

CLIMATE CHANGE

14/2011

Design of the post-2012 climate regime: Sectoral approaches for greenhouse gas mitigation

Discussion paper: Incentives for mitigation investments

ENVIRONMENTAL RESEARCH OF THE GERMAN
FEDERAL MINISTRY OF THE ENVIRONMENT,
NATURE CONSERVATION AND NUCLEAR SAFETY

Project-no. (FKZ) 3710 41 134

Design of the post-2012 climate regime: Sectoral approaches for greenhouse gas mitigation

**Discussion paper: Incentives for mitigation
investments**

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UMWELTBUNDESAMT

This publication is only available online. It can be downloaded from
<http://www.uba.de/uba-info-medien-e/4145.html>.

This paper was conducted as part of the project titled "Design of the post-2012 climate regime: Sectoral approaches for greenhouse gas mitigation".

The contents of this publication do not necessarily reflect the official opinions.

ISSN 1862-4359

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Paper completed in: June 2011

Publisher: Federal Environment Agency (Umweltbundesamt)
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Edited by: Section I 2.1 Climate Change
Juliane Berger

Dessau-Roßlau, July 2011

Summary

Compared to a project-based approach, sectoral mechanisms would result in a different role of role of emitters, investors and government. Under project-based mechanisms the host country government has mainly a supervising role while the economic responsibility remains with the project developer or project owner. Under a sectoral mechanism, the host country government would have a more active role and would have to ensure that the emission reductions are actually achieved because otherwise no revenues to cover additional cost for greenhouse gas mitigation measures would be achieved. On this background we scrutinise whether the shift in responsibility from emitters or investors to host country government would limit or even eliminate emitters' incentives to engage in seeking cost-effective mitigation options and if so, by which means such outcome could be avoided or limited. We analyse the challenges which may be caused by the different responsibility structure, discuss to which extent potential instruments and measures can provide the required incentive to seek for cost effective greenhouse gas mitigation options and provide a summary of the views of selected actors as well as a synopsis of relevant experiences gained so far in this context. We find that sectoral mechanisms involve strong governance skills of the host country government in implementing climate policy and identify a number of potential policy instruments which would provided the required mitigation incentives with different degrees of direct or indirect linking with the global carbon market. As a conclusion we find that pilot scheme would help to establish confidence in the new mechanism and encourage its broader application.

Zusammenfassung

Im Vergleich zu projektbasierten Mechanismen verändern sektorale Mechanismen die Rolle der Emittenten, Investoren und Regierungen. Bei projektbasierten Mechanismen hat die Gastregierung im Wesentlichen eine überwachende Rolle, während die ökonomische Verantwortung beim Eigentümer des Projekts oder beim Projektentwickler verbleibt. Bei sektoralen Mechanismen würde die Gastregierung eine aktivere Rolle übernehmen und müsste sicherstellen, dass die Emissionsreduktionen auch tatsächlich erreicht werden. Ansonsten können die Erträge zur Finanzierung der Treibhausgas-minderungsmaßnahmen nicht erzielt werden. Vor diesem Hintergrund untersuchen wir, ob ein solcher Wechsel in der Verantwortung die Anreize zur Suche nach kostengünstigen Minderungsoptionen verringern oder beseitigen würde. Wir untersuchen ebenso, durch welche Maßnahmen gegebenenfalls eine solche Wirkung verhindert oder begrenzt werden kann. Wir analysieren die Herausforderungen, die sich aus der veränderten Verantwortungsstruktur ergeben. Wir diskutieren zudem, durch welche Anpassungen bei den Instrumenten und Maßnahmen die erforderlichen Anreize zur Suche nach kostengünstigen Minderungsoptionen gesetzt werden. Nicht zuletzt fassen wir die Standpunkte ausgewählter Akteure zusammen und liefern eine Übersicht über relevante, bisher in diesem Zusammenhang gemachte Erfahrungen. Unsere Untersuchung ergibt, dass sektorale Mechanismen eine solide Steuerungsfähigkeit der Gastregierung bei der Umsetzung von Klimapolitik erfordern. Wir identifizieren mehrere potenzielle Instrumente, die die notwendigen Minderungsanreize mit unterschiedlichem Grad direkter oder indirekter Einbindung in den globalen Kohlenstoffmarkt bieten. Als Schlussfolgerung stellen wir fest, dass Pilotprogramme helfen, das erforderliche Vertrauen für den neuen Mechanismus zu etablieren und zu einer breiteren Anwendung ermuntern würden.

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1 Introduction

The basic idea for sectoral mechanisms has been introduced mainly for two entirely different reasons:

- On the one hand they should provide a bridge for the transition towards a global carbon market and for the transition from a non-Annex I to an Annex I country (Schmidt et al. 2006).
- On the other hand they should overcome the flaws of project-based mechanisms such as 1) high transaction costs due to necessary registration, monitoring and verification procedures, 2) lack of environmental integrity due to a high risk of carbon leakage and/or inflated baselines and 3) limitations in the mitigation potentials which could be addressed by them (closure of activities without replacement at the same site; etc.).

The transition from a non-Annex I to an Annex I country would require substantial changes within a country since the entire economy would be subject to an absolute greenhouse gas (GHG) emission cap. The sectoral mechanism has been suggested as an intermediate step towards the integration of all countries into one global carbon market. Non-Annex I countries would have the opportunity to identify certain sectors of their economy which would already be included into the global carbon market while the rest of the economy would still be “unaffected”. Over the time, the coverage of sectors could be gradually increased with the aim to finally include the entire economy into the global carbon market.

At the same time, sectoral mechanism could address the flaws of the project-based mechanisms, since they would enable to streamline many procedural issues. The environmental integrity could at the same time be increased since, generally speaking, the risk of leakage is the smaller the larger the scope of a mechanism and if sectoral thresholds would be ambitiously below BAU to avoid inflated thresholds and reflect own contributions by developing countries.

However, establishing of sectoral mechanisms would also change the role of emitters (e.g. private entities) and of the government. Under project-based mechanisms the host government has mainly a supervising role and may encourage the establishment of projects though the economic responsibility remains with the project developer or project owner. Under a sectoral mechanism, the host country government would have a more active role and would have to ensure that the emission reductions are actually achieved because otherwise no revenues to cover additional cost for GHG mitigation measures would be achieved. Sectoral mechanisms currently are distinguished into sectoral trading and sectoral crediting.

A sectoral trading mechanism implies an absolute commitment to reduce GHG emissions of a certain sector for the host country. “Absolute” implies that in case of non-compliance with the target sanctions will apply to the host country. An amount of allowances corresponding to the target will be allocated to the country ex-ante. Given the binding nature of this mechanism, the government will very likely pass the responsibility onto the sectoral emitters, either by setting up an emissions trading scheme or by imposing mandatory measures.

Besides this “must comply” option under sectoral trading, the sectoral crediting mechanisms offers a “can comply” option. Under a crediting mechanism, a country agrees to a reduction

target as well, which rather corresponds with a business as usual scenario and has no binding character (no lose target). In case of compliance with the target, the emission reductions beyond the target will be credited ex-post. In case of non-compliance, no sanctions apply. Credits will be tradable on the international carbon market and hence provide international finance for mitigation. The idea is, that the host country initially contributes to mitigation through domestic measures (essentially the ones with the lowest abatement costs, so called “low hanging fruits”) but can obtain international carbon finance for activities that address reductions beyond the business as usual scenario (so called “higher hanging fruits”). However, the incentive for the government to meet or even over-achieve the target is clearly weaker as under a trading mechanism with a mandatory goal.

On this background this paper scrutinises whether the shift in responsibility from emitters or investors to host country government would limit or even eliminate emitters’ incentives to engage in seeking cost-effective mitigation options and if so, by which means such outcome could be avoided or limited to the extent possible. It shall be noted here, that emitters may be of different legal nature – public, public-private or solely private nature. It is though assumed that the strongest incentives in this respect are required for private entities, hence this paper concentrates on the private sector.

In the next chapter we describe in detail the issue which may be caused by the different responsibility structure under a sectoral mechanism. Based on these deliberations we discuss to which extent potential instruments and measures can provide the required incentive to seek for cost effective greenhouse gas mitigation options (chapter 3). We complement these considerations with a summary of views of selected actors on this issue (chapter 4) and with a synopsis of experiences gained so far (chapter 5). Finally we draw conclusions and derive implications for the concept of sectoral mechanisms (chapter 6).

2 Description of the issue

2.1 Differences to project-based mechanisms

Sectoral mechanisms are in many aspects fundamentally different to project-based mechanism. However, two aspects are central with regard to the incentive structure of those mechanisms: Sectoral mechanisms

- cover all activities or installations within a certain sector boundary and
- require governments to play a different role.

Under a project-based mechanism, only selected activities or installations will be subject to mitigation measures. Under a sectoral mechanism, in contrast, all installations within an ex-ante determined sector boundary will be covered. This shift will increase the mitigation potential which can be addressed, enhance the portfolio of technical mitigations measures which can be taken, specifically if the sector boundary is wide and includes various activity types, increase environmental integrity by reducing the risk of leakage since output cannot be transferred to uncovered activities and reduce transaction costs because a number of requirements under a project-based approach such as registration and determination of a baseline only have to be done once for the whole sector but not per project activity. Mitigation measures will most likely

only be initiated at those activities with the worst emission performance even though all activities within the boundary will be covered by the mechanism. Sectoral mechanisms will also enable a transition to advanced or integrated mitigation technologies if the sector boundaries are defined adequately.

In addition, the economic responsibility would be shifted from the project owner or project developer to the host country government. Currently, governments only need to approve during the registration process that a planned mitigation project complies with their sustainability criteria but do not face any responsibility if the project does not generate the revenues which are required to recover the mitigation costs. The economic risk of a mitigation project is exclusively borne by the project owner.

Under a sectoral mechanism, private entities cannot take the responsibility for an entire sector which includes all activities. Therefore, the host country government needs to take that responsibility and needs to ensure that the envisaged greenhouse gas mitigation is actually achieved. In this regard sectoral mechanisms are much closer to international emissions trading pursuant to Article 17 of the Kyoto Protocol which entitles Parties to trade emission allowances among them. Governments are not required but may directly involve emitting entities in trading of internationally recognised emission allowances.

The same would apply to sectoral mechanisms. Host country governments would, possibly after consultations with business representatives of the covered sectors, submit a proposal for the implementation of a sectoral mechanism. This proposal would include a clear definition of the sector(s), business as usual projections as sectoral threshold, a target (absolute or no lose) including own contributions and a detailed descriptions how the target should be achieved. After approval of the proposal, the host country government needs to ensure that the projected greenhouse gas reductions are achieved. As with international emissions trading, the government will trade excess allowances or generated reduction credits to cover the cost of incentives for the covered activities or installations in their country (chapter 3).

2.2 Challenges for private investors under a sectoral mechanism

While any sectoral mechanism aims to trigger investments into mitigation activities, a crucial question is how these investments are going to be incentivized. The willingness of investors to invest into certain activities depends on several parameters, such as the mechanism applied (trading or crediting), the detailed layout of the scheme or country and sector specific parameters.

According to the concept of sectoral mechanisms, the host country government agrees on a absolute or voluntary (aka no lose) target for a certain domestic sector. Based on the economic theory underlying these market based instruments, as well as the principle of subsidiary, the government is free to choose the most appropriate and economic means to keep the emissions below the targets.

In order to do so, a domestic framework that urges the emitters of the respective sector to act in line with the governmental specifications has to be set up. Key parameters for successful implementing any sectoral mitigation attempt thus are (i) the design of the policy framework, (ii) the ability of the government to implement or even enforce action under this framework and (iii) the sectoral emitters that have to reduce emissions.

The design of the policy framework determines instruments and measures that can or must be applied to achieve respective reductions and specifies rules and procedures for the application of these measures, for instance on responsibilities of actors, MRV or a sanctioning regime. Those potential measures will differ depending on whether a sectoral trading or a sectoral crediting mechanism is installed and depending on the nature of the target (absolute/no lose).

The ability of a government to implement sectoral mitigation action under the policy framework is certainly dependent on many factors, such as the form of governance or the government's capability to assert its positions against lobby groups. De-facto dictatorship governments may find it easier to enforce action, while democracies strive to adopt rather balanced, consensus orientated solutions. The latter for instance applies to the voluntary commitment of the German industry to reduce emissions, a political compromise that actually failed.

Moreover, the success of any policy will be influenced by the legal character of emitters that can be state owned companies, public-private entities or private businesses (either purely domestic or JVs with foreign shareholders). In the first place, the different forms of entities follow different intrinsic motivation to act and will do this in a more or less economic manner. While public actors tend to operate inefficiently, private companies are first of all profit maximizing entities and thus required to manage their resources efficiently. Second, governments may simply decide that public actors apply certain mitigation measures, whereas private emitters will usually require specific incentives to act in any way other than the most profitable one.

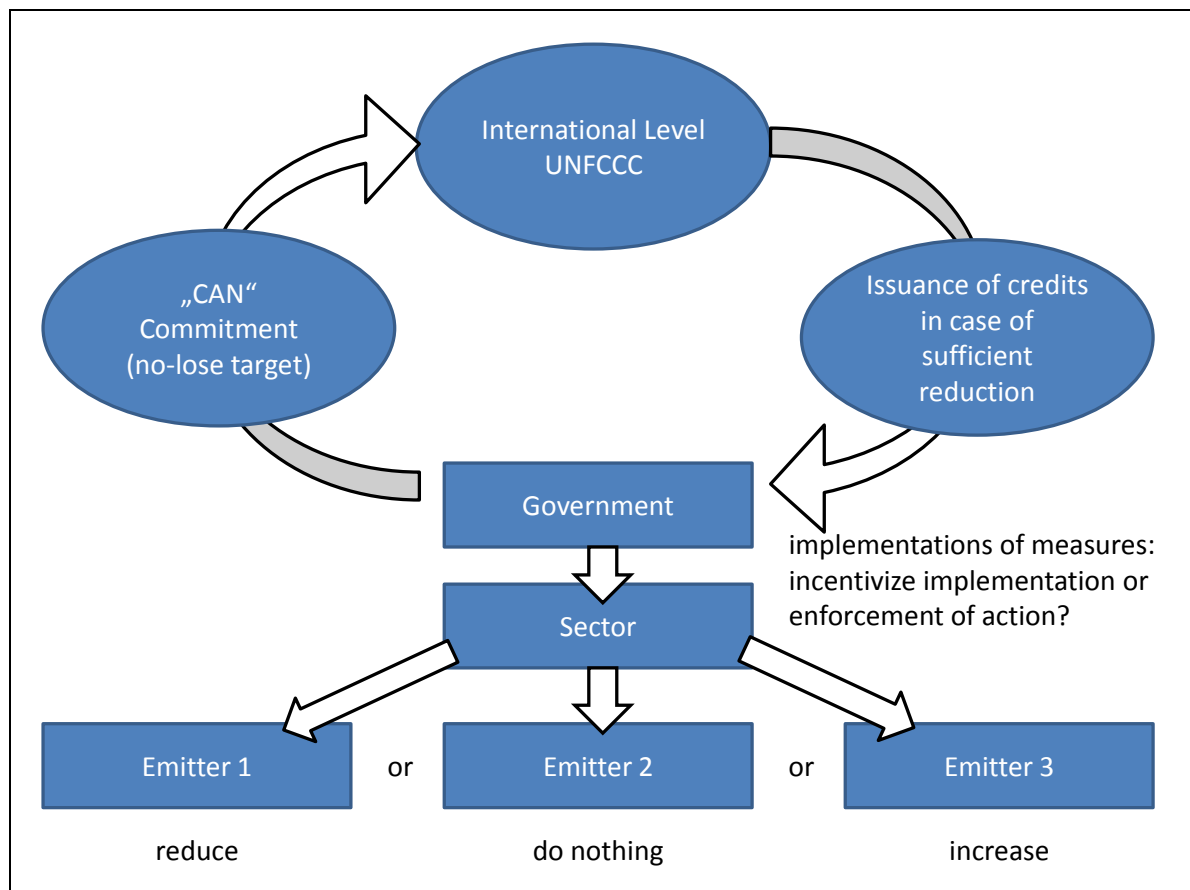
Thus the question, whether a shift of responsibilities towards the governmental level would limit or eliminate incentives for investments, is most relevant for the specific scenario of a sector that is predominantly characterized by private entities and has been featured with a sectoral no lose crediting mechanism. Whether the following hypothetical challenges and their potential solutions actually apply or not will be discussed further below:

- **Principal-Agent dilemma:** Emission reductions are caused by action at the sector level, thus under this set up any action to reduce emissions requires investments by private entities. However, the overarching incentive to reduce emissions is provided by credits that will be issued by an international body, such as the UNFCCC, and be transferred ex-post to the host country government. Only if the government would directly forward the credits or an equivalent of the investment to the investor, this would ensure mitigation through the emitters.
- **Free Riding and sectoral underperformance:** The entire sector (i.e. aggregated emissions) has to comply with a no lose target. If the entire sector misses the no lose target, no sanctions will apply. If the entire sector meets or over-achieves the target, credits will be issued. For a single emitter the question arises, whether all of his competitors will reduce, do nothing or even increase their emissions. The character of the no lose target triggers the do nothing option, i.e. "free riding behaviour", since a missing of the target implies no sanctions and uncertainty over the activities of competitors prevails.
- **Lacking Guarantees:** Besides the costs of opportunity that come along this delayed pay-back, investors face a lack of guarantees that they actually receive an equivalent to their investment in case of underperformance. This is in particular true for foreign investors

from Annex 1 countries. Unlike the Clean Development Mechanism (CDM), a new mechanism lacks experiences and credibility and investors thus will act rather cautiously.

- **Ex-ante investments/ex-post credits:** Investments to bring down the sectors emissions are required prior to the start of a crediting period. But only once the sectoral abatement has been conducted, monitored at installation level and verified, credits can be issued.

Figure 1: Implementation of sectoral measures under a sectoral crediting mechanism



Similarly to other baseline and credit schemes such as the CDM, private entities initially lack incentives and guarantees to invest in emission reduction technology. In order to overcome these challenges, the government could either impose mandatory measures to stay at least within the business as usual scenario or could provide incentives and guarantees for emitters to implement the respective mitigation actions.

2.3 Role of actors

As described above, sectoral mechanisms were, among other reasons, suggested to provide an intermediate step within the transition towards a global carbon market which would finally include all countries. Quite evidently, governments, in particular host country governments, need to take a different role with more responsibilities under such an approach.

Different to project-based mechanisms, where project owners or project developers, i.e. private entities, develop and implement a project, under sectoral mechanisms the host country government would have the leading role in establishing such sectoral mitigation effort in their

country. They would develop a proposal for the implementation of a sectoral mitigation effort which would include

- a clear definition of the sector boundary including an enumeration of activities which would be not covered,
- a business as usual projection which will be used to determine the level of ambition,
- an absolute or a no lose target over a clear time frame (5, 10, 15 years, etc.) which includes a certain degree of own contributions,
- a detailed description of how the necessary mitigation measures are incentivised,
- a projection of the impact of these incentives on the sectoral greenhouse gas emissions and
- a reliable sectoral monitoring plan.

After review by a supervising entity (e.g. UNFCCC), the proposal would be approved and could then be implemented by the government.

In the case of an absolute target (sectoral trading), the host country government would receive allowances corresponding to their target. At the end of the timeframe or after ex-ante agreed periods, the host country government needs to submit a sectoral inventory and to surrender the corresponding amount of allowances. The excess allowances, whose amount can be estimated from the difference between the threshold and the projected impact of sectoral incentives, can be sold on the global carbon market to recover the financial resources which are needed to provide the sectoral mitigation incentives. However, the host country government would have to purchase additional allowances if it finally turns out that the actual emissions are higher than the remaining allowances.

Provided that the units established under a sectoral mechanism are fully fungible with allowances under international emissions trading, the host country government could trade these sectoral allowances with all Parties participating in international or sectoral emissions trading. In addition the host country government could also trade these allowances with private entities of those countries where the governments provide for such direct involvement of the private sector.

With a no lose target (sectoral crediting), credits can only be issued if the promised reductions are actually achieved and verified. Formally the host country government can thus participate in trading efforts only after credits have been issued. However, host country governments could try to establish agreements similar to the so called emission reduction purchase agreements (ERPAs) under the CDM. Under such an agreement the host country government and countries or private entities which need to purchase credits would ex-ante agree to trade credits at a certain price once they are issued. These agreements often include upfront payments by the purchasers which result in a respective rebate on the agreed credits price. That way, the host country government can also mobilise upfront financial resources to recover parts of the costs of those incentives or measures which are planned to achieve the promised emission reduction in their countries sector.

Private entities within the host country can either be involved directly, indirectly or not at all into the global carbon market. It is at the host country's discretion how to provide incentives to private entities (chapter 3). Whichever option is selected, important is that the planned emission reduction is finally achieved. Otherwise no credits can be issued whose revenues could be used to recover the cost of incentives or measures. And even worse, if the host country would have agreed to a sectoral ERPA, they might even be forced to pay for non-delivery of sectoral credits unless such non-delivery risks are not covered by respective insurances.

Obviously, host country governments would have strong interests to ensure that the targets of a sectoral agreement are in fact achieved. Therefore they would need to establish effective regulation which provides sufficient incentives to the private entities in their country to reduce greenhouse gas emissions and they would have to enforce that regulation adequately.

In this regard, free riding would only occur if the host country government would also provide financial incentives to those activities or installations which do not reduce their emissions. However, this would be quite illogic and such provisions should already be identified and corrected during the review process because it certainly would result in a failure of the proposed agreement.

In contrast, host country governments need to guarantee the financial incentives for each tonne actually reduced also if the agreed sectoral target would not be met. Host country governments will therefore propose sectoral agreements which certainly can be met because the economically attractive potential is larger. Private investors will scrutinise the publically available proposal documents for sectoral agreements and will assess whether the targets of the suggested agreement can realistically be achieved or not. If they basically agree with the proposal, they will check whether investing in greenhouse gas emission reductions will be economically attractive or not.

However, the host country's government may change during the economic lifetime of mitigation measures and the new government may withdraw the incentive. This would certainly result in distrust against the new government and the country in general and this distrust would most likely not be limited to mitigation investments but affect any foreign investment. Such regulatory risk can therefore not be entirely denied but seems to be small because it would cause consequences not just for mitigation investments but for the entire host country economy.

Emitters in the covered sectors would at least to that extent be involved that they need to decide whether the provided incentive would make any mitigation measures economically viable. If that is the case they may implement such measures themselves or task project developers with the implementation of such measures.

Greenfield projects such as renewable energy projects may be implemented by emitters or by project developers with specific experience in the respective field. The extent to which project developers will be involved may depend on how the incentives to reduce emissions are provided to the covered sectors. Direct involvement in the (global) carbon market may attract more project developers than emission performance standards (chapter 3).

3 Incentives: instruments and measures

Incentives can be maintained for private companies through several options described below. The discussion assumes that the sectoral target can be allocated to emitting installations in form of an installation-specific baseline; this target level will be called “baseline level”. The first section of this chapter discusses incentives directly related to the emissions credits, the second part policy instruments that serve as an incentive to mitigate and thus indirectly create emissions credits.

3.1 Guaranteed sectoral credit revenues

A host country government could guarantee each company that reduces emissions below the threshold level to receive internationally tradable credits as per the reductions achieved and monitored. This would expose the government to the risk to have to import Certified Emissions Reductions (CERs) or Emission Reduction Units (ERUs) to cover the shortfall caused by companies emitting above the threshold level. The government could reduce the risk by introducing policy instruments that penalize emissions above the threshold level (see 3.7 and 3.8 below).

3.2 Carbon funds with shared risks

All private companies in the sector would be organized in form of a carbon fund that pays dividends to its shareholders pro rata to the achieved and monetized reduction credits. While this approach would reduce the government-related risk, it cannot address the free riding problem, unless the management of the carbon fund would be able to introduce policy instruments that penalize emissions above the threshold level.

3.3 Revenue split

A contract between the private companies and the government would specify a revenue split from the emission credit sales. The government could retain a portion (2-5%) to cover the costs for administration of the scheme, whereas the rest would be allocated proportionally to the reductions achieved. This approach would have the same free riding problems as the one described in 3.2.

3.4 Domestic mandatory emissions trading scheme

Under a mandatory emissions trading scheme (ETS), there would be a clear incentive to reduce emissions as those companies with a lack of allowances would need to acquire allowances to cover their shortfall. The system could be designed as follows: The overall cap of the scheme could be set at the level of the threshold. This would ensure that the crediting threshold is exactly met. The host country could then allow entities in the sector to exchange national emission allowances against futures of sectoral credits. The exchanged national emission allowances would need to be surrendered in a national cancellation account and could hence not be used on the national market anymore. This would ensure that each exchanged allowance results in an emission reduction below the crediting threshold (Schneider & Cames 2009). To prevent that the domestic carbon price exceeds the price of the global carbon market if it turns out that too many domestic allowances have been exchanged, the host country government should also accept internationally recognised units for compliance under the notional trading system. Covered entities would have an incentive to exchange domestic allowances against sectoral 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. Host country governments may see this approach as the first step on the slippery slope towards legally binding commitments and thus be reluctant to accept it.

3.5 Tradable intensity standard

As many developing countries fear an approach based on absolute emissions, Whitesell and Helme (2009) have proposed a tradable intensity standard. The host country government would set an intensity standard in form of a domestic benchmark which is equal to the threshold level for the sector.¹ Installations which beat the benchmark, would receive an internationally recognised credit for each tonne below the benchmark from the host country government. Firms whose emissions exceed the benchmark would have to purchase internationally recognised credits from domestic installations which beat the benchmark or on the global carbon market. For each tonne below the threshold the host country government would receive an internationally recognised sectoral credit from the respective issuing body. In addition, the host country government would receive compliance credits from installations which exceed the benchmark. Both amounts together would be exactly equivalent to the amount which is required to reward the installations whose emissions are below the benchmark.

3.6 Feed in tariffs and subsidies

If a sectoral mechanism is introduced in the electricity sector, the government could introduce a feed-in tariff for renewable electricity. If the tariff is sufficiently high to make renewables commercially attractive, the increasing renewable electricity production will generate sectoral credits. These credits will accrue to the government and could cover part of the cost of the feed-in tariff. The disadvantage of this approach is that the incentive due to the feed-in tariff depends on the credibility of the government which has to sustain the tariff for a substantial time period.

Subsidies could be granted for many sectors and technology types, especially when it comes to energy efficiency improvements (procurement programmes, scrapping schemes for old devices, etc.). The challenge with subsidies is to avoid that they “fossilise” over time and support inefficient abatement options.

3.7 Taxes and subsidy reductions

There are different ways to use taxes as an incentive for sectoral crediting. A win-win approach for the national economy would be the reduction of fossil fuel subsidies accruing to the companies covered by the sector. The reduction of the subsidies would trigger emission reductions and the accrual of sectoral credits to companies reducing emissions would at least partially offset the monetary losses of the companies.

The simplest way of taxation would be to tax revenues from sales of sectoral credits that could be reinvested to buy international credits to cover emissions increases from some companies.

¹ This may require some unit conversion if the baseline level is not defined in form of a benchmark.

From an incentive point of view, such an approach would be highly problematic as it reduces the incentives for reduction and actually encourages free riding.

A much more incentive-compatible way of taxation would be an emissions tax for emissions above the threshold. As a disadvantage, this approach would require determining baseline emissions at installation level which may result in high transaction costs and trigger lobbying activities. Proceeds from this tax could be used by the government to buy emissions credits to cover the shortfall due to the excess emissions; ideally the tax thus would be set at a level equal to the market price for international credits. Due to the variability of these prices, the tax level should probably be set higher to avoid frequent changes.

The host country government could also tax fossil fuel use entirely to incentivise energy efficiency and make renewable fuels commercially attractive. The tax level would have to be set at a level sufficiently high to lead to an emission reduction below the threshold. If the introduction of the tax increases the awareness of energy efficiency improvements, the tax level could remain quite low and still harness a significant amount of sectoral credits that should accrue to the companies directly. The government could then redistribute the revenue from the tax in a way that does not disincentivise further emission reductions.

All tax-related options require good governance and a will provide mitigation incentives if the companies believe in the governments ability to implement and enforce such policies.

3.8 Standards and regulation

A mandatory requirement to install emissions mitigation equipment to reach the threshold could be coupled with a direct allocation of credits to the companies that reduce emissions below the baseline. The host country government guarantees to buy international credits to cover emissions of companies with excess emissions. This approach requires willingness of developing countries to enforce the abatement mandates. Governments might slap penalties on installations that do not comply with the mandate and use the revenues to buy credits to cover the shortfall.

3.9 Result

In order to provide sufficient mitigation incentives for private investors, the host country government would have to introduce policy instruments such as a mandatory regulation sufficient to achieve the threshold or a tax for excess emissions or a combination of several instruments, because then emissions reductions will not be “eaten up” by emissions remaining above the target level. The credibility of such an approach rests on the trustworthiness of the government to enforce a regulation or to collect a surplus emissions tax. Such policy combinations would allow the government to directly collect the funding for acquisition of international credits to reach the sectoral target level.

4 Views of selected actors

Baron, Buchner & Ellis (2009, pp. 23-28) discuss how sectoral crediting can be implemented at the host country and how emitters and other actors can be incentivized to invest in mitigation technology. They discuss options “ranging from a separation from the price signal (credit revenues go to the government) to an attempt at a full link (with full liability assumed by the gov-

ernment in case of overselling)” (Baron, Buchner & Ellis 2009, p. 27). They conclude that for “some of the implementation options ..., the government would also have more liability compared to the CDM” (Baron, Buchner & Ellis 2009, p. 28) and found “that the carbon market incentive to individual investors in mitigation may be less direct, and therefore weaker than that under a single project configuration like the CDM” (Baron, Buchner & Ellis 2009, p. 6). Despite the fact that the implementation of sectoral agreements requires a significant policy effort on the part of the host country government, they agree that incentives for private entities can basically be established.

Whitesell and Helme (2009) analyse various approaches how the price signal of the global carbon market can be fully passed through to the entities covered by a sectoral agreements. They discuss “Sector Programs and NAMAs”, “Cap-and-Trade in Developing Countries”, “No lose Sector Crediting” and “Tradable Intensity Standards” and find that in each of the approaches mitigation incentives can be established which are more or less directly linked to the global carbon markets. Cap-and-trade and a tradable intensity standard (section 3.5) may however provide the most direct incentives since they would be based on internationally recognised units and do not require the establishment of national units.

IETA (2010) also scrutinises how private sector entities could be incentivized to establish greenhouse gas mitigation measures under sectoral mechanisms. They analyse three options, “Central Coordination of Mitigation and Crediting”, “Domestic Sectoral Emissions Trading System” and “Installation-Level Mitigation and Crediting” with respect to their abilities to provide such incentives to the private sector and conclude that certain design options “would entail risks to investment that could severely curtail the ability of private finance to play a significant role,” but “that various options also exist that could incentivize scale up, achieve mitigation objectives, and still meet the needs of private investors” (IETA 2010, p. 15).

For developed or developing country Parties incentives for the private sector do not seem to be an issue at all. Earlier this year, 22 Parties submitted their views on new market-based mechanism including sectoral mechanisms.² Many highlighted that markets in general provide incentives for the innovation and diffusion of low carbon technologies but only Papua New Guinea touches on the issue of incentives for the private sector. However, even Papua New Guinea does not put into questions that incentives for the private sector can be maintained but calls only for an implementation which provides incentives for the business sector at national and international level.

5 Selected experiences

5.1 Guaranteeing the credibility of a mechanism - Lessons of the CDM

The CDM was initially seen as the least attractive of the Kyoto Mechanisms due to the risk of investing in emissions mitigation in developing countries and the huge bureaucracy required to check whether projects were actually additional and whether emissions reductions were real.

² FCCC/AWGLCA/2011/MISC.2 and FCCC/AWGLCA/2011/MISC.2/Add.1

International emissions trading was seen as having much lower transaction costs and Joint Implementation would benefit from the good investment climate in industrialized countries.

Nevertheless, the CDM became the most successful of the Kyoto Mechanisms. This was due to the fact that emissions credits are granted by an international institution without interference of the host country government. This enabled to avoid governmental corruption, especially due to the higher transparency of the CDM process in comparison to the Joint Implementation (JI) process. While the CDM project cycle is cumbersome, it has led to full fungibility of credits and their general acceptance as compliance tools. Only recently, media and NGO pressure has weakened the trust in CERs, leading to the EU decision to ban imports of certain credit types.

Moreover, companies in developing countries, especially the BASIC countries, discovered that CERs are a valuable export commodity, leading to a race to unilaterally develop CDM projects. This had not been foreseen by anyone and is the key secret of CDM success.

The high expectations for JI were shattered when host country governments bickered for years regarding rules how to allocate ERUs and were unclear about the approval rules. International emissions trading suffered from high profile corruption cases when government officials sold AAUs at prices well below market value.

The lessons from the CDM are thus that the availability of a transparent incentive for private companies on the international level which cannot be taken away by governments of low credibility can mobilize significant mitigation action. This means that sectoral crediting mechanisms should be designed in a way that minimizes involvement of host country government other than preventing free riding.

5.2 Examples of successful policies in developing countries

The transition from a project based to a sectoral mechanism will require an enhanced role for government actors. However, successful policies in developing countries have already been implemented in the past and provide important lessons for how private entities can be incentivised to reduce their emissions under a sectoral approach in the future. The following three case studies from developing countries demonstrate how different combinations of incentive instruments and measures can be adopted in order to encourage emission reductions.

5.2.1 The eleventh Five Year Plan in China

In China, the target of a 20% reduction in energy intensity was set for the country's eleventh Five Year Plan (2006-2010). A combination of financial incentives and mandatory regulations ensured that by 2010 the country achieved a 19.1% reduction in energy intensity (Hannon et al. 2011). Although it was necessary for the government to intervene and close small inefficient plants in 2010 to meet the energy intensity target, which was both socially and economically disruptive, various policies incentivising emission reductions also made an important contribution. In particular, the Top 1000 Energy Consuming Enterprise Programme and the Ten Key Projects Energy Efficiency Programme delivered primary energy savings of 124 Mtce and 102 Mtce respectively in 2006-2008 (Hannon et al. 2011).

In order to encourage energy intensity improvements in China's industrial sector, the Top 1000 Energy Efficiency Programme was established. Energy saving targets were set for China's 1,000 largest state-owned enterprises. Every company participating in the programme was required

to develop an energy efficiency action plan showing how the target would be achieved. It was expected that these action plans would include measures to improve the reporting of energy consumption, conduct energy audits and identify and invest in energy efficiency improvements. In addition to setting the energy saving target, the Chinese government instructed local authorities to supervise and monitor the participating firms in the implementation of their energy efficiency action plan. In November 2009, NDRC announced that the Top 1000 programme had reached its target energy savings of 100 Mtce (Price et al. 2010).

Given that the programme was rapidly implemented, there was insufficient time for a detailed assessment to determine the energy saving target of each company. As a consequence, it may be argued that the energy saving target for the Top 1000 Energy Efficiency Programme (i.e. 15% of the total energy savings required in the eleventh Five Year Plan) was not ambitious enough (Price et al. 2010). Therefore it is important to acknowledge that target setting needs to reflect abatement potential. In addition, many companies experienced difficulties in completing energy audits due to the lack of qualified auditing personnel. Capacity building in auditing and monitoring thus remains essential to the effectiveness of energy efficiency programmes. However, although lessons need to be learnt, the Top 1000 Energy Efficiency Programme is generally considered a success and demonstrates how private entities can be incentivised through the setting and monitoring of top-down targets by government actors.

The aim of the Ten Key Projects Energy Efficiency Programme was to deliver an energy saving of 250 Mtce during the eleventh Five Year Period by allocating targeted funding (i.e. approximately 1 billion USD) to energy efficiency projects (WRI 2009). For example, one objective of the program was to increase the efficiency of coal burning boilers and kilns by five and two percentage points (Energy Bulletin 2011). The renovation of medium and small sized boilers with advanced techniques such as pulverised coal firing were incentivised by allowing companies to apply for funding from China's Ministry of Finance. After a comprehensive energy audit, and following accounting and management system checks, an eligible company would receive 60% of the project's capital cost upfront, with the remaining 40% provided after the technology was installed and subject to an evaluation of the energy savings (WRI 2009). Such a payment structure 'rewarded' companies that successfully completed energy saving projects. Based upon the data for 2006-2008 it is expected that the programme achieved its target energy saving (Price et al. 2010).

5.2.2 Ethanol Programme in Brazil

In response to the oil crisis of 1973, the Brazilian government initiated a programme to incentivise the production of large quantities of ethanol from sugarcane (PROALCOHOL) as a replacement fuel for gasoline. Given that Brazil was the world's third largest sugar producer with five million tonnes of raw sugar equivalent in 1975 and that the product was valued at a low price for a long period in the international market, the decision was made to divert some of the sugarcane to ethanol production (Goldemberg 2006). The PROALCOHOL programme involved both compulsory and voluntary measures to stimulate demand for ethanol. Firstly, there was a compulsory requirement to use 10% anhydrous ethanol as an additive to gasoline, which did not require any changes to existing vehicles. Secondly, there was a voluntary requirement to use 100% hydrated ethanol in modified vehicles (Goldemberg 2006).

The PROALCOHOL programme increased the production of ethanol and, by 1981, a quarter of the cars sold in Brazil were fuelled by alcohol (Trennepohl 2010). Essential to the success of the programme was the agreement from the automobile manufacturers in the country to produce vehicles with converted motors. Such an agreement was only possible because the PROALCOHOL programme guaranteed the availability of ethanol in the fuel stations across the country (Goldemberg 2006). The Brazilian government primarily supported this programme through the provision of soft loans to the sugarcane farmers (i.e. to invest in ethanol distilleries) and to the consumer by subsidising the price of ethanol at the pump (Goldemberg 2006). According to Nunes (2007) the subsidy ensured that the ethanol price was set lower than the gas price (i.e. < 65%). Although sales in cars fuelled by alcohol subsequently decreased in the late 1980s and early 1990s, coinciding with lower oil prices and the removal of subsidies, the PROALCOHOL programme demonstrates how private entities can be incentivised to change their business operations in response to the introduction of regulation and financial incentives.

5.2.3 Energy Efficiency Programme in Thailand

During the 1990s the electricity demand in Thailand was increasing rapidly, with lighting representing 25% of national electricity use in the country (Birner 2000). As a consequence a comprehensive five year demand side management (DSM) programme was set up by the Thai national electric power utility (EGAT) in 1993. The new DSM office implemented several market interventions for energy efficiency, which did not rely upon the use of subsidies. Instead EGAT encouraged energy efficiency improvements through various collaborations with manufacturers and public promotions (Birner & Martinot 2003). The switching from thick (T-12) to thin (T-8) fluorescent tubes provides an example of how the DSM programme successfully intervened in the market. By financing an \$8 million consumer information campaign highlighting that the T-8 tubes provided the same quality of lighting as the T-12 tubes whilst consuming less energy, the EGAT secured an agreement with the importers and manufactures of T-12 tubes to switch to T-8 tubes. As a consequence of this market intervention the market share of T-8 tubes increased from a 40% share in 1994 to a 100% market share by the end of 1995 (Birner & Martinot 2003).

The introduction of energy efficiency labelling was another effective market intervention by EGAT in the manufacture of refrigerators. EGAT negotiated a voluntary labelling scheme for refrigerators based upon efficiency performance. This was again supported by an advertising campaign to promote the energy efficiency standard to consumers and EGAT ensured that there was sufficient capacity to audit refrigerator models by partnering with a technical standards institute to test the refrigerators. The scheme was subsequently made mandatory with an increase in the energy efficiency requirements for the labelling scheme. The impact of the programme was impressive. In 1994, only one single door model and 2% of double door models qualified for the highest energy efficiency level. By 2000, all single door and 60% of double door models qualified for the highest efficiency level (Birner & Martinot 2003). The experience in Thailand demonstrates that voluntary agreements can be effective when industry have confidence in government policies to transform the market. The empowerment of consumer choice, through the introduction of energy efficiency labelling and information, can also facilitate necessary market transformations.

6 Implications for the concept of sectoral mechanisms

Sectoral mechanisms strive to trigger investments into sectoral greenhouse gas mitigation activities. In particular under the scenario of a sector with mainly private owned emitters that faces a sectoral no lose target, incentives to invest into mitigation might be low if investors do not get guarantees to receive an equivalent for their investment, e.g. in form of credits. It is thus required to design the implementation of a sectoral mechanism in a way that prevents free riding and provides guarantees to investors. Otherwise private investments will be alienated by the lack of credibility.

As the lessons of a decade of CDM show, the availability of a clear incentive was the key pillar of success. Thus, sectoral mechanisms will only be successful if private companies see such an incentive that has a fair chance of surviving in the long run. The discussion on the role of government has shown that the increased responsibility of the government under a sectoral mechanism requires strong governance of implementing domestic mitigation policies. Therefore, sectoral mechanisms may initially be implemented only in selected developing countries. However, examples of successful climate mitigation policies illustrate that several countries have a good track record in implementing such policies and that a number of developing countries would be eligible for establishing sectoral mechanisms.

In terms of measures, host country governments should concentrate on providing policy instruments that prevent free riding. The fact that a sectoral crediting threshold is no lose for the country as a whole does not necessarily imply that the implementation of the mechanism within the country needs to be no lose as well.

Emissions above the threshold could be penalized by a mandatory regulation or an emissions tax, which would provide a clear message that emissions reductions achieved by one company are not diluted by the non-action of its competitor. Alternatively, subsidies such as feed in tariffs could be used to provide a clear monetary incentive to the private sector. These incentives would however not be directly linked to the global carbon market. The credits would just serve to reduce the government's budgetary burden in the case of a subsidy or to increase revenues in the case of an emission tax. Last but not least sectoral mechanisms can domestically also be implemented as a mandatory emissions trading scheme. Such an approach would establish a direct link to the carbon market and provide strong mitigation incentives at activity level.

However, each host country and each sector is different. Investors, in particular from industrialised countries, will only invest if (i) they trust in the respective government and (ii) believe the implementation of the mechanism is credible enough. In order to build confidence in this regard, pilot schemes should be set up rather sooner than later. Many concerns on lacking incentive structures of sectoral mechanisms will disappear once the new market-based approach is established as long as CDM is currently established.

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