reforestation CDM projects which can only be used for compliance purposes up to 1% of the national GHG emissions of the user country. The regional greenhouse gas initiative emissions trading scheme (RGGI) combines a cap on the use of credits with price

floors. Credits from offset projects may only be imported if a certain carbon market price is exceeded (RGGI 2008). Another approach could be a review clause which could require to regularly examine the supply and demand for credits and to take appropriate measures (e.g. higher targets for industrialised countries) if the supply could exceed the demand.

On the supply side, introducing a cap on the issuance of credits from a SCM could be a measure of ensuring a reasonable balance in the carbon market. The cap could be introduced either on a global level or be allocated to countries. In case of a global supply cap, the possibility to issue credits from a SCM could be allocated on a first comes first serves basis. This would provide incentives for developing countries to propose and use the SCM in a timely manner. A global supply cap could imply that more advanced countries, having more reliable data and better institutional and technical capacities, may then mainly benefit from a SCM, as they would most likely be the first movers. Other countries would need more time to build up the necessary capacity and may then participate in a subsequent commitment period in the mechanism. This issue could be addressed by allocating the global supply cap to groups of countries or even to individual host countries. For example, the issuance of credits from a SCM may be limited to X% of the national total GHG emissions of each developing country that is eligible to participate in the mechanism. Each country could then decide in which sectors the SCM should be used to reduce GHG emissions.

The overall level of the cap could be derived from the overall efforts of all industrialised countries. The cap could, for example, be set at 50% of the overall reduction effort of all industrialised countries. This would ensure that credits issued from a SCM are only a proportion of the global demand for credits. Certainly, the continuation of the CDM and any other new carbon market instruments (e.g. sectoral emissions trading, potential credits from the LULUCF sector) would need to be considered in setting the cap.

A cap would limit the crediting in the participating sectors. The country would still have an incentive to reduce emissions below the crediting baseline; however, efforts to go beyond the level of the cap would not be rewarded. Thus, a disadvantage of introducing a cap on crediting is that it could discourage the country to reduce emissions more strongly. However, a cap could ensure reasonable credit prices and thereby also ensures that the mechanism works and provides incentives to reduce emissions.

Without any mechanism which regulates supply and demand on the global carbon market, the carbon price could easily fall to very low levels. This, however, would neither trigger the necessary transition in industrialised countries towards a carbon friendly economy nor ensure the revenues from the mechanism which are needed to finance carbon friendly investments in developing countries.

11 A UNFCCC policy framework for implementing a SCM

To facilitate discussions on a SCM under UNFCCC, this chapter presents draft modalities and procedures for a sectoral crediting mechanism, similar to the modalities and procedures for the CDM. The objective of the draft is to trigger discussions on possible design options. The draft aims at providing an example of a framework for implementing a SCM, addressing most of the issues discussed in this report.

The proposed approach focuses on principles that should underline the implementation of a SCM and that have to be addressed at UNFCCC level in order to ensure the integrity of the mechanism. More detailed procedures for implementing these principles would need to be decided by an international regulatory body. The approach thus strongly relies on the capacity and integrity of this regulating institution, as well as on host countries taking on the responsibility for proposing and implementing the mechanism. Issues that do not require international supervision but could be at the discretion of host countries are not addressed in the framework. This includes, for example, by which instruments or measures the emission reductions are achieved and how the private sector participates in the mechanism.

Draft modalities and procedures for a sectoral crediting mechanism (SCM)

Definitions

1. For the purpose of these modalities and procedures, the following definitions apply:

   (a) reference GHG emissions are the quantity of GHG emission equivalents that would most likely occur during a calendar year in the sector if all policies and regulations that were adopted before 19 December 2009 are implemented and enforced;

   (b) a sectoral certified emission reduction unit (sCER) is a unit that equals to one metric tonne of carbon dioxide equivalent, using global warming potentials applicable to the relevant commitment period according to relevant decisions by the COP/MOP;

   (c) a sectoral crediting baseline is the quantity of GHG emission equivalents during a calendar year from activities within the boundaries of defined sector against which actual emissions are compared to determine the number of sCERs to be issued;

   (d) leakage is the defined as an increase of greenhouse gas emissions outside the sector boundary as a result of implementing a sectoral crediting mechanism in the sector.

Scope and objective of the mechanism

2. The purpose of the SCM is to assist Parties not included in Annex I in reducing greenhouse gas emissions and assist Parties included in Annex I in achieving compliance with their quantified emission limitation and reduction commitments.

3. Under the SCM, sCERs are issued for the reduction of greenhouse gas emissions from activities or entities within a sector boundary below the sectoral crediting baseline. Sectoral certified emission reductions sCERs can be used by Parties included in Annex I in achieving compliance with their quantified emission limitation and reduction commitments.

4. The SCM shall contribute to achieving additional global reductions of greenhouse gas emissions by setting crediting baselines below the reference GHG emissions for developing countries other than least developed countries.

Institutional arrangements

5. The Conference of the Parties serving as the meeting of the Parties to the Kyoto Protocol (COP/MOP) shall have authority over and provide guidance on the implementation of the SCM.

6. A regulatory body shall supervise and regulate implementation of the SCM under the guidance of the COP/MOP. A separate branch within the UNFCCC secretariat shall serve as regulatory body.

7. The regulatory body shall be coordinated by six directors, three of them from a Party not included in Annex I of the Convention and three of them from a Party included in Annex I of the Convention. The directors shall work on a full-time basis for the regulatory body and shall be elected by the COP/MOP for a term of three years, based on applications submitted to and short-listed by to the UNFCCC secretariat.

8. Decisions by the regulatory body shall be taken by consensus, whenever possible. If all efforts at reaching consensus have been exhausted and no consensus has been reached, the directors may take a decision with a two-third majority by vote.

9. The regulatory body is responsible for:

    (a) deciding on the approval of proposals for implementing a SCM;

    (b) deciding on the issuance of sCERs;

    (c) organizing and conducting independent expert reviews of proposals for implementing a SCM and monitoring reports;

    (d) adopting relevant guidelines, guidance, procedures or templates to facilitate the implementation of the SCM, including, inter alia:

        (i) templates and guidelines for preparing proposals for implementing a SCM and monitoring reports;

        (ii) procedures for the consideration, review and decision on proposals for implementing a SCM and monitoring reports;

        (iii) relevant methodological guidance on, inter alia, determining sectoral boundaries, sectoral crediting baselines and on monitoring sectoral GHG emissions;

(iv) a code of conduct for staff of the regulatory body, including the directors;

(v) procedures to address confidentiality issues;

(e) maintain a registry for the purpose of issuing sCERs;

(f) maintaining a web-site with transparent up-to-date information on the implementation of the SCM, including a repository of decisions and documents;

(g) informing the public about the SCM;

(h) preparing an annual report to the COP/MOP, including recommendations to the COP/MOP.

10. The regulatory body shall ensure transparency, objectivity, consistency, non-discrimination and professionalism in its operations and decisions. Decisions by the regulatory body shall be made publicly available and be substantiated and justified. Requests by Parties and stakeholders to the regulatory body shall be given due consideration.

11. Decisions by the regulatory body on proposals for implementing a SCM and on the issuance of sCERs may be appealed by the host country Party. The Compliance Committee under the Kyoto Protocol shall serve as appeals chamber. The appeals procedure shall be limited to the application of relevant procedures, guidelines or guidance, including issues of grave procedural omission, biased decision-making and/or the violation of the principle of non-discrimination.

12. The regulatory body shall charge an administrative share of proceeds on the issuance of sCERs to cover its expenses. On an interim basis, the regulatory body shall be entitled to use financial resources from fees collected from the administrative share of proceeds of the CDM, subject to further guidance by COP/MOP.

13. Developing country Parties shall authorise a public or private entity as national coordinating body for implementing a SCM.

14. The national coordination body is responsible for:

(a) preparing and submitting the proposal for implementation of the SCM;

(b) coordinating the implementation of the SCM in the host country Party;

(c) preparing and submitting monitoring reports;

15. Developing country Parties are encouraged to assign national coordination agencies for relevant sectors no later than X.

Definition of the sector

16. A proposal for implementing a sectoral crediting mechanism shall include a transparent and objective definition of the sector boundary, including a definition of

(a) the geographical extension of the sector boundary;

(b) the activities or entities included in the sector boundary; and

(c) the greenhouse gases and emission sources included the sector boundary.

17. In defining the sector boundary, it shall be ensured, inter alia, that

(a) leakage is avoided to the extent possible;

(b) relevant data can be collected at the level of the sector definition;

(c) the definition allows for an objective and unambiguous assessment whether or not an entity or activity is included;

(d) all entities or activities included in the sector boundary can be identified by the national coordination body;

(e) several similar entities or activities at the same site are considered as one entity or activity.

18. Small entities or activities with low greenhouse emissions may be excluded from sector boundary with a view to reduce transaction costs. In such cases, the criteria for exclusion shall be based on the size of the entities or activities and not on performance or operation features of the entities or activities. The proportion of greenhouse gas emissions excluded shall not be larger than 5%.

19. Double counting of emission reductions with other sectoral crediting baselines shall be avoided. Towards this end, the sectoral boundary of a proposal for implementing a SCM shall not overlap with other proposals for implementing a SCM by the host country Party or, in the event of overlap, the corresponding emission reductions shall be subtracted in the determination of the crediting baseline.

Length of the crediting period

20. The crediting period starts on 1 January 2013 and ends on 31 December 2017. The length of any future crediting periods shall be decided as part of the periodical review referred to in paragraph 50.

Sectoral crediting baselines

21. A sectoral crediting baseline shall be proposed as an algorithm that relates the GHG emissions from activities or entities included in the sector boundary to one or several socio-economic and/or ambient indicators, such as, inter alia, the national gross domestic product (GDP), the population, the product or service output of the sector in physical (t, km, kWh, etc.) or the ambient temperature.

22. The sectoral crediting baseline shall be finally determined ex-post for each calendar year of the crediting period, following monitoring and review of socio-economic and/or GHG emissions data required for applying the algorithm referred to in paragraph 21 to the applicable year of the crediting period.

23. A proposal for a sectoral crediting baseline shall be accompanied with the relevant sectoral data and information, including, inter alia:

(a) A thorough description of the sector, including, inter alia, relevant policies and regulations, an overview on the private and public entities in the sector, a description of technologies applied in the sector and technological trends, and information on the structure of the industry, such as data on the production capacity and the age of the facilities in the sector;

(b) An identification of all socio-economic and ambient factors that significantly affect GHG emissions in the sector;

(c) An estimation of the historical GHG emissions from the activities or entities included in the sector boundary from 1990 up to the most recent year, including data used to derive GHG emission estimates;

(d) Relevant historical socio-economic data on the sector from 1990 up to the most recent year, including information on, inter alia, sectoral output and GDP, the share of different technologies or practices applied in the sector and any other factors that significantly influence GHG emissions in the sector;

(e) An estimation of the reference GHG emissions in the sector and the socio-economic data referred to in sub-paragraph (b) up to the year 2020, including a sensitivity analysis and uncertainty assessment based on the variation of key underlying factors by a plausible range;

(f) A thorough description of how the host country plans to reduce emissions in the sector, including

(i) a description of the policies and measures that are envisaged to achieve the emission reductions;

(ii) a description of the institutional arrangements made to achieve the emission reductions, including how the emission reductions from the entities or activities included in the sector boundary are stimulated or enforced;

(iii) an estimation of the emissions level that will be achieved with the envisaged measures in the sector;

(g) A thorough description of the methodological approaches, models and data sources used to provide the information referred to in sub-paragraphs (b) to (e);

24. The reference GHG emissions and the sectoral crediting baseline shall be determined in a transparent and conservative manner with regard to the assumptions used and taking into account the uncertainty of the data and models used to estimate GHG emissions and relevant socio-economic and/or ambient data.

25. Where, at the time of submitting a proposal for implementing a SCM, historical data is not available at the required detail or cannot be considered as reasonably accurate, relevant sectoral data may be collected in the years 2010 to 2012 and be applied, after its review, to the algorithm referred to in paragraph 21.

26. Consistency shall be ensured in the use of data sources and methodological approaches for determining the sectoral crediting baseline and monitoring the actual GHG emissions in the sector.

27. For least developed country Parties, the sectoral crediting baseline shall be set at the estimated reference GHG emissions in the sector.

28. For developing country Parties other than least developed country Parties, the sectoral crediting baseline shall be set below the projected reference GHG emissions in the sector, as follows:

    (a) the sectoral crediting baseline shall be

        (i) at least X_1% below the reference GHG emissions in 2013;

        (ii) at least X_2% below the reference GHG emissions in 2014;

        (iii) at least X_3% below the reference GHG emissions in 2015;

        (iv) at least X_4% below the reference GHG emissions in 2016;

        (v) at least X_5% below the reference GHG emissions in 2017;

    (b) the sectoral crediting baseline shall be set below the GHG abatement potential with negative abatement costs;

    (c) the sectoral crediting baseline shall take into account the greenhouse gas emission performance of best available technologies applied in the sector in the most recent five years.

Double counting with registered CDM projects

29. Double counting of emission reductions with projects registered under the clean development mechanism shall be avoided. Towards this end, emissions of greenhouse gases that occur within the sectoral boundary and that are achieved by projects registered under the clean development mechanism shall be subtracted from the sectoral crediting baseline.

Leakage

30. A proposal for implementing a SCM shall include provisions to quantify and account for any sources of leakage emissions that may be significant.

Processing of proposals for implementing a SCM

31. Proposals by Parties for implementing a SCM shall be submitted, through the national coordinating agency, to the regulatory body.

32. After receipt of a proposal for implementing a SCM, the regulatory body shall

    (a) make the proposal publicly available;

    (b) conduct an independent expert review of the proposal;

    (c) invite public comments on the proposal.

33. In conducting the independent expert review, the regulatory body shall

(a) ensure that experts be involved in the review have the necessary knowledge and experience and do not have a conflict of interest;

(b) ensure that the Party has the possibility to provide additional information or to correct information;

(c) check that the proposal is in accordance with all requirements stipulated in these modalities and procedures, with any decisions by the COP/MOP, and with any guidance adopted by the regulatory body.

34. Having considered the outcome of the independent expert review and public comments submitted, the regulatory body shall decide on the approval of the proposal.

35. Once a proposal for implementing a sectoral crediting mechanism is approved by the regulatory body, the algorithm used to determine the crediting baseline shall not be changed, except where a change would result in a lower crediting baseline.

Monitoring and issuance

36. A proposal for implementing a SCM shall include a monitoring plan.

37. The monitoring plan shall describe

(a) the responsibilities within the host country for collecting and archiving relevant data;

(b) which data is collected;

(c) the sources used to collect the data;

(d) the procedures and methods applied to collect the data, such as, inter alia, surveys or statistics;

(e) any measurement methods or measurement protocols that are applied to collect data;

(f) the quality control and quality assurance procedures applied;

(g) an estimation of the uncertainty associated with the collection of data.

38. Parties shall submit, through their national coordinating agencies, a monitoring report for each calendar year to the regulatory body.

39. Monitoring reports shall implement the monitoring plan referred to in paragraph 36 and include:

(a) Any socio-economic and/or ambient data and, if applicable, GHG emissions data for the years 2010 to 2012, required to calculate the sectoral crediting baseline for the calendar year;

(b) A transparent calculation of the GHG emissions of the sectoral crediting baseline;

(c) All data required to determine GHG emissions from entities or activities included in the sector boundary;

(d) A transparent calculation of the GHG emissions from entities or activities included in the sector boundary;

(e) All data required to determine leakage effects;

(f) A transparent calculation of leakage effects;

(g) Information on how sCERs should be distributed.

40. Monitoring reports shall be submitted to the regulatory body not later than one year after the end of the calendar year for which data is reported.

41. After receipt of a monitoring report, the regulatory body shall

(a) make the monitoring report publicly available;

(b) conduct an independent expert review of the monitoring report;

(c) invite public comments on the monitoring report.

42. In conducting the independent expert review, the regulatory body shall

(a) ensure that experts be involved in the review have the necessary knowledge and experience and do not have a conflict of interest;

(b) ensure that the Party has the possibility to provide additional information or to correct information;

(c) check that the monitoring report is in accordance with the monitoring plan, with all requirements stipulated in these modalities, with any decisions by the COP/MOP, and with any guidance adopted by the regulatory body.

43. Having considered the outcome of the independent expert review and public comments submitted, the regulatory body shall decide on the issuance of sCERs.

44. If the regulatory body determines that the monitoring report is appropriate, an amount of sCERs corresponding to the monitored emission reductions shall be issued, subject to the provisions in paragraphs 46 and 47. The monitored emission reductions shall equal to the difference between the greenhouse gas emission equivalents determined as sectoral crediting baseline and the greenhouse gas emission equivalents monitored from activities and entities included in the sector, subtracting any emission adjustments for leakage effects or to avoid double counting of emission reductions.

45. If the regulatory body determines that the monitoring report or parts of the report are not in accordance with paragraph 42(c), it shall not issue sCERs or issue a lower amount of sCERs after adjusting the calculation in the monitoring report in a conservative manner.

46. If the emission reductions determined according to paragraph 44 have a value below zero, no sCERs shall be issued and the corresponding amount shall be subtracted in the issuance of sCERs for subsequent calendar years.

47. The issuance of sCERs in the commitment period from 2013 to 2017 shall be limited for each host country Party to Y% of its total national GHG emissions in 2012.

Any limitations for subsequent credit periods shall be decided as part of the periodical review referred to in paragraph 50.

Transitional issues with regard to CDM projects in the same sector

48. Subject to the provisions in paragraph 29, project activities which started validation under the clean development mechanism on or before 15 April 2010 can continue to issue CERs from emission reductions occurring within the sector boundary until (a) the end of the crediting period that was valid by 15 April 2010 or (b) 31 December 2012, whatever is later.

49. Subject to the provisions in paragraph 29, project activities which started validation under the clean development mechanism after 15 April 2010 can continue to issue CERs only up to 31 December 2012.

Periodical review of the mechanism

50. The SCM shall be reviewed periodically by the COP/MOP. The first review shall start no later than 1 January 2014.

Pledges for implementing and supporting sectoral proposals by developing countries and by industrialised countries

51. Developing country Parties included in Appendix 1 voluntarily commit to proposing and implementing sectoral crediting mechanisms in sectors that cover at least Z% of their total national GHG emissions.

52. Developing country Parties included in Appendix 1 are requested to submit proposals for implementing sectoral crediting no later than 31 December 2010.

53. Industrialised country Parties voluntarily commit to providing additional financial resources, as specified for each Party in Appendix 2, to support developing countries Parties included in Appendix 1 through bilateral or multilateral agreements in implementing the sectoral crediting mechanism.

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