A Clean Development Mechanism (CDM) with atmospheric benefits for a post-2012 climate regime

Discussion paper

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Disclaimer

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1 Introduction

The Clean Development Mechanism (CDM) has become one of the most important elements of the Kyoto Protocol. Over the past years, the CDM has grown to a market with a value of several billion Euros. More than 1,000 projects have been registered and many more are still being developed. This illustrates that the CDM has been a great success in developing a new and global market for GHG emission reduction projects in developing countries.

The CDM has also been criticised for various reasons. This includes a lack of transparency, inadequate governance structures, cumbersome procedures, poor environmental integrity, little contribution to sustainable development, an inequitable geographical distribution of CDM projects, its limited ability to reduce GHG emissions in some sectors and having the character of an offsetting mechanism. These issues are being reviewed in a growing number of publications. Reforms and changes to the CDM are currently being debated under the review of the Kyoto Protocol and the Ad-hoc Working Group on Further Commitments for Annex I Parties under the Kyoto Protocol (AWG-KP).

This paper analyses one possible reform to the CDM for a post-2012 climate regime: the introduction of a CDM “with atmospheric benefits”, meaning that fewer Certified Emission Reduction Units (CERs) would be issued or used compared to the level of emission reductions achieved through a CDM project. In this way, the CDM would be moved away from a pure offsetting mechanism where one ton of emission reduction achieved through the CDM in a developing country enables an industrialised country to increase its emissions by one ton. If fewer emission reductions are credited than are achieved through the CDM project, the CDM could directly contribute to lowering global GHG emissions, thereby providing additional benefits to the atmosphere.

Firstly the context and rationale for introducing a CDM with atmospheric benefits is explained (chapter 2). Effects on the carbon market are discussed in chapter 3. Different options for implementing a CDM with atmospheric benefits are explored in chapter 4. The environmental effectiveness, practical feasibility and political acceptability of a CDM with atmospheric benefits are analysed in chapter 5 and conclusions and recommendations are provided in chapter 6.

2 Why introduce a CDM with atmospheric benefits?

The current CDM is an offsetting mechanism. This means that emission reductions achieved through CDM projects in developing countries enable industrialised countries to increase their emissions above their assigned Kyoto targets. In this regard, the CDM does not reduce global GHG emissions but is, in principle, a zero sum game to the atmosphere – provided that emission reductions from CDM projects are real, measurable and additional, as required by Article 12.5 of the Kyoto Protocol (see further discussion in the box below).

The current CDM has two main objectives: assisting developing countries in achieving sustainable development and helping industrialised countries to lower their costs incurred in meeting their emission reduction targets. By lowering the global costs of mitigation, the CDM makes it easier for Annex I Parties to commit to deeper emission cuts. In this way, the CDM indirectly facilitates the achievement of deeper global emission reductions and thereby contributes to the ultimate objective of the Convention, as stipulated in Article 12.2 of the Kyoto Protocol.

However, a pure offsetting mechanism, such as the current CDM, has considerable limits in addressing GHG emissions in developing countries and contributing to the ultimate objective of the Convention. Parties to the Kyoto Protocol have highlighted that "global emissions of greenhouse gases (GHGs) need to peak in the next 10–15 years and be reduced to very low levels, well below half of levels in 2000 by the middle of the twenty-first century in order to stabilize their concentrations in the atmosphere at the lowest levels assessed by the IPCC to date in its scenarios".[1] The GHG emissions of developing countries have already exceeded emissions from industrialised countries and are expected to increase considerably. In a longer term perspective, it becomes obvious that an offsetting mechanism, such as the CDM, will not be sufficient to bring about the necessary emission reductions. The Stern Review puts this succinctly by highlighting that "even if emissions from developed regions (...) could be reduced to zero in 2050, the rest of the world would still need to cut emissions by 40% from BAU to stabilise at 550 ppm CO_2e. For 450 ppm CO_2e, this rises to almost 80%" (Stern 2007).

An important rationale for introducing a CDM with atmospheric benefits is to further enhance global climate mitigation beyond given targets by industrialised countries in order to achieve ambitious reductions of global GHG emissions. Under a CDM with atmospheric benefits, the emission reductions achieved through the CDM are not fully used to allow increased emissions in industrialised countries; rather a share of the emission reductions is not credited. For example, for a project that brings about two tons of emission reductions, only one CER may be issued. The use of the CER allows

[1] Conclusions adopted by the Ad Hoc Working Group on Further Commitments for Annex I Parties under the Kyoto Protocol at its resumed fourth session held in Bali, 3–11 December 2007

an Annex I country to increase its emissions only by one ton, resulting in a net benefit of one ton for the atmosphere. As discussed in detail in chapter 3 below, the enhanced global GHG abatement due to the introduction of a CDM with atmospheric benefits can occur in both industrialised and developing countries and is financed through the purchase of CERs by industrialised countries.

However, there are also other arguments for introducing a CDM with atmospheric benefits:

- Currently, the CDM faces considerable problems with regard to its environmental integrity (see, for example, Michaelowa and Purohit 2007, IRN 2008, Victor and Wara 2008, Schneider 2007). This has also been recognised by the Parties to the Kyoto Protocol through the request that "in considering possible improvements to the mechanisms, due attention should be paid to promoting, inter alia, the environmental integrity of the Kyoto Protocol and the contribution of the mechanisms to sustainable development".[2] Moving the CDM beyond a pure offsetting mechanism, i.e. towards a system where not all emission reductions by the project are credited, could help alleviate the concerns that the emission reductions from CDM projects are not all necessarily real, measurable and additional.

  In this context, a reduced crediting of emission reductions from CDM projects could be seen as applying a "conservativeness factor" to address the uncertainty involved in assessing the additionality of CDM projects. Approved baseline and monitoring methodologies frequently apply conservativeness factors or make conservative assumptions to address major uncertainties in the calculation of emission reductions. For example, uncertain emission factors or sampling results are adjusted to ensure that emission reductions are estimated in a conservative manner. Similarly, the uncertainty in determining additionality could be addressed by applying a "conservativeness discount" to the overall emission reductions from CDM projects.

  Assessing additionality is counterfactual and hypothetical; finding a balance between limiting the number of free-riders and avoiding too many lost opportunities will continue to be difficult. Whatever the procedures and criteria used to demonstrate additionality, a certain amount of "free-riding" projects will always be part of the CDM. Even with objective and ambitious additionality criteria, such as ambitious benchmarks or technology penetration rates, some projects that would be implemented anyway will qualify for the CDM. In practice, it is impossible to fully ensure that all projects registered under the CDM are additional. Crediting only part of the emission reductions addresses the problem of "free-riding" projects on an aggregated level.

[2] Analysis of means to reach emission reduction targets and identification of ways to enhance their effectiveness and contribution to sustainable development. Draft conclusions by the Chair. FCCC/KP/AWG/2008/L.2

BOX 1: Is the CDM a zero sum game for the atmosphere?

The CDM is a zero sum game for the atmosphere if the quantity of CERs issued corresponds to the quantity of emission reductions achieved through the CDM. If the emission reductions achieved as a result of the CDM are underestimated, there would be a benefit to the atmosphere. In this case the quantity of CERs issued and used by Annex I countries to increase their emission levels would be lower than the actual emission reductions achieved by the CDM. Vice versa, if emission reductions from CDM projects are overestimated, it would result in an increase of global GHG emissions. In practice, the real emission reductions from CDM projects are difficult to determine and are influenced by various factors:

- A key principle in the CDM is “conservativeness” in the estimation of emission reductions (paragraph 45(b) of Decision 17/CP.7). Most approved baseline and monitoring methodologies contain elements of conservativeness, such as the use of conservative default values or adjustments in the case of statistical uncertainties or the exclusion of small baseline emission sources. This tends to result in an underestimation of the calculated emission reductions.
- Another factor that tends to lead to an underestimation of emission reductions is the limited crediting period. Some projects have a longer technical lifetime than the duration of the crediting period. Nearly half of the currently registered projects only seek CERs for one single crediting period of 10 years (30 years for forestry projects) and do not opt for a possible renewal of the crediting period of up to 21 years (60 years for forestry projects) (UNEP/RISOE 2008). On the other hand, a number of CDM projects could be investments that are made earlier and would happen anyhow at a later stage.
- Some CDM projects can induce technological innovation, resulting in positive spill-over effects and further emission reductions in the host countries. On the other hand, the use of the CDM may reduce the necessity and speed of technological innovation in Annex I countries or may result in a lock-in to GHG intensive technologies in these countries.
- Several reports have questioned the extent to which emission reductions achieved under the CDM are additional (Schneider 2007, Victor & Wara 2008, IRN 2008). Projects that are not additional could result in a considerable overestimation of emission reductions: If projects would also occur without the incentive from the CDM but are nevertheless registered as a CDM project, the issuance of CERs results in an increase of global GHG emissions because the CERs allow Annex I countries to increase their GHG emissions whereas the emission reductions from the project in the non-Annex I country would have occurred anyhow. While the CDM Executive Board started to take action to address some of the current problems (e.g. by providing further guidance on how additionality should be assessed), a significant amount of “free-riding” projects is likely to always be part of the CDM, whatever the rules for assessing additionality, given that the demonstration of additionality is a counterfactual and hypothetical exercise.
- The performance of some Designated Operational Entities (DOEs) has been heavily criticised by the CDM Executive Board and other stakeholders (see, for example, Schneider 2007, IRN 2008). For example, it has been reported that in some cases project documentation has been systematically faked by project developers but that this was not identified by DOEs (Michaelowa and Purohit 2007). This would also result in an overestimation of emission reductions achieved through CDM projects. A Validation & Verification Manual (VVM) is being prepared by the CDM Executive Board to provide more clarity on how DOEs should perform their functions.
- The CDM could create perverse incentives for policy makers in developing countries not to adopt policies and measures that abate GHG emissions. For example, policy makers might be hesitant to introduce regulations to reduce GHG emissions if it were to reduce the potential for the development of CDM projects in their country.

In conclusion, quantifying the real effect of the CDM on the atmosphere is uncertain. However, various reports suggest that the problems with additionality and the performance of DOEs could be significant and could result in an overestimation of emission reductions from the CDM.

- Chung (2007) argues that a CDM with atmospheric benefits is a way to “positively engage developing countries in global GHG emission reduction” and sees this as a way for developing countries to provide global mitigation contributions. However, under a CDM with atmospheric benefits, the enhanced GHG abatement is financed by industrialised countries through the purchase of CERs. Moreover, the introduction of a CDM with atmospheric benefits can result in enhanced mitigation action in both industrialised and developing countries and even increased rents for project developers and host countries (see chapter 3).
- The introduction of a CDM with atmospheric benefits could promote the use of more innovative technologies, as fewer credits in combination with higher CER prices favour technologies with lower GHG emissions (see section 5.1).
- The CDM has also been criticised as ineffective because some projects have benefited from very large windfall profits. This applies in particular to the destruction of N_2O from adipic acid and nitric acid plants and the destruction of HFC-23 which is a waste product in the production of HCFC-22. For these mitigation opportunities, the abatement costs are far below the revenues from the CDM. While the market has been very effective in searching for these low-cost opportunities, the huge windfall profits for a few companies are seen as ineffective and causing extra costs for tax payers and consumers in Annex I countries (IRN 2008). The introduction of a CDM with atmospheric benefits could reduce these windfall profits and make the CDM more effective.

Clearly, a CDM with atmospheric benefits has limits in tackling global GHG emissions and should therefore be only one element in a global climate regime alongside other elements which may be more effective to address GHG emissions, such as appropriate policies and measures, other national, regional or international carbon market instruments or financial mechanisms. In a longer term perspective, cap and trade schemes may be more effective than project-based mechanisms to address GHG emissions from large point sources.

Several stakeholders have called for a CDM with atmospheric benefits in a future climate regime: The EU has stressed at UNFCCC negotiations that moving the CDM beyond an offsetting mechanism should, next to new types of carbon market mechanisms, be a key element in a post-2012 agreement. During consultations under the UNFCCC on a post-2012 climate regime, South Korea has proposed the discounting of credits as part of a new mechanism to credit “nationally appropriate mitigation actions” by developing countries (Chung 2008). Chung had earlier proposed a CER discounting scheme as a key element of a post-2012 climate regime to engage developing countries (Chung 2007). He sees a CDM discounting scheme as a way for developing countries to contribute to global mitigation efforts and as an alternative approach to binding caps for developing countries. Meng (2007) has proposed a “value-added CDM” where part of the emission reductions are discounted and retired to the atmosphere. The German emissions trading association BVEK has proposed a CDM discounting scheme where the level of discounting depends on per capita emissions and per capita gross domestic product of the host country (BVEK 2008). Schneider (2007) has highlighted the discounting of emission reductions as an option for the use of CERs in the EU ETS after 2012. The Climate Action Network, a network of environmental non-governmental organisations, has pointed out in its position paper for the COP/MOP3 in Bali in December 2007 that it is “imperative to ensure that the CDM in the future moves beyond offsetting and in fact yields a proper net reduction in global emissions and does not permit developed countries to evade emission reduction responsibilities and obligations” (CAN 2007).

3 Effects of a CDM with atmospheric benefits on the carbon market

Introducing a CDM with atmospheric benefits could have considerable implications for the carbon market. It will affect the CER supply, the level of GHG abatement in industrialised countries, the price of allowances in the carbon market, the global costs of GHG abatement and the rents from suppliers and users of CERs. These effects are analysed in a qualitative and static manner from the perspective of economic theory. It is assumed that a CDM with atmospheric benefits is introduced by discounting emission reductions, meaning that not all of the emission reductions achieved by a CDM project can be used in the carbon market but that a certain fraction is not credited (see discussion of this and other options in chapter 4).

In the analysis, the situation with and without discounting is compared in the context of two different situations:

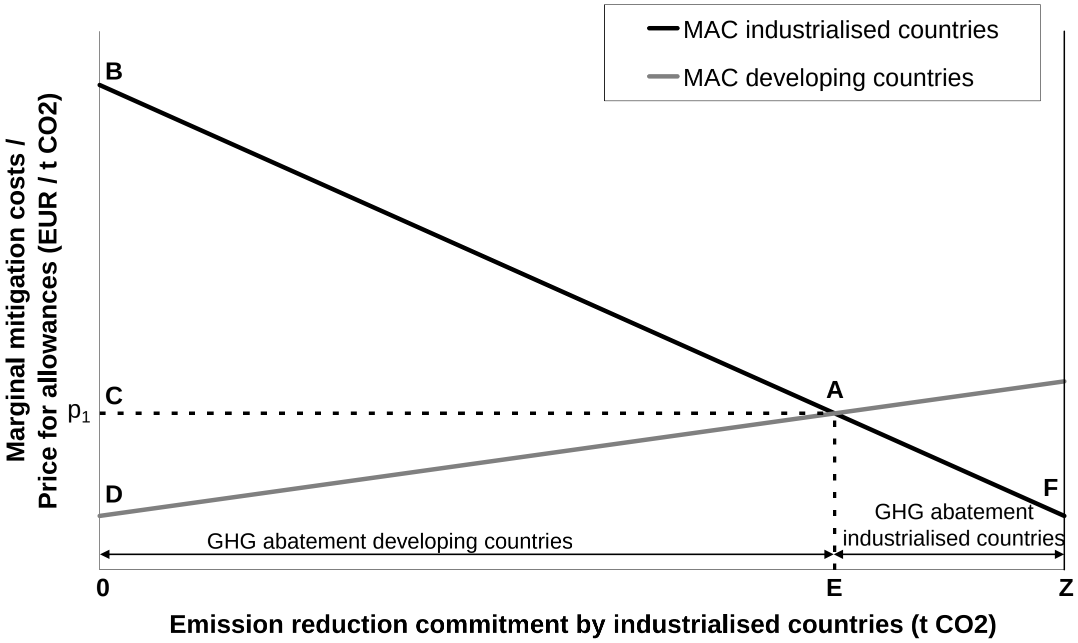
1) A carbon market without any limitations on the use of the CDM (section 3.1).
2) A carbon market where the use of the CDM is limited to adhere to the principle established in the Kyoto Protocol that the use of the mechanisms shall be supplemental to domestic action (section 0). This corresponds to the situation in the first commitment period under the Kyoto Protocol in which emission reductions from the CDM are fully credited but the use of CERs is limited through limits of governmental allowance purchase programmes and the cap on the use of CDM and JI in most national or regional emissions trading schemes, such as the EU ETS.

Several simplifying assumptions are made in the analysis: it is assumed that all emission reductions from CDM projects are real, measurable and additional, that the transaction costs of the CDM are negligible, that the market is fully transparent, and that there are no market barriers. Furthermore, it is assumed that all industrialised countries have binding emission reduction commitments and that developing countries have no commitments to reduce GHG emissions and only participate through the CDM in the carbon market. It is further assumed that industrialised countries could achieve their targets by domestic emission reductions alone, by using only the CDM or by a combination of both. These assumptions are not necessarily valid in real life but do not qualitatively affect the results of the analysis.

3.1 A carbon market without limitations on the use of the CDM

Figure 1 below shows a carbon market without any limitations on the use of the CDM and with the current CDM in which emission reductions from CDM projects are fully credited. The distance 0Z on the x-axis corresponds to the aggregated GHG emission reduction commitment by all industrialised countries, i.e. the axis corresponds to the difference between BAU emissions and the binding caps, aggregated for all industrialising countries. The grey line which starts at the left y axis is the aggregated marginal GHG abatement cost curve (MAC) of all developing countries. In the case of full crediting and in the absence of transaction costs, this curve corresponds to the marginal costs of CER supply. The black line which starts at the right y axis is the aggregated marginal GHG abatement cost curve (MAC) of industrialised countries. In this example, the marginal abatement cost curves (MACs) have been chosen in such a manner that the abatement costs are lower in developing countries. This is supported by data on GHG abatement costs and by economic modelling.

Figure 1: The carbon market without any limit on the use of the CDM and with full crediting of emission reductions from CDM projects



Without any limitation on the use of CERs, market equilibrium is achieved where the marginal GHG abatement costs are equal in industrialised and developing countries (point A). The market price for allowances p_1 corresponds to the marginal abatement costs in both industrialised and developing countries. As a consequence of the lower GHG abatement costs in developing countries, most of the GHG abatement would, in this example, occur in developing countries through the CDM. The use of the CDM reduces the global mitigation costs.[3]

[3] Without using the CDM, the costs for industrialised countries for achieving the emission reduction commitment (0Z) would correspond to the area below the black line (0BFZ). As a result of using the CDM, the global mitigation costs are reduced to the 0DAFZ area. These cost savings or rents from using the CDM are shared between the countries or entities purchasing the CERs (CER users), and those developing the projects and selling the CERs (CER suppliers). The rent of the CER users corresponds to the difference of their domestic mitigation costs and the costs for CER purchase (ABC area); the rent of the CER suppliers corresponds to the difference between the revenues from the sale of CERs and the GHG abatement costs of the CDM projects (DCA area). In the case of unilateral CDM or a tax on

In Figure 2 a CDM with atmospheric benefits is introduced. The reduced crediting implies that the delivery of CERs becomes more expensive. If only a fraction of the emission reductions is credited, the reduced quantity of CERs has to be sold at a higher price to cover the same GHG abatement costs. The marginal costs of CER delivery are illustrated with the new line in Figure 2. In this case, it is assumed that 50% of the emission reductions from a CDM project are credited.

The new market equilibrium is at point M where the marginal costs of CER delivery equal the marginal costs of GHG abatement in industrialised countries. The market price for CERs and allowances from industrialised countries is p_2. The higher costs of CER delivery result in a higher market price p_2 compared to the situation without a CDM with atmospheric benefits (price p_1). As only part of the emission reductions are credited, an enhanced global GHG abatement is achieved, which is illustrated on the left side of the figure (distance 0S). With 50% crediting, the enhanced global mitigation as a result of the introduction of a CDM with atmospheric benefits corresponds to the CER supply (distance 0S = distance 0R).

The enhanced GHG abatement as a result of the introduction of a CDM with atmospheric benefits can come about in developing and industrialised countries. In the example in Figure 2, most of the enhanced GHG abatement occurs in industrialised countries whereas the mitigation in developing countries remains similar to the situation in Figure 1. Whether the introduction of a CDM with atmospheric benefits mainly reduces emissions in developing countries or in industrialised countries depends on the GHG abatement opportunities, their costs, the extent to which emission reductions are credited, as well as other circumstances outside of the CDM (e.g. nationally appropriate mitigation actions in developing countries). However, the figure clearly illustrates that compared to a situation with full crediting of CERs and no limitations on the use of the CDM, the introduction of a CDM with atmospheric benefits could increase the GHG abatement mainly in industrialised countries and does not necessarily result in enhanced GHG abatement in developing countries.

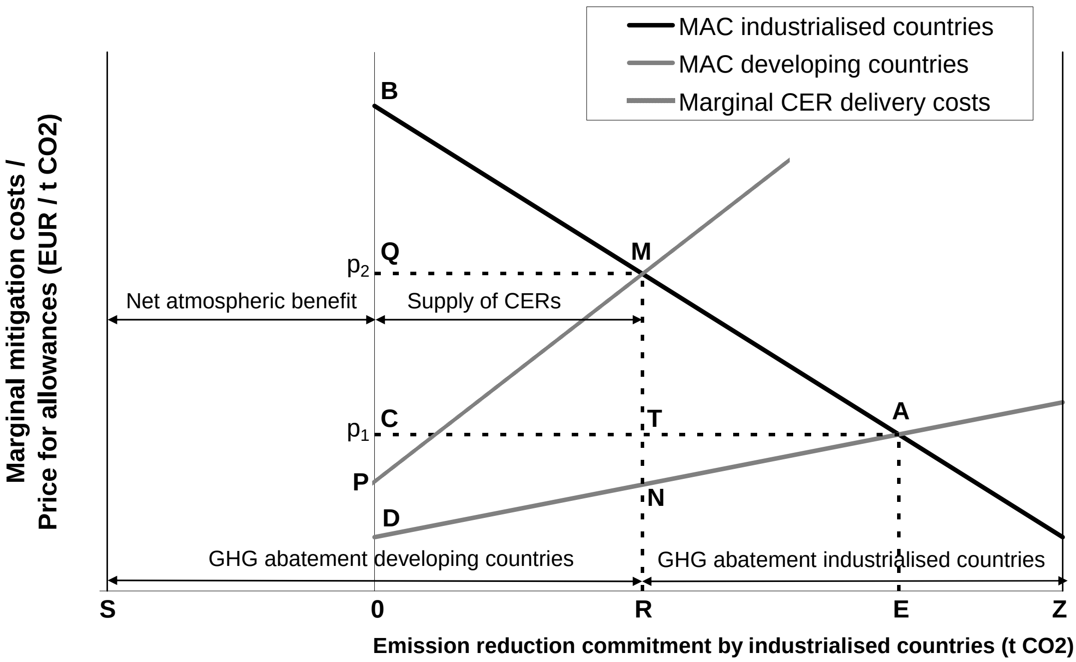
The introduction of a CDM with atmospheric benefits could increase the GHG mitigation costs considerably[4] compared to the situation with full crediting of CERs and no limitations on the use of the CDM (Figure 1). In Figure 2, these costs are mainly paid for by the CER users: the rents of CER suppliers are not significantly affected (the PQM area corresponds approximately to the DCA area). In contrast, the rents of the CER users are reduced considerably since the CER users have to undertake additional domestic mitigation (AMT area) and have to purchase CERs at higher prices (CQMT

CERs by host countries, the rent of the CER suppliers can be considered as a rent for the host country. In the case of bilateral CDM, the rent may be shared between the different entities involved in the development of the project.

4 The actual effects depend significantly on the shape and slope of the marginal abatement cost curves in developing and industrialised countries. In Figure 2, the costs increase by the DPMA area.

area). The value of the CDM market is not affected significantly by the introduction of a CDM with atmospheric benefits. The lower supply of CERs is compensated by higher CER prices.[5]

Figure 2: The carbon market without any limitations on the use of the CDM but with a CDM with atmospheric benefits



In conclusion, in the example provided in Figure 2, the costs of the enhanced global GHG abatement due to the introduction of a CDM with atmospheric benefits are largely paid for by industrialised countries. The distribution of the increased costs between industrialised and developing countries depends on the shape of the marginal abatement cost curves in both developing and industrialised countries as well as the extent to which emission reductions are credited. However, the conclusion that mainly industrialised countries pay for the enhanced GHG abatement holds for a range of different slopes of marginal abatement cost curves and different levels of crediting emission reductions.

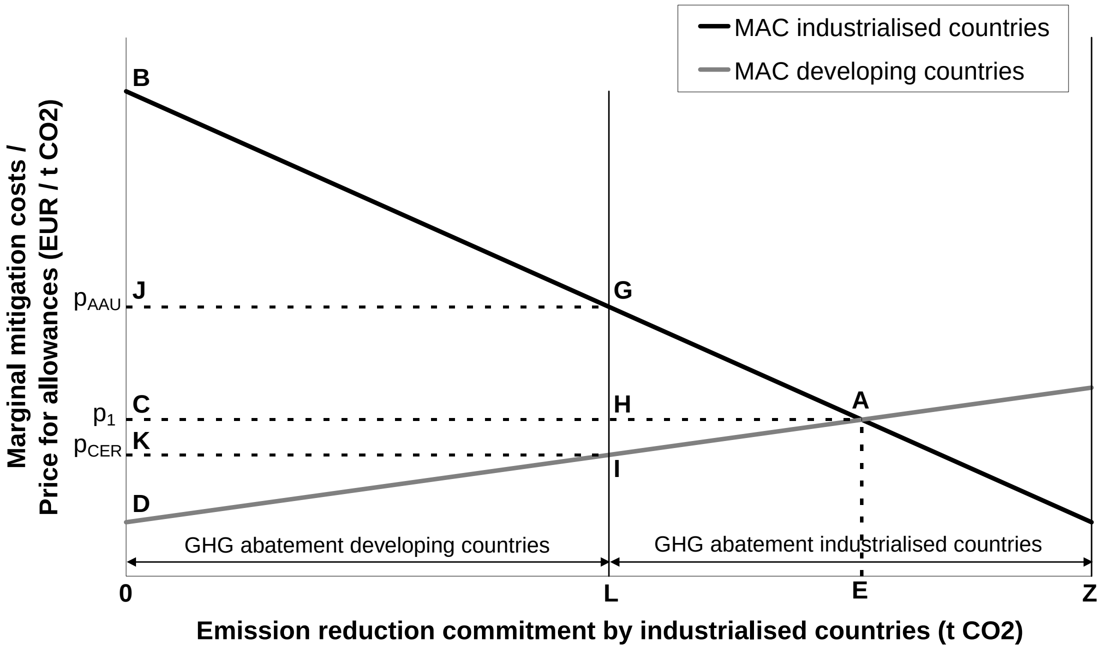
3.2 A carbon market with limitations on the use of the CDM

Figure 3 below shows the situation for a carbon market with a limitation on the use of the CDM and with the current CDM in which emission reductions from CDM projects are fully credited. The limitation is set in a manner that at least half of the emission re-

[5] The value of the CDM market without discounting of CERs corresponds to the 0CAE area. The value of the CDM market with discounting corresponds to the 0QMR area. Both areas have approximately the same size.

ductions compared to BAU must occur in industrialised countries. As the marginal GHG abatement cost curve is lower for developing countries, the CDM is used up to this limit and the market clearance is at points G and I. Compared to the situation without any limitation on the use of the CDM (Figure 1), the GHG abatement in industrialised countries increases by the distance of LE and the abatement in developing countries decreases respectively.

Figure 3: The carbon market with a limit on the use of the CDM but with full crediting of emission reductions from CDM projects



As a consequence of the limitation on the use of CDM, global GHG abatement costs increase by the GHIA area (not taking into account indirect effects, such as the impacts of higher carbon prices on innovation). The limitation on the use of CDM results in two different prices: the price for allowances of Annex I countries p_{AAU} – Assigned Amount Units (AAUs) or allowances in emissions trading schemes – is higher than the price for CERs. This can also be observed in the EU ETS where CERs that have already been issued with no risks of delivery (also referred to as "secondary CERs") are traded at lower prices compared to EUAs. In comparison to the situation without any limitation on the use of the CDM (Figure 1), the price for allowances of Annex I countries increases from p_1 to p_{AAU} and the price for CERs decreases from p_1 to p_{CER}. The limitation on the use of the CDM mainly reduces the rents of the CER suppliers. This is due to a lower CER volume and lower CER prices compared to scenario A. The rents of the CER suppliers decrease by the KCAI area. The rents of the CER users are affected less strongly. The CER users have higher costs as they have to mitigate more domestically (AHG area) but they also benefit from lower CER prices (KCHI area).

The introduction of a CDM with atmospheric benefits in combination with a limitation on the use of the CDM can have different consequences, depending on the level of the limit and the extent to which emission reductions from CDM projects are credited. In order to illustrate the possible implications, three different levels of crediting emission reductions are discussed in the following (50%, 60% and 70%). In all cases, the limit on the use of the CDM is the same as in Figure 3.

Figure 4 shows the market for the case of 50% crediting of emission reductions. In this case, the limit on the use of the CDM would not affect the market clearance price since the introduction of a CDM with atmospheric benefits reduces the CER supply more strongly than the limit on the use of the CDM would do. The market equilibrium is, as in Figure 2, at point M and determined by the introduction of a CDM with atmospheric benefits. Other than in the situation without a CDM with atmospheric benefits (Figure 3), there is only one single carbon market price (p_2) for CERs and for allowances of industrialised countries. The price for allowances of industrialised countries increases moderately from p_{AAU} to p_2 whereas the price for CERs increases considerably from p_{CER} to p_2.

Figure 4: The carbon market with a limit on the use of the CDM and 50% crediting of the emission reductions from CDM projects

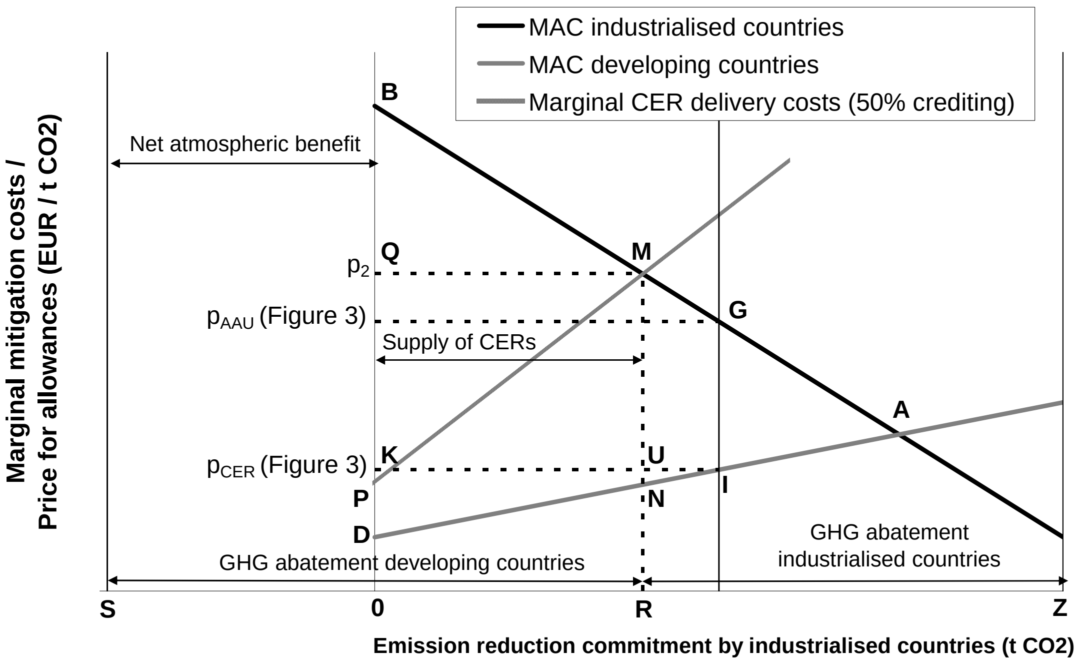
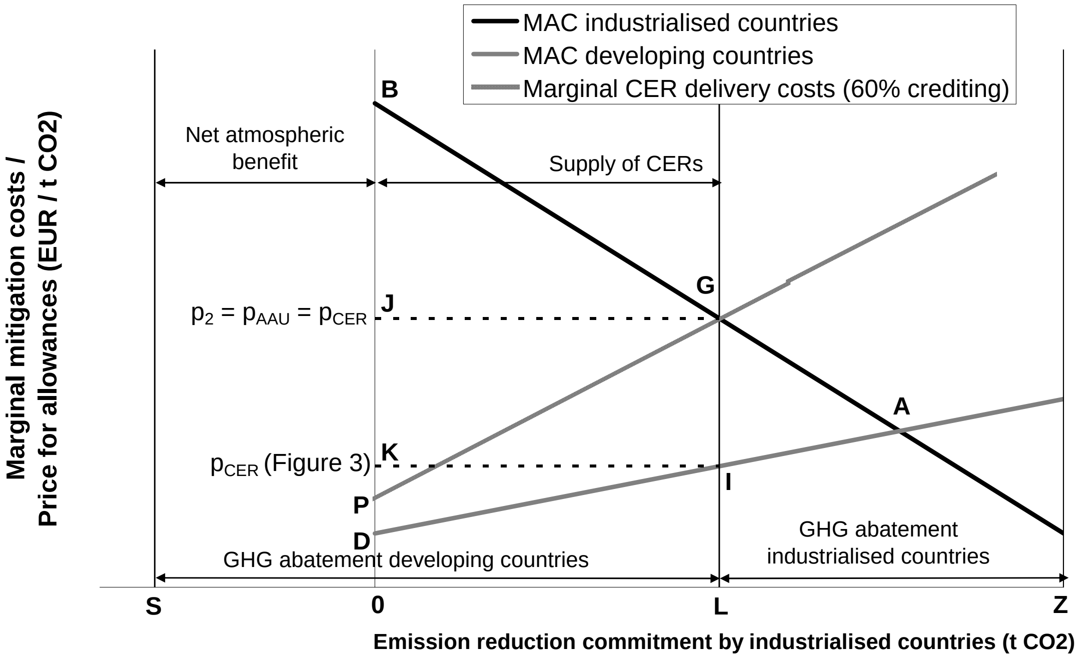


Figure 5 shows the market for the case of 60% crediting of emission reductions. In this case, the level of crediting has been chosen in a manner that the market clearance is, as in Figure 3, at point G. As is the case with 50% crediting, there is only one single carbon market price (p_2) for CERs and allowances of industrialised countries. Whereas the price for allowances of industrialised countries (p_{AAU}) is the same as in the situation without a CDM with atmospheric benefits, the price for CERs increases again considerably from p_{CER} to p_2.

Figure 5: The carbon market with a limit on the use of the CDM and 60% crediting of the emission reductions from CDM projects

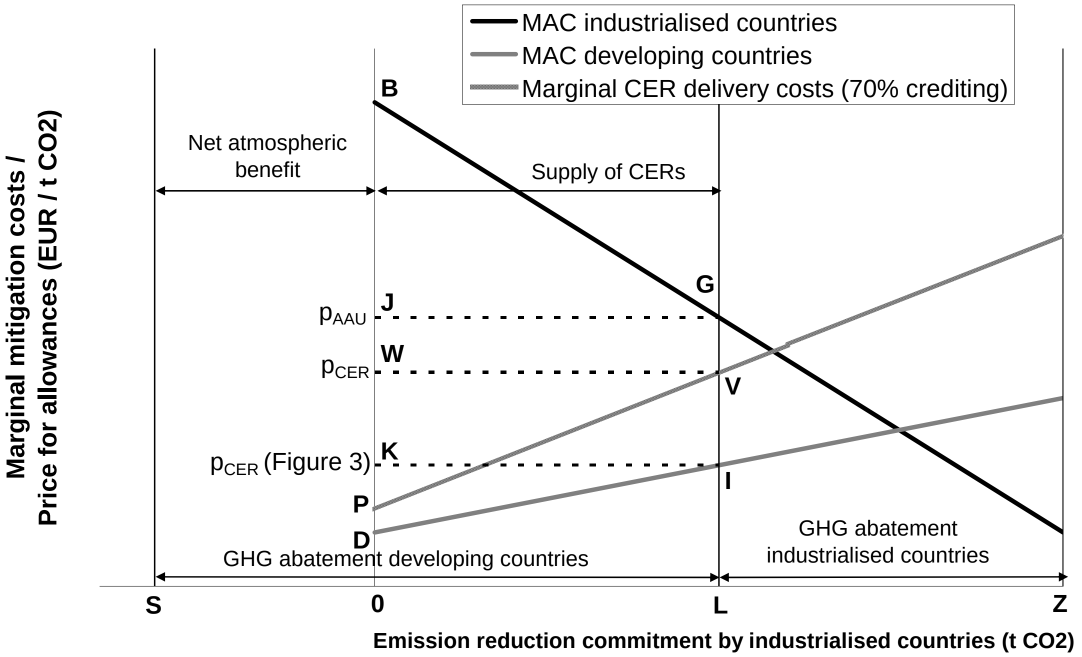


Finally, Figure 6 shows the market equilibrium for the case of 70% crediting of emission reductions. The main difference to the cases of 50% and 60% crediting is that the market clearance point is determined through the limit on the use of the CDM (points G and V). As in the situation without a CDM with atmospheric benefits (Figure 3), this results in different market prices for CERs and allowances of industrialised countries. The price for allowances of industrialised countries (p_{AAU}) is the same as in the situation without a CDM with atmospheric benefits. The price for CERs (p_{CER}) is lower than the price of industrialised countries (p_{AAU}) but again higher than the price for CERs in the situation without a CDM with atmospheric benefits.

The three cases show that the effects on carbon market prices and the level of global GHG abatement are slightly different. However, the three cases have several important aspects in common, in particular if compared to the situation where a CDM with atmospheric benefits is introduced in a carbon market without any limitations on the use of the CDM:

- Whereas the introduction of a CDM with atmospheric benefits enhances in all cases the global GHG mitigation, there are important differences in terms of *where* the enhanced GHG abatement occurs. In a carbon market without any limitation on the use of the CDM, the enhanced GHG abatement occurs mainly in industrialised countries (see section 3.1 above). In contrast, in a carbon market with a limitation on the use of the CDM, the enhanced GHG abatement occurs mainly in developing countries.[6]

Figure 6: The carbon market with a limit on the use of the CDM and 70% crediting of the emission reductions from CDM projects



- In a carbon market with limitations on the use of the CDM, the introduction of a CDM with atmospheric benefits increases the global mitigation costs more moderately than for a carbon market without any limitations on the use of the CDM.[7]
- As for a carbon market without any limitations on the use of the CDM, the costs for the enhanced global GHG abatement are mainly paid for by the users of the CERs, i.e. industrialised countries. Again, this holds for different levels of crediting emission reductions and different slopes of the marginal abatement cost curves.[8]

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[6] In the case of 60% and 70% crediting, the enhanced GHG abatement occurs fully in developing countries (distance 0S). In case of 50% crediting, the enhanced GHG abatement occurs mainly in developing countries and partly in industrialised countries. Again, the exact effects depend considerably on a number of parameters, in particular the stringency of the limit on the use of the CDM, the level of crediting under the CDM and the shape of the marginal abatement cost curves.

[7] In the case of 50% crediting, the global mitigation costs increase by the DMPGI area. In case of 60% crediting this corresponds to the DPGI area and in case of 50% crediting to the DPVI area.

[8] In the case of 50% crediting, the CER users increase their domestic mitigation instead of purchasing CERs (UMGI area) and have to purchase CERs at considerably higher prices than in scenario B (KQMU area). In the case of 60% crediting, the costs for CER users increase more moderately than in the case of 50% crediting since CER users have to pur-

- In a carbon market with limitations on the use of the CDM, the CER suppliers benefit considerably from the introduction of a CDM with atmospheric benefits. In all three analysed cases (50%, 60% and 70% crediting), the rents of the CER suppliers increase significantly compared to the situation without a CDM with atmospheric benefits (Figure 3).[9] Thus, the project developers and, in the case of a unilateral CDM, the host countries benefit considerably from the introduction of a CDM with atmospheric benefits. This conclusion again depends on several parameters, most importantly the stringency of the limitation on the use of the CDM, but holds for a broad range of slopes of the marginal abatement cost curves and for different levels of crediting emission reductions from the CDM.

3.3 Conclusions on the carbon market effects

There are several important conclusions from this qualitative analysis. The main findings are summarised in Table 1. A key aspect of the results is whether a CDM with atmospheric benefits is introduced in a carbon market with stringent limitations on the use of the CDM or whether it is introduced in a carbon market without any such limits. The results further depend on the shape of marginal abatement cost curves, the extent to which emission reductions from CDM projects are credited and the stringency of the limit. Thus, in practice, the effects on the carbon market will differ from the figures used in this paper. However, the qualitative results hold for different slopes of the marginal abatement cost curves (as long as the marginal abatement costs increase more steeply in industrialised countries than in developing countries) and for different levels to which CERs are credited under a CDM with atmospheric benefits. It should also be noted that a limitation on the use of the CDM will only have the described effects if it is set at a level that significantly affects the carbon market.

The following results are particularly important:

- With given targets for industrialised countries, the introduction of a CDM with atmospheric benefits can provide for enhanced global GHG abatement. Whether this enhanced GHG abatement occurs in developing or in industrialised countries depends on whether or not the principle of “supplementarity” (i.e. the principle that the use of mechanism should be supplemental to domestic action) is applied in the reference scenario: If the use of the CDM is not limited, the introduction of a CDM with atmospheric benefits would mainly enhance GHG abatement in industrialised countries. If the use of the CDM is limited, as is foreseen in most emerging GHG emis-

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chase CERs at higher prices (KJGI area) but do not increase their domestic mitigation compared to scenario B. Similarly, in the case of 70% crediting, CER users have to purchase CERs at moderately higher prices (KWVI area).

9 In the case of 50% crediting, the rents of the CER suppliers increase from the DIK area to the KMQ area. In the case of 60% crediting, they increase from the DKI area to the PJG area. In the case of 70% crediting, they increase from the DKI to the PWV area.

sions trading schemes, the introduction of a CDM with atmospheric benefits would mainly enhance GHG abatement in developing countries.

Table 1: Qualitative effects of the introduction of a CDM with atmospheric benefits on the carbon market

	Carbon market without any limit on the use of the CDM	**Carbon market with a limit on the use of the CDM**
Enhanced global GHG abatement occurs mainly in...	...industrialised countries	...developing countries
Global mitigation costs increase...	...significantly	...significantly, but more moderately than in a carbon market without a limit
The costs for enhanced GHG abatement are paid for by...	...the CER users	...the CER users
The rents of CER suppliers...	...remain similar	...increase significantly
The volume of the CDM market...	...remains similar	...is increased

- The introduction of a CDM with atmospheric benefits results in higher prices for CERs. The effects on the CER supply depend again on the extent to which the principle of "supplementarity" is applied in the reference scenario: With limitations on the use of the CDM, the CER supply may not change or may reduce moderately, whereas without limitations on the use of the CDM the CER supply can be reduced significantly. As a consequence of higher CER prices, the volume of the CDM market is not reduced significantly and may even increase if a CDM with atmospheric benefits is introduced in carbon market with a limitation on the use of the CDM.
- The introduction of a CDM with atmospheric benefits increases the global mitigation costs. These increased costs are financed by the users of the CERs (industrialised countries) through the purchase of CERs at higher prices and, if a CDM with atmospheric benefits is introduced in a carbon market without any limitations on the use of the CDM, through increased domestic GHG abatement. The rents of CER suppliers (project developers and host countries) are not affected strongly in a carbon market without any limitation on the use of the CDM and may even increase in carbon market with a limitation on the use of the CDM. Given that the enhanced GHG abatement is financed by public procurement or private entities in industrial-

ised countries and that the rents of CER suppliers may even increase, it seems difficult to regard a CDM with atmospheric benefits as "nationally appropriate mitigation actions" by developing countries.

In this regard, a CDM with atmospheric benefits could be seen as a means to implement the principle of "supplementarity" while achieving enhanced global GHG abatement beyond given targets for industrialised countries. A CDM with atmospheric benefits could be either introduced as an alternative or a supplement to limitations on the use of the CERs. Clearly, an efficient alternative to a CDM with atmospheric benefits could also be the adoption of correspondingly more ambitious targets by industrialised countries.

4 Options to implement a CDM with atmospheric benefits

Introducing a CDM with atmospheric benefits means that fewer CERs are issued and used compared to the level of emission reductions achieved through the CDM projects. This can in practice be implemented with different means, including

(a) discounting of emission reductions in the process of issuance or when they are used by Annex I countries,

(b) ambitious baselines that are set below the level of business-as-usual emissions, or

(c) shorter crediting periods compared with the lifetime of a project.

These options are further analysed in the following, with a focus on the option of discounting emission reductions, as this option has received the most attention in the literature and since it seems more promising than the other options (see comparative discussion in chapter 5).

4.1 Discounting emission reductions

Discounting emission reductions implies that not all of the emission reductions achieved by a CDM project can be used in the carbon market but that a part is not credited, providing a net global GHG emission reduction. The discounting of emission reductions could be implemented in a number of different ways. Key design options are highlighted in the following.

4.1.1 Discounting at the supply or demand side?

Discounting can be implemented on the supply side or the demand side of the CDM:

- On the supply side, only a certain percentage of the calculated emission reductions are issued as CERs. For example, with a discount rate of 50% for two tons of emission reductions by a CDM project activity, only one CER is issued.
- On the demand side, only a certain percentage of the CERs can be used for compliance purposes and the remainder must be “retired to the atmosphere“. For example, with a discount rate of 50%, an Annex I country or company would need to demonstrate that for each CER used for compliance purposes it has transferred another CER to a cancellation account.

In the case of the supply side, the discounting would automatically apply to the whole CDM market. This option would require an agreement at UNFCCC level. This has the important advantage that all Parties would agree and support the concept and avoids a distortion between different markets. With discounting on the demand side, different users (e.g. different regional emissions trading schemes) could potentially also choose different discount rates. This would complicate the linking of emissions trading schemes considerably. Moreover, discounting on the demand side by some Parties or regional emissions trading schemes would also affect other Parties or emissions trading schemes, given that the global carbon market is indirectly linked through the CDM. Discounting by some Parties may partly shift the use of the CDM to other Parties. It may also result in a *global* increase of CER prices due to an increased demand for CERs. In this case, all users of the CDM would pay for the enhanced GHG abatement achieved through discounting of CERs by some Parties or regional emissions trading schemes.

Discounting on the supply side seems therefore preferable. However, in the absence of an agreement at UNFCCC level, discounting on the demand side could be also introduced unilaterally by some Annex I countries or regional emissions trading schemes.

4.1.2 Should discount rates be varied between project types?

One discount rate could be applied to all CDM projects or the level of discounting could be varied between different project types. A differentiation between project types has been proposed by Chung (2007) and in the negotiations under the AWG-KP.[10] In this context, it has also been proposed to introduce multiplication factors in order to favour some project types.

The main advantage of one single discount rate would be its simplicity and the avoidance of any market distortion between project types. With one single discount rate, the idea of a market mechanism that searches for the mitigation opportunities with the lowest costs is largely maintained. A strong differentiation between project types could reduce the cost effectiveness of the CDM as some GHG emission reductions are favoured over others. Besides, one single discount rate is easier to negotiate than many differentiated discount rates. Earlier negotiations on positive lists of project types have shown that it is very difficult to agree internationally on favouring or disfavouring certain project types.

A variation of the discount rate between project types would have the advantage that some project types could be politically favoured over others. If the favoured project types have a lower discount rate than others, they have larger CER revenues and it becomes economically more attractive to develop them. This will then increase their market share in the overall CDM portfolio. For example, Chung (2007) has suggested a heavy discount rate for HFC-23 projects in order to improve the competitiveness of renewable energy or energy efficiency CDM projects.

Different policy and methodological rationales could be used to determine which projects should be favoured:

- **Favouring projects with large benefits for sustainable development.** Increasing the benefits of the CDM for sustainable development has been highlighted as one of the key objectives for a reform to the CDM. Projects with large benefits for sustainable development could be favoured with a lower discount rate. This could

[10] See Option M in FCCC/KP/AWG/2008/L.12 and FCCC/TP/2008/2

help to address the problem that the CDM currently does not contribute significantly to sustainable development as projects with higher benefits for sustainable development would be given an additional market value, thereby making these projects economically more attractive than projects with fewer benefits for sustainable development.

- **Favouring projects that use innovative technologies.** Lower discount rates for projects that use innovative technologies could help to promote the use of innovative technologies. Lower discount rates could be substantiated methodologically since these projects are more likely to have positive spill-over effects, as they contribute to running down the technology learning curves, thereby lowering the costs of these technologies.
- **Disfavouring projects that have very large windfall profits.** For some project types, the CER revenues are magnitudes higher than the mitigation costs. This applies in particular to the N_2O destruction in the adipic acid and nitric acid industry and HFC-23 destruction in the production of HCFC-22. High discount rates could reduce the huge windfall profits for the project developers, or in case of government taxes on CERs, the host country governments, while still providing sufficient incentives to abate these gases. High discount rates would provide considerable benefits to the global mitigation of GHG emissions. In addition, they would reduce the market share of these projects, thereby pushing for other projects that have higher benefits for sustainable development or use more innovative technologies.
- **Disfavouring projects with more questionable additionality.** One of the objectives of a CDM with atmospheric benefits is addressing the fact that a certain amount of “free-riding” projects will always qualify under the CDM. The likelihood of additionality “free-riding” varies among project types. Some project types cover the GHG abatement costs only through CER revenues. These project types are generally regarded to be additional. For some other project types, CER revenues do not play any significant role in relation to the overall investment and other revenues. For these project types, it is less likely that they are additional. Discount rates could in principle also be varied accordingly between project types. However, an important disadvantage of this approach is that higher discount rates for project types with more questionable CER revenues make these projects even more unlikely to be additional, as higher discount rates further decrease the role of CER revenues in the economic attractiveness of these projects. A more effective way may be to exclude project types with rather questionable additionality from the CDM.

While it seems promising in principle to achieve several policy objectives through differentiated discount rates, it could be very challenging to agree upon a set of different discount rates, in particular at UNFCCC level. In addition, it is the prerogative of the host countries to determine which projects contribute to sustainable development. Host countries have different priorities for achieving sustainable development and may thus have different preferences as to which project types should be favoured. Similarly, there may be different perceptions of what an innovative technology is. Finally, different host countries have different project portfolios. When negotiating which project types should be favoured over others, each country may try to push for project types that have a large potential in the own country. Even without these policy considerations, it is methodologically challenging to arrive at a set of differentiated discount rates for multiple projects based on multiple criteria. As a possible simplification, only two or three different discount rates could be considered. Methodological analysis could support the derivation of the discount rates and the categorisation of project types.

4.1.3 Should discount rates be varied between sectors?

As an alternative to the differentiation between single project types, discount rates could also be differentiated between sectors. A rationale for differentiating between sectors could be the different exposure of sectors to international competition with the risk of carbon leakage. Higher discount rates could be used in sectors that are particularly exposed to international competition since higher discount rates would lower the risk of carbon leakage. However, even a CDM with high discount rates has considerable limits in addressing concerns around international competition issues. Other instruments may be more suitable to address international competition concerns.

4.1.4 Should discount rates be varied between countries?

Similar to the differentiation among project types or sectors, the discount rates could also differ between countries. The effects would be similar to the differentiation between project types: lower discount rates for some countries would provide enhanced economic incentives to develop projects in these countries. As for the differentiation among project types, an argument against such a differentiation is that the cost effectiveness of the CDM would be reduced if the value of emission reductions differs between countries. Moreover, a differentiation among developing countries is politically sensitive and difficult to negotiate.

As for the differentiation among project types, there are different rationales to differentiate between countries:

- **Responsibility and capability to take action to mitigate climate change.** Among the group of developing countries, the capacity and responsibility to mitigate GHG emissions varies. Some countries are further developed and have a higher responsibility and capability than other countries. Higher discount rates for more advanced developing countries could reflect this responsibility and capability. Chung (2007) views different discount rates for country groups as a way to address the principle of common but differentiated responsibility under the UNFCCC. He suggests that CERs from high-income developing countries could be substantially discounted while those of low-income countries could be discounted at a minimum rate. Similarly, BVEK (2008) proposed to base the discount rates on the per capita emissions and per capita gross domestic product of the host country as an indicator for the responsibility of the country.
- **Changing the geographical distribution of CDM projects.** In the current CDM portfolio, only a few projects are implemented in African countries and Least Devel-

oped Countries. COP/MOP2 in Nairobi has emphasised that “further efforts are necessary to promote equitable regional distribution of CDM project activities” and the Nairobi Framework was launched to catalyse clean development mechanism in Africa.[11] Lower or no discount rates for Least Developed Countries and/or African countries would provide economic incentives to develop more projects in these countries. However, the effects of an exemption of Least Developed Countries from discounting should not be overestimated as there are several reasons outside the CDM for the current distribution of CDM projects.

Since a differentiation within the group of developing countries will not be achieved easily, a simple approach could be to make use of the only established differentiation under the UNFCCC: the differentiation of the group of Least Developed Countries. For example, discounting could be introduced for all developing countries except for the group of Least Developed Countries.

4.1.5 What level of discounting is appropriate?

Determining the level of discounting is a key challenge. The choice of the discount rate(s) is arbitrary and clearly depends on policy preferences. Discount rates could be derived from different perspectives.

One rationale for introducing a CDM with atmospheric benefits is the need for enhanced global mitigation action. From this perspective, one could try to arrive at discount rates in the light of the necessary contribution of a CDM with atmospheric benefits to global climate change mitigation. Such an approach would be based on many assumptions that are uncertain, including the level of binding GHG mitigation targets by industrialised countries, the level of emission reductions from “nationally appropriate mitigation actions” by developing countries, the extent to which the CDM and possibly other mechanisms will and can be used[12] and the extent to which such emission reductions are real, measurable and additional. At the very least, different scenarios could be developed and modelled to assess the global mitigation contribution of the CDM for different discount rates. Clearly, such an exercise is even more complicated if discount rates are differentiated between project types. Moreover, in doing so, one should also consider other factors that affect whether emission reductions are real, measurable and additional (see box 1).

Another rationale for introducing a CDM with atmospheric benefits is addressing the fact that the additionality requirement can never be fully complied with in practice and that a certain amount of “free-riding” projects will always be part of the CDM. From this

[11] Decision 1/CMP.2 (Further guidance relating to the Clean Development Mechanism), contained in document FCCC/KP/CMP/2006/10/Add.1.

[12] This depends on constraints for the demand of CERs (supplementarity) and constraints for the supply of CERs due to various factors, including, inter alia, the eligibility of host countries to use the CDM (see option J in FCCC/KP/AWG/2008/L.12), the potential of the CDM and the available of baseline and monitoring methodologies

perspective, one could try to arrive at estimates of the level of free-riding projects in the CDM. This is certainly a difficult exercise and any estimate is uncertain. To address this uncertainty of the level of “free-riding” projects, an uncertainty range could be estimated based on the few publications that evaluate the additionality of CDM projects. Discount rates above the higher end of the uncertainty range would provide reasonable confidence that the CDM actually moves beyond offsetting and provides net atmospheric benefits. However, the level of “free-riders” depends on many other factors, such as the rules for additionality, the way designated operational entities (DOEs) are operating etc. It will thus change over time and is difficult to predict.

If the discount rate is to be differentiated between project types, also other rationales could be used to arrive at discount rates. For example, for project activities with large windfall profits, the starting point to determine the discount rate could be the abatement costs and the range of plausible CER prices. On this basis, one could arrive at levels of discounting that provide for a broad range of assumptions on sufficient economic incentives to abate the greenhouse gases but reduce the huge windfall profits. Again, many uncertain assumptions (e.g. on future CER prices) have to be made to arrive at the discount rates.

For project activities that use innovative technologies, one could use economic or innovation models to estimate the potential spill-over effects and derive respectively reduced discount rates for these project types.

As highlighted in section 4.1.2 above, if the route of discounting is chosen, it may be advisable to introduce only a few (e.g. two or three) distinct discount rates to keep the instrument sufficiently simple. Also simple concepts, such as “take two for one” (i.e. a discount rate of 50%), may be simpler to communicate and negotiate.

4.1.6 Should discount rates be fixed or vary over time?

Discount rates can be fixed or vary over time. Chung (2007) has proposed variable discount rates that are adjusted over time, similar to the decisions by central banks on interest rates. He mentions two rationales for variable discount rates: Firstly, adjustments to the discount rate could serve as an instrument to regulate the supply and demand of CERs with the objective to achieve price stability in the carbon market. Another objective of flexible discount rates is the adjustment to the political need for enhanced mitigation in order to achieve the necessary stabilisation of greenhouse gases in the atmosphere.

Discount rates may indeed need to be reviewed periodically. Changes in the discount rates may become necessary in the light of changing needs for global mitigation contributions, changes in the types of technologies that can be regarded as innovative, or to reflect changes in the capability of countries to contribute to global GHG mitigation.

However, when considering reviews to the discount rates, one must bear in mind that investors in CDM projects need certainty for investments – in particular if the income from CERs should be decisive to proceed with the project. Hence, a careful balance must be struck between the need for flexibility and investor certainty. For example, discount rates could be reviewed for each commitment period, i.e. every five years if the current length of the commitment period is maintained, and any review may only become effective at the renewal of a crediting period. This would provide some flexibility to adjust the discount rates and, at the same time, provide certainty for investors for one crediting period.

Another option could be an automatic adjustment of the discount rates based on previously agreed criteria. For example, a reduced discount rate for an innovative technology could cease when a certain technology penetration is achieved or the discount rate for a certain country could become higher once a certain CER volume (per GDP or capita) is reached or once a certain development stage is reached.

4.1.7 Who should decide on the discount rates?

The overall concept of discounting and the general level of discounting are important policy choices. Hence, it makes sense that they are agreed upon at a high level, i.e. by the COP/MOP in the case of agreement at UNFCCC level or by Annex I countries (e.g. EU legislation) in the case of discounting on the demand side. Such an agreement should include any differentiation of the discount rate between groups of developing countries.

In case of a differentiation between project types, some level of decision making might be delegated to more technical bodies. For example, a list of innovative technologies that qualify for a lower discount rate could be established by a technical committee. Similarly, if there is political agreement that projects with high windfall profits should be heavily discounted, the determination of the actual discount rates could be delegated to technical committees. Finally, even the contribution of projects to sustainable development – although a politically sensitive subject – could be evaluated based on the existing criteria of the host countries in a technical manner. Although most host countries claim that they have their own criteria for sustainable development, a comparison of the criteria from different countries has shown that the differences are not very large (Olsen and Fenhann 2008; Schneider and Grashof 2006). Methodological approaches to evaluate the contribution of different CDM project types to sustainable development are also available in the literature (e.g. Sutter 2003, Olsen and Fenhann 2008).

4.1.8 Transition to a CDM with discounting

The transition from the current CDM to a CDM with discounting can be managed relatively easily, given that the existing rules and the existing institutional infrastructure can continue to be used. A key question is at which point in time the discounting should become effective.

One option is that discounting of CERs becomes effective for all projects, including new projects and previously registered projects, from 1 January 2013. This would provide considerable atmospheric benefits directly from the start of the second commitment period. However, it lowers income from CERs below the expectation of project participants which could not foresee the introduction of a discounting scheme. On the other hand, one can argue that current investments in the CDM are largely based on the income from CERs until the end of the first commitment period in 2012, as the prices and validity of post-2012 CERs are rather uncertain. This option can be easily implemented if discounting occurs on the supply side. If discounting occurs on the demand side, national legislation that is already in place and allows private entities to make full use of CERs could be a barrier.

To provide for a larger investor certainty, another option is that in 2013 discounting becomes only effective for projects that have been registered or that have renewed their crediting period *after* an agreement has been reached on a new climate regime, as envisaged for Copenhagen in 2009. For projects that have been registered before Copenhagen in 2009, the discount rates would then become effective at the first renewal of their crediting period after 1 January 2013. This means that a project registered in 2008 could, with a ten year crediting period, still generate full credits without any discounting until 2017. A disadvantage of this option is that similar projects in the same sector and country receive different levels of credits, depending on their starting date, which might cause competition distortions. Moreover, this option provides less atmospheric benefits and may thus require more mitigation actions in the future (e.g. higher discount rates) to achieve the same global mitigation levels.

4.2 Setting baselines below business-as-usual emissions

Selecting baselines that are below the business-as-usual level of emissions could be another way of introducing a CDM with atmospheric benefits. If a lower baseline emission level than the emissions that would occur without the CDM project activity is assumed, then a part of the emission reduction achieved by the CDM project activity is not issued as CERs but provides a net benefit to the atmosphere.

This option would work in a similar manner to the discounting of emission reductions. The difference is that discounting reduces the amount of credits issued for a given abatement effort, i.e. the difference between baseline emissions, project emissions and any leakage sources, whereas a lower baseline only affects the baseline emissions. A practical implication is that the calculation of leakage effects is not affected by this option, whereas leakage emissions would also be discounted for the option of discounting overall emission reductions. This could potentially punish projects with larger leakage emission sources and favour projects without leakage emission sources: in the case of ambitious baselines the full leakage emissions (without discounting) are subtracted from the difference of baseline and project emissions, whereas in the case of discounting also leakage emission sources are discounted.

Another difference is that the level of discounting of emission reductions can be based on policy preferences (see section 4.1.2), whereas the level of baselines below business-as-usual may be based on more technical criteria, such as the performance of certain technologies or practices that go beyond what is common practice in the market. For example, in the power sector, one may use a natural gas combined cycle power plant as a reference technology and baseline. This would correspond to a baseline emission factor of about 400 t CO_2 per GWh of electricity. This factor would be lower than the baseline emission factor in coal-dominated countries (e.g. China, India) but higher than the baseline emission factor in hydro-dominated countries (e.g. Brazil). Thus, in the case of a global technology benchmark, another key difference to the option of discounting of emission reductions is that project implementation would be favoured in some countries and disfavoured in others.

For some sectors, it can be difficult to determine a reasonable baseline below business-as-usual. In the case where only two technologies are available in a sector – a low carbon technology and a business-as-usual technology – it would be difficult to find a rationale for a baseline that is between the two technologies. If the low carbon technology is used as baseline, no carbon credits would be generated at all. If the business-as-usual technology is used, the objective of choosing a baseline below business-as-usual is not achieved. This situation applies to many sectors, including, inter alia, the replacement of incandescent lamps by energy efficient light bulbs, landfill management (either recovery of CH_4 or no recovery), waste water treatment (either anaerobic or aerobic), waste heat recovery in the industry (either recovery or no recovery). For these project types, it would be difficult to construct a baseline below BAU based on technical criteria. The baseline would most probably need to be selected in an arbitrary manner (e.g. X% below the BAU technology). Moreover, defining new baselines is technically more complicated and is administratively more cumbersome than discounting emission reductions.

4.3 Short crediting periods

Under the modalities and procedures for the CDM, as agreed in 2001 in Marrakech, project participants can either choose a single crediting period of 10 years or a crediting period of 7 years that can be renewed twice. For afforestation and reforestation projects, a single crediting period of 30 years or a renewable crediting period of 20 years can be chosen. For some projects, these crediting periods are already shorter than the technical lifetime of the project.

The CDM could also provide atmospheric benefits if the crediting periods are shortened or if they cannot be renewed. This would imply that emission reductions that occur at a later point in time are no longer credited. If these emission reductions would still not have happened without the CDM, not crediting these emission reductions provides a net benefit to the atmosphere. As for the option of discounting, the choice of the length of the crediting period is arbitrary. One option could be to link the length of the crediting period to the length of the commitment periods, such as for JI. The first crediting period could last until the end of the commitment period in which the project has started operation. If commitment periods continue to have a duration of five years, as for the first commitment period from 2008 to 2012, this would shorten the overall crediting period from 21 to up to 15 years.

Compared to the option of discounting emission reductions or baselines below BAU, a key difference is that shorter crediting periods only provide a net benefit to the atmosphere in the future, whereas discounting emission reductions and baselines below BAU would have an immediate effect. Moreover, it is uncertain whether these benefits will become real, as developing countries may use other (carbon market) instruments, such as emissions trading or regulations, in the future to address the emissions. In this case, the crediting period may anyhow not be renewed in the future. Given that the benefits for the atmosphere are more uncertain and occur only in the future, this option is rather different from the other two options.

5 Environmental effectiveness, practical feasibility and political acceptability

In the following, the environmental effectiveness, the practical feasibility and the political acceptability of a CDM with atmospheric benefits are briefly analysed, again with a focus on the option of discounting emission reductions.

5.1 Environmental effectiveness

Compared with the current CDM, a CDM beyond pure offsetting can provide a substantial benefit to the atmosphere. All three options provide such benefits. A key difference of the option of shorter crediting periods is that the benefits to the atmosphere would only be provided in the future, after the end of the last crediting period. This falls in a time frame (e.g. 2030) in which more advanced developing countries may already have taken on binding commitments to reduce GHG emissions. In these cases, the future emission reductions from CDM projects may happen anyhow. Even without binding commitments, many developing countries may adopt ambitious climate mitigation policies or may already participate in regional emissions trading schemes, thereby providing a framework in which these future emission reductions would happen anyway. Thus, this option has a considerably lower certainty as to whether the potential future benefits to the atmosphere will actually be realised.

The environmental effectiveness of a CDM with atmospheric benefits clearly depends on the extent to which emission reductions from CDM projects are credited. Given that a certain amount of “free-riding” projects will always be part of the CDM – whatever the procedures and rules for assessing additionality – it would be desirable that the fraction of emission reductions that are not credited is larger than the rate of projects with questionable additionality. If this can be achieved, a greater use of the CDM would also result in greater absolute global emission reductions. This would in turn back arguments to allow for more flexibility on any limits by industrialised countries on the use of the CDM.

The option of baselines below the BAU may provide more incentives to use innovative technologies in some sectors, compared with the other options. As the baseline emission level is fixed, the incremental emission reductions from using an even more advanced project technology would be fully reflected in the CERs. This is different in the case of discounting emission reductions: as the discounting is applied to the difference between the baseline and project (and any leakage), the additional emission reductions from using an even more advanced technology are also subject to discounting and thus partly not credited. However, this difference is only relevant in some sectors. For projects with negligible or very low project emissions, such as renewable power generation or the destruction of non-CO_2 gases, there is practically no difference between more ambitious baseline and discounting with regard to incentives to use innovative technologies. The two options make a difference for projects to improve energy efficiency and for which a range of efficient technologies are available.

A key concern of industrialised countries in the UNFCCC negotiations is carbon leakage in sectors that are particularly exposed to international competition. The introduction of a CDM with atmospheric benefits does not address or alleviate this concern, as the rents for projects developers do not significantly reduce and may even increase considerably.

5.2 Practical feasibility

A key advantage of a CDM with atmospheric benefits is that it builds upon an existing mechanism. The regulatory structure, with the CDM Executive Board, its panels and the UNFCCC secretariat, is already in place. Methodologies, procedures and rules have been developed over years and only small modifications are needed to introduce a CDM with atmospheric benefits. The private sector has understood how the CDM works and has built up considerable capacity. The CDM has created new players, including project developers, Designated Operational Entities (DOEs), financial institutions, market analysts and stock exchanges. The public sector has gained experience with purchase programmes and the approval of projects. This private and public infrastructure can continue to operate. While the introduction of a completely new mechanism may be promising, it may take years to make it operational. This could be challenging if new mechanisms are only agreed upon in 2009 but should be implemented on a large scale from 2013 onwards.

Among the three analysed options, shorter crediting periods and the discounting of emission reductions appear to be the easiest options to implement. They mainly require a policy agreement on the length of crediting periods and the level of discounting. The development of baselines below the business-as-usual could require more time-consuming and complicated technical and methodological work.

5.3 Political acceptability

If a CDM with atmospheric benefits is to be introduced at UNFCCC level, it would require agreement by all Parties, which may have different perspectives and interests in a CDM with atmospheric benefits.

As illustrated in chapter 3, a CDM with atmospheric benefits provides for enhanced global GHG abatement, which is fully financed by the users of the CDM through the purchase of CERs at higher prices. The volume of the CDM market and the rents for project developers are not negatively affected. On the contrary, higher CER prices can even result in higher rents for project developers. Moreover, the CDM is an instrument with voluntary participation. Therefore, introducing a CDM with atmospheric benefits could probably be accepted by developing countries.

Chung (2007) sees a CDM discounting scheme also as an alternative to binding targets and an opportunity for developing countries to contribute to a net global emission reduction. Developing countries may indeed perceive a CDM with atmospheric benefits as making their own mitigation contributions. However, as shown before, the costs of the enhanced mitigation are fully paid by the CER users and the rents of project developers may even increase. A key question is thus whether industrialised countries are willing to pay higher prices for CERs.

This makes clear that the introduction of a CDM with atmospheric benefits will not be sufficient to address GHG emissions from developing countries and needs to be complimented by nationally appropriate mitigation actions by developing countries. Moreover, the project-based or programmatic character of the CDM would be maintained with the introduction of a CDM with atmospheric benefits. This approach has limits in sectors with dispersed emission sources. As shown above, the introduction of a CDM with atmospheric benefits also does not address or alleviate carbon leakage due to international competition. The CDM may therefore be used in some sectors, whereas new mechanisms, such as emissions trading or sectoral approaches, may complement the CDM.

6 Conclusions and recommendations

Introducing a CDM with atmospheric benefits could be an option for a post-2012 climate regime, and is already under discussion. The introduction of multiplication factors to increase or decrease the certified emission reductions issued for specific project activity types is one of the options identified in the negotiations.[13]

The introduction of a CDM with atmospheric benefits would increase the global GHG abatement efforts. These further global GHG abatement efforts would be fully financed by industrialised countries through the purchase of CERs at higher prices and increased domestic mitigation. The introduction of a CDM with atmospheric benefits could also be regarded as a means to implement the principle that the use of the CDM should be supplemental to domestic action. It could be used as an alternative or supplement to the current limits on the use of CERs in regional emissions trading schemes.

A CDM beyond a pure offsetting mechanism could also help enhance the environmental integrity of the CDM. This has been identified by Parties to the UNFCCC as a key objective for any reforms to the CDM. The fact that a certain amount of "free-riding" projects will always be part of the CDM, whatever the rules for assessing additionality, would be addressed on an aggregated level by crediting only part of the claimed emission reductions. While a greater use of the CDM could currently result in an increase of global GHG emissions (see box 1), the introduction of a CDM with atmospheric benefits could reverse this: a greater use of the CDM could then provide for greater global GHG emission reductions.

An important advantage of a CDM with atmospheric benefits is that it allows for the continuation of an established mechanism with an established public and private infrastructure. The voluntary nature of a CDM with atmospheric benefits and the financing of the enhanced GHG abatement through the carbon market could make the introduction of this instrument in 2013 politically acceptable for many developing countries. However, the users of the CERs, i.e. industrialised countries, have to be willing to accept higher prices for CERs and (under some but not all scenarios) for AAUs. A considerable practical challenge is achieving a policy agreement on the level of crediting emission reductions from CDM projects and whether and how differentiation between countries, sectors and projects should be introduced.

Among the different options for introducing a CDM with atmospheric benefits, the discounting of emission reductions appears the most promising approach. It is technically easy to implement, in particular if implemented on the supply side, and provides immediate benefits to the atmosphere. Importantly, it also allows for key positions of Parties under the UNFCCC for a reform of the CDM to be addressed, such as the prioritisation of innovative technologies, the prioritisation of projects with large benefits for sustain-

13 Option M. in FCCC/KP/AWG/2008/L.12

able development, or addressing the unequal geographical distribution of CDM projects.[14] The introduction of baselines below BAU appears technically difficult for many project types. The option of shorter crediting periods should be disregarded as the benefits to the atmosphere occur only in the future and are rather uncertain. The main advantages and disadvantages of the different approaches to introducing a CDM with atmospheric benefits are illustrated in Table 2.

Table 2: Key advantages and disadvantages of different approaches to introducing a CDM with atmospheric benefits

	Advantages	**Disadvantages**
Discounting of emission reductions **(supply-side)**	• Simplicity of the concept • Prioritisation of some projects types is technically easy to implement	• Supply-side discounting: Agreeing on the level of discounting could be challenging • Demand-side discounting: Linking of emissions trading schemes with different discount rates is difficult
Baselines below BAU	• For some project types, *technical* criteria can be used to define baselines below BAU • Higher incentives for the use of innovative technologies for some project types	• For many project types, reasonable technical criteria are not available to define baselines below BAU • Prioritisation of some project types is difficult
Shorter crediting periods	• Prioritisation of some projects types is easy to implement	• Benefits to the atmosphere occur only in the future and are uncertain

When introducing a CDM discounting scheme, the level of discounting should be sufficiently high to ensure a net benefit to the atmosphere, taking into account that a certain amount of projects qualifies for the CDM but would happen anyhow. Moreover, the global mitigation needs should be taken into account in conjunction with other efforts to abate GHG emissions. With sufficiently high discount rates, any limitations on the use of CDM could potentially be less stringent, as a greater use of flexible mechanisms would then result in a greater global emission reduction.

The introduction of a CER discounting scheme should preferably be agreed upon at UNFCCC level. This avoids the introduction of different discounting approaches by different emissions trading schemes or industrialised countries which would create

[14] See options K and L in FCCC/KP/AWG/2008/L.12

market distortions and hinder the linking of company-based emissions trading schemes. If the concept and level of discounting CERs is agreed upon in the UNFCCC negotiations, discounting on the supply side is technically easier to implement than discounting on the demand side which would require several technical adjustments, including to registries, to the international transaction log and to the accounting and compilation database.

The level of discounting could be differentiated in a simple manner between countries. The same level of discounting could be introduced to all developing countries, except for the group of Least Developed Countries (LDCs) which could be exempted from discounting. This would favour project development in LDCs and help to address the concerns with the geographical distribution of CDM projects. A differentiation between projects types appears promising in terms of achieving some key interests of some Parties to the UNFCCC, but is difficult to negotiate. In the light of the emphasis in UNFCCC negotiations on improving the sustainable development benefits of the CDM, the possibility of introducing a lower discount rate for projects with large co-benefits for sustainable development seems most promising.

Clearly, a CDM with atmospheric benefits has considerable limitations and can therefore be regarded only as one potential building block in a future climate regime. In particular, it should be further assessed in the light of other reforms to the CDM that are discussed in international negotiations, such as positive and negative lists to address additionality, limitations in the eligibility to use the CDM, the introduction of a sectoral CDM or sectoral no-lose targets and the introduction of new project categories[15], which lies outside of the scope of this paper.

A CDM with atmospheric benefits can also not be regarded as a nationally appropriate mitigation action by developing countries because the mitigation costs are still fully paid by the users of CERs. In a longer term perspective, even a CDM with atmospheric benefits will not be sufficient to address GHG emissions in developing countries. It also does not address concerns about carbon leakage as a result of international competition. Other mechanisms, such as company-based emissions trading or sectoral no-lose targets, may thus be more suitable approaches in some sectors.

Further research needs include, inter alia, a quantitative analysis of the implications of different discount rates on the global mitigation effort and the carbon market, including effects on prices, the project portfolio and the geographical distribution of CDM projects; a more thorough analysis of the design options and their implications for the carbon market; the identification of criteria to distinguish projects with high benefits for sustainable development or innovative technologies (if such a differentiation is supported); and an analysis of a CDM with atmospheric benefits in the light of other reforms envisaged for the CDM.

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[15] FCCC/KP/AWG/L.12

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