Options for utilizing the CDM for global emission reductions

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by

Sonja Butzengeiger-Geyer
Paula Castro
Ralph O. Harthan
Daisuke Hayashi
Sean Healy
Karl Magnus Maribu
Axel Michaelowa
Yuri Okubo
Lambert Schneider
Ingunn Storrø

Universität Zürich, Ökoinstitut e.V.,
Perspectives GmbH, Point Carbon

On behalf of the German Federal Environment Agency

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P.O.B. 14 06
06813 Dessau-Roßlau
Germany
Phone: +49-340-2103-0
Fax: +49-340-2103 2285
Email: info@umweltbundesamt.de
Internet: http://www.umweltbundesamt.de
http://fuer-mensch-und-umwelt.de/

Edited by: Section I 2.1 Climate Protection
Anna Schreyögg

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15. Abstract The study describes and discusses in detail how four CDM reform alternatives, namely discounting of emission reductions, ambitious baselines, purchase and cancellation of CERs and reinvestment of CER levies, could be integrated in a Post-2012 climate regime. The study assesses these alternatives, according to their impacts on GHG emission reductions, contribution to sustainable development, cost-efficiency, technical feasibility, incentives and distributional effects as well as negotiatbility. The study shows that the introduction of discounting and ambitious baselines is technically feasible but politically a massive challenge. With the help of an economic model the study shows that the introduction of reform alternatives increases the amount of emission reductions but in comparison to the current CDM the impact is rather limited. But a CDM reform can in any case increase the credibility and improve the environmental integrity of the mechanism.		
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6. Zusammenfassung

Im Rahmen der Sachverständigenleistung wurde im Detail erörtert, wie vier verschiedene CDM-Reformalternativen (*Diskontierung* von Emissionsreduktionen, Anwendung von *Ambitionierte Referenzszenarien* für CDM-Projekte, *Aufkaufs und Stilllegung von Emissionsminderungszertifikate und Pflicht zur Reinvestition von Einnahmen aus dem Verkauf von Emissionsminderungszertifikaten)*in ein Post-2012 Klimaschutzabkommen integriert werden können, um den CDM zur Realisierung von globalen Emissionsreduktionen weiterzuentwickeln. Es wurde untersucht, wie die Konzepte existierende Schwächen des CDM, wie die bisher ungleichmässige geographische Verteilung der Projekte, oder den bisher als limitiert empfundenen Beitrag des CDM zur nachhaltigen Entwicklung in den Gastgeberländern adressieren können. Zwar ist die Einführung von Diskontierungsraten oder ambitionierten Referenzszenarien technisch machbar, stellt aber politisch eine erhebliche Herausforderung dar. Mit Hilfe eines ökonomischen Modells zeigt die Studie, dass die Einführung der Reformalternativen zwar die Gesamtmenge der global erreichten Emissionsreduktionen erhöht, im Vergleich mit dem heutigen CDM aber nur relativ geringe Auswirkungen hat. Gleichwohl kann eine CDM Reform in jedem Fall den Mechanismus glaubwürdiger machen, verbesserte Anreize setzen und die ökologische Integrität zu erhöhen.

17. Schlagwörter Post2012-Klimaregime, UNFCCC, CDM Post 2012, CDM jenseits einer reinen Kompensation		
18. Preis	***19.***	***20.***

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Acronyms and abbreviations

AAU	Assigned Amount Unit
ADCs	Advanced Developing Countries
AOSIS	Alliance of Small Island States
AWG-KP	Ad-hoc Working Group on Further Commitments for Annex I Parties under the Kyoto Protocol
BAU	Business as Usual
BVEK	German emissions trading association
CAN	Climate Action Network
cap	per capita
CCS	Carbon capture and storage
CDM	Clean Development Mechanism
CER	Certified Emission Reduction
CFL	Compact fluorescent lamp
COP/MOP	Conference of the Parties to the UNFCCC serving as the Meeting of the Parties to the Kyoto Protocol
DNA	Designed National Authority
EB	Executive Board
ENEF	Energy efficiency
EU	European Union
GDP	Gross Domestic Product
GHG	Greenhouse gas
GIS	Green Investment Scheme
GNI	Gross National Income
HCFC-22	Difluoromonochloromethane
HDI	Human Development Index
HFC-23	Fluoroform (Hydrofluorocarbon-23) (potent greenhouse gas)
IPCC	Intergovernmental Panel on Climate Change
IRN	International Rivers Network
ITL	International transactions log
JI	Joint Implementation
LDCs	Least Developed Countries
LULUCF	Land use, land use change and forestry
MAC	Marginal abatement cost
M&P	Modalities and procedures
N_2O	Nitrous oxide (potent greenhouse gas)
NAI	Non-Annex I country
NAMAs	Nationally Appropriate Mitigation Actions
NGO	Non-governmental organization
ODCs	Other Developing Countries
REDD	Reduced Emissions from Deforestation and Land Degradation
SD	Sustainable development
SSA	Sub-Saharan Africa

tCO_2e	Emissions equivalent to one tonne of carbon dioxide (in terms of global warming potential)
TT	Technology transfer
UBA	Umweltbundesamt (German Environmental Agency)
UNDP	United Nations Development Programme
UNFCCC	United Nations Framework Convention on Climate Change
US	United States

Executive summary

So far, developing countries do not contribute to global emissions reductions in the framework of the Kyoto Protocol: while they participate in the CDM, the reductions achieved through the mechanism are used for offsetting emissions in industrialized countries, thus resulting in a zero-sum game for the atmosphere. The Intergovernmental Panel on Climate Change (IPCC) states in its Fourth Assessment Report that the industrialized countries need to reduce their greenhouse gas emissions by 25-40% of 1990 levels until 2020, in order to reach an emissions path consistent with the 2°C goal. At the same time it makes clear that the current non-Annex I countries need to reduce their emissions (growth) according to their capabilities, if this target is to be met (report of IPCC Working Group 3, Chapter 13, p. 767). Thus, for the post-2012 climate policy regime developing countries agreed in the Bali Action Plan to embark on Nationally Appropriate Mitigation Actions (NAMAs) if financial support is provided by industrialized countries.

It is not yet clear what the exact nature of NAMAs is, nor in what form the financial support will be provided. While developing countries prefer fund-based financing schemes for realizing emission reductions, others have proposed to continue using market mechanisms to promote mitigation in developing countries. One argument is to build on the existing experience of the CDM, which would allow all Parties to capitalize on its functioning institutional framework (methodologies; validation, monitoring and verification regime) and on its notorious success in mobilizing the private sector. Although a purely offsetting CDM would not contribute to the above-stated goal of reducing emissions in developing countries, the CDM could be further developed to achieve this. This study assesses the contribution of the following CDM reform options to this goal:

- Discounting of emissions reductions: The amount of CERs issued for a project could be discounted, so that some of the emission reductions are not credited.
- Ambitious baselines: An ambitious baseline for CDM projects would be below business-as-usual emissions levels and thus generate reductions that are not credited.
- Purchase and cancellation of CERs: Industrialized countries could purchase CERs and then cancel them without using them for offsetting their own emissions.
- Reinvestment of CER levies in emission reduction projects: CDM host countries could be required to reinvest part of the revenues from CER sales in greenhouse gas reduction projects.

This study describes and discusses in detail how these CDM reform options could be implemented in the post-2012 climate regime, and assesses them according to their impacts on global GHG emissions (environmental integrity), contribution to

sustainable development, cost efficiency, technical feasibility, incentives and distributional effects as well as negotiability. The following qualitative indicators have been used to assess each of these evaluation criteria:

- Environmental integrity: additionality; measurability; timing of emission reductions.
- Contribution to sustainable development: incentives for projects with long-term sustainable development benefits; incentives for small-scale and community-based projects; reduced incentives for projects with large windfall benefits; incentives for innovation and technology transfer.
- Cost efficiency: effect on the cost of Annex I country compliance with their emission reduction targets; contribution to mobilize cost-effective reduction potential; technology-push effects that reduce long-term emission reduction costs.
- Technical feasibility: data availability; administration; methodological feasibility; incorporation in UNFCCC accounting system.
- Incentives and distributional effects: incentives for developing countries to accept the CDM reform option; promotion of an emissions path consistent with the long-term aim of the UNFCCC; neutralization of CDM revenue lobbies; distributional effects across host countries or project types; visibility of distributional effects.
- Negotiability: consistency with equity criteria; use of symbolic numbers; complexity of the reform option and related challenges in governance and lead time for preparation.

Finally, modelling tools are used to quantitatively estimate the size of the impact of three of the CDM reform options on the global carbon market.

Discounting of emission reductions

Discounting emission reductions implies that only a fraction of the emission reductions achieved by a CDM project can be used in the carbon market, thereby providing a net global GHG emission reduction. Discounting has been discussed in the negotiations under the Ad-hoc Working Group on Further Commitments for Annex I Parties under the Kyoto Protocol (AWG-KP), where it has been supported, inter alia, by the EU and South Korea, but opposed by Australia and AOSIS (see e.g. UNFCCC, 2008a, 2008b, 2009). In order to address some of the current shortcomings of the CDM, discount factors could be differentiated according to host countries or according to project types.

Discounting with differentiation according to host countries could be based upon the level of development or the per capita emissions of a host country. Higher discount factors for more advanced countries could provide an incentive for these countries to leave the CDM, as taking up a commitment means that a reduction below a target could be fully rewarded through the sale of allowances, whereas under the discounting scheme, they would be valued less. At the same time, lower

(or no) discount factors for poorer countries would provide enhanced economic incentives to develop CDM projects in these countries, addressing the uneven geographical distribution of CDM projects.

In terms of environmental integrity discounting by host country will not change the way the additionality of GHG reductions from a CDM project is assessed. The overall impact of this approach on the number of non-additional projects entering the CDM is uncertain. The discounting of CERs would lower the number of CERs per GHG reduction achieved but increase the CER price due to the reduced CER supply. Depending upon the relationship between these two variables the number of non-additional projects may decline or even increase. However, a stringent discount factor could minimize the aggregated impact of non-additional projects to improve the environmental integrity of the mechanism, as less CERs would be issued overall. The effect on GHG reductions will be immediate, although the level of emission reductions will depend on the characteristics of the marginal abatement cost curves. Projects high on the marginal abatement cost curve may no longer be viable under a discounted CDM.

In terms of sustainable development contributions, projects with high sustainability benefits could be punished in all countries, especially in advanced developing countries. But as sustainability benefits and profitability of projects are not necessarily exclusive, in a precise sense it cannot be known whether this option has an overall positive or negative effect. Similarly, technology transfer to the more advanced CDM host countries could decrease, but could increase with regards to poorer countries.

Depending on the actual approach chosen for the differentiation of countries, data availability and methodological implementation may become difficult. Transaction costs arise from the negotiation process and from the derivation of discounting factors. Incorporation into UNFCCC accounting should not pose major barriers, since it would suffice to modify the CDM registry.

CDM host countries benefiting from lower discount factors may support this option. If it can be shown that the additional costs are born by CER buyers, opposition can be reduced. The redistribution of CDM projects towards countries with less discounting (e.g., less developed countries) is promoted. While discounting scores high on all negotiability criteria, due to its transparency, discounting with differentiation across host countries could become difficult to negotiate as the losses compared to the status quo are immediately visible and as developing country differentiation is a sensitive topic in the negotiations.

Discounting with differentiation according to project types could be used to promote politically favoured projects. For example, projects that are associated with higher sustainable development benefits, e.g. small-scale renewable projects, could have a relatively low or no discount factor applied. Alternatively, projects that have very large windfall profits (e.g. HFC-23 or industrial N_2O destruction projects) could

be discouraged by setting higher discount factors for them. Further, projects with a more likely additionality could be favoured with less stringent discounting. However, such a differentiation requires political agreement about the parameters defining what is a “good project”.

The effects of discounting according to project types on environmental integrity and sustainable development benefits will depend on what criteria are chosen for the differentiation. The policy goals behind the differentiation criteria may conflict with one another. For example, some of the projects with the highest windfall profits (HFC-23 reduction projects) are the ones that are automatically additional, as they do not have any other revenues than the CER income. Thus, in favouring sustainable development benefits there may be a risk of penalizing additional projects and favouring non-additional ones. However, if the discount factor reflects the share of non-additional projects entering the CDM pipeline (based on information on registration, review and rejection of certain project types derived ex-post) additionality would be improved directly. In any case, project-type specific discounting will provide an immediate contribution to global reductions as long as the discount factors are not set at a level that is prohibitively high and leads to a complete stop of project submissions. In addition, discount factors could be set so that more innovative projects are favoured, so that technology transfer is incentivized.

Data acquisition and methodology probably pose no problems if discounting factors are derived on a rather political basis. However, data availability and methodology may be more difficult when determining the discounting factors on more technical grounds (e.g. if it is decided to conduct a general assessment of project types to derive technically-argued discount factors). The frequency of updating the discount factors influences the transaction costs related to this approach. If only updated at the beginning of each commitment period, the transaction costs can be regarded as very low.

Negotiability of the approach is difficult given the high value that host countries give to sovereignty regarding determination of sustainability and the different possible preferences about what types projects should be encouraged more.

Ambitious baselines

Instead of the business-as-usual (BAU) baseline, in the case of an ambitious baseline, a more conservative baseline is used for the calculation of emission reductions. As a result, the credited emission reductions are lowered. While there are similarities between the setting of ambitious baselines and discounting, the main difference between the two options is that discounting reduces the amount of emission reductions in their entirety, whereas setting ambitious baselines only affects the baseline emissions (i.e. has no impact on the project emissions or leakage). Another difference is that, whereas the choice of the discount factor(s) most likely depends on policy preferences and might therefore be arbitrary, the level of

ambitious baselines is likely to be based on more technical criteria as they can be expected to be derived by technical committees and not by policy makers.

Ambitious baselines have been discussed in the AWG-KP negotiations under the concept of "standardised or multi-project baselines" for the CDM, which was put forward as a means to reduce complexity and subjectivity in baseline and additionality determination. Both the EU and Japan have mentioned that these standardised baselines or benchmarks could be set with a high level of stringency or ambition, in order to improve the environmental integrity of the mechanism, to increase its contribution to global mitigation efforts and to reflect the principle of common but differentiated responsibilities and respective capabilities.

Similarly to discounting, ambitious baselines can in principle be applied to all CDM projects without distinction. This could be made by defining a conservativeness factor (for example, 80%), which is multiplied to the BAU baseline. This conservativeness factor can be defined technically – for example, as a safety measure against possible sources of error when calculating the baseline. But also arbitrary – or symbolic – figures could be used. The level of ambition of the baselines can also be differentiated according to countries or project types.

Setting ambitious baselines for host countries could be based on the idea of a "CDM penetration rate" where the baseline is adjusted downwards as the CDM is used more commonly in the country (i.e. the higher the CDM share of the emissions reduction potential in the country is). In this way, the option would set ambitious baselines for CDM projects in countries where this mechanism has been used most, while CDM projects in immature CDM markets can receive full benefits from the CDM.

In terms of environmental integrity, setting ambitious baselines for host countries will not necessarily prevent non-additional projects from entering the CDM pipeline. Although it is envisaged that the setting of a CDM penetration rate may encourage more additional projects by directing financial support to countries that have low levels of participation in the mechanism, ultimately the rate of the downward adjustment of a host country's BAU baseline will determine the environmental integrity of this approach. For example, it is likely that the downward adjustment of the baseline in a certain country will only occur once the majority of its low-cost and non-additional projects have already been submitted. It is expected that this approach will result in emission reductions increasing over time as the ambitious baseline for a host country is progressively adjusted downwards. However, the exact timing of these emission reductions will depend upon how the threshold is set for the CDM penetration rate (i.e. a high threshold for the CDM penetration rate will delay the timing of GHG reductions compared to a lower threshold).

As for sustainable development, the differentiation according to the CDM penetration rate would encourage more CDM investment in less developed countries, which currently host comparatively few CDM projects. However, CDM projects in advanced

countries will be punished, especially those with high abatement costs and possibly high SD benefits. Projects with large profits and low SD benefits will not be discouraged. A dynamic incentive to transfer innovative technologies to less developed host countries is provided, as the CDM becomes comparatively more competitive in these.

Data acquisition may be difficult for the determination of the CDM penetration rate. In terms of administration, the major part of the work can be done by the UNFCCC Secretariat. Frequent updating of the baselines (e.g. a new penetration rate for each new CDM project submitted for validation) may be more cumbersome and entail uncertainty for investors. The methodological complexity depends on the actual approach chosen for country differentiation. The determination of the CDM penetration rate may be methodologically challenging. Accounting under UNFCCC would not have to be modified since ambitious baselines directly influence verified emission reductions.

CDM host countries benefiting from less (or no) ambitious baselines may support this option. If it can be shown that the additional costs are born by CER buyers, opposition can be reduced. The option does not create a clear incentive for advanced developing countries to take up emission reduction commitments: it can well happen that a least developed country that has developed an excellent CDM strategy suffers more from a stricter baseline than an advanced country that has not mobilized the CDM.

Ambitious baselines face substantial barriers regarding negotiability due to the governance and data challenges in collecting emission data to calculate the CDM penetration rate and due to an unclear consistency of the approach with fairness criteria.

Setting ambitious baselines by project types could be established in various ways. One option would be to introduce mandatory conservativeness factors for calculation of baseline emissions in approved methodologies or tools. Another option would be benchmarking. Benchmarking is generally defined as the “comparison of performance against peers based on a set of criteria”. A comparison against peers implies that entities have a common output which makes them comparable to each other (e.g., electricity generation, cement production, etc.). Emission reductions achieved beyond the benchmark level would be credited as CERs, hence the rest of emission reductions would be contributing to net global emission reductions. Benchmarking is likely to be a suitable instrument only for large homogeneous sectors.

Ambitious baselines at the project type scale based on benchmarks may improve the environmental integrity of the mechanism by providing an objective assessment of the additionality of a CDM project, which would be based more on the “common practice” principle, rather than on the principle of financial additionality. However, the effectiveness of this option is dependent upon the stringency of the benchmark (or

the conservativeness factor) used: The higher the stringency level is, the more likely it is that a CDM project would lead to a contribution to net global emission reductions. But as stringency increases, less projects will be able to claim CERs and thus overall reductions may decrease. Measurability of the reductions may become more complex, as data is not available for all relevant sectors in all relevant countries. Timing of reductions may be delayed due to the difficulties in gathering the needed data. On the other hand, if data is available and the benchmarks are updated frequently to reflect changes in technologies, the timing of emission reductions could improve.

While the effect of the option on projects with generally high SD benefits depends strongly on its design, we do not expect a particular effect on small-scale or community-based projects. A dynamic financial incentive for the transfer of innovative technologies to countries affected by the ambitious baselines is provided, as benchmarking is linked to technological levels.

Data collection can prove challenging if benchmarking is chosen, but will not be a problem for conservativeness factors. Methodologically, while once a benchmark is accepted each project will more easily calculate its emission reductions, the definition of the benchmark is challenging, especially for heterogeneous sectors.

Making ambitious baselines by project types attractive to CDM host countries is considered difficult, due to concerns about data requirements, confidentiality issues and international competitiveness. Industry and domestic CDM lobbies are likely to play a role in preventing this option to be accepted, or in watering down the benchmarks or conservativeness factors. A positive incentive for advanced countries to embark on long-term emission reductions is provided. While transparency is low, a redistribution of projects between project types and, depending on its design, also between countries will be triggered. The complexity of this option and the need of high technical expertise make negotiability difficult.

In terms of economic efficiency, all discounting and baseline stringency increase options will increase compliance costs for Annex I countries due to the reduced supply of CERs to the market.

Purchase and cancellation of CERs

Under this approach, a quantitative CER purchase guarantee is defined for certain host countries or project types / technologies. Countries with emission targets in the post-2012 regime have the obligation to purchase the respective amounts of CERs and cancel them. Cancellation means that the CERs can neither be used for compliance purposes nor sold to any secondary markets, e.g. voluntary offsets. The purchase of CERs without using them for compliance purposes results in an additional global emission reduction.

The purchase and cancellation of CERs by host countries could be defined to favour certain host countries, either individually or in groups (e.g. the group of Least Developed Countries).

With regards to environmental integrity, the purchase and cancellation of CERs by host country will not change the way the additionality of emission reductions from a CDM project is assessed. Depending upon how the host countries are defined this approach may either increase or decrease the number of non-additional projects entering the CDM pipeline. For example, the allocation of CER funds to LDCs may remove some of the barriers (i.e. lack of finance) that prevent the transfer of innovative technology to host countries in order to reduce GHG emissions. However, if host countries are included in CER purchase obligations that have high participation levels in the CDM – the impact of this approach on additionality may become negative. Furthermore, emission reductions may be delayed if the supply of CERs is not enough to meet the purchase obligation.

No significant effect on the amount of projects with high or low SD benefits is expected under this option. Annex I compliance costs will likely rise, if the purchase obligation is satisfied from the same pool of CDM projects that supply CERs for the market. Unutilized cost-effective mitigation potential could be mobilized in the targeted host countries. Data acquisition and methodological requirements probably do not pose major barriers if the purchase obligation is defined according to country groupings. Transaction costs are relevant for the purchase of CERs. Support of developing countries for this option is likely. No incentive for developing countries to embark on long-term emission reductions is created. Domestic CDM lobbies could be incentivized to increase their rent-seeking behaviour. Projects will be redistributed between countries, in a very transparent manner especially if obligations are defined for individual countries. Due to the overall gain for host countries, negotiation does not pose a relevant barrier provided buyers are willing to pay.

The purchase and cancellation of CERs by project type may provide a financial incentive to implement emission reduction projects that are more likely to be additional (i.e. low carbon technologies that are classified on a positive list).

In terms of environmental integrity, this approach will not change how project additionality is determined. Depending on the criteria used to select which project types are eligible, CER purchase obligations could be set for project types with high levels of additionality, which would then enhance the environmental integrity of the CDM. However, if eligible project types are determined by SD criteria it is possible that highly additional projects (i.e. HFC-23 destruction projects) could be disadvantaged by the implementation of this option. Delays may occur with the timing of the emission reduction if the allocated CER demand cannot be matched by the CER supply for a particular project activity.

The effect on projects with high SD benefits will depend on the design of the option, particularly on the criteria used to select what project types or technologies should be

supported. Similarly, technology transfer could be encouraged, if the selected project types imply the use of innovative technologies. Thereby, it could contribute to economies of scale that also reduce long-term mitigation costs in Annex I countries. CDM lobbies might influence decision-making on the selection of technologies to support. If fairness is perceived as low, negotiability will be bad.

Reinvestment of CER levies in emission reduction projects

CER issuance could be taxed and the tax revenues used for re-investment in projects aiming to mitigate greenhouse gas emissions in countries without emission limitations. This would be similar to "Green Investment Schemes" (GIS) as set up by several Annex B countries. Again, a differentiation according to project types or to host countries can be done, both for the level of the tax and for the projects to be subsidized with this revenue.

It is envisaged that the CER levy will crowd out CDM projects with a high marginal abatement cost, i.e. that are additional and therefore such a reform to the CDM may reduce the environmental integrity of the mechanism. Moreover, re-investment of CER levy revenues by host countries could lead to the financing of non-additional projects if appropriate rules are not defined. Measurability of the emission reductions achieved through the reinvested funds will be complex, and possibly similar to the baseline and monitoring methodologies in the current CDM. It is also important to acknowledge that emission reductions will only occur in the future.

The effect on projects with high SD benefits depends on the choices of the countries receiving the funds. Annex I compliance costs would rise unless unutilized cost-effective potential could be mobilized depending on the guidelines regarding eligible projects. As financing would be available upfront (money is readily available after the sale or auctioning of the levied CERs), projects with financial barriers could be mobilized. Transaction costs may be significant for the sale of CERs and transfer of funds to host countries. Host countries have to set up a framework for a proper handling of funds and monitoring of effects. Support from developing countries for the option is limited to those countries benefiting from funding. No important incentive for developing countries to take up a long-term low emissions path is created. Due to the generic opposition to levies, negotiability is low.

If applied to project types, an external definition of SD criteria for the eligible projects is possible, which provides an advantage to the current CDM. Depending on how the criteria to select eligible projects are defined, projects with high SD benefits, and small-scale projects could be directly targeted.

Quantification of impacts on the international carbon market

Using a supply model, discounting of CERs by host countries, by project types and CER purchase and cancellation by host countries are assessed in terms of their impact on the international carbon market. Two demand scenarios are used, one

where credit demand comes from the Kyoto Protocol's Annex B countries plus the US, and one where five additional countries take on emission reduction targets (Brazil, China, Mexico, South Korea and Turkey). While business-as-usual emissions in 2020 are estimated at 56 billion t, reductions in 2013-2020 reach 24.8 billion t in the low and 45.5 billion t in the high demand scenario, where new countries take up commitments. Baseline CDM supply reached over 1 billion t per year in 2020 for high demand, while it does not pass 0.4 billion t in the low demand. Price reaches 36 and 21 € per CER, respectively.

The discounting options by host countries or project types increase CER price by 4 and 6 €, respectively in the low demand scenario, whereas in the high demand scenario, the increase is limited to 1 and 2 €. The purchasing option, where 0.5 billion t CDM emission reductions are cancelled, shifts price by only 1 €.

The volume of CERs available for compliance is mostly affected by the demand scenario chosen: the largest CER supply is observed when no new countries take on binding emission reduction targets. Among the CDM reform scenarios, the baseline CDM (without any changes) provides the most CERs to the market, while out of the three options modelled, the "discounting by host country" option offers most CERs to the market under both demand scenarios.

The three CDM reform options increase the total amount of emission reductions achieved globally, but only in a limited way, as compared to the baseline CDM. Total CER supply is generally lower under the discounting options compared to the baseline CDM. The only exception is for discounting by country in demand scenario 1, where the higher prices stimulate sufficient investments in CDM projects even with the reduced income due to discounting. CER supply available for compliance is, as expected, in all cases lower than under the baseline CDM. Emission reductions increase in Annex I countries in all cases and in non-Annex I countries increase in most cases with the introduction of discounting mechanisms, compared to the baseline scenario. Generally the increased emissions reductions are an effect of higher CER prices.

While this modelling exercise reflects the effects of a very specific operationalization of the CDM reform options under very specific assumptions, it shows that these options increase CER prices and increase global emission reductions, but especially in Annex I countries. This is positive in the sense that non-Annex I countries would not be burdened by these reforms. On the other hand, the effect of the CDM reform options modelled on emission reductions is small as compared to the effect of increasing the number of countries with binding emission reduction targets. Still, reforming the CDM is a goal in itself for making the mechanism more credible, for improving incentives and for increasing environmental integrity.

Zusammenfassung

Unter dem bisherigen internationalen Klimaregime tragen Entwicklungsländer nicht eigenständig zur globalen Emissionsminderung bei: solange bei ihnen Clean Development Mechanism (CDM) Projekte des Kyoto Protokolls umgesetzt werden, werden die durch den Mechanismus erzielten Reduktionen genutzt, um Emissionen in Industrieländern auszugleichen, was für die Atmosphäre auf ein Nullsummenspiel hinausläuft. Der Zwischenstaatliche Ausschuss für Klimaänderungen (Intergovernmental Panel on Climate Change, IPCC) stellt in seinem vierten Sachstandsbericht fest, dass die Industrieländer ihre Treibhausgasemissionen (THG-Emissionen), auf das Jahr 1990 bezogen, um 25 bis 40 % bis zum Jahr 2020 reduzieren müssen, um eine Emissionsentwicklung zu erreichen, die mit dem 2°C-Ziel in Einklang steht. Gleichzeitig wird verdeutlicht, dass die derzeitigen Nicht-Annex I Länder ihre Emissionen (und deren Steigerung) entsprechend ihren Möglichkeiten reduzieren müssen, wenn dieses Ziel erreicht werden soll (Bericht der IPCC-Arbeitsgruppe 3, Kapitel 13, S. 767). Daher stimmten die Entwicklungsländer im Rahmen des Bali Action Plan zu, für ein Post-2012 Klimaschutzabkommen national adequate Reduktionsmaßnahmen (Nationally Appropriate Mitigation Actions; NAMAs) einzuführen, sofern finanzielle Unterstützung von den Industieländern bereitgestellt wird.

Es ist derzeit weder klar, wie genau NAMAs ausgestaltet sein werden, noch auf welche Weise finanzielle Untersützung bereitgestellt wird. Während die Entwicklungsländer zur Realisierung von Emissionsreduktionen Fonds-basierte Finanzierungsmodelle bevorzugen, bevorzugen andere Verhandlungsparteien weiterhin die Nutzung von Marktmechanismen um Emissionsminderungen zu fördern. Ein Argument ist, auf den umfangreichen Erfahrungen aus dem CDM aufzubauen, die es allen Akteuren ermöglichen würde von funktionierenden institutionellen Rahmenbedingen (Methodiken, Validierung, Monitoring und Verifizierungssytem) und dem herausragenden Erfolg der Mobilisierung des privaten Sektors zu profitieren. Obwohl der auf reine Kompensation bedachte CDM nicht zum obengenannten Ziel der Emissionsreduktion in Entwicklungsländern beiträgt, könnte er in diese Richtung weiterentwickelt werden. Diese Studie untersucht, wie die folgenden CDM-Reformalternativen zu diesem Ziel beitragen können:

- Diskontierung von Emissionsreduktionen: Die Anzahl der ausgeschütteten Emissionsminderungszertifikate (Certified Emission Reductions, CERs) für ein Projekt könnte diskontiert werden, so dass einige Emissionsreduktionen nicht in Form von Zertifikaten angerechnet werden – und somit auch nicht zur Kompensation von Emissionen an anderen Orten genutzt werden können.
- Ambitionierte Referenzszenarien („Baselines“): Ambitionierte Referenzszenarien für CDM-Projekte würde unter einer Business-As-Usual (BAU) Emissionsentwicklung liegen und dadurch Reduktionen generieren, die nicht in Form von Zertifikaten angerechnet werden.

- Ankauf und Entwertung von CERs: Industrieländer könnten CERs ankaufen und anschließend entwerten ohne sie als Kompensation für ihre eigenen Emissionen zu nutzen.
- Reinvestition von CER-Erlösen in Projekte zur Emissionsreduktion: CDM-Gastgeberländer könnten verpflichtet werden, Einnahmen aus dem Verkauf von CERs in Projekte zur Reduzierung von THG-Emissionen zu reinvestieren, welche dann keine CERs generieren.

Diese Studie erörtert im Detail, wie diese CDM-Reformalternativen in das Post-2012 Klimaschutzabkommen implementiert werden könnten und bewertet sie hinsichtlich ihrer Auswirkungen auf globale THG-Emissionen (ökologische Integrität), ihrem Beitrag zur nachhaltigen Entwicklung, Kosteneffizienz, technische Machbarkeit, Anreizen und Verteilungseffekten sowie bzgl. ihrer Umsetzbarkeit. Um diese Kriterien zu bewerten, wurden die folgenden qualitativen Indikatoren genutzt:

- Ökologische Integrität: Zusätzlichkeit; Messbarkeit; Zeitpunkt der Reduktionen.
- Beitrag zur nachhaltigen Entwicklung: Anreize für Projekte, die eine langfristige, nachhaltige Entwicklung ermöglichen; Anreize für Small-Scale- und kommunale Projekte; verminderte Anreize für Projekte mit außerordentlicher Rentabilität; Anreize für Innovationen und Technologietransfer.
- Kosteneffizienz: bzgl. der Erreichung der Emissionsziele der Annex I Staaten; Beitrag zur Erschließung von kosteneffizienten Reduktionspotenzialen; Effekte, die den Technologien zum Durchbruch verhelfen, die auf lange Sicht Emissionsreduktionskosten vermindern.
- Technische Machbarkeit: Datenverfügbarkeit; Verwaltung; methodische Machbarkeit; Eingliederung in das UNFCCC-Überwachungssystem.
- Anreize und Verteilungseffekte: Anreize für Entwicklungsländer, die CDM-Reformalternative anzunehmen; Beitrag zu einer Emissionsentwicklung gemäß dem langfristigen Ziel der UNFCCC; Verminderung von Lobbyisumuseffekten; Verteilungseffekte auf Gastgeberländern oder Projekttypen; Sichtbarkeit der Verteilungseffekte.
- Umsetzbarkeit: Konsitenz mit Gleichbehandlungskriterien; Gebrauch von symbolischen Zahlen; Komplexität der Reformalternative, damit verbundene politische Herausforderungen und Zeitbedarf zur Vorbereitung

Abschließend mit Hilfe eines Modellierungsansatzes die quantitative Auswirkung von drei CDM-Reformalternativen auf den globalen Kohlenstoffmarkt abgeschätzt.

Diskontierung von Emissionreduktionen

Bei der Diskontierung von Emissionsreduktionen wird nur ein Teil der Emissionsreduktionen, die durch ein CDM-Projekt erreicht werden, für den Kohlenstoffmarkt nutzbar gemacht. Hierdurch wird eine Nettoredutkion von globalen THG-Emissionen erzielt. Die Diskontierung wurde in den Verhandlungen der „Ad-hoc

Working Group on Further Commitments for Annex I Parties under the Kyoto Protocol (AWG-KP)“ erörtert, wobei sie unter anderem von der EU und Südkorea unterstützt, aber von Australien und AOSIS abgelehnt wurde (siehe auch: UNFCCC, 2008a, 2008b, 2009). Um sich mit einigen der derzeitigen Defizite des CDM zu befassen, könnten Diskontierungsfaktoren entsprechend der Gastgeberländer oder Projekttypen abgeändert werden.

Die Diskontierung nach Gastgeberländern kann z.B. auf dem Entwicklungsniveau oder den Pro-Kopf Emissionen des Gastgeberlandes basieren. Höhere Diskontierungsfaktoren für weiter entwickelte Länder könnten diese dazu veranlassen den heute bestehenden CDM aufzugeben und selbst ein Emissionsziel anzunehmen, da letzteres bedeuten würde, dass eine Reduktion unter die Zielmarke durch den Verkauf von Emissionsberechtigungen voll angerechnet werden könnte. Unter einem Diskontierungsmodell wäre diese jedoch weniger wert. Gleichzeitig würden niedrigere (oder gar keine) Diskontierungsfaktoren für ärmere Länder verstärkte Anreize für die Entwicklung von CDM-Projekten setzen, was dazu beitragen kann die ungleiche geografische Verteilung von CDM-Projekten zu vermindern.

Was die ökologische Integrität betrifft, ändert eine Diskontierung nach Gastgeberland nicht die Art und Weise, wie die Zusätzlichkeit von THG-Reduktionen eines CDM-Projektes beurteilt wird. Der Einfluss der Diskontierung auf die Anzahl von CDM-Projekten, die nicht zusätzlich sind, ist ungewiss. Die Diskontierung von CERs würde die Menge der CERs pro THG-Reduktion vermindern und den CER-Preis aufgrund des reduzierten Angebots erhöhen. Abhängig vom Verhältnis dieser zwei Variablen kann sich die Anzahl der nicht-zusätzlichen Projekte vermindern oder sogar erhöhen. Andererseits könnte ein hoher Diskontierungsfaktor den Gesamtzufluss von nicht-zusätzlichen Projekten vermindern und so die ökologische Integrität des Mechanismus erhöhen, da insgesamt weniger CERs ausgeschüttet werden.
Der Einfluss auf die Reduzierung von THGs wird unmittelbar auftreten. Projekte mit hohen Grenzkosten könnten unter einem diskontierten CDM nicht mehr durchführbar sein.

Hinsichtlich des Beitrags zur nachhaltigen Entwicklung könnten Projekte mit hohem nachhaltigem Nutzen in allen Ländern bestraft werden, besonders in Schwellenländern. Doch da sich ein nachhaltiger Nutzen und die Wirtschaftlichkeit von Projekten nicht zwangsläufig ausschließen, kann nicht genau bestimmt werden, ob diese Alternative im Gesamten einen positiven oder negativen Effekt hat. Gleichermaßen könnte der Technologietransfer in die weiter entwickelten CDM-Gastgeberländer abnehmen, jedoch in die ärmeren Ländern zunehmen.

Je nach dem gewählten Ansatz für die Abgrenzung von Ländern/Ländergruppen zur Bestimmung des individuellm Diskontierungsfaktors, kann sich die Datenverfügbarkeit und die methodische Implementierung als schwierig erweisen. Transaktionskosten werden im Rahmen des Verhandlungsprozesses und der Herleitung der Diskontierungsfaktoren entstehen. Die Einbindung in die UNFCCC-

Überwachungssystem sollte kein größeres Problem darstellen, da eine Modifizierung des CDM-Registers ausreichen würde.

CDM-Gastgeberländer, die von niedrigeren Diskontierungsfaktoren profitieren, werden diese Alternative im Rahmen der UN-Verhandlungen voraussichtlich unterstützen. Sofern makroökonomisch verdeutlicht werden kann, dass die zusätzlichen Kosten der Diskontierung effektiv den Käufern von CERs entstehen (und nicht den Verkäufern durch geringere Einnahmen), kann eine ablehnende Haltung von Verkäuferstaaten vermindert werden. Die Neuverteilung von CDM-Projekten zugunsten von Ländern mit niedrigerer Diskontierungsrate (z.B. weniger entwickelten Ländern) wird vorangetrieben.
Eine Diskontierung mit einer Staffelung der Gastgeberländer könnte aufgrund ihrer Transparenz schwierig zu verhandeln sein, da die Verluste im Vergleich zum Status-Quo sofort offensichtlich sind und eine Differenzierung zwischen Nicht-Annex I Staaten im Rahmen der UNFCCC Verhandlungen insgesamt ein sensibles Verhandlungsthema ist.

Diskontierung im Bezug auf unterschiedliche Projekttypen könnte genutzt werden, um politisch gewollte Projekte zu fördern. Einerseits könnten zum Beispiel Projekte, die mit höheren nachhaltigen Nutzen in Verbindung gebracht werden, wie etwa erneuerbare Kleinprojekte, einen relativ niedrigen oder gar keinen Diskontierungsfaktor zugewiesen bekommen. Andererseits könnten Projekte mit ausgewöhnlich hohen Gewinnmargen, wie z.B. Flurkohlenwasserstoff- oder N_2O-Reduktionsprojekte, durch höhere Diskontierungsfaktoren weniger attraktiv gestellt werden. Darüberhinaus könnten Projekte, die eher zusätzlich sind, mit weniger starker Diskontierung bevorzugt werden. Allerdings benötigten deraetige Einteilungen politische Übereinstimmung bzgl der Definition von „guten Projekten“.

Die Effekte der projektspezifischen Diskontierung hinsichtlich der ökologischen Integrität und des Einflusses auf die nachhaltige Entwicklung sind abhängig von den Kriterien, die für die Einteilung gewählt wurden. Die politischen Ziele hinter den Einordnungskriterien könnten Konflikte auslösen. Beispielsweise sind einige der Projekte mit den höchsten Gewinnmargen (Bsp. Flurkohlenwasserstoffprojekte) vom Grundsatz her stetz zusätzlich, da sie keine andere Einkommensquelle haben als die CER-Erlöse. So kann eine Bevorzugung des Nachhaltigkeitskriteriums zu einem Risiko für zusätzliche Projekte und einer Bevorzugung von nicht-zusätzlichen Projekten führen. Falls der Diskontierungsfaktor jedoch den Anteil von nicht-zusätzlichen Projekten in der CDM-Pipeline wiederspiegelt, würde die Zusätzlichkeit indirekt verbessert. In jedem Fall wird die projektspezifische Diskontierung zu sofortigen globalen Reduktionen führen, zumindest solange die Diskontierungsfaktoren nicht auf ein zu hohes Niveau gesetzt werden, welches zu einem sofortigen Ende von Projekteinreichungen führt. Des weiteren könnten die Diskontierungsfaktoren so angesetzt werden, dass mehr innovative Projekte bevorzugt werden und dadurch Anreize für verstärkten Technologietransfer geschaffen werden.

Datenerhebung und Methodik werden wahrscheinlich keine Probleme darstellen wenn Diskontierungsfaktoren eher politisch hergeleitet werden. Sie könnten sich jedoch als problematisch erweisen, wenn die Diskontierungsfaktoren auf eher technischer Basis ermittelt werden (z.B. falls entschieden wird, technisch-begründete Diskontierungsfaktoren auf Basis einer allgemeinen Bewertung der Projekttypen abzuleiten).
Die Häufigkeit der Aktualisierung der Diskontierungsfaktoren beinflusst die Transaktionskosten dieses Ansatzes. Falls nur am Anfang jeder Verpflichtungsperiode aktualisiert wird, können die Transaktionskosten als sehr niedrig angesehen werden.

Die Verhandelbarkeit dieses Ansatzes ist als schwierig einzustufen, da Gastgeberländer besonders darauf Wert legen, souverän die Definition von Nachhaltigkeit zu bestimmen und damit ihren individuellen Präferenzen hinsichtlich besonders vorzuziehender Projekte Ausdruck zu geben.

Ambitionierte Referenzszenarien

Anstelle eines Business-as-Usual (BAU)-Szenarios wird im Fall der ambitionierten Referenzszenarios ein eher konservatives Referenzszenario für die Berechnung der Emissionsreduktionen genutzt. Ein Ergebnis ist, dass weniger Zertifikate für die Emissionsreduktionen ausgegeben werden. Obwohl Übereinstimmungen zwischen ambitionierten Referenzszenarios und den obengeschriebenen Diskontierungsansätzen bestehen, ist der Hauptunterschied zwischen den beiden Alternativen, dass die Diskontierung die Anzahl von Emissionsreduktionen in ihrer Gesamtheit vermindert, während die Erstellung eines ambitionierten Referenzszenarios „nur“ die für die Berechnung zugrundliegenden Emissionen des Referenzfalls betrifft (beispielsweise gibt es keinen Einfluss auf Projektemissionen oder „Leakage“). Ein weiterer Unterschied ist, dass die Festlegung der ambitionierten Referenzszenarien eher auf technischen Kriterien basieren, da erwartet werden kann, dass sie von technischen Kommittees und nicht von Politikern erstellt werden, während die Diskontierungsfaktoren wahrscheinlich auf politischen Präferenzen basieren und somit „willkürlich“ sein können.

Ambitionierte Referenzszenarien wurden während der AWG-KP Verhandlungen als Konzept namens „Standardisierte oder Multi-Projekt Referenzszenarien“ für den CDM erörtert, um die Komplexität und Subjektivität in der Erstellung des Referenzszenarios und der Zusätzlichkeit zu vermindern. Sowohl die EU als auch Japan betonen, dass diese standardisierten Referenzszenarios oder Benchmarks mit einer hohen Verknappung oder Ambitioniertheit erstellt werden sollten um die ökologische Integrität des Mechanismus zu verbessern, dessen Beitrag zu globalen Reduktionsbemühungen zu erhöhen und das Prinzip gemeinsamer aber differenzierter Verantwortung und den jeweiligen Fähigkeiten des Landes wiederzuspiegeln.

Ähnlich wie bei der Diskontierung können ambitionierte Referenzszenarios prinzipiell für alle CDM-Projekte ohne Ausnahmen angewendet werden. Dies kann geschehen, indem ein konservativer Faktor (zum Beispiel 80%) definiert wird, der mit dem BAU-Szenario multipliziert wird. Dieser konservative Faktor kann technisch definiert werden – beispielsweise als Sicherheit gegenüber möglichen Fehlerquellen in der Referenzszenarioberechnung. Auch willkürliche oder symbolische Zahlen könnten benutzt werden. Die Ambitioniertheit der Szenarien kann auch nach Ländern oder Projekttypen unterschiedlich gestaltet werden.

Das Erstellen von ambitionierten Referenzszenarien für Gastgeberländer könnte auf der Idee einer „CDM-Durchdringungsrate" basieren, wobei das Szenario ambitionierter gestaltet wird, sobald der CDM in größerem Maße im Land genutzt wird (d.h. je höher der Anteil des CDM am Emissionreduktionspotenzial des Landes ist).

Hinsichtlich der ökologischen Integrität wird die Definition von ambitionierten Referenzszenarien für Gastgeberländer nicht zwangsläufig Projekte, die nicht zusätzlich sind, daran hindern, in die CDM-Pipeline zu gelangen. Dabei ist vorstellbar, dass die Definition einer CDM-Durchdringungsrate durch das Ausrichten von finanzieller Unterstützung auf Länder mit wenig Teilnahme am Mechanismus, mehr zusätzliche Projekte entstehen lassen könnte. Schlussendlich wird die Absenkungsrate des Referenzszenarios des Gastgeberlandes die ökologische Integrität dieses Ansatzes bestimmen. Beispielsweise ist es wahrscheinlich, dass die Absenkung des Referenzszenarios in einem bestimmten Land erst dann durchgeführt wird, wenn die Mehrheit der kostengünstig durchführbaren und nicht-zusätzlichen Projekte bereits eingereicht wurde. Es wird erwartet, dass dieser Ansatz zu Emissionsreduktionen führt, die mit der Zeit steigen, sobald das Referenzszenario des Gastgeberlandes progressiv abgesenkt wird. Der genaue Zeitpunkt dieser Emissionsreduktionen wird jedoch darauf beruhen, wie der Grenzwert für die CDM-Durchdringungsrate gewählt wird - d.h. ein hoher Grenzwert für die CDM-Durchdringungsrate wird den Zeitpunkt der THG-Reduktionen im Vergleich mit einem niedrigen Grenzwert nach hinten verschieben.

Wie beim Einfluss auf die nachhaltige Entwicklung würde die Staffelung der CDM-Durchdringungsrate Anreize für höhere CDM-Investitionen in weniger entwickelten Ländern schaffen, die derzeitig vergleichsweise wenig CDM-Projekte haben. CDM-Projekte in entwickelten Ländern würden jedoch benachteiligt, besonders diejenigen mit hohen Grenzkosten und möglicherweise großem Vorteil für eine nachhaltige Entwicklung. Projekte mit hoher Gewinnmarge und niedrigem Beitrag zur nachhaltigen Entwicklung werden nicht benachteiligt. Ein dynamischer Anreiz für den Transfer innovativer Technologien in wenig entwicklete Gastgeberländer ist dadurch gegeben, dass der CDM dort vergleichsweise konkurrenzfähiger wird.

Die Datenbeschaffung zur Bestimmung der CDM-Durchdringungsrate könnte schwierig sein. Hinsichtlich der Verwaltung kann der Hauptteil der Arbeit vom UNFCCC-Sekretariat übernommen werden. Eine regelmäßige Aktualisierung der

Referenzszenarien (z.B. eine neue Durchdringungsrate für jedes neue CDM-Projekt, dass zur Validierung eingereicht wird) kann sehr aufwendig sowie methodisch herausfordernd sein und zudem Unsicherheit für Investoren mit sich bringen. Die methodische Komplexität ist abhängig von dem Ansatz, der für die Länderstaffelung gewählt wird. Das Anrechnungsystem der UNFCCC müsste nicht modifiziert werden da ambitionierte Referenzszenarien verifizierte Emissionsreduktionen direkt beeinflussen.

CDM-Gastgeberländer die von weniger (oder gar keinen) ambitionierten Referenzszenarien profitieren, werden diese Alternative vermutlich unterstützen. Wenn aufgezeigt werden kann, dass die Käufer von CERs die zusätzlichen Kosten tragen werden, kann insgesamt Widerstand abgebaut werden. Diese Alternative schafft jedoch keinen eindeutigen Anreiz für Schwellenländer, Emissionsreduktionsverpflichtungen einzugehen: Es kann zudem sein dass ein besonders wenig entwickeltes Land, dass eine ausgezeichnete CDM-Strategie entwickelt hat, negativer von einem strikten Referenzszenario betroffen ist als ein entwickeltes Land, das den CDM nicht nutzt.

Insgesamt ist festzuhalten, dass ambitionierten Referenzszenarien grundsätzliche Hindernisse hinsichtlich ihrer Verhandelbarkeit und Herausforderungen bei der Beschaffung von Emissionsdaten zur Berechnung der Durchdringungsrate und unklarer Beschaffenheit der Gerechtigkeitskriteien des Ansatzes entgegen stehen.

Die Bestimmung projektspezifischer ambitionierter Referenzszenarien könnte auf unterschiedliche Weise erfolgen. Eine Möglichkeit wäre, verbindliche konservative Faktoren für die Berechnung der Emissionen des Referenzszenarios durch akzeptierte Methodiken oder Anleitungen einzuführen. Eine weitere Möglichkeit wäre das Benchmarking. Benchmarking ist grundsätzlich definiert als „Vergleich der Leistungsfähigkeit gegenüber Gleichartigen aufbauend auf einem Kriterienkatalog“. Ein Vergleich gegenüber Gleichartigen impliziert, dass Anlagen einen gleichwertigen Output haben, durch den sie sich miteinander vergleichen lassen (z.B. Stromerzeugung, Zementproduktion, etc.). Emissionsreduktionen, die unter dem Referenzszenario liegen würden als CERs angerechnet, während der Rest der Emissionsreduktionen zu der weltweiten Nettoemissionsreduktion beitragen würde. Benchmarking ist wahrscheinlich nur für große, homogene Sektoren darstellbar.

Projektspezifische, ambitionierte Referenzszenarien basierend auf Benchmarks können die ökologische Integrität des Mechanismus dadurch erhöhen, dass sie eine objektive Bewertung der Zusätzlichkeit eines CDM-Projektes ermöglichen könnten, die eher auf dem Prinzip der „gemeinsamen Praxis“ als auf dem Prinzip der finanziellen Zusätzlichkeit beruht. Die Effizienz dieser Alternative ist jedoch abhängig von der Stringenz des genutzten Benchmarks (oder des konservativen Faktors): Je höher die Stringenz ist, desto wahrscheinlicher wird ein CDM-Projekt zu einer Nettoreduktion der globalen Emission beitragen. Je höher die Stringenz jedoch ist, umso weniger Projekte können CERs erhalten und dadurch könnten die

Gesamtreduktionen sinken. Die Messbarkeit der Reduktionen kann komplexer werden, da nicht für alle relevanten Sektoren in allen relevanten Ländern Daten verfügbar sind.

Während der Effekt dieser Alternative auf Projekte mit hohem Beitrag zur nachhaltigen Entwicklung stark von der Ausgestaltung abhängig ist, erwarten wir keinen spürbaren Effekt auf Klein- oder kommunale Projekte. Ein dynamischer, finanzieller Anreiz für den Transfer innovativer Technologien in Länder, die von ambitionierten Referenzszenarien betroffen sind, ist gegeben, da das Benchmarking mit dem technologischen Niveau verbunden ist.

Die Datenbeschaffung kann sich bei der Wahl des Benchmarking schwierig gestalten, wird aber für die konservativen Faktoren kein Problem darstellen. Methodisch gesehen ist die Definition des Benchmarks besonders für heterogene Sektoren schwierig - wenn aber erstmnal ein Benchmark gefunden ist, wird jedes Projekt seine Emissionsreduktionen leichter berechnen können.

Projektspezifische, ambitionierte Referenzszenarien für CDM-Gastgeberländer attraktiv zu gestalten wird aufgrund der Sorge über benötigte Daten, Verschwiegenheit und internationale Wettbewerbsfähigkeit als schwierig eingeschätzt. Industrie und inländische CDM-Lobbys werden wahrscheinlich versuchen, die Annahme dieser Alternative zu verhindern oder die Benchmarks sowie die konservativen Faktoren zu verwässern.
Ein positiver Anreiz für Schwellenländer auf langfristige Emissionsreduktionen zu setzen, ist gegeben. Die Komplexität und der Bedarf an hochspezialisierter, technischer Expertise gestalten die Verhandelbarkeit schwierig.

Bezüglich der ökonomischen Effizienz werden alle Diskontierungs- und Referenzszenariomodelle, die die Stringenz des Systems erhöhen, die Zielerreichungskosten der Annex I Staaten aufgrund eines reduzierten Angebots an CERs erhöhen.

Ankauf und Entwertung von CERs

Bei diesem Ansatz wird eine quantitative Garantie für CER-Aufkäufe für bestimmte Gastgeberländer oder Projekttypen / Technologien definiert. Länder mit Emissionszielen innerhalb des Post-2012 Abkommens bekommen die Auflage die entsprechenden Mengen an CERs aufzukaufen und zu entwerten. Entwertung bedeutet, dass die CERs weder zur Erfüllung der Emissionsziele genutzt werden können, noch auf irgendeinem Kohlenstoffmarkt, z.B. dem Markt für freiwillige Kompensationen, verkauft werden dürfen. Dies führt zu einer zusätzlichen globalen Emissionsreduktion.

Der Ankauf und die Entwertung von CERs könnte so gestaltet werden, dass bestimmte Gastgeberländer, entweder Einzelne oder Gruppen (z.B. die Gruppe der am wenigsten entwickelten Länder) bevorteilt werden.

Hinsichtlich der ökologischen Integrität wird dieser Ansatz nicht die Art und Weise ändern, wie die Zusätzlichkeit der Emissionsreduktion eines CDM-Projektes bewertet wird. Abhängig davon, wie die Ankaufsquote nach Gastgeberland differenziert werden, kann dieser Ansatz die Zahl der neuen, nicht-zusätzlichen Projekte entweder erhöhen oder erniedrigen. Beispielsweise kann eine hohe Ankaufsverpflichtung für Projekte aus den am wenigsten entwickelten Ländern einige der Hindernisse (d.h. kein verfügbares Kapital) beseitigen, die den Transfer innovativer, emissionsreduzierender Technologien behindern.
Falls Gastgeberländer, die eine hohe Teilnahme am CDM verzeichnen, jedoch an CER-Ankaufauflagen beteiligt sind, könnte die Auswirkung dieses Ansatzes auf die Zusätzlichkeit negativ ausfallen. Darüberhinaus könnten sich Emissionsreduktionen verzögern, falls das Angebot von CERs nicht groß genug ist, um die Ankaufsauflagen zu erfüllen.

Es wird kein maßgeblicher Effekt auf die Anzahl der Projekte mit niederem oder hohem Beitrag zur nachhaltigen Entwicklung bei dieser Alternative erwartet. Die Kosten zur Erfüllung der Emissionsziele von Annex I Staaten werden leicht steigen, falls die Ankaufauflage von den selben CDM-Projekten gedeckt wird, die auch den allgemeinen CER-Markt bedienen. Ungenutztes, kostengünstiges Minderungspotenzial könnte in den beteiligten Gastgeberländern aktiviert werden. Datenerhebung und methodische Voraussetzungen werden wahrscheinlich keine größeren Schwierigkeiten bereiten, sofern die Ankaufauflage für Ländergruppen festgelegt wird. Die mit dem Ankauf verbundenen Transaktionskosten können als vernachläsigbar eingestuft werden.
Die Unterstützung dieses Ansatzes durch Entwicklungsländer ist wahrscheinlich. Es gibt jedoch keinen Anreiz für Entwicklungsländer, auf langfristige Emissionsreduktionen zu setzen. Inländische CDM-Interessensgruppen könnten motiviert werden, ihr Lobbyverhalten zu verstärken. Es wird zu einer sehr transparenten Neuverteilung von Projekten zwischen den Ländern kommen, besonders wenn die Verpflichtungen für einzelne Länder festgelegt werden. Aufgrund des Gesamtnutzens für die Gastgeberländer sind für die UNFCCC Verhandlungen keine immensen Schwierigkeiten zu erwarten, vorausgesetzt die Käufer sind zahlungsbereit.

Ein projekttyp-spezifischer Ankauf und Entwertung von CERs könnte einen finanziellen Anreiz bieten, Emissionsreduktionsprojekte umzusetzen, die eher zusätzlich sind - d.h. CO_2-arme Technologien, die auf einer Positivliste klassifiziert werden.

Hinsichtlich der ökologischen Integrität beinhaltet dieser Ansatz per se keine Änderungen, auf welche Art und Weise die Zusätzlichkeit bestimmt wird. Abhängig von den Kriterien, die für die Auswahl der zulässigen Projekttypen genutzt wurden, könnten jedoch CER-Ankaufverpflichtungen für Projekttypen mit hoher Zusätzlichkeit eingeführt werden, die somit die ökologische Integrität des CDM erhöhen würden. Falls jedoch zulässige Projekte hinsichtlich ihres Beitrags zur nachhaltigen Entwicklung ausgewählt werden, könnte es sein, dass sehr zusätzliche Projekte –

wie z.B. Projekte zur Neutralisierung von Fluorkohlenwasserstoffen - bei dieser Variante benachteiligt werden. Verzögerungen der Emissionsreduktion können auftreten wenn die zugewiesene CER-Nachfrage vom CER-Angebot eines bestimmten Projektes nicht gedeckt werden kann.

Der Einfluss auf Projekte mit hohem Beitrag zur nachhaltigen Entwicklung wird davon abhängen, welche Kriterien genutzt werden um bestimmen, welche Projekttypen oder Technolgien unterstützt werden sollen. Gleichzeitig könnte der Technologietransfer belebt werden, falls die gewählten Projekttypen die Nutzung innovativer Technologien beinhalten. Dabei könnten Skaleneffekte ausgelöst werden, die auch die langfristigen Emissionsminderungskosten in Annex I Staaten reduzieren. Es ist zu erwarten, dass CDM-Lobbygruppen aktiv werden um die Technologieauswahl zu beeinflussen. Falls die Vertragstaaten die Technologieauswahl als ungerechten Prozess wahrnehmen, sind schwierige Verhandlungen zu erwarten.

Reinvestition von CER-Erlösen in Emissionsreduktionsprojekte

Die Ausgabe der CERs könnte besteuert werden und die Steuereinnahmen könnten für Investitionen in Emissionsreduktionsprojekte in Ländern ohne Emissions-beschränkung genutzt werden. Dies wäre ähnlich den „Green Investment Schemes (GIS)“, die von einigen Annex B Staaten eingeführt wurden. Auch hier kann sowohl eine projektspezifische oder gastlandspezifische Unterscheidung vorgenommen werden.

Es ist zu befürchten, dass die CER-Steuer CDM-Projekte aus dem Mechanismus drängen wird, die hohe Vermeidungskosten haben, d.h. die zusätzlich sind. Daher kann eine solche Reform des CDM die ökologische Integrität des Mechanismus schmälern. Außerdem könnte die gastlandspezifische Reinvestition von CER-Steuereinkünften zu der Finanzierung von nicht-zusätzlichen Projekten führen, falls nicht passende Regeln definiert werden. Die Messbarkeit der durch reinvestierte Mittel erreichten Emissionsreduktionen wird schwierig und möglicherweise ähnlich zu den Baseline- und Monitoringmethodiken im derzeitigen CDM sein. Es ist auch wichtig zu erkennen, dass Emissionsreduktionen nur in der Zukunft auftreten werden.

Der Einfluss auf Projekte mit hohem Beitrag zur nachhaltigen Entwicklung hängt von der Wahl der Länder ab, die die Mittel erhalten. Die Kosten für die Erfüllung der Ziele von Annex I Staaten würden steigen, außer es könnte ungenutztes, kostengünstiges Potenzial geeigneter Projekte außerhalb des CDM aktiviert werden. Da eine Projektfinanzierung im Voraus möglich wäre (das Kapital ist nach dem Verkauf oder der Versteigerung der eingezogenen CERs sofort verfügbar), könnten Projekte mit finanziellen Hindernissen gefördert werden. Die Transaktionskosten für den Verkauf der CERs und den Mitteltransfer ins Gastgeberland können erheblich sein. Gastgeberländer müssen einen regulativen Rahmen für einen einwandfreien Umgang mit den Mitteln und das Monitoring der damit erzielten Effekte aufbauen.

Die Unterstützung von Entwicklungsländern für diesen Ansatz beschränkt sich auf die Staaten, die von den Mitteln profitieren. Es wird kein wirksamer Anreiz für Entwicklungsländer gegeben, auf langfristige Emissionsreduktionen zu setzen. Aufgrund der allgemeinen Ablehnung von Steuern wird die Verhandelbarkeit als gering eingestuft.

Falls der Ansatz projektbezogen ausgestaltet wird, ist eine externe Definition von Nachhaltigkeitskriterien für die zulässigen Projekte möglich, was einen Vorteil gegenüber dem derzeitigen CDM bietet. Je nachdem, wie die Kriterien zur Projektauswahl gewählt werden, könnten Projekte mit hohem Beitrag zur nachhaltigen Entwicklung sowie Kleinprojekte gezielt gefördert werden.

Quantifizierung des Einflusses auf den internationalen Kohlenstoffmarkt

Mit Hilfe eines Angebotsmodells wurden die Ansätze gastlandspezifische und projekttypspezifische Diskontierung von CERs, sowie gastlandspezifischer CER-Ankauf und Entwertung hinsichtlich ihres Einflusses auf den internationalen Kohlenstoffmarkt bewertet.
Aus Ausgangsbasis (Vergleichszenario) wurden zwei Nachfrageszenarios angewendet: ein Szenario mit vergleichsweise niedriger Nachfrage basiert ausschließlich auf der Nachfrage der Annex B Staaten des Kyoto Protokolls und den USA, das andere Szenario mit vergleichsweiser hoher Nachfrage beinhaltet fünf weitere Staaten mit Emissionsreduktionszielen (Brasilien, China, Mexiko, Südkorea und die Türkei). Während die BAU-Emissionen im Jahr 2020 auf 56 Milliarden Tonnen geschätzt werden, werden zwischen 2013 und 2020 im Szenario mit niedriger Nachfrage Reduktionen von 24,8 Milliarden Tonnen $CO_{2äq}$ erreicht. Im Szenario mit hoher Nachfrage werden 45,5 Milliarden Tonnen $CO_{2äq}$ erreicht. Das CDM-Angebot für das Szenario mit hoher Nachfrage über 1 Milliarde Tonnen pro Jahr in 2020, während im Szenario mit niedriger Nachfrage nicht mehr als 0,4 Milliarden Tonnen erreicht werden. Der CER-Preis liegt jeweils bei 36 und 21 €.

Entsprechend der Modellierungsergebnisse erhöhen die Ansätze mit gastlandspezifischer und projekttypspezifischer Diskontierung den CER-Preis um 4 und 6 € im Szenario mit niedriger Nachfrage, während im Szenario mit hoher Nachfrage der Anstieg nur 1 und 2 € beträgt. Die Ankaufvariante, in der von einer Entwertung von 0,5 Milliarden Tonnen CERs ausgegangen wird, erhöht den Preis nur um 1 €.

Das Volumen der CERs, die für die Erfüllung der Emissionsziele verfügbar sind, wird hauptsächlich vom gewählten Nachfrageszenario beeinflusst: Das höchste CER-Angebot ist dann vorhanden, wenn keine neuen Länder Reduktionsverpflichtungen eingehen. Unter den CDM-Reformszenarien bietet das CDM-Referenzszenario (ohne Änderungen) dem Markt die meisten CERs, während von den drei simulierten Alternativen die gastlandspezifische Diskontierung in beiden Nachfrageszenarien die meisten CERs für den Markt aufweist.

Die drei CDM-Reformalternativen erhöhen die Gesamtmenge der global erreichten Emissionsreduktionen, allerdings im Vergleich zum Referenz-CDM nur in begrenzter Form. Das totale CER Angebot ist im Falle der Diskontierungsalternativen grundsätzlich niedriger als im Referenz-CDM. Die einzige Ausnahme ist die gastlandspezifische Diskontierung im Nachfrageszenario 1, in dem höhere Preise ausreichende Investitionen in CDM-Projekte anregen, sogar mit dem aufgrund der Diskontierung geringeren Ertrag. Das für die Erreichung von Reduktionszielen verfügbare CER Angebot ist immer niedriger als im Referenz-CDM. Im Vergleich zum Referenzszenario erhöhen sich Reduktionen immer in Annex-I Ländern und in den meisten Fällen in Nicht-Annex I Ländern mit der Einführung von Diskontierungsmechanismen. Allgemein begründen sich die erhöhten Emissionsreduktionen durch die höheren CER-Preise.

Obwohl die Modellsimulation die Effekte einer sehr spezifischen Anwendung der CDM-Reformalternativen unter ganz bestimmten Annahmen abbildet, zeigt sie, dass diese Ansätze den CER-Preis und die globalen Emissionsreduktionen erhöhen, letzteres vor allem in Annex I Staaten. Dies ist dahingehend positiv, dass Nicht-Annex I Staaten durch diese Reformen nicht belastet werden.
Auf der anderen Seite ist der Effekt der entwickelten CDM-Reformalternativen auf die Emissionsreduktionen im Vergleich zu einer steigenden Zahl von Ländern mit Emissionsreduktionsverpflichtungen gering.
Dennoch ist die Reform des CDM ein Ziel an sich, um den Mechanismus glaubwürdiger zu machen, verbesserte Anreize zu setzen und die ökologische Integrität zu erhöhen.

Introduction

Developing countries, especially advanced ones, have shown a rapid increase of greenhouse gas emissions over the last years. For example, Chinese emissions increased by more than 2 billion t CO_2 equivalent in less than 5 years. As these countries do not have any commitments to date, there is an increasing emphasis on ways to generate greenhouse gas reductions in the post-2012 period. To date, the Clean Development Mechanism (CDM) is the only Kyoto Protocol policy instrument where developing countries participate in greenhouse gas emissions reduction. It allows industrialized countries to generate emissions credits (Certified Emission Reductions, CERs) through emission reduction projects in developing countries. CERs can be used by industrialized countries (Annex B Parties[1]) to achieve compliance with the emissions targets specified in the Kyoto Protocol, and also by private companies e.g. covered by the EU emissions trading scheme. As developing countries do not have any emissions targets, an elaborate body of rules and supervisory institutions has been set up to ensure that CERs reflect "real, measurable and long-term" emission reductions (Art. 12, 5b Kyoto Protocol).

In just four years, the CDM has become one of the most important elements of the Kyoto Protocol. It has mobilized almost 5,000 projects, of which over 2,000 have been formally registered with the CDM Executive Board (EB), the regulatory body overseeing its rules. More than 2.8 billion CERs are expected to be generated by these projects by 2012, and over 9 billion € have been budgeted for CER acquisition. 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 role of market mechanisms in the international climate policy regime after 2012 is strongly linked to the overall degree of ambition of the regime. The Intergovernmental Panel on Climate Change (IPCC) states in its Fourth Assessment Report that the industrialized countries need to reduce their greenhouse gas emissions by 25-40% of 1990 levels until 2020, in order to reach an emissions path consistent with the 2°C goal (report of IPCC Working Group 3, Chapter 13, p. 767). Further, emission levels in Latin America, Middle East, East Asia and China would need to decrease significantly from the business-as-usual (BAU) scenario by 2020. So far, however, countries in these regions have not shown any disposition to accept mandatory emission reduction goals. Therefore, different ways to engage developing countries are being addressed. In the Bali Action Plan, they agreed to embark on Nationally Appropriate Mitigation Actions (NAMAs) provided monitorable, reportable

1 The Kyoto Protocol specifies in its Annex B the countries with quantified emission reduction commitments for the period 2008-2012. UNFCCC's Annex I lists the countries that agreed (in a non-binding manner) to reduce GHG emissions to 1990 levels by the year 2000 under the Convention. While both lists are slightly different in their composition, in this report we use Annex B and Annex I countries as synonyms, implying the countries with binding emission reduction commitments (either between 2008-2012 or after 2012).

and verifiable access to finance would be provided by industrialized countries. While the developing countries prefer fund-based financing schemes for emissions reductions, other proposals use market mechanisms to elicit reductions. For example, the EU has proposed a sectoral crediting mechanism where the baseline would not be business-as-usual, but already the implementation of "no-regret" emissions reductions. Likewise, domestic policies could be credited from such a baseline. So far, the CDM has been a pure offset mechanism, where one tonne CO_2 equivalent (tCO_2e) reduction from a CDM project allows increasing emissions in the Annex B countries by one tonne[2]. Which options exist to develop the CDM further to also generate emissions reductions?

Reforms to the CDM and other options for implementing emission reductions in non-Annex I countries are currently being debated under the Ad-hoc Working Group on Further Commitments for Annex I Parties under the Kyoto Protocol (AWG-KP). The negotiations for improving the CDM include inter alia the following elements:

- Sectoral emission credits based on non-binding targets
- CDM based on NAMAs
- Standardized baselines
- Differentiation of host countries with respect to their participation in the CDM
- Discounting or multiplication of CERs according to project type

This project has the objective to enable the German Federal Government to develop its own negotiation position regarding the contribution of a reformed CDM to global greenhouse gas emissions reductions. Options for the implementation of a reformed CDM will be developed and their pros and cons assessed. Further, their implications for the international emissions market will be analysed, implementation barriers identified and the political acceptability by parties to the Convention evaluated.

This report presents, assesses and discusses several options for utilizing the CDM to achieve global emission reductions. Section 2 shortly identifies reform options that would lead to global emission reductions from the CDM. In section 3, we describe the criteria that will be used to evaluate the proposed options in a qualitative manner, establishing specific assessment indicators for each criterion. Section 4 presents a detailed description and the qualitative evaluation of each option to reform the CDM for global emission reductions. In section 5 a quantitative analysis of the effects of three selected options on the global carbon market is performed. In sections 6 and 7 we draw the conclusions of the study and derive some policy recommendations.

2 Theoretically, full offsetting is no problem as long as the reduction from the CDM project is real and as long as incentives for introduction of emission reduction policies in developing countries are not distorted. A real emission reduction can only be achieved through activities that would not have happened otherwise and thus are "additional" to business-as-usual. If CDM regulators lose sight of this crucial point, then the CDM will be generating meaningless paper credits that displace real reductions in industrialized countries. A study by Schneider (2007) concludes that about 40% of projects and 20% of the CER volume is unlikely to be additional. Michaelowa and Purohit (2007) find a high number of non-additional projects among a sample of 52 registered projects from India.

1. Background

The current CDM is an offsetting mechanism. This means that emission reductions achieved through CDM projects in developing countries enable industrialized 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. As discussed in the introduction, the need to embark on an emissions reduction path beyond industrialized countries requires thinking about a contribution of the CDM to global emissions reduction. The idea to develop the CDM into a mechanism that goes beyond offsetting[3] and achieves global emission reductions has been proposed by several actors in the international climate negotiations. The concept of discounting emission reduction credits was put forward by Korean negotiator Chung (2007), and was later picked up in the Bali Conference in December 2007 by the US NGO Environmental Defence. The EU has stressed in presentations in Bangkok and Bonn in 2008 and in its written contributions to the negotiations that the CDM should be reformed for some developing countries into a mechanism that "allows for a net contribution to mitigation".

Beyond country representatives, researchers and other stakeholders have proposed reforms of the CDM to contribute to global emissions reductions. Meng (2007) discusses a "value-added CDM" where part of the emission reductions is discounted. 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 (2009) and Bakker et al. (2009) have evaluated various approaches to move the CDM beyond offsetting. The Climate Action Network, a network of environmental non-governmental organizations, 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). Even much earlier, environmental NGOs already demanded a discounting of emission credits (Greenpeace 2000), with the aim of ensuring the environmental integrity of the CDM.

These converging positions and previous research provide the basis for an in-depth analysis of the options for a "CDM beyond offsetting".

[3] In this report, we utilize the term "CDM beyond offsetting" to refer to a reformed CDM which generates more emission reductions than those offset in Annex I countries through the purchase of CERs. Such reformed CDM has also been termed by other authors "CDM with atmospheric benefits" or "CDM with global emission reductions". While we choose the term CDM beyond offsetting, we consider these expressions as synonyms.

An important rationale is to enhance global climate mitigation beyond given targets by industrialized countries in order to achieve ambitious reductions of global GHG emissions. Under a CDM beyond offsetting, the emission reductions achieved through the CDM are not fully used to allow increased emissions in industrialized countries; rather a share of the emission reductions is not credited or used for compliance. In the case of a discounting scheme, 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 an Annex I country to increase its emissions only by one ton, resulting in a net benefit of one ton for the atmosphere. The enhanced global GHG abatement due to the introduction of a CDM beyond offsetting can occur in both industrialized and developing countries and is financed through the purchase of CERs by industrialized countries (Schneider 2009). In this vein, Chung (2007) argues that a CDM beyond offsetting 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 certain conditions – e.g. if the price elasticity is high – rents for project developers and host countries could even increase with discounting (Schneider, 2008).

Currently, the CDM faces considerable criticism with regard to its environmental integrity (see, for example, Michaelowa and Purohit 2007, IRN 2008, Victor and Wara 2008, Schneider 2007). 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. Already today, 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.

The CDM has also been criticized because some projects have benefited from very large windfall profits. This applies in particular to the destruction of HFC-23 which is a waste product in the production of HCFC-22 and the destruction of N_2O from adipic acid and nitric acid plants. 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 compared to a situation where just the marginal abatement costs are covered (IRN, 2008; Victor and Wara, 2008). If designed accordingly, introduction of a CDM with atmospheric benefits could reduce these windfall profits and make the CDM more cost-effective.

Further, in a situation where the CER price rises strongly when CER supply is curtailed through discounting, the use of more innovative technologies with higher

abatement costs could be promoted. This however would require that non-additional projects can be identified and excluded because otherwise they would crowd out the high cost technologies.

2. Identification of options to achieve global emission reductions through the CDM

Introducing a CDM with global emission reductions means that fewer CERs are issued and/or used compared to the level of emission reductions achieved through the CDM projects. The following options to implement this in practice have been described in the literature (Chung 2007, Schatz 2008, Michaelowa 2008, Schneider 2009, Bakker et al. 2009):

(a) Discounting of emission reductions: This implies that not all of the emission reductions achieved by a CDM project can be used in the carbon market, i.e. that a part is not credited, thereby providing a net global GHG emission reduction. Discounting can be implemented in several ways, either setting discount factors by project types or by host countries, and either directly at the point of supply (during the process of issuance) or the demand side of the CDM (when CERs are used for compliance by Annex I countries or companies).

(b) Ambitious baselines: In this case, baselines are selected which are below the business-as-usual level of emissions. In this way, a part of the emission reduction achieved by the CDM project activity (as compared to the business-as-usual baseline) is not issued as CERs but provides a net benefit to the atmosphere.

(c) Purchasing and cancelling emission credits from the CDM: In this case, Annex I countries purchase emission credits from the market and cancel them without using them for compliance. The purchase could be financed from the revenues of auctioning emission allowances or through public funding. The level of purchases could be mandatory for certain countries under the international climate regime or voluntary.

(d) Obligation to re-invest the CDM revenues in emission reduction projects: This option would be similar to the concept of Green Investment Scheme (GIS) developed for achieving environmental benefits from trading AAU surplus ("hot air") from transition countries. Under a GIS, which is entirely voluntary, a Party to the Kyoto Protocol expecting that the development of its economy will not exhaust its emissions quota, can sell the excess of its Kyoto quota units (Assigned Amount Units or AAUs) to another Party that cannot meet its Kyoto target on its own. The revenues from the AAU sales are used for financing projects for either reducing greenhouse gas emissions or building

up the necessary framework for this process. Within the CDM framework, the revenues from an additional taxation on CER issuance are re-invested in projects mitigating greenhouse gas (GHG) emissions in non-Annex I countries.

In this report, we will build upon this previous work. After providing a general description of these options to achieve global emission reductions through the CDM, we will discuss concrete implementation options for each of them and assess them according to their impacts on global GHG emissions (environmental integrity), contribution to sustainable development, cost efficiency, technical feasibility, incentives and distributional effects and negotiability.

3. Criteria to evaluate the proposed options

In the following paragraphs, we describe evaluation parameters and develop specific criteria that will be used to assess the effectiveness and viability of the proposed options for a CDM beyond offsetting.

For the assessment, we apply a qualitative evaluation scale, which compares the situation with the reformed CDM (e.g. CDM with discounting, or with ambitious baselines) to the situation with the current (BAU) CDM for each criterion. The scale is as follows:

(--): The proposed option has a significantly negative impact on the respective criterion, as compared to the current CDM.
(-): The proposed option has a slightly negative impact on the respective criterion, as compared to the current CDM.
(0): The proposed option has a neutral impact on the respective criterion, as compared to the current CDM.
(+): The proposed option has a slightly positive impact on the respective criterion, as compared to the current CDM.
(++): The proposed option has a significantly positive impact on the respective criterion, as compared to the current CDM.
(n.d.): The impact of the proposed option on the respective criterion cannot be determined.

It should be noted, that “negative” and “positive” are to be interpreted compared to the current regulatory situation: a *rise in costs*, for example, will be interpreted as a *negative impact* with respect to the current CDM.

While this evaluation scale does not allow for comparisons across criteria (because this would imply that different criteria are given the same importance or relevance), it aims as providing an overview of how the proposed option would fare as compared to the current CDM. Note that in some cases, the evaluation will always be negative: for example, as the CDM rules are already established, introducing any reform will

always imply certain transaction costs (negotiation, data acquisition, setting up an administrative body, etc.). Further, as all options can be implemented in several different ways, the impact on certain criteria cannot be established precisely. In these cases, we provide a range of how the possible outcomes could be.

3.1 Environmental integrity

When assessing the different options to achieve global emission reductions through the CDM, it is important that impacts on global GHG emissions are carefully evaluated. Each option has been designed to contribute to global GHG emission reductions by issuing or using fewer CERs than the achieved emission reductions. However, the proposed options achieve this objective in different ways which may vary with regard to the level, certainty and timing of the achieved global GHG emission reductions.

The contribution of each option proposed to global GHG reductions depends upon the following two criteria

(1) the extent to which any calculated emission reductions do not lead to issuance as CERs, the extent to which issued CERs are not used for compliance purposes, or the extent to which emission reductions achieved from any re-investments of CER revenues are not credited; and
(2) the extent to which the calculated emission reductions are real, additional and measurable.

The first criterion is highly sensitive to the discount factor applied or the level of CER purchase commitment. Therefore it is a key design feature (and not part of this assessment). The main focus of the analysis concerns the second criterion, which involves a qualitative assessment (based upon the following indicators) of how the quality of GHG reductions may vary depending on what option is implemented.

Additionality: As an offsetting mechanism, the CDM currently depends upon the concept of additionality to ensure its environmental integrity. A project is regarded as additional if it would not have been implemented without the incentive from the CDM. This is demonstrated through a barrier analysis, an investment analysis and/or a common practice analysis. The current approach has been criticized as very subjective and difficult to validate in an objective manner. Several reports highlight that a significant number of non-additional projects have been registered (Michaelowa & Purohit 2007, Haya 2007, McCully 2008, Victor & Wara 2008, Schneider 2009), especially in the early years of the CDM. Given the importance of ensuring GHG emission reductions are additional, the potential of each option to ensure that the credited emission reductions are additional will be assessed.

While it is inevitable that these options will result in some non-additional projects continuing to benefit from the CDM, the extent to which these options uphold the

concept of additionality will vary. For example, by applying a conservative discount factor to CERs the discounting option may compensate for GHG reductions from non-additional projects that are illegitimately registered under the CDM, but will not deter developers to submit non-additional projects. Ambitious benchmarks may provide a more objective means to determine additionality and may thus help to reduce the currently observed gaming in the demonstration of additionality. The option to purchase and cancel emission credits from the CDM will only achieve additional GHG reductions if the projects financed by CDM revenues are subject to the same additionality criteria as CDM registered projects.

Measurability: The ability to accurately measure the GHG reductions that result from a project is also an essential requirement for maintaining the environmental integrity of the CDM. The quality of CER production depends upon the GHG reductions from an installation being 'measurable' and therefore each of the options proposed will be assessed on whether or not this criterion will be satisfied. The extent to which additional emission reductions are actually measurable differs significantly between the options. For example, emission reductions against pre-defined benchmarks are certainly more easily measurable than those achieved through re-investments of CDM revenues in emission reduction projects. The level of uncertainty associated with the quantification of GHG emission reductions also needs to be considered, and will differ between the options proposed.

Timing of emission reductions: The timing of GHG reductions is an important consideration when evaluating the environmental integrity of the CDM. The IPCC (2007) emphasizes the need for a collective and rapid response in order to prevent the environmental consequences of runaway climate change. The timing of the global GHG emission reductions will differ depending on which option is implemented. For example, GHG reduction benefits will accrue immediately if discounting is applied to CERs, while the introduction of the option to re-invest CDM funds would result in GHG reduction benefits occurring in the future. Given that political commitments and technologies change over time, emission reductions accruing over a longer time horizon (i.e. re-investing CDM revenues into forestry projects), could potentially be lost as projects that currently would be additional become BAU over time.

Taking into account these different aspects, the following two overarching criteria will be used to evaluate the proposed options with respect to their environmental effectiveness:

- The extent to which the calculated emission reductions are real, additional and measurable.
- The timing of the GHG reductions.

3.2 Contribution to sustainable development

The definition of sustainable development (SD) is controversial. The most widespread definition which was developed by the Brundtland Report, “to meet the needs of the present without compromising the ability of future generations to meet their own needs” is wide enough to be broadly accepted. The concept includes economic, social and ecological aspects, such as economic growth, health and water conservation. It has a holistic perspective and tries to look at systems in a wide spatial and temporal context. However, it can only have meaning when it is applied in a particular context or a scale of values. The variety of views and their discussion become then apparent when the concept is transferred to a more specific and concrete level. For example, the poorest of the poor countries would prioritize increasing the access to freshwater and food, which could be one of their sustainable development strategies, whereas countries with emerging economies would be more concerned about environmental pollution. Many development planners, including country governments, have tried to include the concept into their development strategies, but their priorities and approach to the problem are diverse.

Achieving sustainable development is one of the two objectives of the CDM. As all countries have their own different challenges and priorities, there is no internationally set standard for how the contribution of CDM projects to SD should be assessed. Parties agreed in the Marrakech Accords that Designated National Authorities (DNAs) in host countries should assess whether a project sufficiently contributes to achieving sustainable development. They are mandated to issue a letter of approval or otherwise reject CDM projects according to each country’s own sustainable development criteria. The criteria defined by the host countries comprise many different aspects, including environmental, social, economic and technical ones. Existing approaches and methods for assessment also differ. Some countries use guidelines and checklists, others use negotiated targets and multi-criteria analysis (Sutter, 2003). Projects do not need to comply with all the criteria, but often only with one of them (Schneider, 2007), and in some cases DNAs seem to adopt the simple approach of ensuring that projects produce no harmful impacts (Cosbey et al., 2006). Many studies have already proved that the sustainable development objective of the CDM has been largely disregarded (Schneider 2007; Olsen 2007; Sirohi 2007; Sutter and Parreño 2007). One of the main reasons is that the sustainable development contribution of CDM projects is not given a monetary value. Therefore, only a few projects that have little or no sustainable development benefits have been rejected (UNDP, 2006). If the goal of sustainable development is to be achieved by the CDM, proposals for the reform of this instrument should consider a way to provide (economic) incentives for contributing to that goal.

As discussed above, sustainable development needs depend largely on the context and on the scale (local, national, global). Therefore, it is very difficult to assess the effect of general reform options for the CDM on the sustainable development goal. Especially for the reform options that differentiate among countries, this assessment

is complicated, as different countries have different criteria and approaches to assess this goal.

As for project types, there have been several attempts to propose methodologies that discriminate CDM projects according to their contribution to sustainable development (e.g. Sutter, 2003; Olsen and Fenhann, 2008). This kind of discrimination has the advantage to be internationally applicable and not specific to the context of any one country. However, its simplicity can also mean less validity, as this approach is not capable of differentiating projects against one another within project types.

For example, there is already some recognition that certain project types, such as ***industrial gases projects*** (HFC-23 and N_2O reduction) do not contribute strongly to local or national sustainable development. These projects just provide end-of-pipe technologies which generate only limited employment, and do not transfer important productive technology. On the other hand, ***renewable energy projects*** have theoretically more potential to generate sustainability benefits, for example through increased energy security, infrastructure, employment generation and reduced pollution (e.g. Sutter, 2003; Cosbey et al., 2006; Olsen and Fenhann, 2008).

However, renewable energy projects can also have negative impacts, such as the displacement of residents or reduced water availability for irrigation that can be caused by large hydropower projects. Similarly, while often strongly promoting SD, under certain conditions biomass based power plants can be problematic with regard to sustainable development benefits (Sutter, 2003; Olsen and Fenhann, 2008). In order to ensure sustainable fuel management, only the surplus biomass generated should be used for combustion in biomass plants. According to the SD ranking of projects done by Olsen and Fenhann, biomass energy projects rank below average, while cement projects, to their surprise, have ranked among the highest. Further, some research has concluded that ***small-scale projects*** tend to contribute more to SD than large ones due to their better integration in the local economy (Cosbey et al., 2006; Olsen and Fenhann, 2008).

Innovation effects and technology transfer by CDM projects can be considered as a contribution to sustainable development in terms of technological development and can further contribute to mitigation in developing countries. The CDM is currently the only market mechanism that aims to make economic activities in developing countries less emission intensive. Given the rapid economic growth of these countries, it is essential that they have access to low carbon technologies in order to reduce their increasing contribution to GHG emissions. The transfer of innovative technologies through the CDM may be associated with positive spillover effects, which could result in increased GHG reductions in the future (e.g. capacity building encourages a host country to adopt a low carbon development path, the implementation of innovative technologies could reduce their costs and favour their diffusion due to learning effects, etc). It is important to acknowledge that each of the options proposed will have different innovation effects. For instance, ambitious benchmarks that are updated regularly could provide a dynamic incentive for

innovation. Similarly, innovation effects could be important in the case of re-investment of CDM revenues if particularly innovative technologies are invested in. While the spillover effects – and the resulting contribution to increased mitigation – are very difficult to assess, we assess the contribution of the reform options towards increasing technology transfer through the CDM.

Taking into account these considerations, the following criteria will be used to evaluate the proposed options with respect to their contribution to sustainable development:

- The option creates incentives that favour projects with generally high long-term sustainable development benefits, such as renewable energy generation and energy efficiency projects (long-term sustainability).
- The option creates incentives that favour small-scale and community-based projects (local sustainability).
- The option creates incentives against projects with large profits and low additional sustainability benefits, such as industrial N_2O and HFC-23 destruction projects.
- The proposed option creates incentives for increased technology transfer to / innovation in CDM host countries (technological development, and possibly positive spillover effects).

In this report, contribution to the global mitigation efforts, i.e. to global sustainability will be assessed under the criterion "environmental integrity" described in section 3.1**Fehler! Verweisquelle konnte nicht gefunden werden.**, and incentives to the long-term low emission path will be assessed under the criterion "incentives and distributional effects" (section 3.5).

3.3 Economic efficiency

One of the goals of the CDM is to assist Annex I countries in achieving compliance with their quantified emission limitation and reduction commitments. The rationale behind this objective is that a large low-cost emissions abatement potential exists in non-Annex I countries. The mobilization of this potential through the CDM will reduce the costs of complying with the Kyoto targets, thereby increasing the economic efficiency of mitigation.

Assessing the economic efficiency of reform options for the CDM is a complex task. First, it is important to differentiate the narrow, maybe short-term concept of cost-efficiency for the carbon market, from a broader, macroeconomic and long-term cost-efficiency in achieving overall GHG concentration or temperature rise limits. Second, climate policies have spillover effects that can only be assessed with the support of an integrated economic model, so in this section we will not take them into account.

For the carbon market, cost-efficiency depends on the ***price of emission reduction credits or emission allowances***. This price is determined by the balance between

supply and demand. Assuming that demand is fixed, because it is set politically through the emission reduction targets for Annex I countries and the desired level of supplementarity, the price will then mainly depend on the amount of CERs supplied (assuming also that there are no other mechanisms providing emission allowances or credits). Thus, any reform of the CDM that places limitations on the eligibility of project types or host countries (without introducing an alternative mechanism), or reduces the amount of emission reductions to be credited to any individual project, will affect economic efficiency negatively, at least in the short term. This will happen because, for a given level of demand, the resulting reduction in CER supply will lead to higher CER prices at the equilibrium. Assuming that domestic mitigation actions in Annex I countries are more expensive than actions in non-Annex I countries, individual countries who intend to use CERs to meet part of their emission reduction commitments will face higher costs of compliance.

From a broader perspective, however, discounting CERs or imposing ambitious baselines generates additional emission reductions that are not credited. So, while costs rise, more reductions are achieved. Thus, it would be more correct to compare a situation with CDM beyond offsetting with a situation with "normal" CDM but more ambitious emission reduction targets by Annex I countries, in order to compare economic efficiency for the same level of global mitigation.

A rise in CER prices could (depending on the existing supplementarity rules) induce more domestic mitigation effort in Annex I countries, which could contribute to generate the structural changes necessary for their long-term transition towards a less carbon-intensive long-term emissions path. This would increase economic efficiency if technology development needs a "push" and the initially higher carbon market price is sufficient to ***induce technology development that lowers mitigation costs in the long run*****.** Obviously, evaluation of the long-term effect on efficiency depends on the financial discount factor used and the time horizon for which the analysis applies. Unfortunately, we do not know at what price levels technology breakthroughs occur. Experience with emissions mitigation technology support, e.g. through feed-in tariffs, in the last 20 years shows that such breakthroughs are rare. Support at levels much higher than current carbon market prices had limited impacts; for many renewable energy technologies costs did actually increase during the 2000s.

On the other hand, if less CDM projects are undertaken as a result of the reform measures (e.g., the discount factor makes a renewable energy CDM project unfeasible), technological innovation and structural changes that allow the transition of developing countries towards a less carbon-intensive emissions path could be discouraged, increasing the risk of lock-in in inefficient and carbon-intensive technologies. But if, for example, discount factors are set so that energy-related CDM projects are encouraged as compared to industrial gas projects, this technological transformation could be accelerated. Thus, CDM reform could help to ***mobilize unutilized reduction potentials***, if they contribute to overcome barriers for cost-effective abatement options in, for example, energy efficiency. However, our

knowledge of the incentive level needed to overcome barriers and start technological transformation is woefully inadequate.

Finally, CDM reform measures could also affect the profitability of CDM projects by increasing (or reducing) ***transaction costs***, for example through larger (or smaller) information requirements or more (less) cumbersome monitoring and controlling processes. While transaction costs are an important factor affecting the cost-effectiveness of the CDM, this aspect will be analysed in more detail under the criterion "technical feasibility", described in section 3.4.

The following criteria are derived thus to assess short and long-term cost-efficiency of the proposed reform options:

- Costs of Annex I country compliance with their emission reduction targets, which are affected through changes induced in CER prices (short-term effect).
- The reform option contributes to mobilize unutilized cost-effective reduction potential (short-term effect).
- The option provides an incentive for technology push in the context of domestic mitigation in Annex I countries, thereby promoting a more cost-effective long-term low-emissions path in Annex I countries (long-term effect).

3.4 Technical feasibility

In the context of this study, "technical" feasibility is defined as the feasibility to implement the analysed options in practice. For example, some of the options may require more or more difficult to obtain data for implementation that others. Similarly, some options may require more involvement and thus responsibilities on the local level than others.

The following aspects will be taken into consideration when evaluating the described reform options in section 4:

Methodological feasibility, including data availability

a) Feasibility related to data availability

- The proposed option requires a small amount of parameters / data for implementation
- It is feasible to use one or a small number of data sources (e.g. for benchmarking and discounting) that is derived by a single or a few institutions (i.e. consistency in data collection; easy access to data)
- Public data with sufficient quality is available for all countries/project types
- The time demand for generating the data on the local/regional/national level (implying potential time lags for availability at UNFCCC level) is low

- The uncertainty of the data, especially when generated on national or local level, is low.

b) Feasibility related to administration

- The option can be implemented solely by the UNFCCC, i.e. it does not need to be directly administered by host/investor countries (e.g. monitoring of reinvestment of CDM revenues).
- With regard to implementation and monitoring, the amount and complexity of data to be monitored is low (same as discussed under “data availability” above).
- Achieved emission reductions can be quantified easily.

c) Methodological feasibility

- Accuracy: The option leads to accurate determination of the amount of net emission reductions
- Simplicity: The option is simple to implement.
- Transparency: The option is transparent in its methodological approach and implementation.
- Comprehensiveness: The option is widely applicable to the relevant countries and project types.

Incorporation in UNFCCC accounting

The options described above could also have different implications with regard to their integration into the UNFCCC reporting and accounting structure. For example, some options may require a change to registries and the international transaction log (ITL) while others may be implemented without any such change. Therefore, the implications of the different options are analysed with regard to:

- National registries: Several UNFCCC decisions have specified how national registries should work and communicate with each other. A change in registries would not only require changes to the registry software, but also adapting relevant UNFCCC decisions and reviewing the operation of revised registries by expert review teams under the UN review process.
- CDM registry: A change in the CDM registry would need to be implemented by the UNFCCC secretariat. A review is not required.
- International transaction log (ITL): The ITL tracks and endorses transactions between and within national registries as well as transactions from the CDM registry to national registries. A change in national registries will most likely also require a change to the ITL. This may also affect UNFCCC decisions specifying the operation of the ITL.
- Guidelines for reporting on accounting and reporting on assigned amount units: Reporting and accounting procedures have been agreed upon in

several UNFCCC decisions[4]. Some options may impact relevant reporting guidelines, such guidelines for the electronic format for reporting on assigned amount units.

- Compilation and accounting database: The UNFCCC secretariat holds a compilation and accounting database to calculate whether Annex B Parties fulfil their emission reduction obligations.

Changes to these elements of the accounting system under the Kyoto Protocol are possible but require time and resources. The timelines required for implementing any changes could be important if the changes must be operational immediately at the start of the second commitment period (i.e. 1 January 2013).

3.5 Incentives and distributional effects

Introducing a CDM beyond offsetting implies that a reform of the CDM needs to be negotiated and accepted. Thus, finding ***incentives for developing countries (or groups of them) to accept the CDM reform option*** (discounting, ambitious baselines, etc.) is a necessary step towards it.

A long-term contribution of developing countries to global emission reductions can only be achieved if there are incentives that mobilize emission reductions in an efficient manner while ***promoting the achievement of an emissions path consistent with the long-term aim of the UNFCCC***. There is an inherent tension between the short-term and long-term perspective. In the short term, mobilization of all emission reduction options that have the same marginal costs is efficient. The current CDM has been quite successful in achieving such a mobilization. This efficient short-term policy however may lead to perverse incentives not to embark on an emission reduction path by CDM host countries. The CDM Executive Board tried to address this challenge by deciding that new policies promoting emissions reductions in the host countries should not be taken into account in baseline and additionality determination. This decision essentially upholds the incentive to embark on CDM projects but makes it more difficult to "wean off" the economic actors from the CDM revenues in a situation where the degree of development of a country would warrant shouldering at least of part of the mitigation costs. Given the intense development of CDM projects in several advanced developing countries, the power of CDM project development lobbies might soon reach a level where it can influence the country position in a sense that prevents them from taking up part of the mitigation cost. Therefore, reaching the long-term target of the UNFCCC requires breaking of the ***CDM revenue lobbies*** before they become too powerful.

Any option that leads to a reduction of crediting of CDM compared to the current system may have a negative ***distributional effect for developing countries***, as

[4] For example, this applies to decision 13/CMP.1 (Modalities for the accounting of assigned amounts under Article 7, paragraph 4, of the Kyoto Protocol) and decision 14/CMP.1 (Standard electronic format for reporting Kyoto Protocol units).

revenues from the sale of CERs will be reduced[5]. These effects can occur on different levels. Some options may redistribute among countries, whereas others may redistribute according to technologies. Depending on the option chosen, this ***distributional effect can be directly visible or opaque***. Direct visibility is given when there are clear numerical allocations of the contribution to global emission reduction for each country or project type. Opacity is high if the reduction of crediting is not immediately visible to the layman observer, but hidden within e.g. baseline or benchmark determination and can only be determined by experts.

We thus assess for each option whether

- possible incentives for developing countries (or groups of them) to accept the option can be found
- it sets an incentive for developing countries to embark on an emission reduction path consistent with the long-term target of the UNFCCC in the medium to long term
- it enables to neutralize powerful CDM lobbies – i.e. developers of and consultants for CDM projects - in host countries through mobilization of other beneficiaries. For example, in China and India developers of wind and hydropower projects have become an economically relevant group with the possibility to influence political decisionmaking. In Brazil it is the sugar mill owners who want to get CERs for their bagasse cogeneration plants.
- it redistributes between project types or countries
- its redistributive impacts are directly visible or opaque.

The latter two issues are closely related but need not work in the same direction. An opaque proposal might neutralize a key lobby in a context where the lobby has limited analytical capacity whereas in another context full visibility of the impacts may allow to forge a coalition against a powerful lobby benefiting from the status quo.

3.6 Negotiability

Developing countries have argued in the past that ***equity criteria*** should play a larger role in the climate negotiations. Therefore, proposals for contribution of the CDM to global emissions reductions have to satisfy common fairness criteria. For example, any parameters based on income levels should be based on a purchasing power metric. Only a solution perceived as fair might be able to overcome the opposition against giving up CDM revenues that have become quite attractive for several advanced developing countries.

20 years of experience with climate negotiations have shown that their level of complexity is just barely manageable in an international context where every country has a de facto veto. Decisions on a ministerial level have often been based on

[5] An exception would be a situation where the price elasticity is very high and therefore the reduction in supply will lead to an increase in overall revenues. It is however unlikely that this situation would hold in the current carbon market. It is likely though that an increase in CER prices due to the reduction of supply reduces the net negative distributional effect.

heavily ***symbolic numbers*** not grounded on detailed analysis, as was the case for the emission target levels in the Kyoto Protocol[6] as well as the definition of small-scale thresholds for CDM projects[7]. While its is possible to allocate technically complex decisions to lower levels of the UNFCCC process, such as the CDM Executive Board[8], parameters that are key for distribution of benefits and costs need to be decided on the ministerial level. This means that the principles of allocation of the mitigation burden to be covered by developing countries have to be defined sufficiently simply to allow ministers to understand the implications for their countries.

Complexity of a proposed solution can have both advantages and disadvantages in a negotiation setting. Complex solutions have the advantage that they allow log-rolling, i.e. the granting of very specific benefits to certain stakeholders. An advantage exists if powerful lobbies in a country do not understand that a proposal works to their disadvantage and thus do not weigh on the government to block the proposal. With a direct discounting system, the disadvantages for CDM project developers can easily be assessed. But if the loss of CERs is due to a complicated procedure of calculating an emissions benchmark, CDM developers will not be able to gauge the impact during the negotiations. But this advantage can easily turn into a disadvantage if the complexity of the system hides loopholes that are difficult to close ex post. Further disadvantages come up if the complexity prevents implementation of CDM projects as well as effective governance and leads to gaming of the system. For example, a benchmark system requires data that may not be available in many least developed countries. Moreover, an overly complex system may be unable to exercise adequate governance, as the need to decide on specific cases makes it impossible to engage on deciding on issues of general importance[9]. Often, complexity leads to long lead times for implementation of a system. In the context of a benchmark system, collection of data for benchmarks will be time-consuming.

For each option, we will assess

- its consistency with basic fairness criteria
- its amenability to the use of easily understandable, symbolic numbers
- its complexity and related challenges in governance and lead time for preparation.

[6] The symbolism related to steps of 1 percentage point for each of the large players, with the US in the centre. 6 (target for Japan and Canada) – 7 (target for the US) – 8 (target for the EU.

[7] Here, the number 15 was used despite completely different parameters for the three project categories. This led to a sizeable bias, which eventually generated enough pressure to change the numerical values.

[8] The EB was able to decide on the question of additionality which had been impossible to resolve on the level of the Conference of the Parties.

[9] Recently, the CDM Executive Board has been suffering from this problem, as it had over 100 project-specific cases per meeting and thus was unable to decide on reform of generic rules, e.g. of the programmatic CDM.

4. Evaluation of CDM reform options

4.1 Discounting of emission reductions

General description

What it is about

Discounting emission reductions implies that only a fraction of the emission reductions achieved by a CDM project can be used in the carbon market, thereby providing a net global GHG emission reduction. Such a reform would move the CDM beyond simply offsetting emissions and enable a net contribution from the mechanism to global GHG emission reductions.

Motivation for it

The ability to discount the value of CERs enables not only to provide to an own contribution to mitigation by developing countries, but also to differentiate the crediting of emission reductions at both the host country and project type scale, which may potentially address several of the current shortcomings of the CDM. For example, the uneven distribution of CDM projects could be addressed by using a discount factor to differentiate participating host countries according to their level of economic development. This would provide an economic incentive for project developers to prioritize project development in less developed countries. Moreover, it would provide an economic incentive for developing countries to commit to binding or no-lose sectoral or national GHG reduction targets, as a higher level of discounting makes their participation in the CDM financially less viable than a participation in the carbon market through targets, in which case emission reductions below the target are fully accounted for. Alternatively, differentiation could be established at the project level on the basis of criteria such as the sustainable development benefits of the project, the likelihood of the additionality of the project, the magnitude of any windfall profits from the project type, etc. Applying a discount factor to projects based on these criteria may enhance the environmental integrity of the CDM and further its contribution to promoting sustainable development in host countries. Moreover, discounting may improve the competitive situation of many countries sidelined in today's CDM.

Discounting has been discussed in the negotiations under the Ad-hoc Working Group on Further Commitments for Annex I Parties under the Kyoto Protocol (AWG-KP), where it has been supported, inter alia, by the EU and South Korea, but opposed by Australia and AOSIS (see e.g. UNFCCC, 2008a, 2008b, 2009).

Implementation

Discounting could be implemented at UNFCCC level or by the users of the CERs:

- With an agreement at the UNFCCC level (i.e. on the discount factor(s)), discounting could be implemented from the supply-side, so that only a percentage of the verified emission reductions are issued as CERs. In this

report, we understand discount factors as the percentage of emission reductions that is not credited. For example, a 30% discount factor would imply that only 70% of the verified emission reductions are issued as CERs. This type of discounting would be applicable to the whole carbon market.

- Alternatively, CER users (i.e. Annex I countries) could set their own discount factors. In this case, the users could only use a fraction of their CERs for compliance purposes, while another fraction would need to be transferred to a cancellation account. For example, a 50% discount factor would imply that a user would need to cancel one CER for each CER that is used for compliance. This demand-side discounting would allow for different CER buyers to set individual discount factors.

In the following, we describe and assess two implementation options for discounting: with discount factors differentiated by host countries, and with discount factors differentiated by project types.

4.1.1 Discounting of emission reductions by host countries

Detailed description

In this option, the discount factor could be differentiated between the countries where CDM projects are implemented. Several criteria for differentiation of the discount factor could be used, including, for example, the level of development of the host country, its level of emissions, etc. The level of development, measured for example through the Human Development Index (HDI) or through the gross domestic product per capita (GDP/cap), would be an indicator of the country's capability to pay for emission reductions. If we assume that a larger economy, with larger GDP/cap, has more possibilities to reduce emissions than a smaller one, this could also be an indirect indicator of the country's mitigation potential. The level of emissions, measured for example as the per capita emissions (t CO_2e/cap), would be an indicator of the country's responsibility towards climate change.

Further, different ways to operationalize the differentiation by host countries are possible. A very straightforward differentiation approach would be to consider the Least Developed Countries (LDCs) as one group, which would be exempted from the discounting, and to set a uniform discounting factor for all other non-Annex I countries.

At the other extreme, each non-Annex I country could have an own discount factor, linking it to the level of development or emissions of the country. The stronger its economy and/or the larger its emissions, the stricter the discount factor would be for the country. Michaelowa (2008) provides an example of how this could work. The discount factor for each country could be directly linked to the indicators used for level of development and responsibility of each country.

As an intermediate solution, discount factors could be differentiated among a few groups of developing countries. The groups could be established on the basis of agreed criteria, as will be shown in the example below. For example, the LDCs could be again exempted from any discounting, whereas the other non-Annex I countries would be categorized in groups with different discount factors.

Higher discount factors for more advanced countries could provide an incentive for these countries to leave the CDM, as taking up a commitment means that a reduction below a (sectoral) target could be fully rewarded through the sale of allowances, whereas under the discounting scheme, they would be valued less. At the same time, lower (or no) discount factors for poorer countries would provide enhanced economic incentives to develop CDM projects in these countries.

Hence, differentiation of discount factors between countries could thus serve two objectives: countries with more responsibility and capability to take action to mitigate climate change could be encouraged to take up commitments and the geographical distribution of CDM projects could be addressed which is a recurring concern expressed in decisions by the COP/MOP. Discounting in this context would reflect the principle of "common but differentiated responsibilities" enshrined in the UN Framework Convention on Climate Change.

In a first step, the basis for differentiating host countries would have to be negotiated. Several social and socio-economic indicators for country differentiation and several country groupings have already been proposed in the literature (see e.g. Karousakis et al., 2008 and Bakker et al., 2009 for an overview of country differentiation and grouping options; Ott et al., 2004 for a specific proposal on country differentiation according to capability, responsibility and mitigation potential, and Michaelowa, 2008). In a second step, the discounting factors for each country or group of countries would have to be agreed upon. They could be negotiated for each compliance period, and be again adjusted as countries develop.

The purpose of this report is neither to discuss all possible country differentiation systems nor to propose a concrete way of how discounting should be implemented, but rather to assess and compare several possibilities for moving the CDM beyond an offsetting mechanism. In the following, we present an example of how discounting by countries could look like.

Example

In each commitment period, CER discount factors are fixed for specific country groupings. The country groups are based on socio-economic indicators that provide an indication on the capability and responsibility for climate change. In our example, shown in Table 1, we use Gross Domestic Product per capita (GDP/cap) and Human Development Index (HDI) to define four country groups. Our categories are somewhat similar to the World Bank income groups, which are fixed according to Gross National Income (GNI) per capita.

Table 1: Classification of non-Annex I countries into groups for differentiated discounting of CERs

Group	GDP/cap	HDI	WB category	Countries
Non-Annex I Developed Countries	> USD 10,000	> 0.85	High income	Argentina, Bahrain, Barbados, Brunei, Chile, Israel, Korea, Kuwait, Qatar, Singapore, United Arab Emirates
Advanced developing countries (ADCs)	> USD 5,000	> 0.7	Upper middle income	Algeria, Belize, Brazil, Cape Verde, China, Colombia, Costa Rica, Dominican Republic, Fiji, Iran, Macedonia, Malaysia, Mexico, Panama, Samoa, Saudi Arabia, Seychelles, St. Vincent-Grenadines, Suriname, Thailand, Tonga, Trinidad and Tobago, Tunisia, Uruguay, Venezuela
Other developing countries (ODCs) or	< USD 5,000 > USD 5,000	> 0.6 < 0.7	Middle income	Armenia, Azerbaijan, Bolivia, Bosnia, Botswana, Cameroon, Congo, Cote d'Ivoire, Cuba, DPR Korea, Ecuador, Egypt, El Salvador, Gabon, Georgia, Ghana, Guatemala, Honduras, India, Indonesia, Iraq, Jamaica, Jordan, Kazakhstan, Kenya, Kyrgyzstan, Lebanon, Libya, Malta, Moldova, Mongolia, Morocco, Namibia, Nicaragua, Nigeria, Oman, Pakistan, Paraguay, Peru, Philippines, South Africa, Sri Lanka, Syria, Tajikistan, Turkmenistan, Uzbekistan, Vietnam, Zimbabwe
Least Developed countries (LDCs)	(*)	< 0.6	Low income	Afghanistan, Angola, Bangladesh, Benin, Bhutan, Burkina Faso, Burundi, Cambodia, Cape Verde, Central African Republic, Chad, Comoros, Dem. Rep. Congo, Djibouti, Equatorial Guinea, Eritrea, Ethiopia, Gambia, Guinea, Guinea-Bissau, Haiti, Kiribati, Lao, Lesotho, Liberia, Madagascar, Malawi, Maldives, Mali, Mauritania, Mozambique, Myanmar, Nepal, Niger, Rwanda, Samoa (**), Sao Tomé and Principe, Senegal, Sierra Leone, Solomon Islands, Somalia (***), Sudan, Timor-Leste, Togo, Tuvalu, Uganda, Tanzania, Vanuatu, Yemen, Zambia

Source: Adapted from the country classification in the CLIMSTRAT model by Öko-Institut.
Notes: GDP/cap, HDI and GHG/cap for 2005, World Bank categories for 2008.
(*): Least Developed Countries are defined in terms of gross national income (GNI) per capita, which is different from GDP/cap. To belong to the LDCs, countries' three-year average GNI/cap should be less than USD 750; when it exceeds USD 900, they leave this category.
(**): Samoa is still listed as a LDC, but decision on its graduation from this group is pending since 2008, after the UN recommended this change in status in 2006. According to its development indicators, if it graduates, it would belong to our category "Advanced developing countries".
(***): Somalia is not a Party to the UNFCCC.

In a next step, to determine the discount factors for each of the four country groups, the GDP and greenhouse gas emissions per capita are used. The median GDP/cap and GHG/cap are determined for each country group and then compared to the average values for the whole non-Annex I country group. These two proportions are given the same weight, as both principles are equally important and are not directly correlated. Thus, the discount factors are calculated using following formula:

$$\text{Discount factor} = 1 - \frac{2}{\frac{\text{Group's median GHG/cap}}{\text{Non-Annex I GHG/cap}} + \frac{\text{Group's median GDP/cap}}{\text{Non-Annex I GDP/cap}}}$$

Negative discount factors are not permitted, since this would imply issuing more than one CER per tCO_2e emissions reduced. Table 2 shows the resulting discount factors. The discount factor of 80% for the NAI developed countries means, for instance, that for CDM projects in these countries only 20% of the verified emission reductions would be issued as CERs.

Table 2: CER discount factors by country group

Country group	Median GDP/cap (2000 US$ PPP)	Median GHG/cap (tCO_2/year)	Discount factor
NAI Developed	22358	11.85	80%
ADC	7089	3.34	32%
ODC	3808	1.37	0%
LDC	1338	0.20	0%
All NAI countries	4662	2.36	

Possible market effects of discounting by host countries

Discounting will have impacts on the CER market, but, as shown below, the exact impacts will depend on the marginal abatement costs in the countries affected and on the size of these countries (and how their internal CDM market might affect international CER prices).

Figure 1 shows the case of a small country that does not influence the CER price and fully uses its mitigation potential to the point where the marginal abatement costs (MAC) equal the CER world market price. Introduction of discounting shifts the MAC curve upwards and the CER generation falls strongly, as high cost abatement options are no longer utilized. Still, a contribution to global mitigation is made.

Figure 1: Impact of country-specific discounting on CER generation and global discounting in the case of a small country

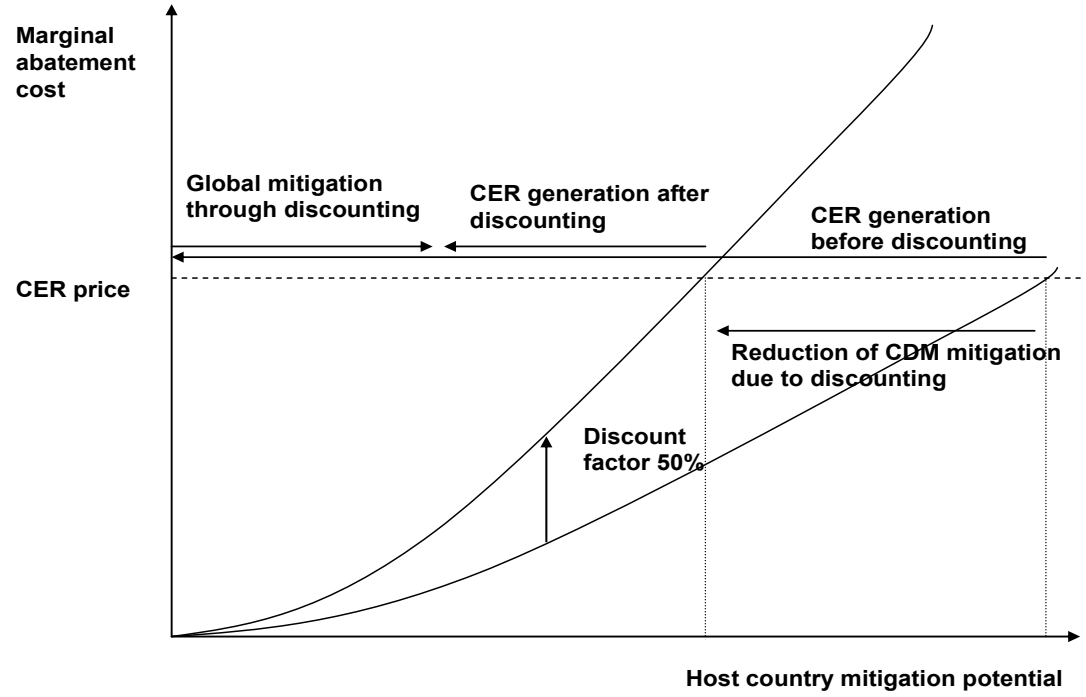
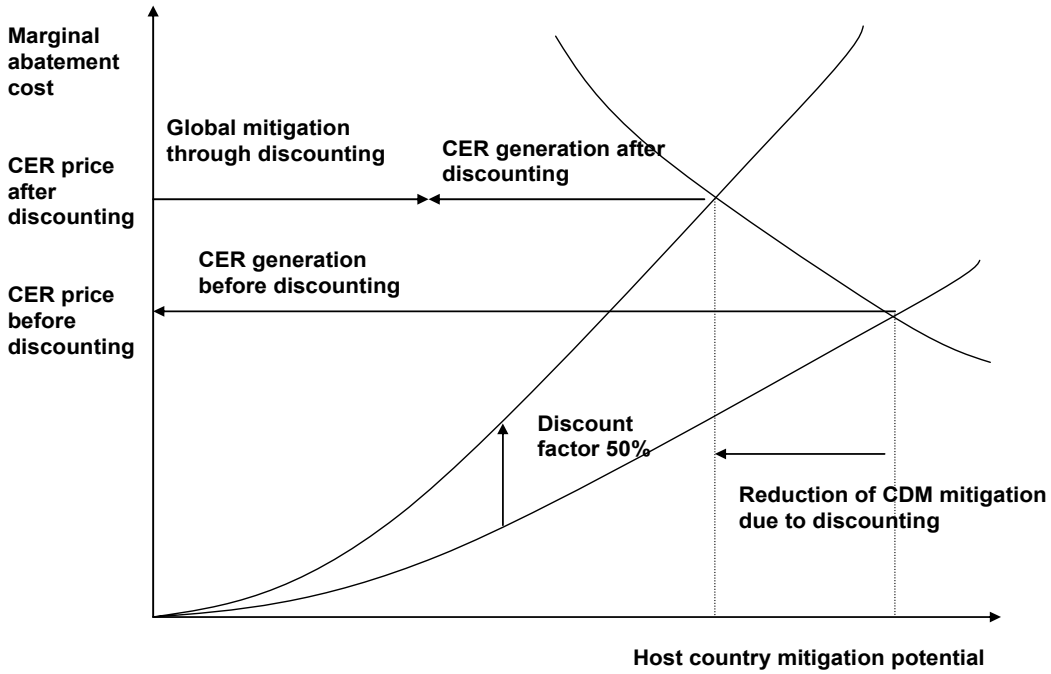


Figure 2 now shows the case of a large country that influences the CER price. Here, discounting increases the CER price, which leads to a higher global mitigation and CER generation compared to the case of Figure 1 due to the fact that a part of the high cost options is mobilized through the CER price increase.

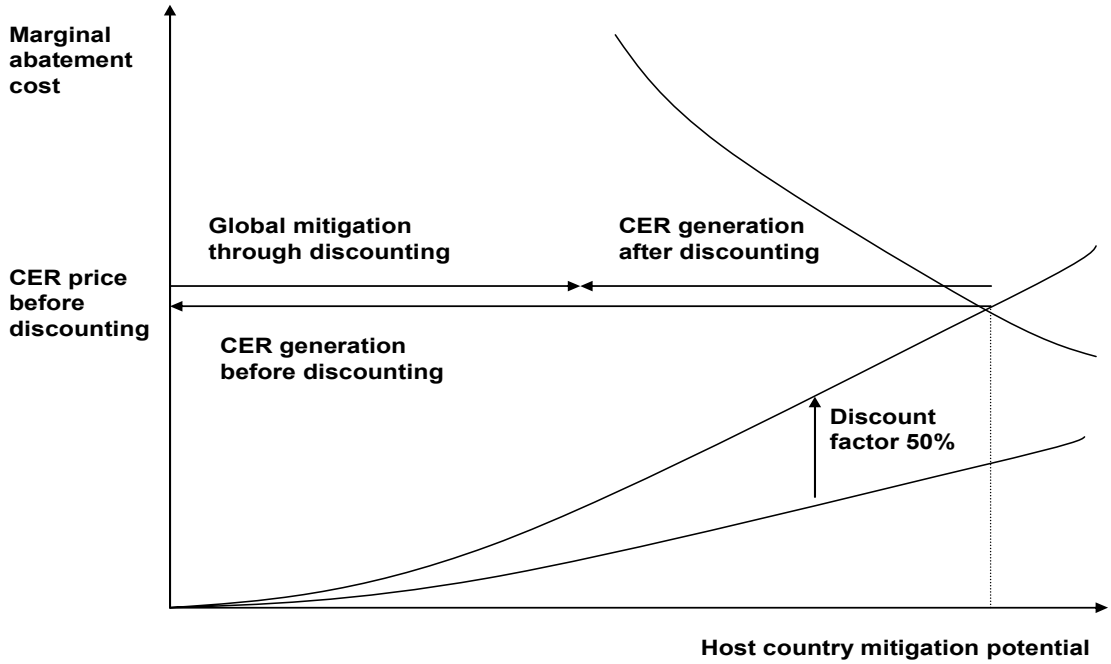
Figure 2: Impact of country-specific discounting on CER generation and global discounting in the case of a large country



The long-term impact of country-specific discounting depends on the willingness of host countries facing a high discount factor to take up commitments and on the degree of stringency of these commitments. If the commitments are stringent, the long-term impact will be very high. If the commitments include hot air, the impact will be negative. Therefore, the overall long-term contribution of country-specific discounting to global mitigation depends upon the ability of negotiators to prevent developing country commitments that generate hot air.

In summary, the country-specific discounting of CERs will have a positive (+ to ++) impact on the timing of GHG reductions compared to the current CDM, as global emission reductions will take place immediately, and as an incentive for long-term mitigation commitments will be created for host countries affected by discounting. Figure 3 shows the case where a country has a large amount of low-cost options that due to political barriers have not been utilized so far. Here, even after introduction of discounting still all mitigation potential is used and the contribution to global mitigation is maximized.

Figure 3: Impact of country-specific discounting on CER generation and global discounting in the case of a large country underutilizing its CDM potential to date



However, if many countries of the type shown in Figure 3**Fehler! Verweisquelle konnte nicht gefunden werden.** – e.g. LDCs with high mitigation potential in forestry sequestration such as the Democratic Republic of Congo - are exempt from discounting, whereas countries fully utilizing their medium-high cost CDM potential face a high discount factor, the utilization of medium-high cost options might be stalled until the latter countries take up a commitment.

Detailed assessment

Environmental Integrity

The impact of discounting CERs by host countries on the environmental integrity of the CDM will be evaluated according to the following criteria:

Additionality:
With regard to the methodology for assessing project additionality, the discounting of CERs by host countries will not change how project additionality is determined - compared to the current CDM.

The overall impact of this option on the number of non-additional projects entering the CDM is uncertain. In general, discounting may result in an increase on the number of non-additional projects entering the CDM pipeline, if the net CER revenues that are received by CDM projects are reduced as a result of the discount. However, it is important to acknowledge that the exact effect of discounting CERs on net CER revenues is unclear as the option would 1) lower the number of CERs per GHG reduction achieved but 2) would also increase the CER price due to the reduced CER supply. Depending upon the relationship between these two variables the number of non-additional projects may decline or even increase. It is conceivable that the effect of the CER price increase could be even higher than the reduction in the number of CERs (Schneider, 2009), in which case the share of CDM projects with more questionable additionality may decline due to the net increase in CER revenues.

On the other hand, the differentiation of the discount factor by host countries may improve the additionality of CDM projects by re-distributing financial investment to support the installation of GHG abatement technologies in LDCs – if we assume that CDM projects in LDCs are more additional (as they face further barriers) than those in more advanced host countries.

Thus, we expect that the effect of this option on additionality is generally uncertain (due to its relationship with CER revenues), ranging from having a negative (-) to a positive (+) impact as compared to the current CDM. In the concrete example presented, the impact on additionality would be slightly positive (+), due to the expected redistribution of projects to less developed countries.

Measurability:
The option to discount CERs will not involve changes from how the current CDM quantifies GHG reductions. As the CERs generated from a CDM project are simply discounted at either the supply or demand side, the methodological requirements of baseline and monitoring methodologies remain unchanged from the current operation of the CDM.

It is expected that both generally and for the example this discounting option will have a neutral impact on the measurability of GHG reductions in comparison to the current project based CDM.

Timing of GHG emissions:
Discounting CERs at the host country scale will have an immediate effect on the timing of GHG reductions from the date of its introduction. The scale of this impact depends on the shape of the marginal abatement cost curve and the degree of utilization of low-cost potential under the CDM to date in the different countries. However, there will always be a contribution to global reduction whose size depends on the shape of the curve and the discount factor.

The long-term impact of country-specific discounting depends on the willingness of host countries facing a high discount factor to take up commitments and on the degree of stringency of these commitments. If the commitments are stringent, the long-term impact will be very high. If the commitments include hot air, the impact will be negative. Therefore, the overall long-term contribution of country-specific discounting to global mitigation depends upon the ability of negotiators to prevent developing country commitments that generate hot air.

In summary, the country-specific discounting of CERs will have a positive (+ to ++) impact on the timing of GHG reductions compared to the current CDM, as global emission reductions will take place immediately, and as an incentive for long-term mitigation commitments will be created for host countries affected by discounting.

Overall effects on environmental integrity:
- Discounting CERs at the host country scale will not directly address the additionality of GHG reductions from a CDM project. However, a stringent discount factor could minimize the aggregated impact of non-additional projects to improve the environmental integrity of the mechanism.
- Discounting CERs at the host country scale will have an immediate effect on GHG reductions, although the level will depend on the characteristics of the marginal abatement cost curves. Projects high on the marginal abatement cost curve may no longer be viable under a discounted CDM.

<u>Contribution to sustainable development</u>

Contributions to sustainable development (SD) of this option are complicated to assess, as SD benefits of CDM projects do not relate to different levels of development or responsibility for climate change, but countries define their own SD priorities according to their economic, environmental or social situations. Therefore, each country has different criteria and approaches to assess SD. In general, this option would likely not have any significant effects on the contribution of CDM projects to achieving SD.

The proposed example, where more advanced countries receive stricter discounting, could to some extent contribute to a more equitable geographical distribution of CDM projects and increase projects in LDCs and sub-Saharan African countries. However, there is no evidence that SD benefits of CDM projects in these countries are greater than in the other developing countries with higher GDP and HDI.

Projects with generally high SD benefits:
In the longer term, there will be more CDM projects in countries with lower discount factors, which might contribute to increase in projects with SD benefits in these countries. On the other hand, the option could unnecessarily punish projects with high SD benefits, which are already difficult to implement, especially in countries with higher discount factors. Thus, whether the option has an overall positive or negative SD effect cannot be known, and thus we conclude that the impact is undetermined (n.d.). A possible option to avoid unnecessarily punishment for projects with high SD benefit is to combine this option with project type- specific discounting.

Small and community-based projects:
Regarding the project size, in countries with high CER discount factors, those projects that yield little profit, i.e. small scale and community-based projects might be no more feasible to implement due to the reduced CER income. Again, in general the effect is undetermined (n.d.), but slightly negative for projects in advanced developing countries (- to 0).

Projects with large profits and low SD benefits:
In countries affected by high discount factors, project developers will tend to favour low-cost, high-profit projects, such as industrial N_2O and HFC-23 destruction projects, which generally have low SD benefits. But it should be noted that the projects with large profits do not always correspond to projects with low SD benefits. For example, a project (or programme) on large-scale distribution of CFLs (compact fluorescent lamps) could have a large CER and high SD benefits. Nonetheless, it is much easier for project developers to implement industrial gas destruction projects than those projects with high CERs and SD benefits. Therefore, if project developers would prefer large scale projects due to the discounted CERs, those projects that are simple would be preferred. Thus, the impact is undetermined (n.d.), and slightly negative (- to 0) in the example.

Technology transfer:
Although discounting CERs at the host country scale according to levels of economic development will encourage CDM projects to be initiated in less developed countries, such as LDCs, there is no guarantee that these CDM projects will necessarily result in the transfer of innovative technology. On the one hand, given that less developed countries often have higher needs for technology transfer than more advanced developing countries, which often use their own technologies in their projects, it may be argued that this option would support technology transfer to less developed countries. On the other hand, penalizing CDM projects in advanced developing countries could result in reduced technology transfer to these countries. Therefore,

the use of discounting differentiated by host countries would have uncertain impacts on the actual level of technology transfer – but possibly tending to positive effects (0 to ++ impact compared to the current CDM). In the example, we expect a positive (+) impact on TT to less developed countries, but uncertain impact on TT to the more advanced ones.

Overall effect on sustainable development:

- The option could unnecessarily punish projects with high SD benefits in all countries, especially in "non-Annex I developed countries" and in "advanced developing countries". But as SD benefits and profitability of projects are not necessarily exclusive, in a precise sense it cannot be known whether this option has an overall positive or negative effect to SD benefits.
- Similarly, the option could punish technology transfer to the more advanced CDM host countries, but could increase TT to ODCs and LDCs.

Economic efficiency

Annex I compliance costs:

Discounting CERs by host countries will in general reduce the supply of credits to the carbon market, thereby increasing the costs of compliance for Annex I countries with their reduction targets. This cost increase will be in direct relationship with the stringency of the discount factor and the mitigation potential penalized in the affected host countries, thus its real magnitude is uncertain (impact rated - to --). However, the cost of the overall emission reductions achieved (counting also those that are not credited) will depend on the shape of the abatement cost curves in Annex I and non-Annex I countries, and could be higher or lower than the cost when similar emission reductions are achieved through stricter Annex I reduction targets. In the specific example shown above, the countries with 80% discounting currently host 7% of the CERs expected to be generated by 2012, and the countries with 32% discounting host 67%. If such geographical distribution continues after 2012, this level of discounting could have a sizeable impact on the CER market.

Mobilization of unutilized cost-effective potential:

A discounting scheme where more advanced non-Annex I countries have more stringent discounting factors would help to mobilize emission reduction options in poorer countries, but these options are not necessarily more cost-effective than those in more advanced developing countries. While less advanced countries may have significant low-cost opportunities for emission reductions, e.g. due to less efficient technologies being used there, the costs of identifying these opportunities and overcoming non-market barriers for their implementation could be substantial. Thus, it cannot be concluded whether a discounting scheme differentiated by host countries would contribute to mobilize unutilized cost-effective reduction potential, and the effect is rated as non determined (n.d.).

Technology push for more cost-effective long-term reductions:
The higher CER prices resulting from discounting could incentivize increased domestic mitigation action in Annex I countries, including a technology-push that makes long-term emission reductions more cost-effective. The size of the incentive will not only depend on the discount factor, but also on many other factors influencing emission reduction supply and demand and technology development, such as the level of emission reduction targets in Annex I countries, domestic climate and energy policies in Annex I countries, other limitations to CER imports due to supplementarity considerations, and whether other supply sources (such as REDD, or increased supply from countries not affected by discounting) arise. With the existing uncertainties regarding the future climate regime, it is still not possible to estimate whether such an incentive could be significant, thus we rate this impact as 0 to (+). For a detailed discussion of the effect of supplementarity combined with discounting on Annex I domestic action, see Schneider (2008).

Overall effects on economic efficiency:

- Due to the reduced supply of CERs to the market, compliance costs for Annex I countries will rise.
- While unutilized cost-effective mitigation potential can be better mobilized in host countries not affected by discounting, transaction costs of implementing these projects could be significant.
- Rising CER prices could incentivize increased mitigation and technology development in Annex I countries, resulting in more cost-effective long-term emission reduction. However, the size of such an incentive cannot be determined, as it depends on many other factors.

Technical feasibility

Data availability:
If the definition of discount factors by country or country group is aligned to its economic development, one can assume that the needed data – such as Gross Domestic Product per capita (GDP/cap) or Human Development Index (HDI) - is readily available for all CDM host countries, as this information is regularly reported to international institutions, such as the UN statistics. GHG emissions data reported by developing countries is only available for the years 1990 (or 1994) and 2000 (if second national communications have been reported), but data exists from other sources. Once data sources are agreed upon, the implementation is straightforward and could solely be managed by the UNFCCC, thus keeping overall transaction costs at a low level. Thus, we rate data availability as generally neutral (0) to slightly negative (-) as compared to the current CDM, and in the example slightly negative, due to the need for data on GHG emissions.

Administration:
Transaction costs result primarily from the negotiation process and when determining, updating, and applying the discount factors to the CDM host countries. Thus, we rate administration costs as slightly worse than in the current CDM (-).

Methodologies:
On methodological feasibility, the option in general is accurate in determining the net emission reductions as the discounted amount of CERs will clearly lead to net emission reductions. In the example, the proposed procedures for the country group selection and discount factor setting are simple, transparent and readily applicable to any host countries. In the actual application, however, it may lose simplicity, transparency and wide applicability depending on how the discount factors are determined. We therefore rate the general methodological feasibility as 0 to (-). Due to the simplicity of the approach, the example is rated as neutral (0).

Incorporation into UNFCCC accounting:
For implementing this option, it would probably suffice to modify the CDM registry in which country-specific discounting factors could be included. This modification could be implemented by the UNFCCC secretariat. Due to the small modifications needed, we rate this option as neutral (0).

Overall effects on technical feasibility:

- In the example, data for implementing this option is available with some limitations, and the methodology is straightforward. Generally, depending on the actual approach chosen for the differentiation of countries, data availability and methodological implementation may become more difficult.
- Transaction costs arise from the negotiation process and from the derivation of discounting factors.
- Incorporation into UNFCCC accounting should not pose major barriers, since it would suffice to modify the CDM registry.

Incentives and distributional effects

Incentive for developing countries to accept the option:
While not all CDM host countries will like the idea of country-level discounting, the countries favoured with lower (or no) discounting will likely support it, as this means that their chances to benefit from the CDM increase. In our specific example, both LDCs and ODCs would be expected to support discounting, as they would gain in CDM-related competitiveness in comparison to ADCs and NAI developed countries. ADCs and NAI developed countries, in turn, will likely be against this specific country-level discounting scheme.

Further, some studies have already shown that discounting does not necessarily imply higher costs for the project developer or host country. In fact, depending on other market rules, such as supplementarity, it can even result in higher rents for CER suppliers, due to the resulting rise in CER prices (see Schneider, 2008 for further details). If this is made clear to CDM host countries and project developers, then their possible opposition to a discounting system might be reduced.

Finally, even if discounting is not accepted in the international negotiations, CER buyer countries can still decide unilaterally to discount the CERs they buy for their own compliance. While this option is not as effective in generating global mitigation benefits as an international agreement, it does not need the support of CDM host countries for being introduced.

Thus, the overall incentive for developing countries to accept the option can range from (-) to (+).

Incentive for developing countries to take up a long-term low emissions path:
Country-level discounting gives an economic incentive for developing countries to embark on own emission commitments, which increases with the level of development: the higher the level of discounting, the less attractive it is for a country to stay in the CDM, as its credits would be valued less compared to reductions made under an emissions cap. By taking up national or sectoral, binding or no-lose emission reduction targets, the country could – once its target is met – trade its emission allowances at the full market price, which could become more financially attractive than the discounted CDM. Country-level discounting is therefore fully compatible with the long-term target of the UNFCCC. The example shows that the incentive can be substantial and thus is likely to promote taking up of commitments by advanced non-Annex I countries. The overall contribution to take up a long-term low emissions path can thus be seen as very positive (++).

Neutralizing domestic CDM lobbies:
Given that all project developers of a country suffer in a similar manner, lobby neutralization is not possible. Lobbies will thus continue to act as in the current CDM setup. The contribution can be seen as neutral.

Redistribution between project types and countries:
Direct redistribution is only done between countries. There will not be any direct redistribution between project types. At the margin, certain project types will be impacted by the discounting and these will be the types with the highest marginal abatement costs (see analysis above). Thus the desired redistribution towards low-income countries can be achieved if these countries are able to remove barriers that have so far hampered their CDM development. The effect can be evaluated as positive (+).

Transparency of redistributive impacts:
The effects of the country-specific discounting are fully visible and easy to understand. As long as the calculation of discount factors is not obfuscated, the transparency can be evaluated as very high (++).

Overall effects on incentives and distribution of projects:

- CDM host countries benefiting from lower discount factors may support this option. If it can be shown that the additional costs are born by CER buyers, opposition can be reduced.

- The option creates an economic incentive for advanced developing countries (those affected with higher discount factors) to take up emission reduction commitments.
- The option does not neutralize domestic CDM lobbies.
- The option promotes the redistribution of CDM projects towards countries with less discounting (e.g., less developed countries. The redistribution is very transparent.

Negotiability

Consistency with fairness criteria:
Discounting on the country level is explicitly aimed to be proportional to ability to pay and follows the polluter pays principle. Therefore, it satisfies fundamental fairness principles. The inclusion of the HDI might be somewhat unfair as a country with high HDI might have very low per capita emissions and thus be burdened too highly. The weighting of the two or three components determining the discount factor might lead to discussions about the precedence of one of those criteria. Therefore, the evaluation of fairness depends on the parameters chosen for the calculation of the discount factor; generally it can be seen as high (+). The example with a relatively limited differentiation of countries can be seen as relatively fair (+).

Use of symbolic numbers possible:
The basis from which the discount factor starts can easily be chosen according to the principle of a symbolic number. Thus this criterion is fully satisfied (++).

Low complexity, governance challenges and preparation time:
Country-based discounting is easy to administer and does not generate any governance challenges. Preparation of a proposal is not time-intensive. Still, discussions over country differentiation within the non-Annex I group are very sensitive, and this would negatively impact the negotiation time of such a proposal. Overall the evaluation is neutral to positive (0 to +).

Overall effects on negotiability:

While discounting scores high on all criteria, due to its transparency, the country differentiation could become difficult to negotiate as the losses compared to the status quo are immediately visible and as it is a sensitive topic among non-Annex I countries. Therefore, overall negotiability is only seen as neutral (0) to positive (+).

Summary of assessment

Reform option / Evaluation criteria	Discounting by host countries	
	In general	In the example
Environmental integrity		
Additionality	- to +	+
Measurability	0	0
Timing of GHG reductions	+ to ++	+
Contribution to sustainable development		
Favours projects with generally high SD benefits	n.d.	n.d.
Favours small and community-based projects	n.d.	- to 0
Disfavours projects with large profits and low SD benefits	n.d.	- to 0
Promotes technology transfer	0 to ++	+
Economic efficiency		
Annex I compliance costs	- to - -	-
Mobilization of unutilized cost-effective potential	n.d.	n.d.
Technology push for more cost-effective long-term reductions	0 to +	0 to +
Technical feasibility		
Data availability	0 to -	-
Administration	-	-
Methodologies	0 to -	0
Incorporation into UNFCCC accounting	0	0
Incentives and distributional effects		
Incentive for developing countries to accept the option	- to +	- to +
Incentive for developing countries to take up a long-term low emissions path	++	++
Neutralizing CDM lobbies	0	0
Redistribution between project types or countries	+	+
Transparency of redistributive impacts	++	++
Negotiability		
Consistency with fairness criteria	+	+
Use of symbolic numbers possible	++	++
Low complexity, governance challenges and preparation time	0 to +	0 to +

The criteria will be assessed on a qualitative scale with the range ++, +, 0, -, - -. n.d. means that the respective criterion cannot be assessed qualitatively in this option. The basis for comparison for the evaluation is the present CDM, so that "0" means no change, + means a slight improvement, ++ means a large improvement, and so forth.

4.1.2 Discounting of CERs by project types or sustainable development criteria

Detailed description

For this implementation option, a differentiated discount factor could be introduced according to project types. Such a differentiation has been proposed by Chung (2007), Schneider (2009) and in the negotiations under the AWG-KP. In this context, it has also been proposed to introduce multiplication factors larger than one in order to further favour some project types. However, it is important to acknowledge that this study only considers discounting and not multiplication factors larger than one. A variation of the discount factor between project types would imply that some project types are politically favoured over others. This requires political agreement about the parameters defining what is a "good project". The project types with a high discount factor would de facto become a "negative list". If the favoured project types have a lower discount factor 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.

Different policy and methodological rationales could be used to determine which projects should be favoured by the discounting approach. For example, projects that are associated with higher sustainable development benefits (e.g. small-scale renewable projects) could have a relatively low discount factor applied. This would provide a market value to the CDM objective of contributing to sustainable development in the host country. Favouring projects that use innovative technologies, in order to facilitate technology diffusion would also have a similar positive effect on the promotion of sustainable development. Alternatively, for projects that have very large windfall profits (e.g. HFC-23 or industrial N_2O destruction projects) higher discount factors could be applied. This could further incentivize smaller scale projects with higher sustainable development benefits.

Discounting could also be implemented to improve the environmental integrity of the CDM. For example, projects with more questionable additionality could be discouraged through discounting to avoid 'free riding'. For some project types, CER revenues do not play any significant role in relation to the overall investment and other revenues. These project types are less likely to be additional and could be assigned higher discount factors. However, an important disadvantage of this approach is that higher discount factors for project types with more questionable CER revenues make these projects even more unlikely to be additional, as this further decreases 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.

In comparison to politically established discount factors, discount factors could be based on more technical grounds, such as on the share of non-additional projects of a certain kind (e.g. by assessing the number of projects registered, reviewed and

rejected), the sustainable development benefits or the magnitude of windfall profits. Once political agreement on the principles is achieved, the derivation of discount factors could then be delegated to a technical committee akin to the Methodology Panel of the CDM Executive Board.

One challenge of setting the discount factor is certainly its predictability. On the one hand, predictability is necessary in order to reduce uncertainties for investors. On the other hand, pre-defined discount factors may for instance not be flexible enough to account for potential future improvements of technologies (thus making projects potentially even less additional).

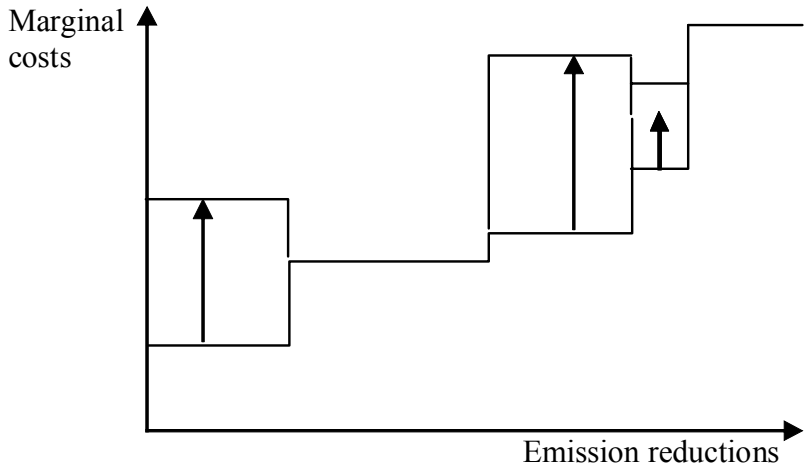
Discount factors could also be agreed upon at the demand side. However, this would require consent among buyers which may be difficult to achieve. Applying discount factors unilaterally by some buyers could however be a first step in that direction.

Possible market effects of discounting by project types

Discounting by project types will have the effect of modifying the marginal abatement cost curves, because some project types will become more expensive than before in relation to others. In Figure 4, a hypothetical marginal abatement cost curve consists of five project types, of which three undergo discounting to different degrees. For two of them, discounting leads to a shift in the position on the curve.

This effect may cause some projects to become non feasible at given CER prices. While this will affect additional projects (those that depend on the CER revenue to be financially feasible), it will not affect non-additional projects (those for which the CER revenue is not relevant for financial closure): these will get less revenue from the CDM, but will still be possible to implement. Thus, depending on the design of the option, and if careful attention is not paid on the demonstration of additionality, there may be a risk of penalizing additional projects and favouring non-additional ones.

Figure 4: Effect of discounting on marginal abatement costs



Example

In this example, the discount factor is derived considering additionality and sustainable development effects. The discount factors for additionality are derived from Schneider (2007) who grouped CDM projects in three categories.

Table 3: Discount factor for additionality

Additionality category	Description	Examples	Discount factor
A1	Projects without economic benefits other than CERs	HFC-23, N_2O, CH_4 destruction	5%
A2	Projects with economic benefits other than CERs and considerable CER impact	Recovery and utilization of CH_4	30%
A3	Projects with other economic benefits than CERs and small CER impact	Renewable energy, energy efficiency, fuel switch	50%

Source: Derived from Schneider (2007)

For sustainability effects it is assumed that discount factors are directly linked to the type and design of projects.

Table 4: Discount factors for sustainability effects

Sustainable development category	Description	Examples	Discount factor
S1	High SD impact	Gold Standard projects	0%
S2	Medium SD impact	Supply side energy efficiency, waste heat recovery, fuel switch, non-Gold Standard renewable projects	33%
S3	Low SD impact	Industry gas projects (HFC-23, N_2O)	67%

Source: Öko-Institut

The combined discount factors are derived by multiplying the discount factors for additionality and sustainability, as shown in Table 5.

The number of CERs issued is calculated by multiplying the verified emission reductions with the combined discount factor and deducting this value from the verified emission reductions. For instance, a project that involves flaring of landfill would fit into additionality category A1 and in sustainable development category S2.

The combined discount factor is therefore 37%, which means that 63% of verified emissions are issued. That means for every 1,000 tCO_2e of emission reductions verified, 630 CERs would be issued.

This example is only provided for illustrative purposes. Different criteria or discount factors could be used to differentiate among project types.

Table 5: Combined discount factors for additionality and sustainability

Combined category	Additionality	Sustainable development	Combined discount factor
A1 - S1	Projects without economic benefits other than CERs	High SD impact	5%
A1 - S2	Projects without economic benefits other than CERs	Medium SD impact	37%
A1 - S3	Projects without economic benefits other than CERs	Low SD impact	68%
A2 - S1	Projects with economic benefits other than CERs and considerable CER impact	High SD impact	30%
A2 - S2	Projects with economic benefits other than CERs and considerable CER impact	Medium SD impact	53%
A2 - S3	Projects with economic benefits other than CERs and considerable CER impact	Low SD impact	77%
A3 - S1	Projects with other economic benefits than CERs and small CER impact	High SD impact	50%
A3 - S2	Projects with other economic benefits than CERs and small CER impact	Medium SD impact	67%
A3 - S3	Projects with other economic benefits than CERs and small CER impact	Low SD impact	83%

Source: Öko-Institut

Detailed assessment

Environmental integrity

Additionality:
With regard to the methodology for assessing project additionality, discounting CERs according to project type will not change how project additionality is determined - compared to the current CDM.

The overall impact of this option on the number of non-additional projects entering the CDM depends on the way discounting is differentiated. If – like in the example – the parameter is directly linked to the degree of additionality of a certain project type, it will promote additional projects. However, within some project types some projects can well be additional whereas others are business-as-usual. Here project-type-

specific discounting does not improve additionality. It will reduce the share of additional projects if the situation depicted above and in Figure 4 exists. As previously discussed, although the discounting of CERs will decrease the quantity of CERs issued, it is unknown exactly how the CER price will react to this reduction in CER supply. Depending on how these two variables interact with one another this option could lead to an increase or a reduction in the number of non-additional projects that are illegitimately registered.

Furthermore, discount factors that are designed to achieve desirable political outcomes may have negative environmental consequences. For example, it has been suggested that a heavy discount factor should be applied for all HFC-23 destruction projects in order to improve the competitiveness of renewable energy and energy efficiency CDM projects (Chung, 2007). However, discounting project types in order to promote technologies with SD benefits may actually work against the environmental integrity of the CDM. Such a discounting approach could result in the most additional projects (i.e. HFC-23) being financially disadvantaged by a reduction in CER revenue due to their minimal SD benefits. Although the exact impact of such discounting remains uncertain, it is evident that the application of politically driven discount factors at the project type scale could compromise the environmental integrity of the mechanism if the discount factor is high enough to make the most additional projects no longer viable.

Alternatively, criteria may be used to reflect the share of non-additional projects entering the CDM pipeline (e.g. by using a discounting factor derived ex-post from information on registration, review and rejection of certain project types). A discount factor to reflect the share of non-additional projects would compensate for non-additional GHG reductions more accurately than any discounting attempts at the host country scale, and therefore this discounting option may improve the environmental integrity of the mechanism.

Given that the example applies a low discount factor to favour CDM projects with high levels of additionality and high SD benefits, it is likely that this particular option will result in a positive (+) impact on additionality compared to the current CDM. However, due to the uncertain impact of the option on the net CER revenues of CDM projects, it is expected that the discounting of CERs according to project types will generally range from a neutral (0) to a very positive (++) impact on additionality compared to the current CDM.

Measurability:
As for the discounting of CERs at the host country scale, the implementation of this option will not involve significant changes from how the CDM currently quantifies GHG reductions. It is thus expected that both generally and for the example this discounting option will have a neutral impact on the measurability of GHG reductions in comparison to the current CDM.

Timing of GHG reductions:
Project-type specific discounting will provide an immediate contribution to global reductions as long as the discount factors are not set at a level that is prohibitively high and leads to a complete stop of project submissions. The long-term contribution might be less than in the case of country-specific discounting, as project-specific discounting does not provide a consistent incentive to take up commitments. If project types that have a long lifetime beyond their CDM crediting period get a low discount factor, the contribution to global reduction increases in the long term. It is expected that the example will have a positive impact (++) on the timing of GHG reductions compared to the existing CDM.

Overall effects on environmental integrity:

- Discounting CERs at the project type scale will not affect how additionality is measured within the CDM. However, if the discount factor reflects the share of non-additional projects entering the CDM pipeline (based on information on registration, review and rejection of certain project types derived ex-post) additionality will be improved directly.
- Discounting CERs at the project type scale will lead to an immediate contribution to global reductions.

Contribution to sustainable development

As explained above, different policy and methodological rationales could be used to determine which projects should be favoured by the discounting. This would require agreement by countries on what is a contribution to SD, which might be elusive given the concerns of many developing countries not to lose sovereignty. The effect on SD benefits will depend on the design of the option and the level(s) of discounting applied.

General impacts:
If this option is designed to favour projects that are considered to have higher SD benefits (e.g. small-scale renewable projects) by giving them lower discount factors, the option will provide a market value to SD benefits. To further incentivize smaller scale projects with higher sustainable development benefits, the option can disfavour projects that have very large windfall profits (e.g. industrial N_2O or HFC-23 destruction projects) with little or no SD benefits by setting higher discount factors for them.

However, if the option is designed to improve the environmental integrity, the opposite can occur. Renewable projects will be disfavoured since these usually have more questionable additionality. Industrial N_2O or HFC-23 destruction projects will be favoured as the additionality of these projects is usually very clear.

Thus, the impact of the option on the SD contribution of the CDM can range from negative (-) to positive (+).

Impacts in the proposed example:
In the proposed example, the projects with high SD impact and high additionality have a lower discount factor than those that have low SD benefits and low additionality. For example, HFC-23 destruction projects, which have high additionality and low SD benefits, fall into the category A1-S3, with a discount factor of 68%. The discount factor is relatively high compared to others, but the project might be still possible to implement as it produces a large amount of CERs. Those projects that support a long-term transition of the energy system, such as supply-side energy efficiency, have medium additionality and SD impact. They fall into the category A2-S2, which would be discounted by 53%. Small renewable projects, with less additionality and high SD benefit, would rank A3-S1 or A3-S2, which would be discounted by 50% and 67% respectively. In this case, project developers might disfavour these types of project as the discount factor is high and they will not generate many CERs. If this option is adopted, small scale and community-based projects that generate few CERs might be difficult to implement.

Technology transfer:
Depending upon how discount factors are differentiated according to project types, this option may facilitate the transfer of innovative technologies, in particular if project types with more innovative technologies have lower discount factors. However, the exact impact of the measure will again depend on the criteria for discounting. Thus, the impact of this option on the transfer of innovative technologies is rated (-) to (+).

In the example, discount factors have been established based upon SD and additionality criteria. While the SD criterion includes an innovation component, the additionality criterion (as it is set in the example) may rather discourage innovative projects. Thus, we rate the example as 0 to (-) in terms of technology transfer. However, if an additionality criterion is built upon the concept of “common practice”, then a differentiation according to the additionality of projects could be a good encouragement for innovative projects involving technology transfer.

Overall effect on sustainable development:

- The effect will depend on the design of the option, being positive if the differentiation of the discount factor is based on SD criteria. It could be negative if the differentiation is based on additionality criteria based on financial additionality, but could be positive in terms of technology transfer if it is based on “common practice” additionality criteria.

Economic efficiency

Annex I compliance costs:
A strong differentiation between project types will reduce the cost effectiveness of the CDM, as some projects become more expensive than before, as has been shown in Figure 4**Fehler! Verweisquelle konnte nicht gefunden werden.**. If project types with high abatement costs are favoured over project types with lower abatement costs, compliance costs on the global level will increase.

In the specific example, where discount factors are based partly on the level of contribution of the project type to sustainable development, discounting will increase the marginal abatement costs of the cheapest options, such as industrial gas projects, most strongly, due to the fact that marginal abatement costs and contribution to sustainable development often have a negative correlation. However given that the cost increase of these options is not likely to push them to a level where they become non-viable, a full crowding out cannot be expected. Still, as less CERs will be available, a rise in compliance costs is to be expected.

Both in general and in the example, a negative effect (- - to -) on Annex I compliance costs (this is, an increase in costs) is expected.

Mobilization of unutilized cost-effective potential:
Discount factors could be set so that they favour cost-effective emission reduction options that are not being captured by the CDM so far, such as demand-side energy efficiency. In the specific example shown above, demand-side energy efficiency projects would have a medium to high sustainable development impact, and a medium additionality, as they would have economic benefits other than from CER sales, but the CDM is expected to significantly contribute to their realization. Accordingly, CERs from these projects would be discounted less than other project types, but still significantly (between 30 and 53% discount factor). If CER prices do not rise sufficiently to provide the needed financial incentive, such level of discounting could discourage investments in this sector.

The impact of this option on the mobilization of cost-effective mitigation potential will thus depend on its design, and may vary between negative (-) and positive (+).

Technology push for more cost-effective long-term reductions:
As in the previous option, the higher CER prices resulting from discounting could incentivize increased domestic mitigation action in Annex I countries, including a technology-push that makes long-term emission reductions more cost-effective. The size of the incentive will not only depend on the discount level, but also on many other factors influencing emission reduction supply and demand and technology development. Thus, it is currently not possible to estimate whether the size of this effect could be significant, and we rate it as 0 to (+).

Overall effects on economic efficiency:

- Due to the increased costs of certain project types and to the reduced supply of CERs to the market, compliance costs for Annex I countries will rise.
- The impact of this option on the mobilization of cost-effective mitigation potential will depend on its design.
- Rising CER prices could incentivize increased mitigation and technology development in Annex I countries, resulting in more cost-effective long-term emission reduction. However, the size of such an incentive cannot be determined, as it depends on many other factors.

Technical feasibility

Data availability:
If discount factors by project types are determined on a political level (such as in the example), this reform option is relatively simple to handle in terms of data requirements, as regulators have only to check which project type the CDM projects trying to get registered belong to, in order to apply the relevant discount factor. In this case, implementation mainly requires political decisions on:

- what criteria should be used to categorize CDM projects for the discounting,
- which project types belong to which category, and
- what discount factors are to be applied for each category.

If discount factors are determined based on technical criteria, and if an assessment of project types is needed to derive discount factors, data requirements can easily become more cumbersome. This approach can also be expected to cause significant transaction costs both on the political level (agreeing on indicators e.g. for a project types' sustainability benefits; approving the results of the assessment) and on a technical level (conducting the assessment). Thus, the impact on data requirements is rated (-) to 0 as compared to the current CDM.

Administration:
The frequency of updating the discount factors influences the transaction costs related to this approach. If only updated at the beginning of each commitment period, the transaction costs can be regarded as very low; especially if the application of discount factors is done centrally at the UNFCCC Secretariat. Thus, the impact on administration needs is rated 0 to (--) as compared to the current CDM.

Methodologies:
On methodological feasibility, the option is generally accurate in determining the net emission reductions as the discounted amount of CERs clearly represents the net emission reductions. No changes in existing CDM methodologies are required. In the example, the proposed procedures for project type classification and discount factor setting are simple, transparent and readily applicable to any project types. In general, however, this option may lose simplicity, transparency and wide applicability depending on how the discount factors are determined. As described above, the discount rate setting becomes very complex if a more technical assessment of project types is to be conducted. Thus, we rate the impact on methodological feasibility as 0 to (--).

Incorporation into UNFCCC accounting:
As for the option related to discounting according to countries, it would probably be sufficient to modify the CDM registry, in which project-specific discounting factors could be included. This modification could be implemented by the UNFCCC secretariat. Due to the small modifications needed, we rate this option as neutral (0).

Overall effects on technical feasibility:

- Data acquisition and methodology probably pose no problems if discounting factors are derived on a rather political basis as in the example. However, data availability and methodology may be more difficult when determining the discounting factors on more technical grounds.
- Administration efforts depend on the number of updates required. If updated once in a commitment period and handled by the UNFCCC Secretariat, administration is fairly easy.
- Incorporation into UNFCCC accounting should not pose major barriers, since it would suffice to modify the CDM registry.

Incentives and distributional effects

Incentive for developing countries to accept the option:
It might be more difficult to find groups of developing countries that support the option of discounting CERs by project types than groups that support the option of discounting by host countries. Only if the option is targeted towards very specific project types (e.g. reduction of industrial gases), then countries hosting mainly other types of projects may see a benefit from it. However, as in the case of discounting by host countries, if it can be demonstrated that the costs of discounting are mainly born by the credit buyers, then opposition might be lessened. Thus, the overall incentive for developing countries to accept the option can range from (-) to (+).

Incentive for developing countries to take up a long-term low emissions path:
Discounting according to project characteristics can provide an incentive for advanced developing countries to embark on commitments if the criteria work against projects in industrial sectors (industrial gases and heavy industry) and benefit projects that are more likely to be embarked on at lower levels of development. In case the criteria lead to stronger discounts for large projects, the same result will be achieved. As additionality problems are unlikely to be linked to the degree of development, additionality-related discounting does not contribute to this aim. On the other hand, if many project types face substantial discounting, all CDM host countries may have an incentive to shift to a system (sectoral or national no-lose or binding targets) where all their reductions are recognized in the carbon market. The overall effect should be positive (+) and remains so in the example.

Neutralizing domestic CDM lobbies:
Lobby neutralization can be possible, as lobbies are likely to be organized along project types and a specific lobby can be singled out. For example, the industrial gas lobby can be directly attacked and lobbies supporting other project types will happily join.

Redistribution between project types and countries:
Redistribution among project types will be massive, whereas redistribution among countries depends on the difference of attractiveness of project types between

countries. The overall effect can range from (–) to (+) depending on the link of project type availability and host country development level.

Transparency of redistributive impacts:
The opacity is high if the allocation of discount factors is made only after a detailed assessment of each project. If the definition of parameters is sufficiently clear to allow unambiguous ex-ante determination of the discount factor, the impacts would be clearly visible. Transparency thus can range from (--) to (++). In the example, it is high at (+).

Overall effects on incentives and distribution of projects:

- If very specific project types, such as industrial gases, are targeted, host countries with mainly other types of projects may support this option. If it can be shown that the additional costs are born by CER buyers, opposition can be reduced.
- Depending on the criteria for project type differentiation and the level of discounting, the option could create an economic incentive for developing countries to take up emission reduction commitments.
- The option can neutralize project type-specific CDM lobbies.
- The option promotes the redistribution of CDM projects among project types, and an indirect redistribution among host countries. Transparency of the redistribution depends on how the discount factors are determined.

Negotiability

Consistency with fairness criteria:
Fairness of the proposed discount factors is difficult to judge if many different parameters are combined. While it seems promising in principle to achieve several policy objectives through differentiated discount factors, it could be very challenging to agree upon a set of different discount factors, in particular at UNFCCC level. In addition, it is the prerogative of the host countries to determine which projects contribute to sustainable development and have different priorities and preferences in this regard. 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. Overall fairness is thus lower than in the context of the current CDM, ranging from (- -) to (-). The example can be evaluated as (-), as the differentiation of discount factors is not based on specific fairness criteria. For example, energy efficiency should probably have been put in a high SD category. The differentiation of discount factors according to SD impact is huge and should have been lower.

Use of symbolic numbers possible:
Given the high number of possible combinations, the use of symbolic numbers is only partially possible. Generally, project-specific discounting should be valued as

neutral compared with the current CDM. The example uses highly symbolic numbers (multiples of a third) and thus can be valued as positive.

Low complexity, governance challenges and preparation time:
Even without political considerations, it is methodologically challenging to arrive at a set of differentiated discount factors for multiple projects based on multiple criteria. As a possible simplification, only two or three different discount factors could be considered. For example, it could be politically agreed to favour project types that were emphasized as priority in previous COP/MOP decisions (renewable energy and improvement of energy efficiency). Methodological analysis could support the derivation of the discount factors and the categorization of project types. Governance requirements regarding classification of projects are high. Overall, the instrument scores negative to positive if the differentiation is focused on just one criterion and is simple.

Overall effects on negotiability:

Given the high value that host countries give to sovereignty regarding determination of SD and the high complexity of negotiations, overall evaluation is negative (-).

Summary of assessment

Reform option / Evaluation criteria	**Discounting by project types**	
	In general	**In the example**
Environmental integrity		
Additionality	0 to ++	+
Measurability	0	0
Timing of GHG reductions	+ to ++	++
Contribution to sustainable development		
Favours projects with generally high SD benefits	- to +	- to +
Favours small and community-based projects	- to +	- - to -
Disfavours projects with large profits and low SD benefits	- to +	- to 0
Promotes technology transfer	- to +	- to 0
Economic efficiency		
Annex I compliance costs	- - to -	- -
Mobilization of unutilized cost-effective potential	- to +	-
Technology push for more cost-effective long-term reductions	0 to +	0 to +
Technical feasibility		
Data availability	- to 0	-
Administration	- - to 0	-
Methodologies	- - to 0	-
Incorporation into UNFCCC accounting	0	0
Incentives and distributional effects		
Incentive for developing countries to accept the option		

Reform option / Evaluation criteria	Discounting by project types	
	In general	In the example
Incentive for developing countries to take up a long-term low emissions path	+	+
Neutralizing CDM lobbies	+	+
Redistribution between project types or countries	- to +	- to +
Transparency of redistributive impacts	- - to ++	+
Negotiability		
Consistency with fairness criteria	- - to -	-
Use of symbolic numbers possible	0 to +	+
Low complexity, governance challenges and preparation time	- - to +	+

4.2 Ambitious baselines

General description

What it is about

The objective of this approach is to introduce ambitious baselines for certain countries or certain project types. Instead of the business-as-usual (BAU) baseline[10], a more conservative or *ambitious* baseline is used for the calculation of emission reductions. As a result, the credited emission reductions are less, so that the CDM project contributes to net global emission reductions.

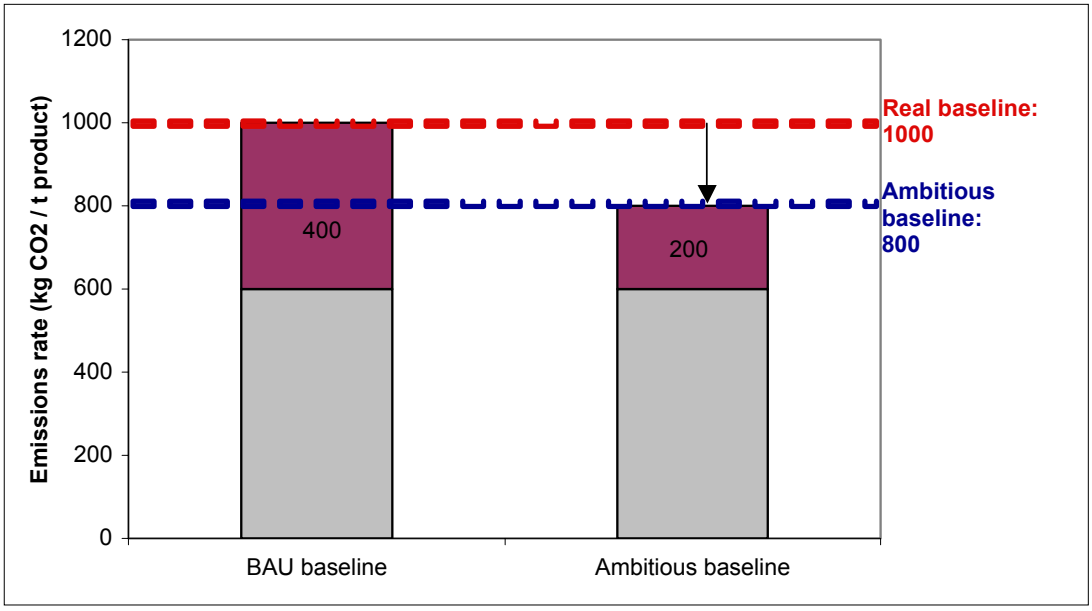
In Figure 5 we present an example: For an energy efficiency project, we have that the real (BAU) baseline is 1 tCO_2e emissions per unit of product. With the CDM project, now only 0.6 tCO_2e are emitted per unit of product, as a result of the gain in efficiency. In this case, 0.4 tCO_2e reductions would be credited per unit of product. An ambitious baseline could be set, so that the baseline considers only 80% of the BAU emissions, this is, 0.8 tCO_2e per unit of product. When using this baseline, only 0.2 tCO_2e reductions would be credited per unit of product.

While there are similarities between the setting of ambitious baselines and discounting, the main difference between the two options is that discounting reduces the amount of emission reductions in their entirety, whereas setting ambitious baselines only affects the baseline emissions (i.e. has no impact on the project emissions or leakage). Another difference is that, although the choice of the discount factor(s) is arbitrary and most likely depends on policy preferences, the level of ambitious baselines is likely to be based on more technical criteria as policymakers often do not understand the intricacies of baseline setting (Schneider 2009). As has frequently been shown by the COP decisions on CDM, policymakers wanted to make baseline determination and additionality assessment more lenient but were unable to

[10] BAU baselines in this report refer to baselines that are selected according to approved methodologies under the current CDM.

come up with a concrete proposal. Therefore, the technical expertise of the Methodology Panel and the CDM Executive Board prevailed that wanted to keep the methodologies strict.

Figure 5: Effect of ambitious baselines on credited CERs



Motivation for it

The motivation for introducing ambitious baselines is similar as for introducing discounting. On the first place, an ambitious baseline automatically provides for an own contribution to mitigation by the host countries, implying net mitigation beyond offsetting. Further, the setting of ambitious baselines at the host country scale could be differentiated between host countries. Host countries with a higher capability or responsibility to take action could have more ambitious baselines than less advanced countries or countries with lower GHG emissions. Ambitious baselines could also be established so as to encourage a more equitable distribution of CDM projects by providing a financial incentive to exploit mitigation opportunities in host countries with lower levels of CDM participation. Moreover, the introduction of ambitious benchmarks as baseline emissions could improve the environmental integrity of the mechanism by assessing the additionality of CDM projects more objectively.

Ambitious baselines have been discussed in the AWG-KP negotiations under the concept of “standardised or multi-project baselines” for the CDM, which was put forward as a means to reduce complexity and subjectivity in baseline and additionality determination. Both the EU and Japan have mentioned that these standardised baselines or benchmarks could be set with a high level of stringency or ambition, in order to improve the environmental integrity of the mechanism, to increase its contribution to global mitigation efforts and to reflect the principle of common but differentiated responsibilities and respective capabilities (UNFCCC 2008a, 2009).

Implementation

Similarly to discounting, ambitious baselines can in principle be applied to all CDM projects without distinction. This could be made, as shown in the example on Figure 5, by defining a conservativeness factor (in that case, 80%), which is multiplied to the BAU baseline. This conservativeness factor can be defined technically – for example, as a safety measure against possible sources of error when calculating the baseline. But also arbitrary – or symbolic – figures could be used.

There are several other ways to implement ambitious baselines, and they can also be differentiated according to host countries or to project types. The following sections will detail how such differentiated ambitious baselines could look like.

4.2.1 Ambitious baselines by host countries

Detailed description

There are several ways to introduce ambitious baselines differentiated by host countries. In implementing this option two important choices have to be made: (1) the way how countries are differentiated has to be agreed and (2) the procedures or criteria to establish the ambitious baselines have to be developed.

Regarding the differentiation by countries, similar considerations as for the option of discounting above apply. One could only differentiate between two country groups (LDCs and other developing countries), between several groups of countries, or even between all countries. Ambitious baselines could then apply to some countries or the ambition of the baseline could depend on criteria, such as, GDP/cap, GHG/cap, etc.

To establish ambitious baselines below BAU, various approaches could be used. It should be noted that this section focuses on options for a country-wide adjustment of BAU baselines. Therefore, as opposed to the section “ambitious baselines by project types”, options based on project-type-specific criteria are not discussed here.

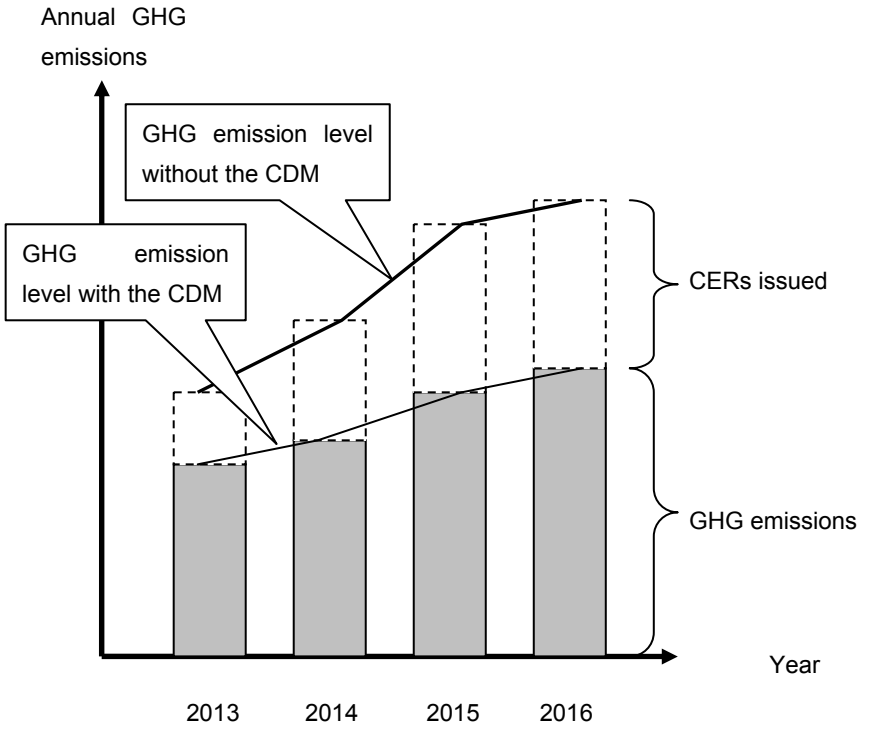
One option for such a country-wide adjustment could be to mandate consideration of “new E- policies” in the baseline setting, which is exempted under the current CDM.[11] New E- policies are defined as “national and/or sectoral policies or regulations that give comparative advantages to less emissions-intensive technologies over more emissions-intensive technologies, and have been implemented after the adoption of the CDM M&P by the COP (decision 17/CP.7, 11 November 2001). However, this option is linked to the long-debated perverse incentive issue.[12]

[11] See EB22 Annex 3 “Clarifications of the consideration of national and/or sectoral policies and circumstances in baseline scenarios (version 02)”.

[12] Namely, requiring consideration of new E- policies in the baseline might provide non-Annex I countries with a wrong incentive not to introduce mitigation policies. It is because the introduction of such policies would reduce the baseline emissions of CDM projects in the host country, making the country less attractive for CDM projects.

Another option would be to set the ambitious baselines by reducing the BAU baseline emissions based on a “CDM penetration rate”. The CDM penetration rate is an indicator to assess how commonly the CDM is used as a mitigation instrument in the host country. The CDM penetration rate shall be determined, based on the most recent data available, for each CDM project at the time of submission of the project for validation. The concept is summarized in Figure 6.

Figure 6: Concept of the CDM penetration rate



$$\text{CDM penetration rate} = \frac{\text{Annual CERs issued in the country}}{\text{Annual CERs issued in the country} + \text{Annual GHG emissions in the country}}$$

$$= \frac{\square}{\square + \blacksquare}$$

As the CDM penetration rate increases, the CDM becomes a more common mitigation instrument in the country, thus showing comparatively weak additionality of CDM projects. If the CDM penetration rate in the host country exceeds a certain threshold, the baseline emissions of any further CDM projects will be subject to a downward adjustment of the BAU baseline. In this way, the option would set

ambitious baselines for CDM projects with comparably weak additionality, while CDM projects in an immature CDM market can receive full benefits from the CDM.

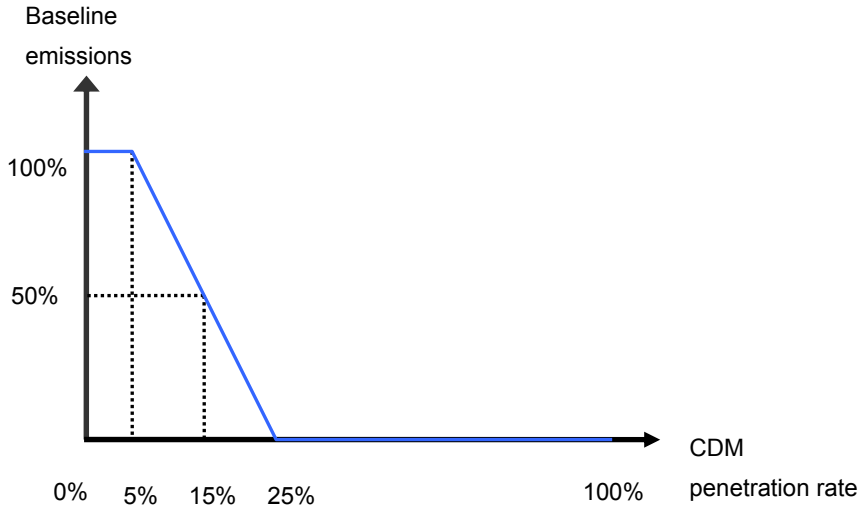
Example

As the new E- policy option is likely to face difficulties with the perverse incentive issue, we will focus on the CDM penetration rate option as an example.

First of all, countries subject to the ambitious baseline option are selected based on the country groups described in Table 1 (e.g. “non-Annex I developed countries” and “advanced developing countries”). For the selected countries, the CDM penetration rate is applied to set the level of ambitious baselines. Figure 7 provides a schematic concept of the application of the CDM penetration rate with exemplary figures. There will be no adjustment of the BAU baseline emissions up to the CDM penetration rate of 5%. Beyond this point, the BAU baseline emissions of any CDM project types will gradually be reduced to zero at the CDM penetration rate of 25%. No baseline emissions can be assumed beyond the threshold.

Suppose that a country in the selected country group emitted 6.7 $MtCO_2e$ in 2013 and had 1,180,000 CERs issued (equivalent to 1.18 $MtCO_2e$) in the same year, the CDM penetration rate is calculated as 15%. According to the thresholds for the BAU baseline adjustment, and assuming a linear decrease in the BAU baseline emissions between these thresholds, the CDM penetration rate of 15% corresponds to a 50% downward adjustment.

Figure 7: CDM penetration rate for ambitious baseline setting



The thresholds for the BAU baseline adjustment (5% and 25% given as an example in Figure 7) will have to be agreed upon at the COP/MOP level. They can be set

either uniformly or differently for the selected country groups. For the sake of simplicity, the uniform threshold option was chosen in this example.

This approach introduces a less stringent BAU baseline adjustment for countries that have just entered the CDM market, and a more stringent adjustment for countries that have already enjoyed a great amount of CDM benefits. In many cases, the former corresponds to countries that are less developed and are not able to offer an attractive investment climate, while the latter corresponds to countries that generally attract a greater amount of investment.

Detailed assessment

Environmental integrity

Additionality:
With regard to the methodology for assessing project additionality, the setting of ambitious baselines by host country will not change how project additionality is determined - compared to the current CDM.

If baselines are established with the current approach and adjusted downwards proportionally to features of the host country, such as the 'CDM penetration rate', then this option may improve the additionality of CDM projects in certain circumstances. For example, the setting of a CDM penetration rate may direct financial support to countries that have low levels of participation in the mechanism, such as LDCs. As a consequence, this may lead to additional CDM projects if LDCs are enabled to overcome the barriers (i.e. lack of capital) that prevent the installation of GHG abatement technology. However, it is also envisaged that non-additional projects will continue to be registered if this option is implemented. For example, the downward adjustment of the baseline in a certain country will only occur once the majority of its low-cost and non-additional projects have already been submitted. Therefore, the setting of ambitious baselines by host countries will not necessarily reduce the number of non-additional CDM projects that are registered – especially during the early stages of a host country's participation.

The exact impact of setting ambitious baselines by host countries on CDM project additionality is uncertain. Similar to the discounting of CERs, this option will reduce the supply of CERs by setting the ambitious baseline below the BAU baseline. This reduced supply of CERs may lead to an increase in the CER price, however the exact relationship between these two variables is uncertain, as other factors – such as CER demand – will also influence the CER price. Therefore, CDM projects may become more or less additional as a consequence of this option. It is important to note that ambitious baselines do not necessarily reduce the number of non-additional projects entering the pipeline. They just result in fewer CERs being credited, and only in the extreme, when the higher threshold is reached, no new projects can be registered. This may result in a perverse incentive: non-additional projects, usually submitted first, will be registered without the ambitious baseline. Later projects,

usually the more expensive ones, will be subject to increasingly ambitious baselines, and the CDM revenue may then be not enough to make them viable.

The setting of the threshold for the downward adjustment of the BAU baseline will also impact upon the additionality of CDM projects. For instance, in the example threshold levels are set between 5% to 25% of the CDM penetration rate. This threshold level is uniformly applied to all host countries.
Given that the example sets relatively low thresholds for the downward adjustment of the BAU baseline, it is likely that this particular option will have a positive (+) impact on additionality compared to the current CDM.

Due to the fact that the thresholds for the downward adjustment of the BAU baseline may be set higher than in the example, it is expected that the setting of ambitious baselines by host countries will generally range from having a negative (-) to a positive (+) impact on the issue of additionality compared to the current CDM.

Measurability:
The setting of ambitious baselines at the host country scale will not involve significant changes from how the CDM currently quantifies GHG reductions. For example, differentiating countries according to their 'CDM participation rate' will still require GHG reductions to be calculated using the same baseline and monitoring methodologies that are employed by the existing CDM. However, the new ambitious baseline will be set by multiplying the original (BAU) baseline with the adjustment factor resulting from the CDM penetration rate in the host country. As the CDM penetration rate needs to be calculated from current data on GHG emissions and CERs issued in the country, a constant update of these data is required. Thus, measuring the creditable reductions will become more cumbersome.

It is expected that the setting of ambitious baselines differentiated by host countries according to CDM penetration rates will have a slightly negative impact on the measurability of GHG reductions, in comparison to the current CDM. If other methods are defined to set the ambitious baselines, the impact could be between neutral to slightly negative.

Timing of GHG reductions:
The setting of an ambitious baseline, which is progressively adjusted downwards to reflect the changing status of a host country (i.e. through the use of a CDM penetration rate), will result in GHG reductions (beyond offsetting) increasing over time. For example, when the 'CDM penetration rate' of a host country exceeds a certain threshold – the issuing of subsequent CERs will be more heavily discounted as the baseline is adjusted downwards – therefore increasing the proportion of net GHG reductions. If the CDM penetration rate is used to differentiate host countries, the timing of GHG reductions will depend on how the threshold is set. For example, a high threshold for the CDM penetration rate will delay the timing of GHG reductions compared to a lower threshold. Given this variability, the setting of ambitious

baselines according to host countries will most likely result in GHG reductions occurring over a longer time period than the option to discount CERs.

Given that the example sets relatively low thresholds for the downward adjustment of the BAU baseline, it is likely that this particular option will have a positive (+) impact on the timing of GHG reductions compared to the existing CDM.

Due to the fact that the thresholds for the downward adjustment of the BAU baseline may be set higher than in the example, it is expected that the setting of ambitious baselines by host countries will generally range from having a negative (-) to a positive (+) impact on the timing of GHG reductions compared to the current CDM.

Overall effects on environmental integrity:

- Ambitious baselines at the host country scale will not prevent the non-additional projects from entering the CDM pipeline, and it remains uncertain whether the option will increase or reduce the share of non-additional projects that are registered by the EB.
- GHG reductions will increase over time if ambitious baselines are set according to a host country's CDM penetration rate. The exact timing of GHG reduction will depend on the threshold set for the downward adjustment of the baseline.

Contribution to sustainable development

As has been explained before, evaluating the SD benefits of a CDM reform option with differentiation by host countries is complicated, as different countries have different criteria and approaches to assess this goal.

Projects with generally high SD benefits:
Similar to the discounting CERs option, this option will also unnecessarily punish projects with high SD benefits in countries with ambitious baselines. A possibility to avoid such negative impact is to agree on a positive list of project types that will be excluded from the application of this option. However, negotiating such a positive list may prove impossible, as different parties would push for the project types that will most likely take place in their countries.

In the longer term, there will be more CDM projects in countries with less ambitious baselines, which might contribute to an increase in SD benefits in these countries. Whether the option has overall positive or negative effect on SD cannot be known.

Small and community-based projects:
Regarding the project size, in countries with more ambitious baselines, those projects that yield little profit, i.e. small-scale and community-based projects, might be no more feasible to implement.

Projects with large profits and low SD benefits:
In countries affected with more ambitious baselines, project developers will tend to favour projects with large profits including industrial N_2O and HFC-23 destruction projects. However, as has been explained in the evaluation of the discounting option, the projects with large profits do not always correspond to projects with low SD benefits. However, if project developers prefer large-scale projects due to the ambitious baseline, simple projects such as N_2O and HFC-23 destruction are more likely to increase.

Technology transfer:
Although the setting of ambitious baselines at the host country scale is likely to increase levels of LDC participation in the CDM, differentiating countries according to their 'CDM penetration rate' will not necessarily result in the transfer of innovative technology. At this scale, the setting of ambitious baselines can only affect where CDM projects are initiated but will still not be able to directly influence which mitigation option is selected to achieve the desired GHG reduction. However, in contrast to the discounting of CERs by host countries, it may be argued that the setting of an ambitious baseline by host countries will provide a dynamic incentive to reduce GHG emissions via the introduction of more innovative technology (Schneider, 2008). For instance, the use of low thresholds in the example should disadvantage host countries with a high CDM penetration rate in favour of LDCs with low levels of CDM participation. Although the example will not influence what technologies are installed it can be expected that transfer of innovative technology will occur to some extent due to the limited existence of innovative technologies in LDCs.

Given that the example sets relatively low thresholds for the downward adjustment of the BAU baseline, it is likely that this particular option will have a positive (++) impact on the technology transfer compared to the project based CDM.

Due to the fact that the thresholds for the downward adjustment of the BAU baseline may be set higher than in the example, it is expected that the setting of ambitious baselines by host countries will generally range from having a neutral (0) to a positive (++) impact on the timing of GHG reductions compared to the project based CDM.

Overall effect on sustainable development:
- This option will promote more CDM investment in less developed countries, and may therefore indirectly contribute to further SD benefits in them. However, it will punish CDM projects in advanced countries, especially those with high abatement costs and possibly high SD benefits.
- It will not discourage projects with large profits and low SD benefits.
- The option may provide a dynamic incentive to transfer innovative technologies to host countries participating in the CDM.

Economic efficiency

Annex I compliance costs:
Introducing ambitious baselines by host countries will in general reduce the supply of credits to the carbon market, thereby increasing the costs of compliance for Annex I countries with their reduction targets. This cost increase will be in direct relationship with the stringency of the new baselines; i.e., for the specific example described in the text, with the CDM penetration rate in each country and with the thresholds chosen for baseline adjustment. As in the case of discounting, the cost of the overall emission reductions achieved (counting also those that are not credited) will depend on the shape of the abatement cost curves in Annex I and non-Annex I countries, and could be higher or lower than the cost when similar emission reductions are achieved through stricter Annex I reduction targets. Thus, the effect on compliance costs is rated as negative (- to --), as costs will tend to rise.

Mobilization of unutilized cost-effective potential:
Ambitious baselines differentiated by host countries do not have a clear effect on the mobilization of unutilized cost-effective reduction potential. In the example, where ambitious baselines are set on the basis of CDM penetration rates, and assuming that cheap abatement options are utilized first (provided there are baseline and monitoring methodologies available), then the cheaper options in the countries introducing ambitious baselines would have been used already. Given the differences in the attractiveness of host countries, however, cheap potential in less developed countries (not affected by the ambitious baselines) would become more competitive. Again, cost-effectiveness of mitigation projects in less developed countries will be affected by the costs of identifying these projects and overcoming non-market barriers for their implementation. In conclusion, the effect is rated as non determined (n.d.).

Technology push for more cost-effective long-term reductions:
The higher CER prices resulting from the reduced supply could induce increased domestic mitigation in Annex I countries, including a technology-push that makes long-term emission reductions more cost-effective. The size of the incentive will not only depend on the level of ambition of the new baselines, but also on many other factors influencing emission reduction supply and demand and technology development, so that it is currently not possible to estimate whether the size of these effects could be significant, so we rate them as 0 to (+).

Overall effects on economic efficiency:
- Due to the reduced supply of CERs to the market, compliance costs for Annex I countries will rise.
- While unutilized cost-effective mitigation potential can be better mobilized in host countries not affected by ambitious baselines, transaction costs of implementing these projects could be significant.
- Rising CER prices could incentivize increased mitigation and technology development in Annex I countries, resulting in more cost-effective long-term

emission reduction. However, the size of such an incentive cannot be determined.

Technical feasibility

Data availability:
Implementing this option will require two additional sets of data: data for the selection/definition of country groups and data for defining the stringency level of the ambitious baselines. As discussed in the evaluation of the option "Discounting by countries", some data requirements for the country group selection/definition such as GDP/cap and HDI can be considered to be readily available, while data sources for GHG emissions will have to be agreed upon.

Data requirements for defining the stringency level of the ambitious baselines strongly depend on the actual approach chosen. For example, if one applies standard "stringency factors" that are identical for certain country groups (e.g. related to their development status/historical emissions/etc), no or only very minor additional data will be required for implementing this approach[13]. In comparison, if one implements the above named example of "CDM penetration rates", this option requires the availability of the following data for all host countries:

1) CERs issued from all registered CDM projects in a host country during the past year, and
2) the host country's GHG emissions in the same timeframe, verified by an independent body to the UNFCCC.

While 1) can be calculated easily on the basis of the UNFCCC's database, consistent data on 2) may not exist for all host countries, especially not the least developed ones. Given the fact that the baseline stringency depends on the CDM penetration rate, it must be secured that annual GHG emissions data of each host country is determined properly and with a consistent methodology. This means that host countries need to deliver the respective data, which likely need to be verified and updated with the decided frequency. Thus, while in general terms, data requirements may not be too cumbersome (- to --), in the example, they may pose significant problems for implementing this option (--).

Administration:
In terms of administration, the major part of the work can be done by the UNFCCC Secretariat. If one decides to calculate the CDM penetration rate individually for each new CDM project activity at each submission for validation, this causes some transaction costs at the UNFCCC, but no major efforts if data is readily available. However, this approach would also imply a certain degree of planning uncertainty for project developers and/or investors, as the effective discount rate will be determined quite late in the process. Thus, we rate the effect on administration as (-) to (--).

[13] It may be noted that such an approach would be very similar to a discounting approach as discussed in section 4.1.

Methodologies:
As regards methodological feasibility, the option in general leads to accurate determination of net emission reductions because the decreased amount of the BAU baseline emissions clearly corresponds to the net emission reductions. In the example of the CDM penetration rate option, the option may well be complex as the estimation of the GHG emissions in a host country would require a harmonized methodology applicable to the relevant countries. Even with such a harmonized methodology, possible biases in the underlying data or assumptions would likely lead to a lack of transparency. Furthermore, the applicability of this option is limited to countries where the GHG emissions can be determined with the necessary level of confidence. This may make the applicability of the option rather limited. In general, the option "ambitious baselines by host countries" involves a wide range of implementation approaches, and hence its general assessment is difficult to perform. However, it is most likely that the option would lead to an increased methodological complexity, and therefore we rate this impact as (-) to (--).

Incorporation into UNFCCC accounting:
Ambitious baselines would directly be applied to each project. The accounting under UNFCCC itself would not have to be modified since ambitious baselines directly influence verified emission reductions. We therefore rate the impact of this option on UNFCCC accounting as neutral (0).

Overall effects on technical feasibility:

- Data availability does not constitute an issue for the definition of country groups. However, data acquisition may be difficult for the determination of the level of stringency (as for the determination of GHG emissions for non-Annex I countries for the derivation of the penetration rate in the example).
- Administration can be handled by the UNFCCC secretariat and therefore does not pose major barriers. Frequent updating of baselines may be more cumbersome and entail uncertainty for investors.
- The methodological complexity depends on the actual approach chosen. In the example, the determination of GHG emissions of each country may be methodologically challenging.
- Accounting under UNFCCC would not have to be modified since ambitious baselines directly influence verified emission reductions.

<u>Incentives and distributional effects</u>

Incentive for developing countries to accept the option:
As in the case of discounting by host countries, the groups of countries not affected by the ambitious baselines (e.g. LDCs and ODCs in the example) would be expected to support this option, as they would gain a competitive advantage from its implementation. Again, if it can be demonstrated that the extra costs due to the reduced CER issuance are mainly covered by the Annex I CER buyers, opposition by CDM host countries may be reduced. Thus, the overall incentive for developing countries to accept the option can range from (-) to (+).

Incentive for developing countries to take up a long-term low emissions path:
As the level of ambition of the baseline depends on the share of CDM projects in total mitigation potential (CDM penetration rate), it can well happen that a least developed country that has developed an excellent CDM strategy suffers from a stricter baseline than an advanced country that has not mobilized the CDM. So the ambitious baseline can lead to perverse redistributive effects and will not contribute to the taking up of commitments by advanced countries. The overall incentive is thus skewed and evaluated as negative (-).

Neutralizing domestic CDM lobbies:
There will be an automatic neutralization of CDM lobbies as the baseline gets more ambitious the stronger the CDM lobby has become in a country. The proposal can thus be evaluated as very positive (++).

Redistribution between project types and countries:
As no project-type specific element exists for setting the baselines, there will not be any redistribution according to project types. However, redistribution between countries will take place but not be known ex ante. Therefore the evaluation is slightly positive (+).

Transparency of redistributive impacts:
The direct visibility of redistributive impacts is relatively high once the mitigation potential has been determined. However, each project developer does not know the exact baseline level until his place in the "project queue" has been determined. Therefore, the opacity in each specific case is relatively high and the overall evaluation is negative (-).

Overall effects on incentives and distribution of projects:

- CDM host countries benefiting from less (or no) ambitious baselines may support this option. If it can be shown that the additional costs are born by CER buyers, opposition can be reduced.
- The option does not create a clear incentive for advanced developing countries to take up emission reduction commitments.
- The option contributes to neutralize domestic CDM lobbies.
- The option promotes a redistribution of CDM projects between countries, but this redistribution is not visible ex ante.

<u>Negotiability</u>

Consistency with fairness criteria:
The fairness value of the ambitious baseline can be disputed. On the one hand, the procedure for determining the level of ambition of the baseline is unbiased, but the definition of mitigation potential requires expert judgement. Moreover, the outcome

could lead to a situation where an advanced developing country gets a less stringent baseline than a least developed country with an active CDM strategy. Thus the evaluation is negative (-).

Use of symbolic numbers possible:
The key parameters of the proposal can use symbolic numbers and thus the proposal is valued positively.

Low complexity, governance challenges and preparation time:
The governance challenges in collecting the emission data for countries that do not regularly publish their inventory and the allocation of a specific discount factor to each project make this proposal complex and heavy to administer. It needs a certain lead time before being implemented. The overall evaluation is negative (-).

Overall effects on negotiability:

Ambitious baselines face substantial barriers regarding negotiability and thus are evaluated as negative (-).

Summary of assessment

Reform option / Evaluation criteria	Ambitious baselines by host countries	
	In general	In the example
Environmental integrity		
Additionality	- to +	+
Measurability	- to 0	-
Timing of GHG reductions	- to +	+
Contribution to sustainable development		
Favours projects with generally high SD benefits	n.d.	n.d
Favours small and community-based projects	- to 0	- to 0
Disfavours projects with large profits and low SD benefits	- to 0	- to 0
Promotes technology transfer	0 to ++	++
Economic efficiency		
Annex I compliance costs	- - to -	-
Mobilization of unutilized cost-effective potential	n.d.	n.d.
Technology push for more cost-effective long-term reductions	0 to +	0 to +
Technical feasibility		
Data availability	- - to -	- -
Administration	- - to -	- - to -
Methodologies	- - to -	-
Incorporation into UNFCCC accounting	0	0
Incentives and distributional effects		
Incentives for developing countries to accept the option	- to +	- to +
Incentive for developing countries to take up a long-term low	-	-

Reform option / Evaluation criteria	Ambitious baselines by host countries	
	In general	In the example
emissions path		
Neutralizing CDM lobbies	++	++
Redistribution between project types or countries	+	+
Transparency of redistributive impacts	-	-
Negotiability	**-**	**-**
Consistency with fairness criteria	-	-
Use of symbolic numbers possible	+	+
Low complexity, governance challenges and preparation time	-	-

4.2.2 Ambitious baselines by project types

Detailed description

To establish ambitious baselines below BAU by project types, various approaches could be used. One option would be to introduce mandatory **conservativeness factors** for calculation of the baseline emissions in approved methodologies or tools. For example, the "Tool to calculate the emission factor for an electricity system" provides conservative default efficiency factors for power plants to be used in case the necessary data for efficiency determination is not available. E.g. the efficiency of a new subcritical coal power plant is specified as 39% whereas under normal operation conditions in a developing country, actual efficiency would not surpass 35%. Other methodologies apply conservativeness adjustment factors to default values or the overall baseline emissions to address a large uncertainty associated with the emission reductions (see, for example, the example shown in Figure 5). The use of such conservativeness factors for the baseline emission calculation would lead to a smaller amount of CERs issued, hence contributing to net global emission reductions.

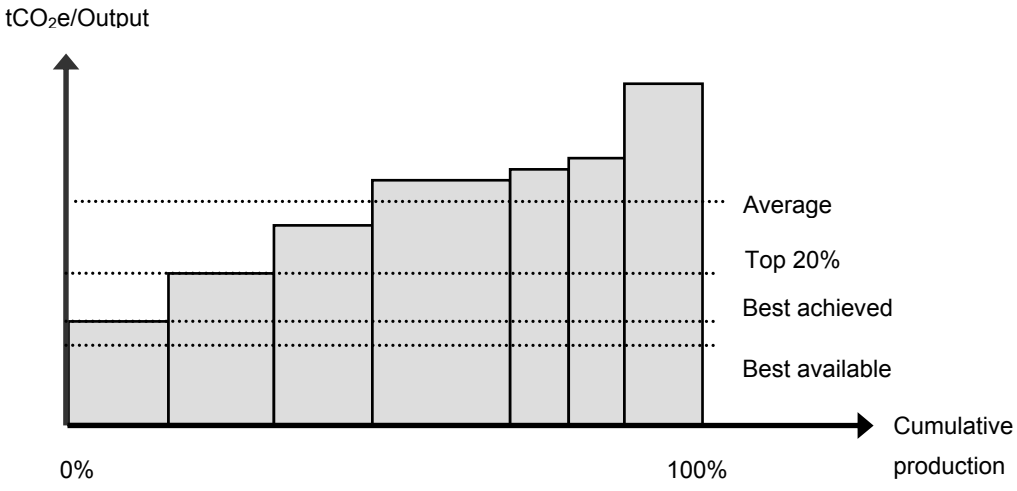
Such conservativeness factors can be determined based on a technical assessment. For some project types, however, it may be difficult to technically determine a reasonable baseline below BAU. For example, in case there are only two technologies available in a sector – a low-carbon technology and a BAU technology – it would be difficult to find a rationale for an ambitious baseline that lies between the emission levels of these two technologies. In such cases, the baseline would most likely have to be selected in an arbitrary manner (e.g. X% below the BAU technology) (Schneider 2009), or different baselines would have to be set for the different technologies. Maybe not all project types are ideal candidates for this option.

Another option would be **benchmarking**. Given the prominence of benchmarking in the international negotiations, it will be discussed in detail. Benchmarking is generally defined as the "comparison of performance against peers based on a set of criteria".

A comparison against peers implies that entities have a common output which makes them comparable to each other (e.g., electricity generation, cement production, etc.). Emission reductions achieved beyond the benchmark level would be credited as CERs, hence the rest of emission reductions would be contributing to net global emission reductions.

Benchmarking can be set at different levels of stringency. For example, Figure 8 describes four levels of stringency: (i) best available technology, (ii) best achieved, (iii) top 20%, and (iv) average. The average level represents the average performance of the selected peers. The top 20% level is a form of a top percentile approach, which selects the level of performance of a certain percentile of the cumulative production capacity. [14] The best achieved level corresponds to a demonstrated performance level at an existing plant. Lastly, the best available level assumes a plant with all best components and best practices which could nowadays be achieved. The higher the stringency level is, the more likely it is that a CDM project would lead to a contribution to net global emission reductions.

Figure 8: Benchmarking and stringency levels



However, the overall contribution to global reductions does not increase proportionally with stringency. As the number of projects actually able to claim CERs would fall, overall reductions would fall from a certain level of stringency. For example, if the best available technology level is used as benchmark, then no project would be able to beat the benchmark, and the credited reductions would be zero. The level of "lost emissions reductions" depends on the "real" baseline performance, i.e. the performance of a project which would be implemented without CDM revenue. For example, if in Figure 8 the real BAU performance is the average performance, the maximum contribution to global reductions would be achieved with a benchmark

[14] The top percentile approach can select any stringency level (e.g. 10%, 30%). If the stringency level is set as 50%, it is similar to the average level.

set at the level of the third best project. Then the first and the second best project would be mobilized, whereas the difference between the performance level of the average and the third best project would contribute to global reductions. In the case of the top 20% benchmark, only the first best project would be mobilized while the second best project would fail. The difference between the average performance and the 20% benchmark multiplied by the production level would be the first project's contribution to net global emission reductions, while the second project would not take place and thus the difference between the average performance and the 20% benchmark multiplied by the second project's production would be lost.

The benchmark stringency levels have to be agreed upon by COP/MOP or a technical committee. They can theoretically be set either uniformly or differently by project types or sectors[15]. Differentiation in the stringency level can be done, for example, based on "overall" SD impacts or additionality of mitigation measures in the sector. There are several sectors that obviously have low or high SD impacts in their mitigation measures (e.g. low SD: nitric acid, adipic acid, HCFC-22; high SD: energy efficiency in buildings, renewable energy for users). However, it should also be kept in mind that the overall SD impacts are more difficult to assess if a benchmark is set at an aggregate level. For example, if a single benchmark is established for a power sector in a host country (in tCO_2/MWh), the benchmark accommodates all different fuel types for power generation. Both fossil fuels and renewable energies bundled, it would be difficult to assess the overall SD impacts of the sector. On the other hand, such assessment becomes easier if benchmarks are established for each fuel type. However, the disaggregation of benchmarks would increase transaction costs of this option. The same argument applies to the assessment of overall additionality of mitigation measures in the sector. For example, the cement sector accommodates many different project types. Some of these have obviously weaker additionality than others (e.g. cement blending). As mitigation measures are bundled at the sector level, the overall additionality of the sector is difficult to assess. Therefore, differentiation of benchmark stringency levels by sectors would likely be very difficult to implement.

Further, temporal and geographical boundaries would need to be defined in order to select the peer group. The peer group could be selected as all plants in the sector, or just the plants constructed within a certain period (e.g. the five most recent years). In addition, the geographical boundary of plants included in the peer group could range from the host country, a region or the whole world, and would need to be agreed upon.

Furthermore, a benchmark could also be used to demonstrate additionality. Namely, any emission reductions achieved below the additionality benchmark can

[15] The reference to sectors in this section of the report should not be interpreted as a reference to sectoral approaches. Rather, we refer to economic sectors because these are the natural peer group for determining a benchmark: a benchmark for a project in a cement plant will be based on the performance of the cement sector in the country, region or world, for example.

automatically be granted CERs. Such an additionality benchmark can be set either at the same stringency level as the baseline benchmark, or at a more stringent level. The underlying benchmarking work would have to be verified by an independent body to the UNFCCC. Also, the benchmark would have to be updated at a certain time interval in order to reflect the changes in the technological and economic situations over time. Once the benchmark is set, it serves as the baseline for all CDM projects in the corresponding sector or project type.

In general, sectors appropriate for benchmarking produce goods or services identical in their nature and in their production processes. Also, ideal sectors are highly concentrated, with limited geographical factors affecting the level of GHG performance (e.g. grid emission factors), and already have a large amount of available data for benchmarking. If there are significant variations in these regards, multiple benchmarks have to be established at a more disaggregated level (e.g. at each production process of a plant). Therefore, benchmarking is likely to be a suitable instrument only for large homogeneous sectors. For other sectors for which benchmarking is not appropriate, alternative approaches (e.g. use of conservative values in the baseline emission calculation as described above) have to be considered.

Example

Benchmarking for the cement sector is taken as an example here, whose benchmarking indicator is expressed in tCO_2/t cement. It is assumed that cement plants currently operating in the world have GHG intensity from 0.6 to 1.0 t CO_2/t cement. The top 20% level is proposed as a stringency level because it has been well accepted as a conservative benchmarking level under the current CDM.[16] The top 20% level serves as the benchmark for both baseline determination and additionality demonstration. Based on the stringency level, the benchmark is calculated as 0.7 tCO_2/t cement. A cement plant, with GHG intensity of 0.8 tCO_2/t cement, implements either a single or a set of mitigation measures to improve its GHG performance. After the implementation of the measures, the GHG intensity of the plant has decreased to 0.65 tCO_2/t cement. Suppose that the plant has produced 1 million t cement in a given year, 50,000 CERs would be awarded to the plant. On the other hand, the rest of emission reductions from the BAU baseline (0.8 tCO_2/t cement) of 100,000 tCO_2 in the year would contribute to the net global emission reductions beyond offsetting.

[16] There is a CDM baseline approach called 48.c which determines the baseline emissions as "the average emissions of similar project activities undertaken in the previous five years, in similar social, economic, environmental and technological circumstances, and whose performance is among the top 20% of their category". While in this example we mention the world's average GHG intensity of cement plants as the group for comparison, the benchmark can also be set by just comparing with plants in the same country or region.

Detailed assessment

Environmental integrity

Additionality:
The setting of ambitious baselines below BAU emission levels contributes to global GHG emission reductions, as the amount of CERs issued is lower than the actual emission reductions achieved. Similar as for the option of discounting, the effects on environmental integrity depend heavily on the extent to what the ambitious baseline is set below BAU emissions.

The use of emission benchmarks could provide a more objective means to demonstrate additionality (i.e. any GHG reductions below the additionality benchmark can automatically be issued with CERs). Benchmarking would serve to a concept of additionality more close to the "common practice" principle, rather than to the principle of financial additionality. This could have two effects: on the one hand, projects that would anyhow lower their emissions below the benchmark would now qualify for the CDM and could formally demonstrate their additionality by meeting the emissions benchmark. On the other hand, the currently observed gaming in demonstrating additionality with the investment or the barrier analysis could be reduced thanks to the clearer rule applied with the benchmark. Which effect prevails depends highly upon 1) the stringency of the benchmark applied and 2) the sector of the project type targeted.

As with previous options, the exact impact of reducing CER supply on the issue of project additionality is uncertain. If a stringent set of benchmarks (or of conservativeness factors) are applied to each project type – then the option could improve the environmental integrity of the mechanism by reducing the registration of non-additional projects. Conversely, less stringent benchmarks may allow many BAU projects to generate CERs and this would work against the environmental integrity of the CDM. Additionally, if the benchmark is too stringent, then many projects may be punished and become unfeasible.

Furthermore, the use of benchmarking to set ambitious baselines is restricted to large and homogeneous sectors. For sectors that produce a variety of different goods or services (i.e. chemical industries) or sectors where GHG emissions are spatially dispersed (transport), multiple baselines may need to be established. Once benchmarks become very disaggregated, they are no longer different from today's project-specific baselines. Alternative approaches (i.e. the use of conservative values in the baseline emission calculation) may have to be adopted for sectors that are not suitable for benchmarking, and additionality may have to be determined through the Tool of Additionality.

In conclusion, the option's impact on additionality of CDM projects may range from negative (-) to very positive (++), depending on the detailed design and the sectors involved. In the example for the cement sector, as benchmarking is possible, if a

sufficiently conservative benchmark is set, the impact on additionality may be very positive (++).

Measurability:
As previously discussed, the use of benchmarking to set ambitious baselines may improve the measurability of GHG reductions by enabling the additionality of CDM projects to be determined in a more objective manner. However, the application of benchmarking could pose more technical challenges for the measurement of GHG reductions compared to the existing methodologies used in the project based CDM. For example, the application of benchmarking would require the collection of data for an entire industry. In contrast, data monitoring under the project based CDM only requires the collection of GHG emissions for an individual plant. As a consequence, the option to set ambitious baselines by using benchmarks would depend upon the availability of accurate GHG emission data for a whole industry (at the country, region, or world level) - in order to verify the GHG reductions from an individual plant. For many industries collection of these data would be very expensive and may also face opposition as companies do not want to reveal their competitive position.

Thus, depending on the industrial sector and the host country involved, and on the decision about the geographical boundary to be considered for setting the benchmark, this option will generally range from a strongly negative (--) impact to a neutral impact on the measurability of GHG reductions compared to the current CDM. In the example of the cement sector, average emissions data exists for the whole world, but may be difficult to obtain for specific countries.

Timing of GHG reductions:
If benchmarks are used to set ambitious baselines according to project type, the timing of the GHG reductions will depend on how frequently the benchmark is updated to reflect socio-economic changes over time. A benchmark that is updated frequently will deliver more immediate GHG reductions (with an increased level of certainty) compared to a benchmark that is only updated at longer time intervals. It is envisaged that the rate of GHG reductions would increase with the frequent updating of benchmarks as this approach would, for example, respond quickly to the emergence of innovative GHG abatement technologies and set more ambitious baselines accordingly. Determining how often the benchmark is modified will ultimately involve a compromise between ensuring the stability of the CER market and fulfilling the mechanism's objective to reduce GHG emissions. It is likely that this compromise will prevent the option from fulfilling its maximum potential with regards to the timing of GHG reductions.

Furthermore, as previously discussed, the introduction of benchmarks will increase the amount of monitoring data that is required from individual plants to entire industrial sectors. As a consequence, the development of emission benchmarks may become a time consuming process that could potentially delay the implementation of the option – and thus delay the timing of GHG reductions.

It is expected that the example will have a positive (++) effect on the timing of GHG reductions in comparison to the current CDM if the benchmarks for the cement sector are frequently updated and are based on world average data. However, due to the fact that not all sectors are currently suitable for benchmarking, it may be necessary to firstly improve data collection for these data poor sectors - this may delay GHG reductions and therefore it is envisaged that this option will generally range from a negative (-) to a positive (++) impact on the timing of GHG reductions compared to the project based CDM.

Overall effects on environmental integrity:

- Setting ambitious baselines at the project type scale may improve the environmental integrity of the mechanism - by providing an objective assessment of the additionality of a CDM project. However, the effectiveness of this option is dependent upon the stringency of the benchmark (or the conservativeness factor) used.
- Measurability of the reductions may become more complex, as data is not available for all relevant sectors in all relevant countries.
- Timing of reductions may be delayed due to the difficulties in gathering the needed data. On the other hand, if data is available and the benchmarks are updated frequently to reflect changes in technologies, the timing of emission reductions could improve.

Contribution to sustainable development

The use of ambitious benchmarks by project type does not directly promote projects with higher sustainable development benefits, except if a differentiation in the stringency of benchmarks would be based on sustainable development benefits.

Projects with generally high SD benefits:
The level of contribution of this option to SD will depend on the design of the option. For example, SD benefits from projects in the power sector will be higher if the benchmark is established for each fuel type. As has been explained, if the benchmark is established for each fuel type among the power sector, renewable energies will be more preferred than improved coal power plants.

Small and community-based projects:
Small projects are not likely to be particularly affected by benchmarking, so the effect of this option would be neutral.

Technology transfer:
Due to the fact that the baseline emissions level is fixed, the incremental emission reductions from using an even more advanced project technology would be fully reflected in the quantity of CERs issued (Schneider, 2008). The setting of ambitious baselines according to project type should therefore provide a dynamic incentive for transfer of low carbon technologies, which is one of the important elements of SD criteria in many host countries, and which may also encourage future GHG

reductions due to positive spill over effects. The introduction of these technologies could promote environmental benefits, such as improved air, water and land quality and conservation of natural resources in host countries. However, some less carbon intensive technologies can have other negative environmental effects, as for example CFLs.

It is expected that this option will have a positive (++) effect on technology transfer for sectors suitable for benchmarking in comparison to the current CDM. For sectors not suitable for benchmarking, the application of mandatory conservative factors for baseline calculations should still provide a dynamic incentive to encourage the transfer of innovative technology therefore it is expected that this option will generally have a positive (++) impact.

Overall effects on sustainable development:

- While the effect of the option on projects with generally high SD benefits depends strongly on its design, we do not expect a particular effect on small-scale or community-based projects.
- The option is expected to generate a dynamic financial incentive for the transfer of innovative technologies to countries affected by the ambitious baselines.

Economic efficiency

Annex I compliance costs:

Introducing ambitious baselines based on technology benchmarks will in general reduce the supply of credits to the carbon market, thereby increasing the costs of compliance for Annex I countries with their reduction targets. Thus, we rate this effect as negative (-to --). However, the cost of the overall emission reductions achieved (counting also those that are not credited) will depend on the shape of the abatement cost curves in Annex I and non-Annex I countries, and could be higher or lower than the cost when similar emission reductions are achieved through stricter Annex I reduction targets.

Mobilization of unutilized cost-effective potential:

Whether ambitious baselines based on technology benchmarks, as in the example, would contribute to mobilize unutilized cost-effective reduction potential would mainly depend on which project types or sectors introduce ambitious baselines and which do not. Within a given sector, an ambitious baseline would incentivize individual plants to implement all cost-effective mitigation measures needed to beat the baseline and earn CERs. On the one hand, each plant would be forced to implement more mitigation measures (than in the case with the BAU baseline) to be able to access carbon credits, but on the other hand, fewer plants would be capable of doing so. Thus, a clear effect cannot be distinguished here.

Technology push for more cost-effective long-term reductions:
The higher CER prices resulting from the reduced supply, as well as the higher technology standards promoted by ambitious baselines based on benchmarks could incentivize the development and deployment of cleaner technologies for the sectors being targeted in non-Annex I and indirectly also in Annex I countries. This technology-push would however also depend on many other factors influencing emission reduction supply and demand and technology development.

Overall effects on economic efficiency:

- Annex I compliance costs would rise due to the reduced supply of CERs to the market.
- Unutilized cost-effective potential could be mobilized within individual plants in the sectors affected, but other plants would not be able to meet the ambitious baselines and would thus be prevented to undertake a CDM project.
- Ambitious baselines could directly incentivize the development of cleaner technologies and so facilitate a reduction of mitigation costs in the future.

Technical feasibility

Data availability:
For implementing this option, additional data and effort may be necessary for the definition of the ambitious baselines. If one applies a simple method to derive the "conservativeness factors" for the baselines – such as standard factors per project type – no or very limited data is needed[17]. If one implements the option of benchmarking, reliable benchmarks need to be derived for each sector / project type under consideration. Hence, installation-level data on CO_2 intensity is needed for all installations operated in the relevant sectors, potentially even separated by individual CDM host countries. It can be expected that such data is available only in a few sectors such as the cement and steel industry, but not in many others. For sectors where this data is not readily available for all host countries, it needs to be gathered. This means heavy involvement by all CDM host countries; and the experience with the EU Emissions Trading Scheme has shown that gathering reliable data on the installations level can be a quite time consuming challenge. We therefore rate this option regarding data availability as (--) to neutral (0). The example is rated as (-).

Administration:
With regards to administration, the benchmark values would need to the updated regularly, with a frequency to be decided by the COP/MOP. The higher the frequency, the higher the overall transactions costs and the higher the overall accuracy of the approach. We therefore rate this option as neutral (0) to (--) regarding this criterion.

[17] It may be noted that such an approach would be very similar to a discounting approach as discussed in section 4.1.

Methodologies:

On methodological feasibility, the option can accurately identify the amount of net emission reductions only if the BAU baseline emission level is known. Namely, it is the difference between the benchmark level (or the conservativeness-adjusted baseline) and the BAU baseline emissions level. However, with benchmarking, this is not always the case as it is not necessary for a plant in the sector to calculate the BAU baseline emissions to receive CERs – it just has to prove that the current emission intensity is lower than the benchmark level. There are a number of methodological challenges in the benchmark setting such as sector boundary setting[18] and choice of a benchmark indicator.[19] Transparency of this option is likely to be limited as a large part of the data required for benchmarking is often confidential. The applicability of this option is most likely limited to large, homogeneous sectors in which the necessary data can be obtained in a coordinated manner. The option "ambitious baselines by project types" in general involves a wide range of implementation approaches, and hence its general assessment is difficult to perform. However, it is most likely that the option would lead to an increased methodological complexity. We therefore rate the general impact of the option on methodologies as (-) to (--) and the (less complex) example as (-).

Incorporation into UNFCCC accounting:

As for ambitious baselines by countries, the accounting under UNFCCC itself would not have to be modified since ambitious baselines are directly applied to each project and directly influence verified emission reductions. We therefore rate the impact of this option on UNFCCC accounting as neutral (0).

Overall effects on technical feasibility:

- Data acquisition may be easy for conservativeness factors; however significant challenges arise if data have to be collected on an installation level for different sectors and host countries.
- Administration becomes more cumbersome the more frequently ambitious baselines by project type are to be updated.
- Methodological requirements probably lead to an increased complexity as in the example for the benchmark.
- Accounting under UNFCCC would not have to be modified since ambitious baselines would directly be applied to each project and therefore directly influence verified emission reductions.

[18] The decision on the sector boundary for the cement production, for example, includes whether to include transport of raw materials or to focus on a certain part of the production process only (e.g. clinker production).

[19] The choice of benchmark indicator is more challenging for a sector with a wide range of products. The chemical sector, for example, has a number of chemical products on which the benchmark indicator can be set (e.g. ammonia, methanol, urea, propane, etc.). In such a sector, it is difficult to set a uniform indicator. Therefore, multiple benchmark indicators have to be employed, leading to complex disaggregation of benchmarking.

Incentives and distributional effects

Incentive for developing countries to accept the option:
Making ambitious baselines by project types attractive to CDM host countries is a difficult task. Only if it is decided that some countries (e.g. LDCs) will be exempted from this approach, then their support could be gained, as they would profit from a competitive advantage with respect to the affected host countries. However, this is not likely to happen, as this would imply a differentiation by project types and by host countries, which would be too complex to negotiate. Further, concerns about data requirements, confidentiality issues and international competitiveness may discourage countries from accepting this option. Thus, we rate this incentive as negative (-).

Incentive for developing countries to take up a long-term low emissions path:
Assuming that the technology level is proportional to the overall development level of a country, an ambitious benchmark system will provide an incentive for advanced countries to embark on long-term emission reductions. It is thus evaluated as very positive (++). The specific example for the cement sector is seen as positive (+).

Neutralizing domestic CDM lobbies:
Benchmark setting can be distorted by lobbies that by nature have an excellent knowledge of their sector and thus are likely to provide arguments to overworked officials why a benchmark should have a certain level. Their influence is likely to be especially strong when it comes to technology definition. Thus lobbies are strengthened and the evaluation of the lobby item is negative (-). In the cement case, the lobbies have already provided substantial input and the outcome is quite specific to the lobby input (-).

Redistribution between project types and countries:
Benchmarks can lead to sizeable redistribution between project types but also between countries, if they are disaggregated geographically. They therefore are evaluated positively to neutral. In the cement case, there is no redistribution among project types but among countries.

Transparency of redistributive impacts:
While a benchmark is very clear once it has been defined, the process of setting up the benchmark can be opaque. Thus transparent governance of benchmark-setting is crucial to prevent opacity. Depending on governance, transparency can be low (- -) to high (+). In the cement case, transparency of the process was relatively high but the company-specific numbers were kept secret to prevent competition impact. Thus, overall evaluation is neutral.

Overall effects on incentives and distribution of projects:

- Making ambitious baselines by project types attractive to CDM host countries is considered difficult. Industry and domestic CDM lobbies are likely to play a

role in preventing this option to be accepted, or in watering down the benchmarks or conservativeness factors.
- Ambitious baselines may provide a positive incentive for advanced countries to embark on long-term emission reductions.
- This option will generate a redistribution of projects between project types and, depending on its design, also between countries, but the transparency of setting a benchmark may be low.

Negotiability

Consistency with fairness criteria:
Benchmarks can be set according to fairness principles if the technology definitions are not biased against certain countries. Benchmarks can be very fair if the choice of aggregation levels both technologically and geographically allows to allocate more stringent benchmarks to advanced industries and countries compared to less developed ones. But they can also be rather unfair if they only apply to certain "lighthouse industries" in an otherwise undeveloped environment. This could for example be the case in aluminium production. The overall evaluation is thus strongly positive (++) to neutral (0). In the cement example, fairness is quite high.

Use of symbolic numbers possible:
The choice of the percentile for definition of a performance benchmark can be highly symbolic. Therefore evaluation is very positive (++). In the cement example symbolism was limited but this is due to the fact that it has not yet been decided by policymakers.

Low complexity, governance challenges and preparation time:
As experienced in the EU emissions trading scheme, benchmark setting requires high technical expertise and will be politically controversial. The example of the CDM Executive Board who for many years was unable to approve benchmark-based methodologies shows that even a very transparent governance process may have difficulties in benchmark determination. Lead time for benchmark determination will be high. Thus, overall evaluation is very negative (- -). In the cement case, it took more than 5 years to agree on a benchmarking approach. Thus it is also evaluated negatively.

Overall effects on negotiability:
The complexity overrides the positive assessments on the other criteria and thus negotiability is evaluated as neutral (0) to negative (-).

Summary of assessment

Reform option / Evaluation criteria	Ambitious baselines by project types	
	In general	In the example
Environmental integrity		
Additionality	- to ++	++
Measurability	-- to 0	-
Timing of GHG reductions	- to ++	++
Contribution to sustainable development		
Favours projects with generally high SD benefits	n.d.	0
Favours small and community-based projects	0	0
Disfavours projects with large profits and low SD benefits	n.d.	n.d.
Promotes technology transfer	++	++
Economic efficiency		
Annex I compliance costs	- to --	-
Mobilization of unutilized cost-effective potential	- to +	- to +
Technology push for more cost-effective long-term reductions	0 to +	0 to +
Technical feasibility		
Data availability	0 to --	--
Administration	0 to --	n.d.
Methodologies	- to --	-
Incorporation into UNFCCC accounting	0	0
Incentives and distributional effects		
Incentive for developing countries to accept the option	- to --	-
Incentive for developing countries to take up a long-term low emissions path	++	+
Neutralizing CDM lobbies	-	-
Redistribution between project types or countries	+ to 0	+
Transparency of redistributive impacts	- - to +	0
Negotiability		
Consistency with fairness criteria	++ to 0	+
Use of symbolic numbers possible	++	+
Low complexity, governance challenges and preparation time	- -	- -

4.3 Purchase and cancellation of CERs

General description

What it is about

Under this approach, a quantitative CER purchase guarantee is defined for certain host countries or project types / technologies. Countries with emission targets in the

post-2012 regime have the obligation to purchase the respective amounts of CERs and cancel them. Cancellation means that the CERs can neither be used for compliance purposes nor sold to any secondary markets, e.g. voluntary offsets. The purchase of CERs without using them for compliance purposes results in an additional global emission reduction.

Motivation for it

Apart from the main objective of achieving additional global GHG emission reductions, this option allows to manage CDM demand by prioritizing certain host countries or project types/technologies: the defined purchase guarantees an additional demand for CDM projects from countries or project types / technologies that are currently considered underrepresented in the CDM. Hence, it is a means to support certain host countries, such as African countries, or project types, such as renewable energy projects or projects with very innovative technologies.

While the option of purchase and cancellation of CERs has not been directly discussed in the climate negotiations, there has been some discussion on establishing quotas for purchasing CERs from particular host countries or project types under the AWG-KP.

Implementation

In detail, implementation would be as follows:

- A quantitative CER-purchase and cancellation commitment is defined for the group of countries with emission targets in the post-2012 regime or Annex I countries of the Convention (in the following simply referred to as “Annex I countries”).
- This CER-purchase commitment might be either constant or in-/decreasing for each year of the post-2012 commitment period, or might apply as a total for a commitment period.
- Annex I countries would jointly provide the funding for the CER purchase; each country’s contribution would be negotiated. For example, each country’s contribution could be in relation to the amount of emission reductions they are expected to achieve given their targets and their current emissions. It could also be proportional to the UNFCCC fee assessment scale.
- The CER-purchase itself could be organized via a central body such as the UNFCCC Secretariat, or institutions such as the World Bank, possibly supervised by the UNFCCC. The work of this body would be based on COP/MOP’s guidelines and would ensure that the agreed differentiation of purchase obligations by host countries or project types / technologies takes place.
- Purchased CERs would be transferred to a cancellation account of national registries or a particular cancellation account of the CDM registry, so that they cannot be used for compliance or other offsetting purposes neither by Parties to the UNFCCC, nor by private market players (national/regional emissions trading schemes), nor by the voluntary market.

- Hence, the quantitative CER purchase commitment is, under the assumption that all those CERs represent real, measurable and long-term emission reductions, equivalent to the atmospheric benefit of this option.
- In case CER supply from a specific host country / project type is not sufficient to satisfy the demand in a given year, it might be transferred (banked) to the next year within a commitment period.

4.3.1 Purchase and cancellation of CERs by host countries

Detailed description

In this option, the quantitative CER purchase benefit is limited to a defined set of host countries. Hence, the COP/MOP would agree on CER quantities that are to be acquired from defined host countries.

Details of the purchase targets would be subject to negotiations between the Parties to the UNFCCC. The two most relevant questions in this regard are:

1. Are purchase benefits quantified individually for single host countries, or are they defined as joint benefits for groups of host countries?
2. What are the parameters for defining purchase benefits; both for single-country targets and targets for group of countries?

Ad 1) One might define purchase benefits for each individual host country or for groups of host countries. As an example for the latter, the purchase benefit would be defined for e.g. all countries in Sub-Saharan Africa (SSA) or all least developed countries, but would not be quantified for individual countries within this group. This would allow for more flexibility for the purchasers, but might lower the geographical targeting of the option. On the other hand, defining the purchase benefits for individual host countries will significantly increase transaction costs (negotiations), and increases the 'risk' that there is not enough supply for satisfying the CER demand resulting from the purchase commitment, especially for small host countries[20].

ad 2) As discussed in section 4.1.1, there is a wealth of parameters that can be applied for defining the purchase benefit for a host country.
Single-country purchase benefits can, inter alia, be defined on the basis of:

- the host country's income levels (GDP/capita or PPP/capita). The lower the income levels in a country, the higher would be the purchase benefit that applies to the host country;

[20] For avoidance of doubt, there is no "penalty" for the host country in case not enough CERs are generated to match with the quantitative purchase benefit - it would be more a 'missed chance'.

- the host country's overall development level, e.g. as evaluated on the basis of the Human Development Index (HDI). The lower the HDI, the higher would be the purchase benefit that applies to the host country;
- the host country's historical accumulated emissions in absolute terms [tCO_2e]. The lower the accumulated historical emissions, the higher would be the purchase benefit that applies to the host country;
- a combination of any of these parameters.

Purchase benefits for groups of host countries can, inter alia, be defined on the basis of:

- their geographic region (e.g. SSA, AOSIS); or
- their categorization in terms of development- or income level, e.g. as done by the establishment of 'income groups' of countries by the World Bank (see section 4.1.1);
- a combination of any of these parameters.

Being aware of the wealth of implementing options, the following paragraphs describe in more detail an example of how the option "purchase and cancellation of CERs by country" could be implemented if one decides for country groupings.

Example

Purchase targets are defined for country groupings based on their income and development levels. In this example, it is assumed that the Parties to the UNFCCC agree to apply the categorization as per Table 1 of section 4.1.1. It is also assumed that the Parties to the UNFCCC agree that only the groups Least Developed countries (LDCs) and Other Developing Countries (ODCs) qualify for benefiting from the purchase obligation.

- For the group of LDCs, a total purchase obligation of 12.5 million CERs/yr is defined for the country group; to be met in total for the whole crediting period.
- For the group of ODCs, a total purchase obligation of 6.5 million CERs/yr is defined for the country group; to be met in total for the whole crediting period.

Table 6 summarizes the purchase benefit by country.

Table 6: Purchase benefits by country

Group	Countries within group	Annual cumulative purchase benefit for the group	Total purchase benefit over commitment period[21]
LDCs	Afghanistan, Angola, Bangladesh, Benin, Bhutan, Burkina Faso, Burundi, Cambodia, Cape Verde, Central African Republic, Chad, Comoros, Dem. Rep. Congo, Djibouti, Equatorial Guinea, Eritrea, Ethiopia, Gambia, Guinea, Guinea-Bissau, Haiti, Kiribati, Lao, Lesotho, Liberia, Madagascar, Malawi, Maldives, Mali, Mauritania, Mozambique, Myanmar, Nepal, Niger, Rwanda, Samoa, Sao Tomé and Principe, Senegal, Sierra Leone, Solomon Islands, Somalia, Sudan, Timor-Leste, Togo, Tuvalu, Uganda, Tanzania, Vanuatu, Yemen, Zambia	12.5 million CERs	100 million CERs
ODCs	Armenia, Azerbaijan, Bolivia, Bosnia, Botswana, Cameroon, Congo, Cote d'Ivoire, Cuba, DPR Korea, Ecuador, Egypt, El Salvador, Gabon, Georgia, Ghana, Guatemala, Honduras, India, Indonesia, Iraq, Jamaica, Jordan, Kazakhstan, Kenya, Kyrgyzstan, Lebanon, Libya, Malta, Moldova, Mongolia, Morocco, Namibia, Nicaragua, Nigeria, Oman, Pakistan, Peru, Paraguay, Philippines, South Africa, Sri Lanka, Syria, Tajikistan, Turkmenistan, Uzbekistan, Vietnam, Zimbabwe	6.5 million CERs	52 million CERs

Detailed assessment

Environmental Integrity

Additionality:
With regard to the methodology for assessing project additionality, the purchase and cancellation of CERs by host countries will not change how project additionality is determined compared to the current CDM. It is therefore expected that non-additional projects will continue to be illegitimately registered if this option is implemented.

The overall impact of this option on the number of non-additional projects entering the CDM is uncertain – and may have a positive or negative effect on the mechanism. For example, the specific allocation of CER funds to LDCs may remove

[21] Assuming a commitment period from 2013 - 2020.

some of the barriers (i.e. lack of finance) that prevent the transfer of innovative technology to host countries in order to reduce GHG emissions. As a consequence, this option may improve the additionality of CDM projects. However, the effectiveness of this option to improve the additionality of CDM projects will depend on how host country groupings are defined. For example, if host countries are included in CER purchase obligations that have high participation levels in the mechanism – the impact of the option on additionality may be more negative.

Given this uncertainty, the setting of the CER purchase obligation may have a variable impact on the additionality of CDM projects. In the specific example, which sets a CER purchase obligation of 12.5 million CERs from LDCs, overall additionality of the CDM may be increased, as projects in LDCs are expected to be, in general, more additional (since they are not common practice and face large implementation barriers). However, in the context of the current CDM market, the CER purchase obligation set in the example represents a small percentage of total CER supply – which is expected to reach 2.9 billion CERs by the end of the first commitment period (UNEP/RISOE CDM Pipeline, 2009).

Due to the general possibility of focusing CER funds on host countries where CDM projects are more likely to be additional, it is expected that the example will have a positive (+) impact on the issue of additionality compared to the current CDM.

Measurability:
It is envisaged that this option will have a neutral impact on the issue of GHG measurability compared to the existing CDM, as the same methodologies and tools will be used.

Timing of GHG reductions:
The option to purchase and cancel CERs may have an immediate impact on GHG reductions; however the exact timing of the GHG reductions will ultimately depend on how the option is implemented. For example, if CER purchase benefits are defined for individual host countries there is a real risk that the CER supply may fail to meet the demand resulting from a purchase obligation. If this scenario occurred, the CER purchase obligation may have to be postponed until the host country could increase its CER supply, which would significantly delay the timing of GHG reductions. However, if purchase benefits are defined for groups of host countries – as in the example – the increased flexibility from an investment perspective should reduce the risk of inadequate CER supply delaying GHG reductions.

Due to the increased flexibility from purchasing and cancelling CERs from a group of host countries, it is expected that this example will have a neutral impact on the timing of GHG reductions compared to the existing project based CDM. Given the potential delay to GHG reductions if this option is implemented for individual host countries, it is envisaged that this option will generally range from having a negative (-) to a neutral impact on the timing of GHG reductions.

Overall effects on environmental integrity:

- The purchase and cancellation of CERs differentiated by host countries will not prevent non-additional projects from entering the CDM pipeline. Furthermore, whether this option contributes to an increase or a reduction in non-additional projects will depend upon how the CER purchase obligation is set.
- Measurability of the emission reductions will not change.
- Emission reductions may be delayed if supply of CERs is not sufficient to meet the purchase obligation.

Contribution to sustainable development

Regardless of how the host countries will be selected, the overall effect of this option to SD benefits is difficult to assess. SD benefits neither depend on income levels nor development status nor geographic characteristics. If the obligation to purchase and cancel a certain amount of CERs is high in a country/group, this option may lead to an increase in projects in the selected country/group. Whether the country/group will increase high SD benefit projects will depend on each country's CDM project approval process.

Projects with generally high SD benefits:
Unlike the discounting and ambitious baseline options by countries, this option does not punish projects with high SD benefits nor small-scale or community-based projects. It also does not favour large industrial gas projects.

Technology transfer:
While the purchase and cancellation of CERs by host countries will inevitably increase the CDM participation of certain countries, such as LDCs, the allocation of CER demand will not necessarily result in the transfer of innovative technology. The option can only encourage where CDM projects are initiated but will not directly influence which mitigation option is selected to achieve the desired GHG reduction. It is likely that first the projects with the lowest mitigation costs will be implemented, especially if purchase obligations are defined for country groups. As a consequence it is uncertain whether the purchase and cancellation of CERs by host countries will necessarily facilitate the transfer of innovative technology. However, if CER purchase agreements were defined by individual host countries this would be less likely to happen and the rate of innovative technology transfer would significantly increase.

Due to the increased flexibility from purchasing and cancelling CERs from a group of host countries, it is expected that this example will have a neutral to slightly positive impact on the transfer of innovative technologies compared to the current CDM. However, if the option to purchase and cancel CERs was implemented for individual host countries, it is expected that this option will generally range from having a positive (+) to a positive (++) impact on the transfer of innovative technologies.

Overall effect on sustainable development:

- No significant effect on the amount of projects with high or low SD benefits is expected.
- Technology transfer could be increased depending on how the purchase obligation is defined (for which countries, and whether as a group or as individual countries).

Economic efficiency

Annex I compliance costs:
If this option is not coupled with an active search for new CDM projects, from which the purchase obligation is performed, it could reduce the supply of credits to the compliance carbon market, as both the CERs for the purchase obligation and the CERs for target compliance would come from the same pool. Therefore, CER prices could rise and costs of compliance for Annex I countries would rise as well, and we rate this impact as negative.

Further, this option will impose a new expense on Annex I countries, which could however be regarded as part of Annex I commitments to finance mitigation (and adaptation) in developing countries.

The cost of the overall emission reductions achieved (counting also those that are not credited) will depend on the price set for the CERs under purchase obligation, which has to be higher than the abatement costs of the underlying projects. Thus, the overall cost efficiency of this option will depend on the shape of the abatement cost curves in the CDM host countries selected for purchase obligations. While less advanced countries may have significant low-cost opportunities for emission reductions, e.g. due to less efficient technologies being used there, the costs of identifying these opportunities and overcoming non-market barriers for their implementation could be substantial. Thus, it cannot be concluded whether a CER purchase obligation for less developed countries, as in the example above, would reduce overall emission reduction costs.

Mobilization of unutilized cost-effective potential:
The effect of this option on the mobilization of unutilized cost-effective reduction potential also depends on what abatement opportunities actually exist in the benefitted host countries and on the purchase price, and can be rated from 0 to (++). In the example, if we assume that LDCs and ODCs host significant low-cost abatement opportunities (for the same reasons as above), these opportunities could be mobilized if the price set for the purchase obligation is sufficiently high (positive effect).

Technology push for more cost-effective long-term reductions:
This option could affect the level of domestic mitigation in Annex I countries if the purchase obligations are large enough to increase the CER price so that more domestic mitigation becomes affordable. This increased domestic action could in turn

induce a technology-push that could make long-term emission reductions more cost-effective. The size of the incentive would not only depend on the amount of purchase obligations, but also on many other factors influencing emission reduction supply and demand and technology development. In the example given, as the purchase obligation is relatively small as compared to the whole CDM market, a significant price increase is not likely.

Overall effects on economic efficiency:

- Annex I compliance costs will likely rise, if the purchase obligation is satisfied from the same pool of CDM projects that supply CERs for the market.
- Unutilized cost-effective mitigation potential could be mobilized in the targeted host countries.
- A technology push for more cost-effective reductions could be achieved only if the price rise is sufficient.

Technical feasibility

Data availability:

The option only requires the data necessary for the country group definition and categorization, such as GDP/cap, HDI/country, or GHG emissions. As discussed in the previous sections, most of this data is readily available for all CDM host countries and also regularly updated by independent international institutions such as the World Bank, which apply a uniform methodology within their data sets. Only sources for data on GHG emissions would have to be agreed upon, if this criterion is used for country differentiation. Thus, we rate data availability as generally neutral (0) to slightly negative (-) as compared to the current CDM, and in the example neutral, due to straightforward categorisation of countries.

Administration:

The implementation could solely be managed by a UNFCCC body, thus keeping overall transaction costs at a relatively low level. It is likely that transactions costs will mainly be caused by the purchase of CERs. We therefore rate the impact of this option on this criterion as slightly negative (-).

Methodologies:

With regards methodological feasibility, the option in general is accurate in determination of the amount of net emission reductions since the cancelled CERs clearly correspond to the net emission reductions. In the example given above, the proposed procedure for the country group selection is simple. It simply assumes a certain amount of purchase benefit for each country group. If some objective criteria will have to be established, however, the purchase benefit setting can become more complex. In general, transparency of this option is high. But it is subject to change depending on the procedures for the purchase benefit setting. Lastly, the option is likely to be readily applicable to any host country. We therefore rate the general methodological feasibility as neutral (0) to (-). Due to the simplicity of the approach, the example is rated as neutral (0).

Incorporation into UNFCCC accounting:
Impacts on UNFCCC accounting depends on the actual implementation of this option. If purchase obligations are fulfilled by financial transfers to a multilateral body such as the World Bank, no modifications to UNFCCC accounting may be necessary, since CERs could directly be cancelled in the World Bank account in the CDM registry.
If individual countries or groups of countries are to purchase and cancel directly CERs, impacts on accounting may be significant. National registries and the CDM registry may have to be modified in order to separate CERs to be purchased and cancelled under this option from CERs for compliance purposes. The ITL may have to be modified, too. Furthermore, the differentiation of CERs for the purchase and cancellation obligation and for compliance may also require modifications in accounting and reporting guidelines as well as in the compilation and accounting database.
We therefore rate the general impact of this option on UNFCCC accounting as neutral (0) to very negative (--).

Overall effects on technical feasibility:

- Data acquisition and methodological requirements probably do not pose major barriers if the purchase obligation is defined according to a country grouping as in the example. Other approaches may be more cumbersome.
- Administration could be managed by UNFCCC keeping transaction costs low. However, transaction costs are relevant for the purchase of CERs.
- UNFCCC accounting is not affected if purchase obligations are managed by financial flows to a multilateral organization such as the World Bank. Significant modifications to UNFCCC accounting may be necessary if individual countries are to purchase and cancel CERs.

<u>Incentives and distributional effects</u>

Incentive for developing countries to accept the option:
Host countries benefiting from the purchase obligation will likely support this option, as it will ensure financial flows to them. Countries without such benefit may oppose it – if they consider that it implies a competitive disadvantage for them – or be indifferent. If the purchase obligation is not too high in comparison with the whole CER market (as in the example), then no opposition due to competitiveness concerns should be there. Thus, we rate the option as having a neutral to positive effect.

Incentive for developing countries to take up a long-term low emissions path:
CER purchasing and retirement does not provide any incentive to developing countries to embark on long-term emission reductions. It is therefore valued strongly negative (- -). This also applies to the specific example.

Neutralizing domestic CDM lobbies:
The purchasing option will not reduce influence of CDM lobbies. It is likely to increase rent seeking of lobbies who want to access the purchase money. Thus it is valued as negative to very negative.

Redistribution between project types and countries:
According to the selection criteria for the purchases, there can be a substantial redistribution of revenues between countries. Thus it can be seen as positive to very positive, depending on the volumes purchased. The example is evaluated as positive due to the somewhat limited volume of purchases.

Transparency of redistributive impacts:
The impacts will be clearly visible due to the transparency of CER retirement at the UNFCCC level. Transparency is thus very high if allocation is done on a country-by country basis. If allocation is limited to a group of countries, transparency will be lower as allocation within the group can be opaque. This is the case for the example.

Overall effects on incentives and distribution of projects:
- Support of developing countries for this option is likely.
- No incentive for developing countries to embark on long-term emission reductions is created.
- Domestic CDM lobbies could be incentivized to increase their rent-seeking behaviour.
- Projects will be redistributed between countries, in a very transparent manner especially if obligations are defined for individual countries.

<u>Negotiability</u>

Consistency with fairness criteria:
The allocation of the funds can easily take into account fairness criteria. But the outcome may be unfair, especially if relatively large country groupings are chosen. Evaluation is thus very positive (++) to neutral (0). The example is positive (+), as the LDCs receive the lion's share of the budget allocation.

Use of symbolic numbers possible:
The budget levels allocated or the total number of CERs to be retired can be highly symbolic. The example shows the used of simple numbers and is thus positive (+).

Low complexity, governance challenges and preparation time:
Governance of the actual purchase process, such as tendering for projects can be challenging, but complexity will be low. Lead times can be as low as for simple discounting. The overall evaluation thus is positive (+).

Overall effects on negotiability:
The overall attractive conditions for host countries make negotiability easy (+).

Summary of assessment

Reform option / Evaluation criteria	Purchase and cancellation of CERs by host country	
	In general	In the example
Environmental integrity		
Additionality	- to +	+
Measurability	0	0
Timing of GHG reductions	- to 0	0
Contribution to sustainable development		
Favours projects with generally high SD benefits	n.d.	n.d.
Favours small and community-based projects	n.d.	n.d.
Disfavours projects with large profits and low SD benefits	n.d.	n.d.
Promotes technology transfer	0 to ++	0 to +
Economic efficiency		
Annex I compliance costs	- to - -	- to - -
Mobilization of unutilized cost-effective potential	0 to ++	+
Technology push for more cost-effective long-term reductions	0 to +	0 to +
Technical feasibility		
Data availability	- to 0	0
Administration	-	-
Methodologies	0 to -	0
Incorporation into UNFCCC accounting	0 to --	n.d.
Incentives and distributional effects		
Incentive for developing countries to accept the option	0 to +	+
Incentive for developing countries to take up a long-term low emissions path	- -	- -
Neutralizing CDM lobbies	- - to -	- - to -
Redistribution between project types or countries	+ to ++	+
Transparency of redistributive impacts	+ to ++	+
Negotiability		
Consistency with fairness criteria	0 to ++	+
Use of symbolic numbers possible	+	+
Low complexity, governance challenges and preparation time	+	+

4.3.2 Purchase and cancellation of CERs by project types or technologies

Detailed description

In this case, the quantitative CER-purchase benefit is defined for a set of project types / technologies. Hence, the COP/MOP would define which project types / technologies qualify for being purchased with this mechanism.

The selection of project types / technologies that qualify for the purchase benefit could again be based on numerous criteria, inter alia:

- Sustainable development benefits of given project types / technologies (for a more detailed discussion see section 4.1.2), including technology transfer;
- Typical GHG abatement costs of a project type / technology. One could either support technologies that currently have high GHG abatement costs with the objective to lower the costs; or support technologies that are characterized by low GHG abatements costs in order to increase the economic efficiency of the overall system (or a combination of the two options);
- Global future GHG-reduction potential below a certain price level in tCO_2e of project types / technologies that today are still in their infancies.

A relatively simple option would be to define a positive list and not to differentiate between the eligible project types / technologies any further ("option I"). Alternatively, one could define a share [%] for each project type / technology to be purchased to meet the defined quantitative CER-target ("option II").

Example

It is assumed that the quantitative CER-purchase benefit is 150 million CERs/year. It is further assumed that the project types / technologies photovoltaic, wind energy, energy efficiency in buildings including lighting, solar water heaters, domestic biogas, and solar cooking qualify for the purchase benefit. Please note that this is a hypothetic example; Parties could also decide for geothermal, solar thermal power, ocean wave technologies, etc.

Table 7 shows the amounts of CERs that need to be purchased by project type / technology.

Table 7: Purchase benefit by project type

Project type / technology	Share defined by Parties to the UNFCCC	CERs to be purchased per year
Photovoltaic	n.a.	0 – 150 million
Wind energy	n.a.	0 – 150 million
Energy efficiency in buildings including lightening	n.a.	0 – 150 million
Solar water heaters	n.a.	0 – 150 million
Domestic biogas	n.a.	0 – 150 million
Solar cooking	n.a.	0 – 150 million

Detailed assessment

Environmental integrity

Additionality:
With regard to the methodology for assessing project additionality, this option will not change how project additionality is determined. It is therefore expected that non-additional projects will continue to be illegitimately registered if this option is implemented.

Depending on the criteria used to select which project types are eligible, CER purchase obligations could be set for project types with high levels of additionality, which would then enhance the environmental integrity of the CDM. However, if eligible project types are determined by SD criteria it is possible that highly additional projects (i.e. HFC-23 destruction projects) could be disadvantaged by the implementation of this option.

In the example, the following project types are eligible for CER purchase obligations – photovoltaic, wind energy, energy efficiency in buildings, solar water heaters, domestic biogas and solar cooking. While solar energy projects and energy efficiency in buildings could be considered as highly additional (solar projects because they are expensive, and energy efficiency because these projects are still not common in the CDM), wind energy projects may be less additional, depending on the host country.

Due to the varying levels of additionality between the project types that are eligible in the example it is expected that this option will have a neutral impact on the additionality of project types. However, considering that additionality criteria could be used to determine the eligibility of project types for CER purchase obligations it is expected that this option will generally range from having a neutral to a positive (++) impact additionality compared to the project based CDM.

Measurability:
As the same methodologies and tools are used for this option, the measurability of GHG reductions does not differ from the project based CDM.

Timing of GHG reductions:
The option to purchase and cancel CERs according to project type should have an immediate impact on GHG reductions; however delays may be experienced during the transition to this option. For example, it is expected that the selection of eligible project types to include in a CER purchase obligation will prove to be politically controversial – and this may delay the implementation of the option and thus delay GHG reductions.

In addition, if project types that were still in the infancy of their development were financially supported via this option – it is likely that GHG reductions would occur in the future as initially the additional CER demand would not be satisfied by the CER

supply. However, if there is flexibility over which project types (i.e. the share of CERs for each project type is not fixed, as in the example) are eligible under the obligation – then delays in GHG reductions may be avoided.

Thus, the impact of this option on the timing of emission reductions could be neutral to slightly negative.

Overall effects on environmental integrity:

- The purchase and cancellation of CERs according to project type will not completely prevent non-additional projects from entering the CDM pipeline. However, depending on the criteria used to define the purchase obligation, this option provides a financial incentive to develop projects that are more likely additional.
- The purchase and cancellation of CERs according to project type may have an immediate effect on GHG reductions. However, delays may occur if the allocated CER demand cannot be matched by the CER supply for a particular project activity.

Contribution to sustainable development

Projects with generally high SD benefits, small-scale projects:
Whether this option contributes to additional SD benefits will depend on the technologies chosen and the amount of agreed CERs to be purchased. This option could contribute to additional SD benefits if positive list of projects types / technologies with high SD benefits are agreed, such as small-scale renewable projects. The level of contribution to SD benefits will depend on the amount of agreed CERs to be purchased and cancelled. The higher the amount agreed to be purchased, the higher the contribution to SD benefits would be. If countries would agree on a positive list, the selection of projects should be carefully examined. The option is not capable of differentiating projects against one another within project types. Therefore, it is better to specify in detail as possible and avoid project types / technologies that might have negative SD effects. The specific example given would promote both renewable energy projects and small scale projects.

Projects with large profits and low SD benefits:
As defined above, this option would not affect the demand for projects with large profits and low SD benefits.

Technology transfer:
The purchase and cancellation of CERs according to project type could encourage the transfer of innovative technologies to host countries. However, the exact impact of the measure will again depend on the criteria used to select which project types to include in a CER purchase obligation. The specific example given above would favour the diffusion of solar energy technologies, for instance. However, if project types were selected for CER purchase obligations based upon their level of additionality – CDM projects with minimal SD benefits but high levels of additionality

(i.e. HFC-23 destruction) may be financially encouraged limiting the transfer of innovative technologies.

Due to selection of project types according to SD criteria, it is expected that this example will have a positive (++) impact on the transfer of innovative technologies in comparison to the project based CDM. However, considering that project types may be selected for CER purchase obligation that are not based on SD criteria - it is expected that this option will generally range from having a neutral to a positive (++) impact.

Overall effect on sustainable development:

- The effect on projects with high SD benefits will depend on the design of the option, particularly on the criteria used to select what project types or technologies should be supported.
- Similarly, technology transfer could be encouraged, if the selected project types imply the use of innovative technologies.

Economic efficiency

Annex I compliance costs:
Here again, the obligation to purchase and cancel a certain amount of CERs from the market will reduce the supply of credits to the carbon market and impose a new expense on Annex I countries, thereby increasing their costs of compliance with reduction targets. The magnitude of this impact will depend on the level of the purchase obligation in relation to the size of the CER market. Thus, we rate this effect as negative.

The cost of the overall emission reductions achieved (counting also those that are not credited) will depend on the abatement costs of the project types selected for CER purchase obligation. If this option is designed to favour innovative project types, which might be costlier than other abatement options even in Annex I countries, overall the cost of this option could be higher than under a system where Annex I obligations achieve a similar global emission reduction level. If it is designed to favour low-cost abatement projects that are currently under-represented in the CDM, this option could reduce overall emission reduction costs.

Mobilization of unutilized cost-effective potential:
Depending on the choice of projects to be favoured by the purchase obligations, this option could be designed to mobilize unutilized cost-effective reduction potential, such as demand-side energy efficiency projects.

Technology push for more cost-effective long-term reductions:
This option could affect the level of domestic mitigation in Annex I countries if the purchase obligations are large enough to increase the CER price so that more domestic mitigation becomes affordable. At the same time, targeting innovative technologies with the purchase benefit (e.g. photovoltaics) could lead to economies

of scale in their production. This in turn could also promote a technology-push that leads to a more cost-effective long-term emissions path in Annex I and non-Annex I countries.

Overall effects on economic efficiency:

- Compliance costs of Annex I countries will increase, in a magnitude depending on the level of the purchase obligation.
- Depending on the design of the option, cost-effective mitigation options could be mobilized.
- If it targets innovative technologies, it could contribute to economies of scale that also reduce long-term mitigation costs in Annex I countries.

Technical feasibility

Data availability:

If the decision regarding eligible project types / technologies is taken on a political level (decision by COP/MOP) under consideration of existing knowledge and on the benefits of individual project types / technologies, this option does not require any additional data at all. If the decision is done on a more technical level and if one decides to conduct a general assessment of project types to derive purchase benefits for the underlying purpose, data requirements can easily become much heavier. This approach can also be expected to cause significant transaction costs both on the political level (agreeing on indicators e.g. for project types' sustainability benefits; approving the results of the assessment) and on a technical level (conducting the assessment). We therefore rate data availability as generally neutral (0) to very problematic (--) as compared to the current CDM, and in the example neutral, due to the straightforward categorisation of project types.

Administration:

Administration can be done, without host country contributions, solely by a UNFCCC body, thus keeping overall transaction costs on a relatively low level. It is likely that transactions costs will mainly be caused by the purchase of CERs. We therefore rate the impact of this option on this criterion as slightly negative (-).

Methodologies:

The option in general is methodologically accurate in determination of the amount of net emission reductions since the cancelled CERs clearly correspond to the net emission reductions. The example given above simply assumes a positive list and a certain amount of purchase benefit by each project type. If some objective criteria will have to be established, however, the selection of the positive-list technologies and the purchase benefit setting can become more complex. Transparency and applicability of this option largely depends on these procedures. We therefore rate the general methodological feasibility as neutral (0) to very negative (--). Due to the simplicity of the approach, the example is rated as neutral.

Incorporation into UNFCCC accounting:
As for purchase obligation by host countries, UNFCCC accounting is not affected if purchase obligations are managed by financial flows to a multilateral organization such as the World Bank. Significant modifications to UNFCCC accounting are necessary if individual countries are to purchase and cancel CERs.
We therefore rate the general impact of this option on UNFCCC accounting as neutral (0) to very negative (--).

Overall effects on technical feasibility:

- Data acquisition and methodological requirements do not pose major barriers if purchase obligations are based on political decisions. A differentiation of purchase obligations by project types on more technical grounds may be more challenging.
- Administration could be managed by UNFCCC keeping transaction costs low. However, transactions cost are relevant for the purchase of CERs.
- UNFCCC accounting is not affected if purchase obligations are managed by financial flows to a multilateral organization such as the World Bank. Significant modifications to UNFCCC accounting are necessary if individual countries are to purchase and cancel CERs.

<u>Incentives and distributional effects</u>

Incentive for developing countries to accept the option:
As in the country-specific purchase obligation, CDM host countries are likely to support this option, as it will ensure financial flows to them. In this case, as there is no differentiation between host countries, the support is likely to come from all non-Annex I countries, but especially those where the technologies selected for the purchase obligation are more viable. Thus, we rate this incentive as positive.

Incentive for developing countries to take up a long-term low emissions path:
Incentives for embarking on long-term emissions reductions are as inexistent as in the case of the country-specific purchase programmes.

Neutralizing domestic CDM lobbies:
CDM lobbies might be able to influence decision-making on the budget allocated to their project type. This would be particularly pertinent if the decision on the allocation is taken on a technical level. Therefore, this option is to be evaluated negatively.

Redistribution between project types and countries:
The distribution according to project types will be substantial, whereas redistribution according to countries depends on the project types chosen. The redistributive impact is thus evaluated as having the full range from negative to positive. Given the unclear allocation of the fund to the list of project types in the example, the range can only be narrowed somewhat.

Transparency of the redistribution
Once the list of supported project types or technologies is defined, the redistribution is transparent, especially if each technology is given a specific purchase share.

Overall effects on incentives and distribution of projects:
- Support for the option from CDM host countries is very likely.
- No incentives for embarking on long-term emission reductions are created.
- CDM lobbies might influence decision-making on the selection of technologies to support.
- Redistribution across project types may be substantial, and across host countries depends on the project types chosen.

Negotiability

Consistency with fairness criteria:
It will be difficult to link project-type specific purchases to fairness criteria, as the differentiated allocation can take into account many parameters, which might but need not be linked to fairness. The other parameters remain as in the case of country-specific programmes. Evaluation is neutral (0) to negative (-). The example is clearly negative (-)

Use of symbolic numbers possible:
For each project type, symbolic numbers can be applied; it is thus evaluated as positive (+). The example shows the ease of setting numbers (+)

Low complexity, governance challenges and preparation time:
The political debate about the allocation formulae can be highly complex. Once the political decision regarding allocation for each project type has been taken, complexity is minimal. The only challenge is to avoid gaming of project types, where developers try to redefine a project to fit into a category with a higher availability of funds. Evaluation is thus neutral (0).

Overall effects on negotiability:
Overall negotiability is neutral (0), given the key importance of fairness.

Summary of assessment

Reform option / Evaluation criteria	**Purchase and cancellation of CERs by project types**	
	In general	**In the example**
Environmental integrity		
Additionality	0 to ++	0
Measurability	0	0
Timing of GHG reductions	0 to -	0
Contribution to sustainable development		
Favours projects with generally high SD benefits	- to+	0 to +

Reform option / Evaluation criteria	Purchase and cancellation of CERs by project types	
	In general	In the example
Favours small and community-based projects	- to +	0 to +
Disfavours projects with large profits and low SD benefits	- to +	0
Promotes technology transfer	0 to ++	++
Economic efficiency		
Annex I compliance costs	- to - -	- to - -
Mobilization of unutilized cost-effective potential	- to +	+
Technology push for more cost-effective long-term reductions	0 to ++	+
Technical feasibility		
Data availability	0 to - -	0
Administration	-	-
Methodologies	0 to - -	0
Incorporation into UNFCCC accounting	0 to - -	n.d.
Incentives and distributional effects		
Incentive for developing countries to accept the option	+	+
Incentive for developing countries to take up a long-term low emissions path	- -	- -
Neutralizing CDM lobbies	-	-
Redistribution between project types or countries	- - to ++	- to +
Transparency of redistributive impacts	+ to ++	+
Negotiability		
Consistency with fairness criteria	0 to -	0 to -
Use of symbolic numbers possible	+	+
Low complexity, governance challenges and preparation time	0	0

4.4 Reinvestment of CER levies in emission reduction projects

General description

What it is about

In this option, CER issuance is taxed and the tax revenues are used for re-investment in projects aiming to mitigate greenhouse gas emissions in countries without emission limitations in the post-2012 regime (non-Annex I countries). The functioning would be similar to current "Green Investment Schemes" (GIS) as set up by several Annex B countries such as Hungary, the Czech Republic, Ukraine, or Latvia under the Kyoto Protocol, which agreed to GIS on a voluntary basis. See e.g. EBRD (2009) for further details on GIS.

In the current CDM, levies for adaptation (2% of CERs) and administration fees are collected; some host countries levy further taxes. The key example is China, where HFC-23 projects are taxed at 65% and N2O projects at 30%. The revenues flow into

a fund among whose tasks is the reinvestment in emissions reductions projects. Many Parties have been objecting to an expansion of levies from the CDM to the other Kyoto Mechanisms.

Motivation for it

Hence, the rationale is to create atmospheric benefits through investing a part of CDM revenues in climate protection projects, whose emission reductions will not be used for compensating greenhouse gas emissions elsewhere. While all CDM rules would not apply to these climate protection projects, they would need to be monitored, reported and verified in order to ensure the environmental integrity of the system.

This CDM reform option has not been discussed so far in the climate negotiations.

Implementation

In more detail, this option would be implemented as follows:

- CER issuance is taxed on top of the current adaptation fee. This levy would be x% of the CERs issued by the CDM Executive Board and be subtracted at each issuance.
- An international body could sell or auction these CERs and use the resulting revenues for re-investment in emission reduction projects in countries without emission targets in the post-2012 regime, following the guidance of COP/MOP[22].

As an alternative to the proposed uniform CER levy, it would also be possible to differentiate the level of the CER levy by host countries and/or project types; e.g. to define a higher levy for industrial gas projects than for renewable energy projects. This allows influencing the system through two levers:

1) the differentiation of the CER levy by project types or host countries can be used to lower the attractiveness of conducting CDM project activities that are located in advanced developing countries and/or that offer low sustainable development benefits, etc. For example, a higher levy in NAI developed countries and ADCs would make CDM projects in LDCs more attractive.
2) the reinvestment of the tax receipts allows for subsidization of certain other host countries and/or project types/technologies.

4.4.1 Reinvestment of CER levy in emission reduction projects in particular host countries

[22] An alternative to the re-investment in projects would be to purchase CERs and cancel them. This would avoid some of the monitoring challenges related to the re-investment in projects as described further below. At the same time, this approach would be very similar to the option “Purchase and cancellation of CERs” as discussed in the previous section, and is therefore not analyzed here in more detail.

Detailed description

In this option, the COP/MOP defines

a) the countries that are eligible for receiving part of the revenues, and
b) the share of revenues each country will receive.

The COP/MOP may define general guidance regarding eligible projects and/or programmes for reinvestment. Host countries that are seeking financial support for projects/programmes would need to apply for such, and the above mentioned international body makes the final decision. This enables host countries to decide which projects/programmes they want to support, while making sure that the funds are spent for activities serving the overall objective of this approach.

With regard to practical implementation, the receiving countries need to establish the regulative and organizational framework to allow for the proper handling of received finances as well as proper monitoring. It may be noted that a direct monitoring of emission reductions achieved by the re-investments is quite challenging.

Again, there is a wealth of options how to define eligible receiving countries and how to determine their shares; also see the discussions in the previous sections. With regard to the following example, we again focus on the approach described in section 4.1.1:

- Non-Annex I countries are categorized into groups in relation to their development status, i.e. in accordance with Table 1 of section 4.1.1.
- In a next step, it is decided which of the groups qualify for receiving the revenues created by the CER-levy.
- For each of the groups that qualify, a share of the CDM revenues is defined. This share also considers the number of countries that belong to the group.
- Countries that belong to a given group share the overall revenues allocated to this group. Funds are allocated on a first-come, first-served basis.

Example

The revenues generated by selling the CERs accruing under the CER levy amount to 1.5 billion €/yr. It is also assumed that the Parties agree that out of the groups shown in Table 1, only the groups LDCs and ODCs qualify for receiving a share of the revenues.

- The revenue share for the group of LDC is defined as 75%;
- The revenue share for the group of ODCs is defined as 25%.

Table 8 shows the financial volumes that are allocated to countries without emission targets in the Post-2012 regime following the described approach:

Table 8: Funds allocated to emission reduction projects by host country

Group	Countries within group	Share of revenues to group
LDCs	Afghanistan, Angola, Bangladesh, Benin, Bhutan, Burkina Faso, Burundi, Cambodia, Cape Verde, Central African Republic, Chad, Comoros, Dem. Rep. Congo, Djibouti, Equatorial Guinea, Eritrea, Ethiopia, Gambia, Guinea, Guinea-Bissau, Haiti, Kiribati, Lao, Lesotho, Liberia, Madagascar, Malawi, Maldives, Mali, Mauritania, Mozambique, Myanmar, Nepal, Niger, Rwanda, Samoa, Sao Tomé and Principe, Senegal, Sierra Leone, Solomon Islands, Somalia (**), Sudan, Timor-Leste, Togo, Tuvalu, Uganda, Tanzania, Vanuatu, Yemen, Zambia	75%, i.e. 1.125 billion €
ODCs	Armenia, Azerbaijan, Bolivia, Bosnia, Botswana, Cameroon, Congo, Cote d'Ivoire, Cuba, DPR Korea, Ecuador, Egypt, El Salvador, Gabon, Georgia, Ghana, Guatemala, Honduras, India, Indonesia, Iraq, Jamaica, Jordan, Kazakhstan, Kenya, Kyrgyzstan, Lebanon, Libya, Malta, Moldova, Mongolia, Morocco, Namibia, Nicaragua, Nigeria, Oman, Pakistan, Peru, Paraguay, Philippines, South Africa, Sri Lanka, Syria, Tajikistan, Turkmenistan, Uzbekistan, Vietnam, Zimbabwe	25%; i.e. 0.375 billion €

Detailed assessment

Environmental Integrity

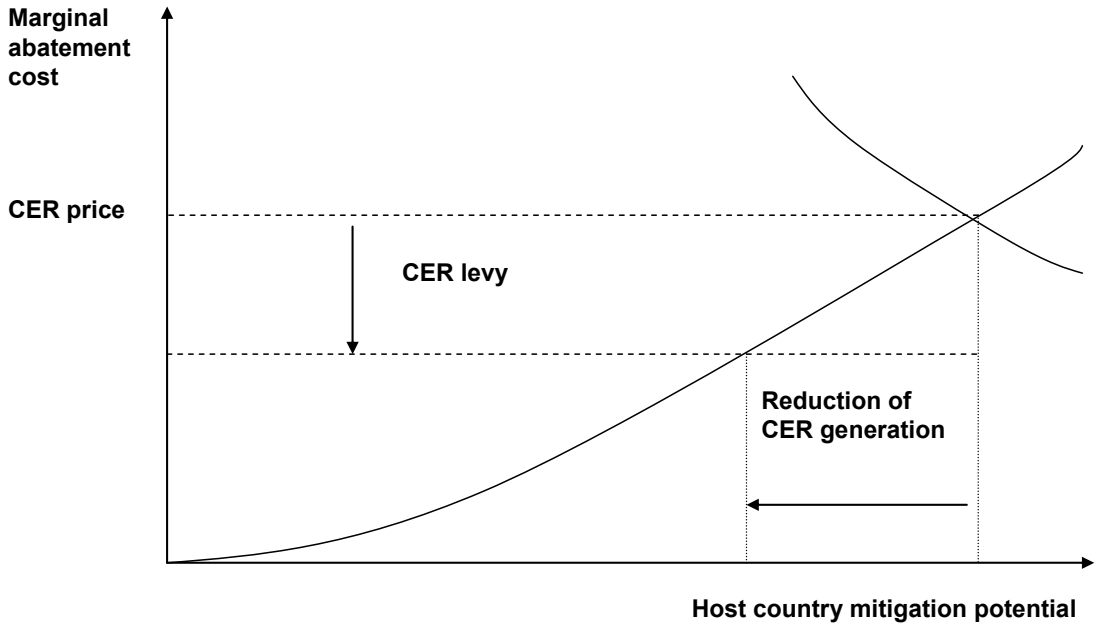
Additionality:
The re-investment of CER levy revenues at the host country scale will not address the problem of project additionality as the option involves the re-allocation of CER revenue after a CDM project has already been registered.

The overall impact on additionality depends on the reaction of CER supply to the levy and the additionality characteristics of the projects the levy is invested in. Figure 9 shows the effect of the levy on CER supply. As expected, the projects with the highest marginal abatement costs, i.e. highly additional projects, will be crowded out by the levy.

This means that the net impact on additionality depends on the slope of the marginal abatement cost curve of the CDM projects and the additionality characteristics of the projects the levy is invested in, as well as their mitigation costs if they are additional. Obviously, transaction costs of administering the levy will also lead to a dead-weight loss. Assuming all projects financed from levy revenues are additional, overall additionality increases if the marginal abatement cost curve of CDM projects is steeper than the marginal cost curve of projects financed through levy revenues. If the slope of the marginal cost curves is similar and a high share of the projects financed from levy revenues is not additional, the levy reinvestment option will increase GHG emissions. Given the difficulty of assessing project additionality, the likelihood that non-additional GHG reduction projects are financed through CER levy

revenues will be as high as in the current CDM if additionality testing is applied as per CDM rules. Thus the risk of emissions increase is high and the generic option has to be evaluated negatively (-).

Figure 9: Effect of a CER levy on CER supply



In the example, 75% of the CER levy revenues are allocated for LDCs and 25% for ODCs. Given the high share of the CER levy revenues that are allocated to LDCs, it may be argued that this example would improve the additionality of GHG reduction projects – by providing financial support to LDCs to overcome the barriers that prevent the installation of GHG abatement technology. So the share of additional projects will probably be quite high. If the marginal abatement cost curve of the projects reinvested in is flat, the option should be neutral to slightly positive.

Measurability:
While the re-investment of CER revenues will not change the existing methodologies and tools that are used to measure GHG reductions in the project based CDM; the option will increase the amount of data monitoring needed to ensure that all GHG reductions are 'real, measurable and additional'. For example, this option would require the establishment of an emissions baseline and project emissions for each GHG reduction project financed by the CER levy – this is in addition to the monitoring requirements that already exist for conventional CDM projects. Unfortunately, the institutional capacity does not currently exist to monitor these additional CER financed GHG reduction projects. Unless similar methodologies, tools and supervising bodies to the CDM are established to monitor these GHG reduction projects that are outside of the mechanism - the measurement of GHG reductions from this option will be highly uncertain. Even if the CER levy revenues were administered by an independent body - it is not guaranteed that the financial support

given to particular host countries will necessarily translate into the expected GHG reductions. For example, a GHG reduction project financed by CER revenues may experience unanticipated transaction costs that could compromise the performance of the activity.

Due to the increased monitoring demands of this option - it is expected that the re-investment of CERs by host country is likely to have a negative (--) impact on the measurability of GHG reductions compared to the project based CDM.

Timing of GHG reductions:
The re-investment of CERs at the host country scale will result in GHG reductions occurring in the future. Basically, it will take time until a fund is created with the CER levies, the decision is made on which projects to finance and the projects are implemented. Thus, emission reductions will happen in an uncertain future.

Further, depending on the types of projects that will be funded, reductions can take place over a shorter or longer time period. Generally, reductions in the energy sector start immediately, while reductions (or sequestration) in the forestry sector take place over a very long period of time, and their permanence is not secured. As LDCs are likely to have a larger potential in the forestry sector, it is likely that this will be the case if the option is implemented as described in the example. Given that political commitments change over time, emission reductions accruing over a longer time horizon could potentially become BAU emissions and therefore compromise the environmental integrity of the mechanism.

For these reasons, it is expected that the option will generally have a negative (-) impact on the timing of GHG reductions compared to the current CDM.

Overall effects on environmental integrity:
- The CER levy will crowd out CDM projects with a high marginal abatement cost, i.e. that are additional. Moreover, re-investment of CER levy revenues by host countries could lead to financing of non-additional projects if appropriate rules are not defined.
- Measurability of the emission reductions achieved through the reinvested funds will be complex, and possibly similar to the baseline and monitoring methodologies in the current CDM.
- The re-investment of CERs by host countries will result in GHG reductions occurring in the future.

<u>Contribution to sustainable development</u>

Projects with generally high SD benefits, small-scale projects:
Regardless of how the particular host countries will be selected, the overall effect of this option on SD benefits is difficult to assess. SD benefits neither depend on income levels nor development status. The selected host countries could reinvest in projects with high SD benefits, such as small renewable energy projects and

community based projects, but they could also invest in projects with less SD benefits. If the COP/MOP provides some guidance on what kinds of climate projects are acceptable for the reinvestment of funds, this uncertainty may be lowered. Another way to show preference for projects with high SD benefits in this option would be to exempt some project types that generate less CERs and high SD benefits from the CDM levy.

Projects with large profits and low SD benefits:
This option will not affect projects with large profits and low SD benefits (such as industrial gas reduction projects), unless higher levies are set for them.

Technology transfer:
Given that the COP/MOP may define general guidance regarding eligible project and/or programs for re-investment, there is an opportunity for this option to encourage the transfer of innovative technologies to the host countries participating in the mechanism. However, this could be politically contentious and it may be more realistic to assume that lower cost abatement opportunities (involving less innovative technologies) will also be eligible for CER re-investment. If the international body applied less stringent requirements on the re-investment of CERs it is likely that the option will mainly influence the location of CDM projects – the extent of innovative technology transfer would therefore be more uncertain.

However, given that the majority of host countries in the LDC group (in the example) have experienced limited levels of participation in the mechanism, it may be argued that the re-investment of 75% of CER levy revenues will to a certain extent transfer innovative technologies – simply due to the limited number of innovative technologies that currently exist in LDCs.

Thus, it is expected that the example will have a positive (+) impact on the transfer of innovative technologies in comparison to the current CDM project. In general, it is expected that the re-investment of CERs will have a neutral to positive (++) impact on the transfer of innovative technologies compared to the current CDM.

Overall effect on sustainable development:

- The effect on projects with high SD benefits depends on the choices of the countries receiving the funds, and on possible guidance by the COP/MOP.
- No effect is expected no projects with large profits and low SD benefits, unless higher levies are set for them.
- Technology transfer might be promoted, if the guidance by the COP/MOP includes the promotion of innovative technologies, or if LDCs are favoured with the funding.

Economic efficiency

Annex I compliance costs:
A CER levy would initially increase CER prices. However, the CERs levied would later return to the market when they are auctioned again. While achieving a redistribution of profits, the amount of CERs in the market would remain the same, but the total cost of acquiring them would rise by an amount equalling the market price of the levied CERs. Further, the transaction costs of administering the reinvestment would be substantial. Thus, we rate the effect on compliance costs of Annex I countries as negative.

The cost of the overall emission reductions achieved (counting also those that are generated by the emission reduction projects financed through the CER levy) will depend on the abatement costs of these latter projects. This will in turn depend on the abatement cost curves in the countries benefitted, and on the projects prioritized by the countries for financial support. If the cost of implementing the prioritized projects/programs is below the CER market price, then the additional emission reductions are cost-effective.

Mobilization of unutilized cost-effective potential:
Whether this option could contribute to mobilizing unutilized cost-effective reduction potential will depend on the general guidelines regarding eligible projects or programs for funding, and on the project choice by the receiving countries. Another important factor is the timing of the availability of funding. Under this mechanism, the funding would come from CERs that have already been issued and auctioned – thus, capital for investment in the emission reduction projects would be available up front, which is an important difference to the current CDM. This availability of upfront financing could more effectively contribute to overcome existing barriers to implementation of cost-effective reduction measures, such as demand-side energy efficiency.

Technology push for more cost-effective long-term reductions:
Again, it is not clear whether such a mechanism would provide sufficient economic incentives to push innovative, cost-effective mitigation technologies into the market. This will depend on the size of the levy and its effect on CER market prices, and also on the project types / technologies eligible for funding, as well as on broader carbon market factors.

Overall effects on economic efficiency:
- Annex I compliance costs would rise due to the levy imposed on CERs.
- Unutilized cost-effective potential could be mobilized depending on the guidelines regarding eligible projects. As financing would be available upfront (money is readily available after the sale or auctioning of the levied CERs), projects with financial barriers could be mobilized.
- A technology push is possible, depending on the size of the levy.

Technical feasibility

Data availability:
Similar to the previous option, no additional data need to be gathered for implementation except for the data related to the country group selection / categorization. Again, if this is done on the political level, one can expect most the required data to be available already (GDP/cap, HDI, historical emissions). Only sources for data on GHG emissions would have to be agreed upon, if this criterion is used for country differentiation. Thus, we rate data availability as generally neutral (0) to slightly negative (-) as compared to the current CDM, and in the example neutral, due to straightforward categorisation of countries.

Administration:
In addition, this option requires a political decision on the level of the CER levy [x%]. If the level of the levy is decided once for each commitment period, related transaction costs can be assumed on a medium to low level. However, transaction costs related to its implementation easily become significant: the CER shares need to be auctioned/sold and generated income must be re-distributed to eligible receiving countries. The latter need to establish the regulative and organizational framework to allow for the proper handling of received finances as well as proper monitoring.
Transaction costs related to post-implementation monitoring strongly depend on the monitoring requirements defined by COP/MOP. It may be noted that a direct monitoring of emission reductions achieved by the re-investments is quite challenging, as it would require establishing an emissions baseline and project emissions for each activity - similar to current CDM projects.
We therefore rate the impact of this option on administration as negative (-) to (--).

Methodologies:
As to methodological feasibility, the option in general may well be inaccurate in determination of the amount of global net emission reductions if there is no procedure to prove that the reinvestment has led to real emission reductions. In the example given above, the proposed procedures for the selection of country groups and share of revenue receipt are methodologically simple, but they are left for political decisions. If some objective criteria will have to be established, however, these procedures may well be more complex. In general, transparency of this option is high. But it is subject to change depending on the procedures for the reinvestment criteria setting. Lastly, the option is likely to be readily applicable to any host country.
We therefore rate the impact of this option as negative (-) to (--) and (-) in the example due to its straightforward categorisation of countries.

Incorporation into UNFCCC accounting:
Current UNFCCC accounting is not affected by this option since re-investment of revenues is outside of the Annex I compliance scheme and outside the CDM. Requirements related to use of funds and monitoring of effects of this option can be mandated by COP/MOP decisions for a post-2012 agreement.

We therefore rate the impact of this option on the UNFCCC accounting as neutral (0) to (-).

Overall effects on technical feasibility:

- Data for country grouping as in the example is readily available and therefore does not pose major barriers. Data sources for GHG emissions would have to be agreed upon.
- Transaction costs may be significant for the sale of CERs and transfer of funds to host countries. Host countries have to set up a framework for a proper handling of funds and monitoring of effects. Transaction costs for post-implementation monitoring depends on COP/MOP decisions.
- The methodology for country grouping is straightforward; other approaches may be more challenging. It may be methodologically challenging to determine whether emission reductions actually have occurred.
- Current UNFCCC accounting is not affected by this option. Requirements related to use of funds and monitoring of effects can be mandated by COP/MOP decisions.

Incentives and distributional effects

Incentive for developing countries to accept the option:
Convincing all CDM host countries to accept a further levy on CERs may be difficult. However, the countries that expect to benefit from this option – the countries or country groups that would receive financing from the levy – could become a strong supporter of the option.
A risk exists, if this option is regarded as a transfer of funds from developing to developing countries. If it can be demonstrated that the costs of the levy are mostly accrued by the CER buyers, then this risk would diminish. Thus, the incentive is rated as negative to positive, depending on how many host countries benefit and how many are punished through this option.

Incentive for developing countries to take up a long-term low emissions path:
While full reinvestment, especially in long-term emission reductions would lead to an emission reduction path, there needs to be a credible penalty for rechanneling revenues into projects that do not reduce emissions. This infringes on national sovereignty and thus is difficult to enforce. However, there is no further incentive to embark on emissions reductions beyond the projects paid for. At best, some spillover effects might occur. Thus the option is rated negative (-)

Neutralizing domestic CDM lobbies:
CDM lobbies may be neutralized through the mobilization of lobbies benefitting from the reinvestment. Thus the levy has a positive impact here.

Redistribution between project types and countries:
There would not be any direct redistribution among project types, but some redistribution to the countries receiving the funds. Due to the lower CER revenue for

the private sector, the willingness to embark on CDM projects might be reduced and thus project types will shift compared to a situation without the levy. Overall evaluation would be negative.

Transparency of redistributive impacts:
Levy collection would be very transparent, provided the revenue levels from auctioning / sales are published. Allocation of funds to projects might be opaque. Thus, evaluation might range from negative in the case of opaque administration to positive if the allocation is made in a transparent way.

Overall effects on incentives and distribution of projects:

- Support from developing countries for the option is limited to those countries benefiting from funding.
- No important incentive for developing countries to take up a long-term low emissions path is created.
- CDM lobbies can be neutralized.
- Redistribution to benefiting countries exists, but penalized countries will be affected. The transparency of the option may be high or low.

Negotiability

Consistency with fairness criteria:
Levies are not attractive to parties. The collection of the levy will not be fair as the capacity of a CDM project to shoulder the levy depends on many different parameters. The distribution of the levy can be squared with fairness criteria. Thus overall fairness is negative (--) to neutral (0). In the specific case, it is slightly negative (-).

Use of symbolic numbers possible:
Symbolic numbers can be used on the collection side, but on the distribution side the use will be limited. Overall evaluation is thus neutral (0).

Low complexity, governance challenges and preparation time:
The main challenge will be governance of the reinvestment. While the concept is easy to understand, it requires complex governance structures. Weak governance could lead to a race to the bottom and an overall demise of the idea. There would have to be international criteria to prevent such a race to the bottom. The evaluation is thus negative (--).

Overall effects on negotiability:
The overall evaluation is negative (-)

Summary of assessment

Reform option / Evaluation criteria	Reinvestment of CDM-revenues by host country	
	In general	In the example
Environmental integrity		
Additionality	-	0 to +
Measurability	--	--
Timing of GHG reductions	-	-
Contribution to sustainable development		
Favours projects with generally high SD benefits	0 to +	0 to +
Favours small and community-based projects	0 to +	0 to +
Disfavours projects with large profits and low SD benefits	0 to +	0
Promotes technology transfer	0 to ++	+
Economic efficiency		
Annex I compliance costs	- to - -	- to - -
Mobilization of unutilized cost-effective potential	0 to ++	0 to ++
Technology push for more cost-effective long-term reductions	0 to +	0 to +
Technical feasibility		
Data availability	0 to -	0
Administration	- to --	n.d.
Methodologies	- to --	-
Incorporation into UNFCCC accounting	0 to -	n.d.
Incentives and distributional effects		
Incentive for developing countries to accept the option	- to +	- to +
Incentive for developing countries to take up a long-term low emissions path	-	-
Neutralizing CDM lobbies	+	+
Redistribution between project types or countries	-	-
Transparency of redistributive impacts	- to +	- to +
Negotiability		
Consistency with fairness criteria	- - to 0	-
Use of symbolic numbers possible	0	0
Low complexity, governance challenges and preparation time	-	-

4.4.2 Reinvestment of CER levy in emission reduction projects by project types / technologies

Detailed description

In this case, the revenues generated by the CER levy are re-invested in certain project types / technologies aiming to reduce greenhouse gas emissions in countries without emission limitations in the post-2012 regime. The Parties to the UNFCCC

would define which project types / technologies qualify for being purchased by this mechanism and eligible ones could then apply for receiving funds on a first-come-first-serve basis.

As discussed earlier, a relatively "simple" option is to define a positive list and not to differentiate between the eligible project types / technologies any further ("option I"). However, it has not been possible to negotiate a positive list for CDM projects in the past.

Alternatively, one could define a revenue share [%] for each project type / technology ("option II"). Criteria may be sustainable development benefits, or high abatement costs (> x €/tCO_2e) of the different technological options. Further details are provided in the following example:

Example

It is assumed that the revenues generated by the CER levy amount to 1.5 billion €/yr. It is also assumed that the following project types / technologies qualify for receiving part of these revenues: photovoltaic, wind energy, energy efficiency in buildings including lightening, solar water heaters, domestic biogas, and solar cooking.

Table 9 shows the amounts of CERs that need to be purchased by project type / technology.

Table 9: Funds allocated to emission reduction projects by project type

Project type / technology	Option I		Option II	
	Share defined by Parties to the UNFCCC	Re-investment (€)	Share defined by Parties to the UNFCCC	Re-investment (€)
Project types / technologies with high sustainable development benefits				
Photovoltaic	n.a.	0 – 1.5 billion	5%	75 million
Wind energy	n.a.	0 – 1.5 billion	10%	150 million
Energy efficiency in buildings	n.a.	0 – 1.5 billion	10%	150 million
Solar water heaters	n.a.	0 – 1.5 billion	7.5%	112.5 million
Energy efficient lighting	n.a.	0 – 1.5 billion	7.5%	112.5 million
Solar cooking	n.a.	0 – 1.5 billion	5%	75 million

Detailed assessment

Environmental integrity

Additionality:
As the re-investment of CER revenues is applied after the registration of a CDM project, it is expected that this option will not improve how project additionality is assessed.

Generally, the discussion above applies. However, the option to re-invest CER revenues according to project type may ensure that the majority of these projects result in additional GHG reductions. For example, GHG reduction projects that are associated with a high level of additionality (which could be determined by IRR or barrier analysis) could be set as an eligible technology and assigned a high percent share of CER revenues. If more additional GHG reduction projects were given a higher percent share of CER levy revenues and the marginal abatement cost curves of CDM projects are steep this option encourages additional GHG reductions that are financed by CER revenues. However, if SD criteria are applied to determine project type eligibility for CER re-investment – the selection of project types with additional benefits may disadvantage project types that are highly additional in nature (e.g. HFC-23 destruction) and thus overall additionality would be negatively affected.

In the example, the following project types are eligible for CER purchase obligations – photovoltaic, wind energy, energy efficiency in buildings, solar water heaters, domestic biogas and solar cooking. It is expected that these project types will demonstrate varying levels of additionality. However, as the example defines a CER percent share for each technology, the eligible project types can be differentiated further to reflect their varying levels of additionality.

Overall, the generic option is likely to have a negative (-) to neutral impact compared to the current CDM, while the example will probably be neutral.

Measurability:
As with the re-investment of CER revenues at the host country scale, this option will have a similar impact on the measurability of GHG reductions. The monitoring data required will increase due to the need to ensure that the GHG reductions from the projects financed from re-invested CERs are 'real, measurable and additional'. The GHG reductions associated with this option may also be more uncertain than alternative proposals because the re-investment of CER revenues will not necessarily translate to GHG reductions due to additional risks i.e. unexpected transaction costs.

Due to the increased monitoring demands of this option - it is expected that the re-investment of CERs by project type is likely to have a negative (-) impact on the measurability of GHG reductions compared to the current CDM.

Timing of GHG reductions:
This option will have a similar impact on the timing of GHG reductions as the re-investment of CER levy revenues at the host country scale. It will result in GHG reductions occurring in the future, mainly because it will take time until a fund is created with the CER levies, the decision is made on which projects to finance and the projects are implemented.

Further, depending on the types of projects that will be funded, reductions can take place over a shorter or longer time period. In the example, as projects in the energy sector are selected, emission reductions will start immediately after the project is implemented.

Thus, the option will have a negative (- to --) impact on the timing of GHG reductions.

Overall effects on environmental integrity:

- The re-investment of CERs according to project type will not prevent non-additional projects from entering the CDM pipeline. It will lead to a loss of additional projects that can only be made up for by a high share of low-cost, but additional projects financed by levy revenues.
- The measurability of GHG reductions will be more uncertain if this option is introduced.
- The re-investment of CERs according to project type will result in GHG reductions occurring in the future.

<u>Contribution to sustainable development</u>

Whether this option contributes to additional SD benefits will depend on the technologies chosen and the monitoring system agreed. An important difference with the current CDM is that, in this option SD criteria for the eligible projects can be defined externally (by the COP/MOP or the funding body), without the involvement of the host country. This would allow for more uniform and objective criteria in project selection.

Projects with generally high SD benefits, small-scale projects:
This option could contribute to additional SD benefits if positive list of projects types/technologies with high SD benefits are agreed, such as small-scale renewable projects, and if the reinvested projects are properly monitored. The level of contribution will depend on the amount of levy revenue be invested. The higher the amount of investments, the higher the contribution to SD benefits would be. To show more preference on the selected projects with high SD benefits this option could exclude the same project types from collecting the levy. In the example, the option could contribute to additional SD benefits as it increases renewable energy, energy efficiency and small-scale projects that are considered to have higher SD benefits than other project types.

Projects with large profits and low SD benefits:
In general, the option will not affect projects with large profits and low SD benefits significantly. However, a higher CDM levy could be applied to HFC and N_2O projects, to make the differentiation according to SD benefits clearer.

Technology Transfer:
Depending upon which project types are selected for CER levy re-investment, this option may facilitate the transfer of innovative technologies. For the example, it is evident that project types may have been selected for CER purchase obligations based upon SD criteria. The majority of the project types selected should facilitate future GHG reductions by transferring innovative GHG abatement technologies, such as photovoltaics. However, if the criteria for selecting project types are based on levels of additionality, the implementation of this option will not fulfil its potential to encourage the transfer of innovative technology to host countries.

Due to selection of project types according to SD criteria, it is expected that this example will have a positive (++) impact on the transfer of innovative technologies in comparison to the current CDM. However, considering that project types may be selected for the re-investment of CERs that are not based on SD criteria - it is expected that this option will generally range from having a neutral to a positive (++) impact.

Overall effect on sustainable development:
- This option allows for an external definition of SD criteria for the eligible projects, which provides an advantage to the current CDM.
- Depending on how the criteria to select eligible projects are defined, projects with high SD benefits, and small-scale projects could be directly targeted.
- Projects with large profits and low SD benefits are not directly affected, unless they receive a higher levy.
- Technology transfer could be effectively promoted by including it as one of the criteria for the selection of eligible projects.

<u>Economic efficiency</u>

Annex I compliance costs:
A CER levy would initially increase CER prices. However, the CERs levied would later return to the market when they are auctioned again. While achieving a redistribution of profits, the amount of CERs in the market would remain the same, but the total cost of acquiring them would rise by an amount equalling the market price of the levied CERs. Thus, this effect is rated as negative.

The cost of the overall emission reductions achieved (counting also those that are generated by the emission reduction projects financed through the CER levy) will depend on the abatement costs of these latter projects. If this option is designed to favour innovative technologies, their abatement costs could be relatively high. If it is

designed to favour cost-effective technologies that currently face barriers to enter the CDM, then costs would be low.

Mobilization of unutilized cost-effective potential:
This option could be designed to directly finance unutilized cost-effective reduction potential, such as demand-side energy efficiency projects. Here again, the timing of the availability of funding is an important aspect. The availability of upfront financing made possible by the use of revenues from auctioning CERs could more effectively contribute to overcome existing barriers to implementation of cost-effective reduction measures than the current CDM. Thus, the effect is considered neutral to positive.

Technology push for more cost-effective long-term reductions:
Again, it is not clear whether such a mechanism would provide sufficient economic incentives to push innovative, cost-effective mitigation technologies into the market. The option entails the opportunity to target innovative technologies for funding (e.g. photovoltaics), which could lead to economies of scale in their production. This in turn could also promote a technology-push that leads to a more cost-effective long-term emissions path in Annex I and non-Annex I countries. The size of this incentive will however depend on the size of the levy, its effect on CER market prices and the amount of funding allocated to the targeted technologies, as well as on broader carbon market factors, and is thus rated neutral to positive.

Overall effects on economic efficiency:
- Annex I compliance costs will rise.
- Unutilized cost-effective mitigation potential could be mobilized depending on the criteria defined for project selection. Availability of upfront financing would make it easier.
- A technology push could be generated, if innovative technologies and/or if the effect on CER prices is significant.

Technical feasibility

Data availability:
In terms of feasibility related to data availability and related to administration, this option has the same characteristics as the option “Purchase and cancellation of CERs by project types or technologies”. We therefore rate data availability as generally neutral (0) to very difficult (- -) as compared to the current CDM, and in the example 0, due to the straightforward categorisation of project types.

Administration:
As for the option of re-investment of CDM revenues according to host countries, this option requires a political decision on the level of the CER levy. If the level of the levy is decided once for each commitment period, related transaction costs can be assumed on a medium to low level. However, transaction costs related to its implementation easily become significant: the CER shares need to be auctioned/sold and generated income must be re-distributed to eligible project types.

As for the option of re-investment of CDM revenues according to host countries, transaction costs related to post-implementation monitoring strongly depend on the monitoring requirements defined by COP/MOP. It may be noted that a direct monitoring of emission reductions achieved by the re-investments is quite challenging, as it would require establishing an emissions baseline and project emissions for each activity - similar to current CDM projects.
We therefore rate the impact of this option on administration as negative (-) to (--).

Methodologies:
As to methodological feasibility, the option in general may well be inaccurate in determination of the amount of global net emission reductions if there would be no procedure to prove that the reinvestment has led to real emission reductions. In the example given above, the proposed procedure for the selection of project types is methodologically simple, but the choice is left for political decisions. If some objective criteria will have to be established, however, the procedure is likely to become more complex. Transparency and applicability of this option largely depends on these procedures.
We therefore rate the impact of this option as (-) to (--) and (-) in the example due to its straightforward categorisation of project types.

Incorporation into UNFCCC accounting:
Current UNFCCC accounting is not affected by this option since re-investment of revenues is outside of the Annex I compliance scheme and outside the CDM. Requirements related to monitoring of effects of this option can be mandated by COP/MOP decisions for a post-2012 agreement.
We therefore rate the impact of this option on the UNFCCC accounting as neutral (0) to negative (-).

Overall effects on technical feasibility:

- Data for a differentiation between project types as in the example is readily available if based on political decisions.
- Transaction costs may be significant for the sale of CERs and transfer of funds to project types. Transaction costs for post-implementation monitoring depends on COP/MOP decisions.
- The methodology for differentiation by project types is straightforward; other approaches may be more challenging. It may be methodologically challenging to determine whether emission reductions actually have occurred.
- Current UNFCCC accounting is not affected by this option. Requirements related to monitoring of effects can be mandated by COP/MOP decisions.

<u>Incentives and distributional effects</u>

Incentive for developing countries to accept the option:
As in the previous option, convincing CDM host countries to accept a further levy on CERs may be difficult. Further, this option does not create clear benefits for a group

of countries, which would support it – thus, possible support by groups of developing countries will depend on which project types or technologies are selected for funding. A risk exists again, if this option is regarded as a transfer of funds from developing to developing countries. If it can be demonstrated that the costs of the levy are mostly accrued by the CER buyers, then this risk would diminish. Thus, the incentive is rated as neutral to negative.

Incentive for developing countries to take up a long-term low emissions path:
More than in the host-country-related reinvestment scheme, due to the higher likelihood of spillovers, a low emissions path could be reached. Therefore, the evaluation would be neutral.

Neutralizing domestic CDM lobbies:
The impact on CDM lobbies will be the same as in the country-specific option.

Redistribution between project types and countries:
There would be a clear redistribution between project types that would subsequently lead to a redistribution among countries depending on the technical potential of projects in each country. The overall effect depends on the availability of projects in each country. It is likely negative to neutral.

Transparency of redistributive impacts:
The redistribution would principally be transparent if administered centrally by the UNFCCC Secretariat. Project types and tender procedures need to be defined properly.

Overall effects on incentives and distribution of projects:

- Support for the option among CDM host countries will be difficult.
- A low emissions path could be indirectly promoted among developing countries, due to spillover effects.
- CDM lobbies may be neutralized through the mobilization of lobbies benefitting from the option.
- Redistribution among project types may lead to redistribution among host countries, depending on the choice of eligible projects. The redistribution would be transparent.

<u>Negotiability</u>

Consistency with fairness criteria:
The fairness in allocation of the funds to projects requires transparent governance. Allocation according to project types is clearly less fair than allocation to countries. The evaluation is thus negative, (-) to (- -).

Use of symbolic numbers possible:
There is no change regarding the utilization of symbolic numbers, which is thus neutral (0).

Low complexity, governance challenges and preparation time:
It might be difficult to convince countries to put sizeable resources in the hands of the UN. The decisions on governance of these resources are likely to be problematic. The evaluation is thus negative (-)

Overall effects on negotiability:
The overall assignment is negative (-).

Summary of assessment

Reform option / Evaluation criteria	Reinvestment of CDM-revenues by project type	
	In general	**In the example**
Environmental integrity		
Additionality	- to 0	0
Measurability	-	-
Timing of GHG reductions	- to --	-
Contribution to sustainable development		
Favours projects with generally high SD benefits	0 to ++	++
Favours small and community-based projects	0 to ++	++
Disfavours projects with large profits and low SD benefits	- to +	0
Promotes technology transfer	0 to ++	++
Economic efficiency		
Annex I compliance costs	- to - -	- to - -
Mobilization of unutilized cost-effective potential	0 to ++	+ to ++
Technology push for more cost-effective long-term reductions	0 to ++	+ to ++
Technical feasibility		
Data availability	0 to --	0
Administration	- to - -	n.d.
Methodologies	- to - -	-
Incorporation into UNFCCC accounting	0 to -	n.d.
Incentives and distributional effects		
Incentive for developing countries to accept the option	0 to --	-
Incentive for developing countries to take up a long-term low emissions path	0	0
Neutralizing CDM lobbies	+	+
Redistribution between project types or countries	- to 0	- to 0
Transparency of redistributive impacts	0 to +	0 to +
Negotiability		
Consistency with fairness criteria	- - to -	- -
Use of symbolic numbers possible	0	0
Low complexity, governance challenges and preparation time	-	-

5. Quantification of impacts on the international carbon market[23]

5.1 Key methodological elements

To simulate the implications for volumes and prices of the different supply and demand configurations we have used Point Carbon's CER supply model in combination with Point Carbon's long term carbon price model.

The supply model is based on a combination of analysis of empirical trends from available CDM data; marginal abatement curves; and expert evaluation of future developments. The modelling is bottom-up in the sense that it is based on estimates of annual inflow of new projects on a project type basis. Project performance, which informs the assumptions on future reduction and issuance rates, is based on data from the development of CDM so far. The historic data derives from the world's largest CDM/JI project database, which is developed by Point Carbon. In addition, we use "top down" information, in the form of marginal abatement cost curves published by the IPCC's latest assessment report, which provide guidance on maximum emission reduction potentials. The further into the future we estimate supply, the more we rely on these marginal abatement curves.

The demand model is a macro-econometric tool that projects business as usual emissions using macroeconomic drivers as the source of growth. The two demand scenarios were constructed in collaboration with UBA to reflect two possible pictures of international commitment to emissions reductions and timelines. Also using information on abatement potentials and costs from the IPCC, the model ultimately produces demand curves in the phase 2013-2020 for each of the two scenarios.

5.2 Selection of implementation options for quantitative assessment

From the eight options for utilizing the CDM to achieve global emission reductions described qualitatively above, three were selected, in accordance with UBA, for the quantitative analysis of their impacts on the global carbon market. We have focused on those options that scored highly in our assessment above.

[23] Disclaimer: The opinions contained in this section of the report (except 5.2) are those of Point Carbon. While Point Carbon considers that the information contained, analysis presented and opinions expressed are all sound, all parties must rely on their own judgement when using the information contained in this report. Point Carbon makes no representations or warranty, expressed or implied, as to the accuracy or completeness of such information. Point Carbon will not assume any liability to any party for loss or damage arising out of the provision of this report.

Discounting of CERs by host countries was selected due to its current political importance and relevance in the climate negotiations. As highlighted above, this option has the potential to improve some of the shortcomings of the current CDM, such as its unequal geographical distribution, in addition to achieving global emission reductions. There are several qualitative studies on the possible effects of discounting and on how this option could be designed, so a more macro-level, quantitative analysis seems appropriate at this stage.

Discounting of CERs by project types or technologies was selected also due to its current political relevance. Further, this option provides an opportunity to directly improve additionality of the CDM and to provide concrete financial incentives for high contributions of CDM projects to sustainable development.

The options involving ambitious baselines were not selected for the quantitative assessment due to the difficulty in modelling them, especially in the case of benchmarks for project types, as data for setting appropriate benchmarks is not available, so that they would have had to be chosen arbitrarily. Due to the limits of the model, ambitious baselines would have been modelled in a very similar way as discounting. For a future research project, modelling the CDM penetration rate discounting option would be a promising topic.

The third option chosen for modelling is CER purchase and cancellation by host countries. We consider that this is quite a new proposal on the table, which has also been endorsed publicly by some representatives of developing countries which makes it interesting to look at in more detail.

5.3 Demand: Definition of scenarios for quantitative assessment

In collaboration with UBA, two demand scenarios were identified as a backdrop to the quantitative assessment of the implementation options analysed in this report. The two demand scenarios outlines which countries will take on targets in the period 2013-2020 and what these targets will be. The following two demand scenarios were chosen (see also Table 10):

D1) No new countries take on targets compared to today, except:

a) US (0% below 1990 level)
b) Russia/Ukraine: -40% below 1990 level.

D2) With new countries taking on targets

- Mexico, South Korea, China, Brazil, Turkey will take on targets from 2013
- No new CDM projects in these countries from 2013 and onwards
- Existing CDM projects in countries taking on targets from 2013 will continue throughout the period (2013-2020)
- US (-10% below 1990 level) and Russia/Ukraine -40% below 1990 level.

In both scenarios, the allocation is reduced linearly from 2012 emissions to the 2020 target.

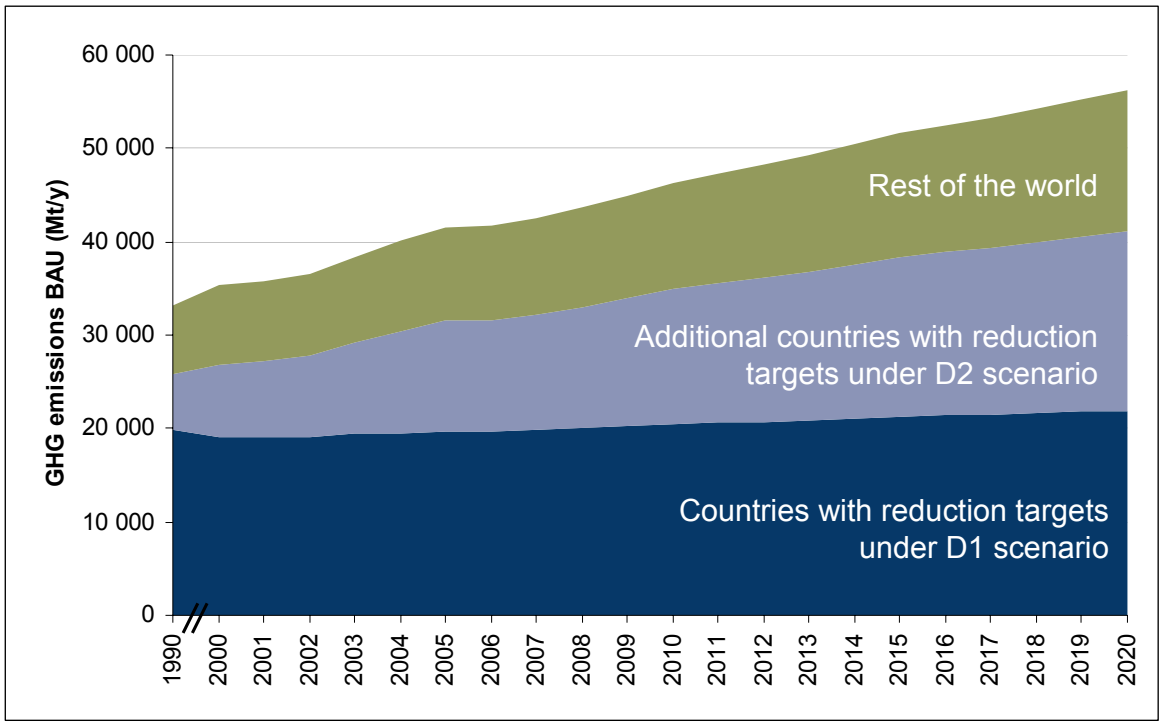
Table 10: Reduction targets in the two demand scenarios (D1 and D2)

Countries	Phase end-point target (in 2020)
Scenario 1	
US	0% below 1990 level (i.e. 1990 level)
Old Annex B (minus Russia/Ukraine)	- 20% below 1990 level
Russia/Ukraine	- 40% below 1990 level[24]
Scenario 2	
Newcomers (Brazil, China, Mexico, South Korea, Turkey)	-5% below 2012 level
US	-10% below 1990 level
Old Annex B (minus Russia/Ukraine)	-30% below 1990 level
Russia/Ukraine	-40% below 1990 level[25]

1) Global GHG emissions (BAU)

We expect that global GHG emissions reach 56 Gt CO_2e in 2020. The share of total emissions covered by countries with targets increases significantly from 45% in demand scenario 1 to 75% in demand scenario 2.

Figure 10: Global GHG emissions (BAU)



[24] Note that this converts to approximately -5% reduction from BAU
[25] Note that this converts to approximately -5% reduction from BAU

2) BAU emissions and caps for countries with targets

Figure 11 and Figure 12 show the business as usual (BAU) emissions from countries with targets and the cap they will have to meet under demand scenario 1 and 2 respectively. The area between the two lines in the graph shows the gap-to-cap, or in other words how much volume that is needed to be reduced.

Demand scenario 2 will trigger most reductions, where countries with targets will reduce 45.5 Gt CO_2e in the 2013-2020 period. This compares to a reduction of 24.8 Gt CO_2e in demand scenario 1.

Figure 11: Emissions and caps for demand scenario 1

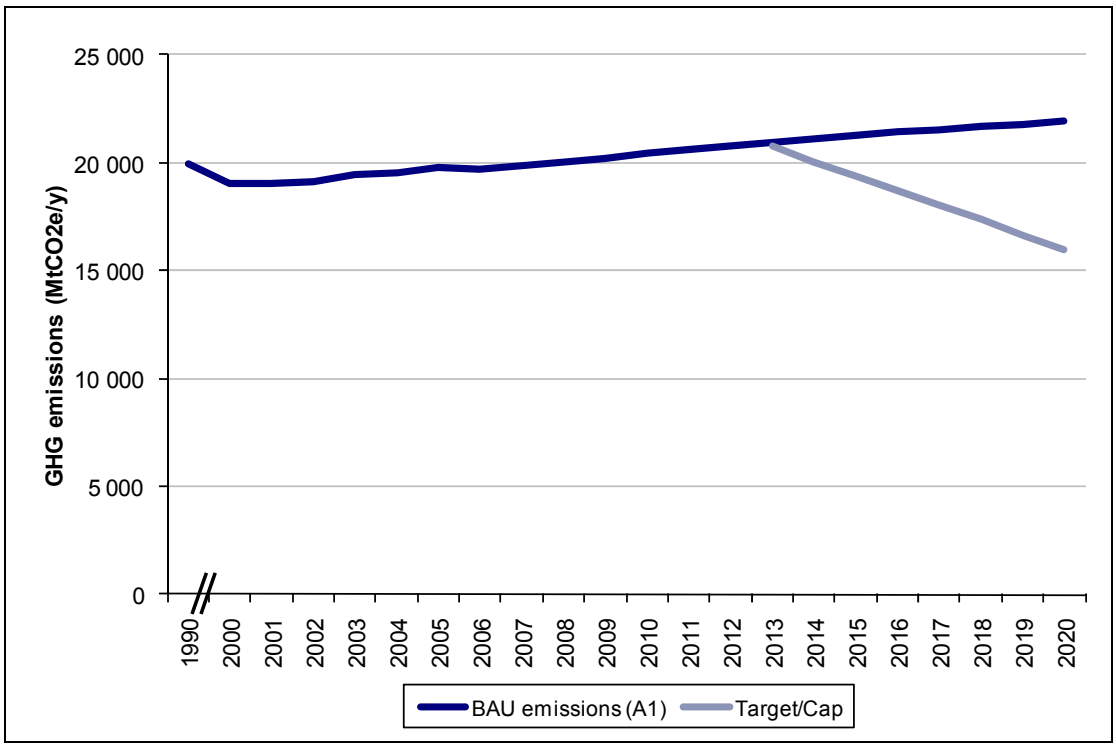
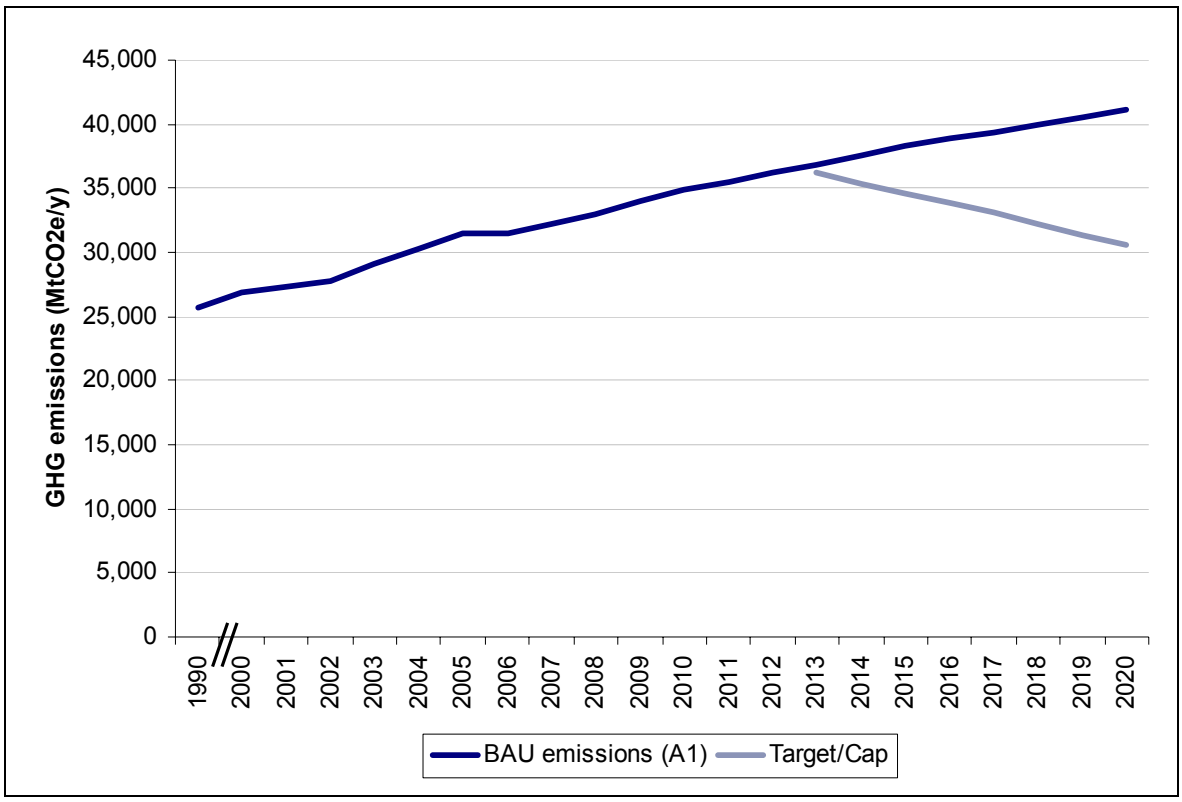


Figure 12: Emissions and caps for demand scenario 2



5.4 Supply

A CDM baseline scenario has been constructed to provide a benchmark to measure the three options analysed. The CDM baseline towards 2020 represents a continuation of the existing CDM. In other words: a continuation, and natural development, of current CDM regulation. As outlined in section 5.1, a combination of "bottom up" and "top down" information has been used in the CDM baseline scenario estimates.

1) CDM baseline

In the baseline CER supply scenario, which we [26] have defined as a natural development of CDM, we assume that:

- New methodologies are invented and implemented to realize further abatement potentials
    - In particular for the important industry sectors: cement, steel and aluminium
- Existing HFC-23 projects will provide supply only until the end of the respective crediting period (i.e. no renewal of crediting period)[27]

[26] In collaboration with UBA.

- CCS (carbon capture and storage) is not included in the 2013-2020 period
- Reduced deforestation and degradation (REDD) will not affect national compliance, in other words REDD is not included in the baseline
- Nuclear energy projects are not included
- The full IPCC abatement potentials are not realized under CDM for any of the project types due to additionality constraints, lack of awareness of CDM as well as institutional and project-specific challenges related to implementation of CDM projects.

Figure 13: CDM baseline by project types (at €30/tCO_2e)

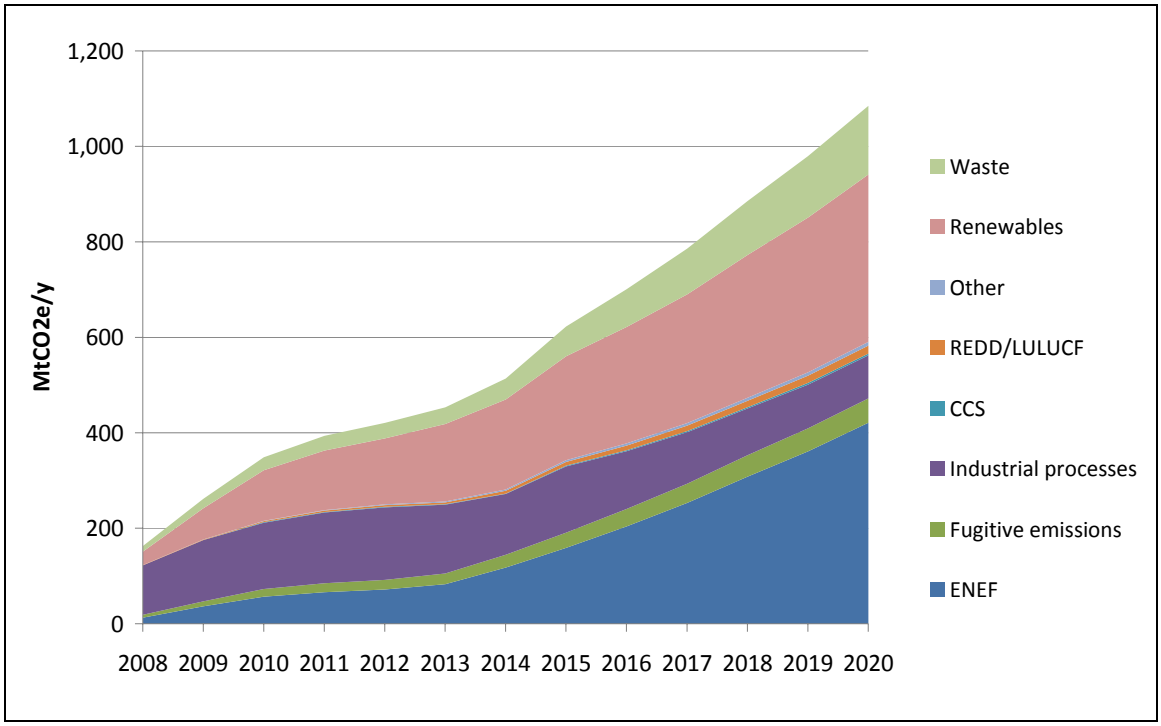
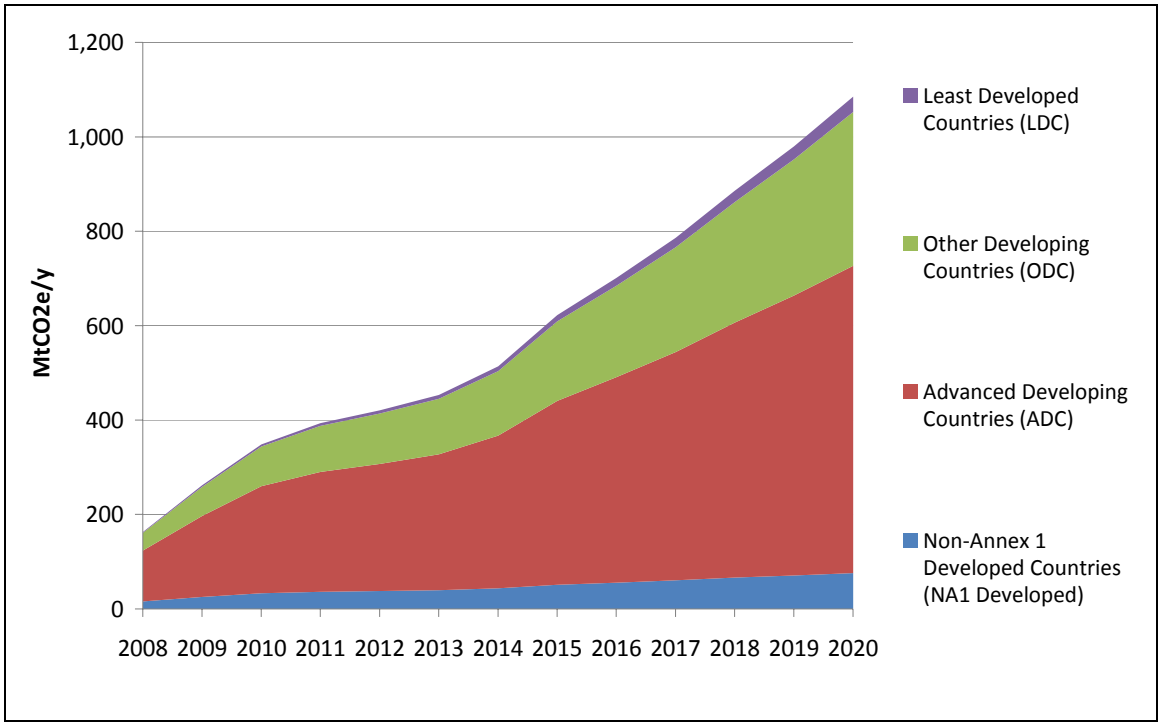


Figure 13 shows the expected reductions under CDM at a price of 30 €/tCO_2e. In the baseline scenario, the largest sector is energy efficiency, where we assume that around 60% of reductions are related to the cement, steel and aluminium sectors, while the remaining reductions come from the energy sector and other industry sectors. The second largest sector is renewable energy, where we assume the largest type is bio-energy, followed by wind, hydropower and geothermal as suggested by the IPCC. For higher prices there is also a significant inflow of PV and concentrating solar power plants. Further, we see a large growth in waste projects, dominated by landfill and wastewater projects. We expect that a large share of the industrial processes potential has already been developed in 2012. Fugitive emissions projects have been slow in their progress under the current CDM, but we allow the sector to grow somewhat due to new projects that capture coal mine methane and some oil and gas flaring reduction projects. Compared to total supply,

[27] We do not assume that ”new-capacity”-HFC-23 projects will be allowed under CDM.

only limited reductions are expected from afforestation and reforestation projects (LULUCF) under current regulation.

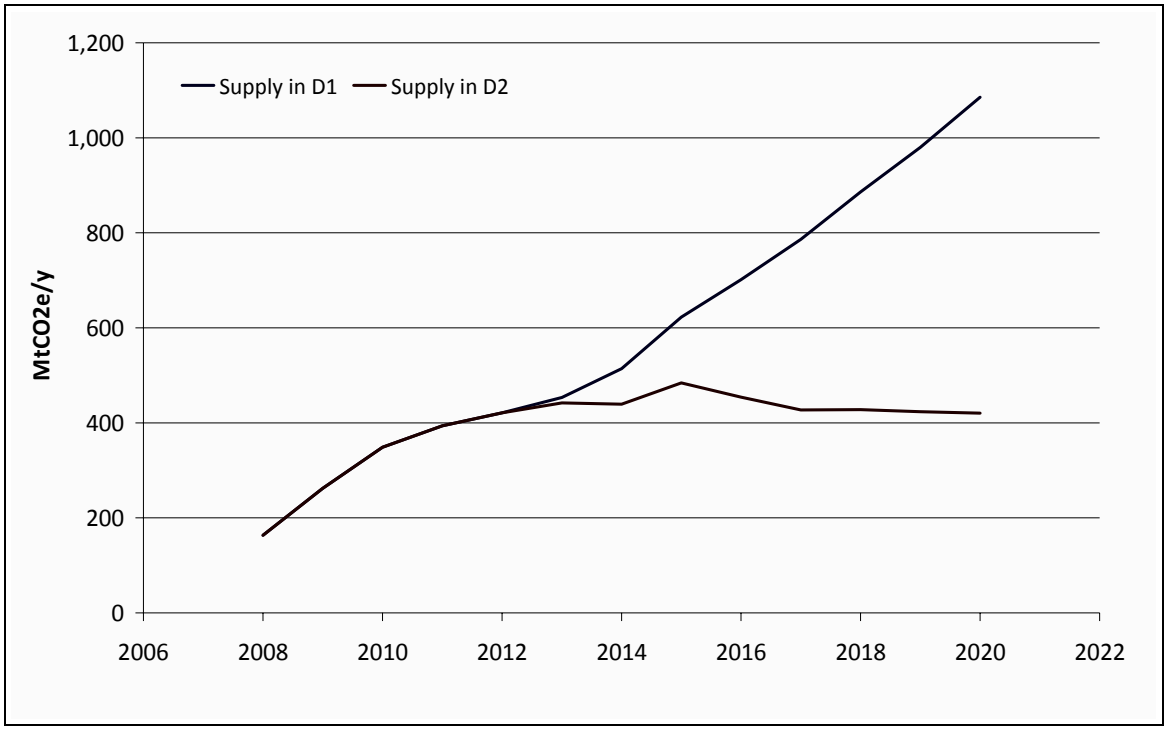
Figure 14: CDM baseline by region (at €30/tCO_2e)[28]



Most emission reductions from CDM projects are expected to take place in advanced developing countries (ADCs, 60% in 2020), followed by other developing countries (ODCs, 30% in 2020) as shown in Figure 14. Under our baseline scenario (natural development of current CDM regulation) little volume is expected from CDM projects in least developed countries (LDCs), constituting only 3% of total reductions expected from CDM projects in 2020. This is nevertheless an increase compared to the 1.75% from LDCs found in the CDM pipeline today.

[28] For a full list of countries included in the different categories, please see Table 1.

Figure 15: CDM supply in demand scenario 1 and demand scenario 2 (at €30/tCO_2e)



Demand scenario 2 implies that Brazil, China, Mexico, South Korea and Turkey all take on emission reduction targets from 2013 and onwards. In our model these countries are allowed to continue with their existing CDM projects, however with no renewal of their existing crediting period. Nevertheless, we see in Figure 15, that the CDM supply under this scenario (D2) is substantially reduced compared to a scenario where these countries would not take on targets (D1). The volume reduction seen in D2 from the five new countries taking on targets from 2013 is compensated somewhat by the growth in CDM volumes in other countries, nonetheless the D2 scenario will provide less than half of the CDM volume (in 2020) compared to the D1 scenario.

Figure 16: CDM supply as a function of price

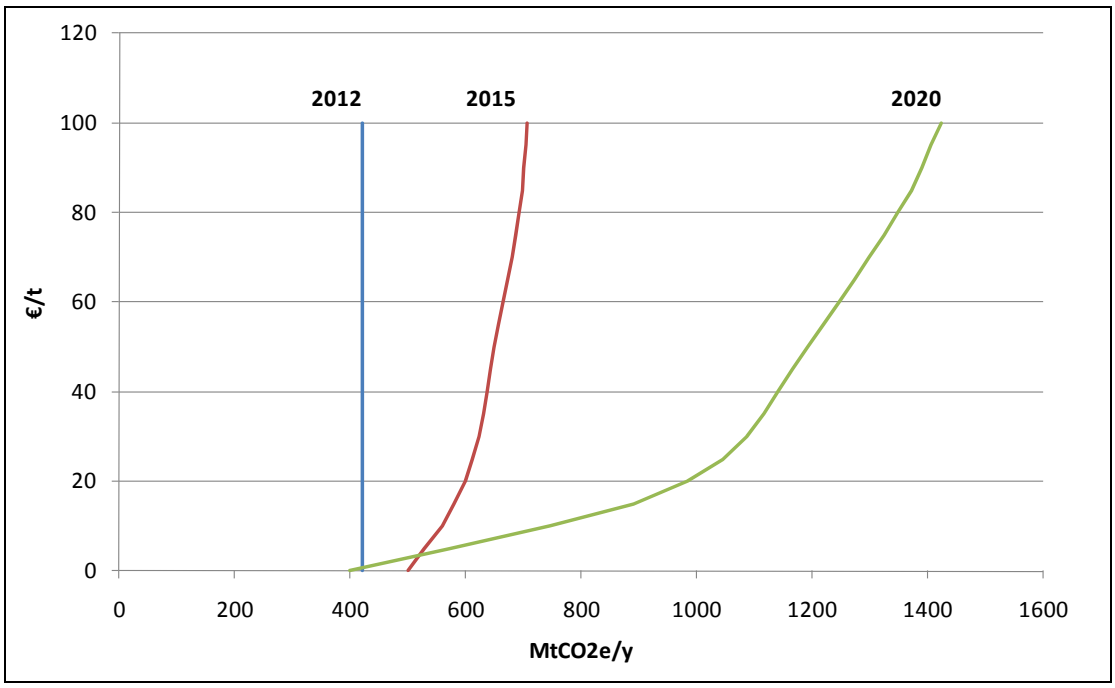


Figure 16 shows the expected reductions in 2012, 2015 and 2020 under the baseline CDM scenario for different CER prices.
The price sensitivity is largest in 2020 because projects have more time to develop and because more high-cost options are available.

2) Reform options

Discounting

Discounting can be done based on different criteria and can target different factors. In our modelling of different reform options, we have modelled two different discounting options; focusing on discount factors based on host country and project types respectively. Table 11 and Table 12 below outlines the discount factors used.

Table 11: Discount factors per host country category used in the model

Country categories	Discount factor
Non-Annex I Developed Countries (NAI Developed)	80%
Advanced Developing Countries (ADC)	32%
Other Developing Countries (ODC)	0%
Least Developed Countries (LDC)	0%

As described in the section outlining the "discounting by project type" option (section 4.1.2) a combined discount factor is suggested. A discount factor is hence applied to all project types depending on the project type's additionality and sustainable

development benefit. For modelling purposes, the following combined discount factors have been applied (see Table 12):

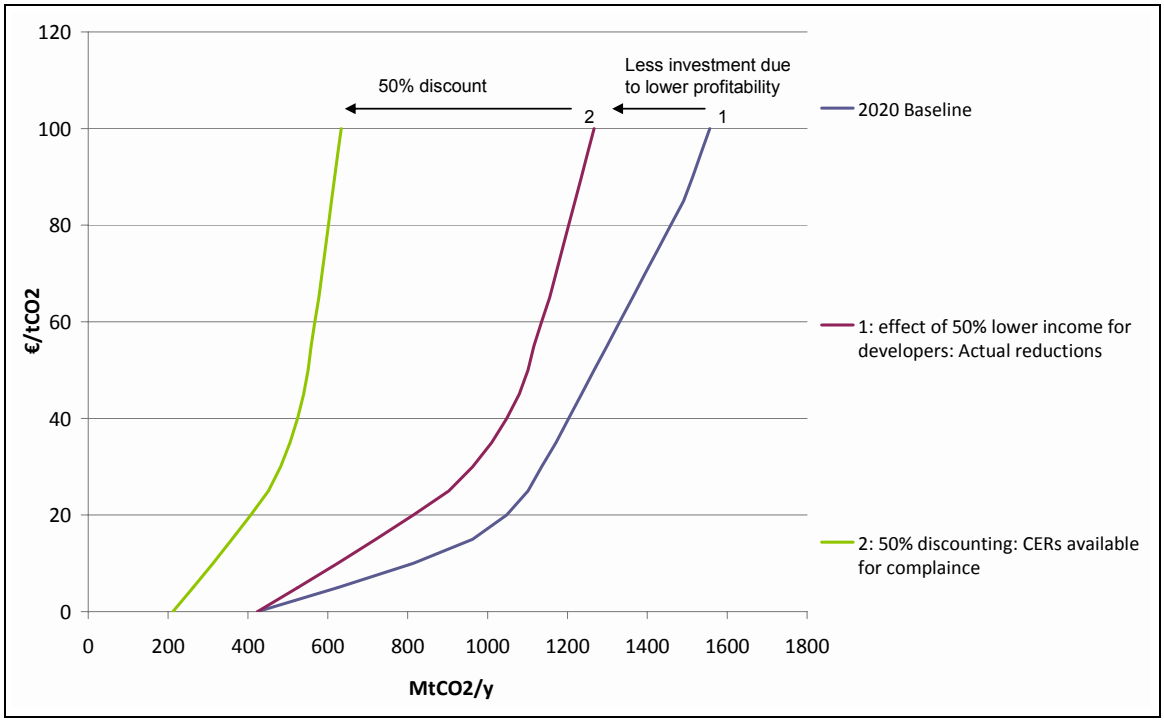
Table 12: Combined discount factors per project type used in model

General project types	Combined discount factor
ENEF	25%
Renewable energy	25%
Fugitive emissions	50%
LULUCF	50%
Other	50%
Waste	50%
Industrial processes	75%

Theoretical effect of discounting

At a given price, fewer project developers will be willing to develop projects since they only receive 50 per cent of their "actual" CERs[29]. In other words, we expect fewer investments due to lower profitability. At a given price, this supply will consequently be reduced by more than the discount rate (see Figure 17), which has been taken into account in our modelling.

Figure 17: Theoretical effect of discounting (example with 50% discounting)



[29] in a situation where the discount rate per project is 50%

Purchase and cancellation

The following data (Table 13) has been used as input in our model for the third option: “Purchase and cancellation by Annex I countries”.

Table 13: Purchase obligation for Annex I countries

Country categories	Purchase obligation for Annex I countries (guaranteed amount bought 2013-2020)
Non-Annex I Developed Countries (NA1 Developed)	None
Advanced Developing Countries (ADC)	None
Least Developed Countries (LDC) + Other Developing Countries (ODC)	500 million CERs (62.5m/y)

5.5 Results

Table 14: Summary of results

	Global carbon price/ CER price[30]	Reductions from CDM projects (CER supply)	CER supply available for compliance	Reductions in Annex I	Reductions in non-Annex I countries[31]	Total reductions
	€/tCO2e	**Gt** (Gt/year)	**Gt** (Gt/year)	**Gt** (Gt/year)	**Gt** (Gt/year)	**Gt** (Gt/year)
Demand D1						
Without CDM	**58**	**-**	**-**	**24.78** (3.10)	**0**	**24.78** (3.10)
Baseline CDM	**21**	**5.72** (0.71)	**5.72** (0.71)	**19.07** (2.38)	**5.71** (0.71)	**24.78** (3.10)
Discounting by country	**25**	**5.87** (0.73)	**3.96** (0.49)	**20.83** (2.60)	**5.87** (0.73)	**26.70** (3.34)
Discounting by project type	**27**	**5.47** (0.68)	**3.43** (0.43)	**21.35** (2.67)	**5.47** (0.68)	**26.82** (3.35)
Purchase + cancellation CDM	**22**	**Baseline +39 Mt** (Baseline +5 Mt)	**Baseline -461 Mt** (Baseline -58Mt)	**Baseline +460 Mt** (Baseline +58 Mt)	**Baseline +39 Mt** (Baseline +5 Mt)	**Baseline +500Mt** (Baseline +63 Mt)
Demand D2						
Without CDM	**42**	**-**	**-**	**25.04** (3.13)	**20.49**[32] (2.56)	**45.52** (5.69)
Baseline CDM	**36**	**3.60** (0.45)	**3.60** (0.45)	**23.06** (2.89)	**22.47** (2.81)	**45.52** (5.69)
Discounting by country	**37**	**3.52** (0.44)	**3.14** (0.39)	**23.31** (2.91)	**22.59** (2.82)	**45.90** (5.74)
Discounting by project type	**39**	**3.52** (0.44)	**2.12** (0.27)	**23.87** (2.98)	**23.05** (2.88)	**46.93** (5.87)
Purchase + cancellation CDM	**37**	**Baseline +10 Mt** (Baseline +1 Mt)	**Baseline -490 Mt** (Baseline –61 Mt)	**Baseline +270 Mt** (Baseline +34 Mt)	**Baseline +231 Mt** (Baseline + 29 Mt)	**Baseline +500 Mt** (Baseline +63 Mt)

[30] The global carbon price equals the expected CER price, since we assume no supplementarity. The price represents the average real price (2008) in the period 2013-2020

[31] This column represents current non-Annex 1 countries. I.e. reductions from new countries taking on targets in D2 is included in the four bottom rows ("Demand D2")

[32] Represents reductions from new countries taking on targets in D2, namely: Brazil, China, Mexico, South Korea, Turkey

Effects on CER prices

As we can see from Table 14, CDM is much more important as an abatement option in D1 compared to D2. Without CDM, prices would be at an average of 58 €/tCO_2e in D1 and 42 €/tCO_2e in D2. The lower price in scenario 2 mainly reflects that new countries come in with lower relative reductions efforts but large abatement potentials.

With the baseline CDM, average prices in the 2013-2020 period is 21 €/tCO_2e for demand scenario 1 and 36 €/tCO_2e for demand scenario 2. The effect of including CDM volumes is thus most important in demand scenario 1, where large low-cost abatement volumes could be imported through the CDM.

With all CDM options in this study, average prices in the 2013-2020 period will range from 21 €/tCO_2e to 39 €/tCO_2e, depending on the scenarios modelled. The baseline scenario provides the lowest prices, but when new countries take on targets and the US increases its target (D2) the price increases. As can be seen from Table 14, all options analysed will lead to higher prices compared to the CDM baseline. With the implementation of a discounting-option (either by country or by project type), the price will increase quite substantially under D1 compared to the CDM baseline scenario, and less so under D2.

Effects on volumes of CERs available for compliance

The largest CER supply volumes can naturally be expected under a scenario where no current CDM countries take on binding targets in 2013 (D1). The baseline scenario provides most CERs to the market, while out of the three options modelled, the “discounting by host country” offers most CERs to the market under both demand scenarios. The “discounting by project type” option provides the least available supply for compliance, and hence also the highest CER prices.

Effects on reductions from CDM projects

Generally CDM reductions are lower under the discounting options compared to the baseline CDM. The only exception is for discounting by country in demand scenario 1, where the higher prices stimulate sufficient investments in CDM projects even with the reduced income due to discounting.

Effect on emission reductions that take place in Annex I countries

We see from Table 14 that reductions in Annex I countries increase with the introduction of a discounting mechanism, compared to the baseline scenario. This applies under both demand scenarios. When new countries take on targets and

adopt efficient reduction policies in D2, additional emission reductions will take place in Brazil, China, Mexico, South Korea and Turkey.

Effect on emission reductions that take place in non-Annex I countries

We see from Table 14 that reductions in non-Annex I countries increase in most cases with the introduction of discounting mechanisms, compared to the baseline scenario. This applies under both demand scenarios. But under D1, discounting by project types actually reduces the CDM reductions (see CDM section above). Generally the increased emissions reductions are an effect of higher CER prices.

Net effects on GHG emissions

By giving new countries that previously did not have a target an emission reductions commitment, one naturally increases the total reductions seen[33]. In addition, the US takes on a tougher target in D2. In our model, the total reductions increase by approximately 70-80% under D2 depending on which reform option is used. This can be seen in the column to the right ("total reductions") in Table 14. All reform options provide a larger net effect on GHG emissions compared to the baseline CDM scenario, with "discounting by project type" leading to the largest net effect.

Discounting by country

D1

- The price goes up from 21 €/tCO_2e (baseline CDM) to 25 €/tCO_2e by introducing discounting by countries. The price increase is due to less available supply for compliance.
- Nevertheless, in D1 the actual reductions from CDM projects goes up due to a higher price, but as mentioned above, the volume available for compliance goes down compared to the CDM baseline due to the actual discount imposed.
- Higher prices lead to more internal abatement in Annex I countries and hence an increase in reduction volumes from Annex I countries. It is interesting to note that of the increased reductions resulting from the "discount by country"-option, the majority happens in Annex I countries.

D2

- The price will also increase under D2 compared to baseline CDM, but only with 1 €/tCO_2e (going from 36 €/tCO_2e to 37 €/tCO_2e). The limited increase in price is mainly due to the fact that advanced developing countries (ADCs) take on targets, and hence are not CDM countries anymore.
- ADCs represent a large share of CDM projects in D1. When some of these countries are not allowed to do new CDM projects anymore

[33] Assuming that the target taken on is below BAU emissions.

(under D2) the total supply from CDM projects will go down compared to D1.

- The limited increase in price leads to no impact on the CDM project reductions or CERs available for compliance, and both go down compared to the baseline.

Discounting by project type

D1

- Prices rise for the "discounting by project type" option (27 €/tCO2e) representing an increase in price from the baseline option of 6 €/tCO_2e. The price is again up due to less available CERs for compliance.
- This option leads to less available volume for compliance compared to the discounting by country option, however the amount of total reductions are more or less equal.
- Again, it is clear that the discounting option leads to more reductions in Annex I countries compared to the CDM baseline modelled.
- However, as a matter of fact, introducing a "discounting by project type" option would lead to a *reduction* in emission reduction volumes from non-Annex I countries compared to the baseline.

D2

- The "discounting by project type" in D2 leads to the highest price in our model run (39 €/tCO_2e) The CDM project reductions are equal to the "discounting by country" option, but an overall heavier discounting has been applied under the "discounting by project type" option.
- Hence, the "discounting by project type" leads to the lowest amount of available CERs for compliance.
- The limited CER supply available for compliance and the high price, lead to higher reductions in Annex I countries as well as higher reductions in non-Annex I countries. This again results in the highest total emission reduction globally out of the scenarios we have modelled.

Purchase and retirement

D1

- In theory, the effect of CER purchase and cancellation is a loss of credits for compliance which will increase global prices until the targets are met by more internal abatement and additional CDM supply.
- Nevertheless, by retiring 500 Mt CO_2e, the effect will be 500 Mt CO_2e more reductions, as this represents additional demand. With less available supply, the overall effect will be 500 Mt CO_2e more reductions; partly in Annex I and partly through the CDM. In other words, not all of the 500 MtCO_2e will be compensated by extra CDM supply.

- The cancellation of 500 million CERs (from Least Developed Countries and Other Developing Countries combined) leads to the smallest total reduction under D1, out of the three options modelled. This is defined through our (arbitrary) choice of the amount of CERs to be purchased and cancelled (500 million).
- Out of the 500 Mt CO_2e additional demand created by this purchase and cancellation option, the majority of will be replaced by reductions in Annex I countries: a staggering 92% or 460 Mt CO_2e reductions reductions under D1 and 54% or 270 Mt CO_2e in D2.
- One of the arguments for this option is to facilitate and secure the development of CDM projects in LDCs/ODCs. However, it is uncertain how many new projects this option will trigger, since we believe that these country groups will provide more than 500 Mt CO_2e over the 2013-2020 period (2000 Mt CO_2e from ODCs and 174 Mt CO_2e from LDCs to be exact). If however, the purchase obligation is set higher, or in other words the demand is increased, one might get a stronger effect on the global price and total reductions. By doing this, reductions in Annex I and non-Annex I will go up (due to the increased price).

D2

- In the D2 scenario we see the same effects as in D1 for this CDM option. However, there are some differences:
- Under D1 the purchase and cancellation option provides the smallest total reductions out of the three options modelled. However, under D2 the purchase and cancellation option leads to more total reductions than discounting by country.
- More of the reductions compensating for the additional demand of 500 Mt CO_2e will come from non-Annex I countries in D2 compared to D1 (46%, or 231 Mt CO_2e in D2 compared to only 8%, or 39 Mt CO_2e in D1).

- Although the purchase and cancellation option does not necessarily increase the CDM supply significantly or not necessarily even the supply from LDCs, the volumes we estimate for these countries are uncertain. The additional demand for credits from least developed countries will secure volumes from these countries and may increase volumes further when investments are considered less risky (e.g. by improved institutional structures). Furthermore, if the additional demand is set higher than what we have assumed in our baseline scenario (i.e. 174 Mt CO_2e from LDCs and 2000 Mt CO_2e from ODCs), potential large regional price differentiations might develop (high demand for CERs from LDCs will lead to higher regional prices). This could kick-start CDM development in least developed regions and increase volumes further. Such effects are, however, not captured by the modelling.

Conclusions

There is a number of options that could harness global emissions reductions from the CDM. Discounting of emission reductions, ambitious baselines, purchase and cancellation of CERs and using CER levies to finance further emission reduction projects are the options that have been assessed in this study. While discounting factors are likely to be set using more political criteria, ambitious baselines could also be established on the basis of technical criteria, but this would require the data to be available.

All of the options discussed could be designed so that they tackle other shortcomings of the CDM, such as its geographical distribution or its second goal of contributing to sustainable development in its host countries. This could be achieved through differentiation across host countries or project types.

Generally, options that differentiate according to countries are more likely to set an incentive for developing countries to take up commitments than options differentiating according to project types. Discounting of CERs according to countries would be the favourite in that respect. However, differentiation by host countries is generally difficult to negotiate as losers immediately are aware of their losses and as differentiation between non-Annex I countries is a sensitive issue in the climate regime.

While differentiation according to project types seems to be less sensitive, it is also difficult to negotiate due to the sovereignty concerns of developing countries when defining sustainable development, and to the different policy goals that may guide such differentiation (promoting projects with sustainable development benefits, discouraging projects with windfall profits, promoting projects with more likely additionality), which sometimes oppose each other. Having a clear definition of goals could reduce these difficulties.

Thus, while differentiation could be pursued to improve some of the shortfalls of the CDM, negotiability issues suggest that the simpler the approach chosen, the more likely it is that it will be accepted.

While CER purchase and cancellation seems to be a straightforward option for achieving emission reductions through the CDM, the decision about which CERs to purchase (from which countries or project types) will also be difficult for negotiators. Further, this option will require the willingness of Annex I countries to openly subsidize projects without being able to use the CERs.

Reinvesting a CER levy in more emission reduction projects will also be difficult to accept, due to the general unattractiveness of taxes and to the methodological complexity associated with establishing and monitoring these additional emission reduction projects.

Modelling shows that price effects triggered by discounting are limited and that emission reductions do actually increase, but in a limited way. Thus, the trade-off between the transaction costs related to negotiating and setting up any of these CDM reform options and the relatively little short-term gains in emission reductions needs to be weighted when deciding whether to pursue them. However, other considerations also influence this decision. Reforming the CDM is a goal in itself, for making the mechanism more credible and improving its environmental integrity, and also for improving or shifting incentives.

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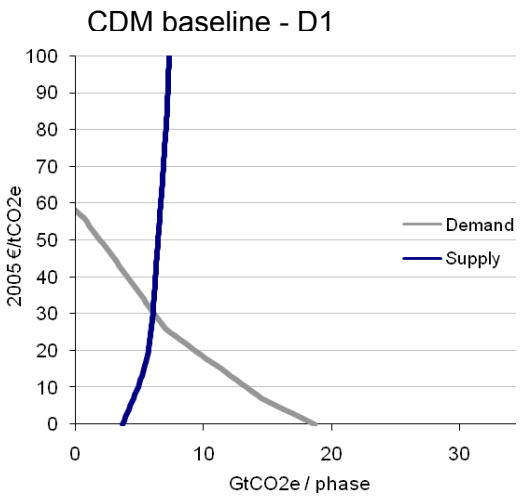
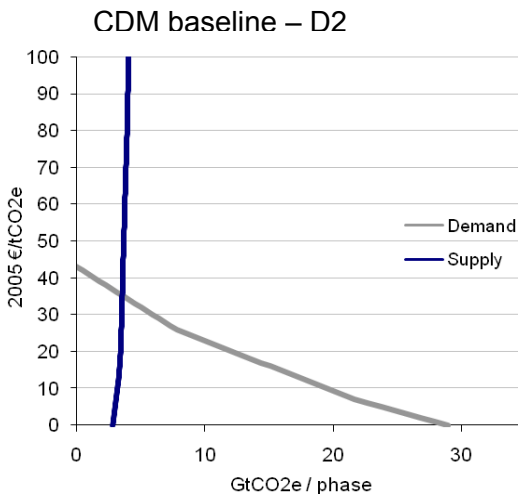
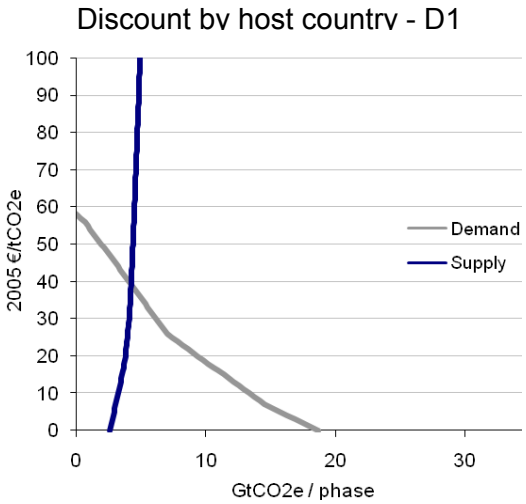
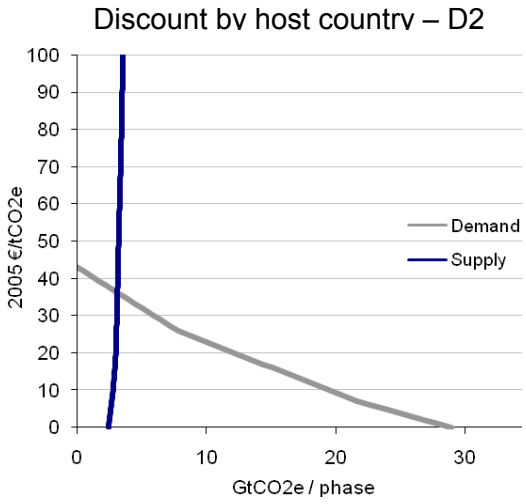
Victor, D.; Wara, M. (2008): A Realistic Policy on International Carbon Offsets. Working Paper 74. Stanford, USA, April 2008.

7. Annex

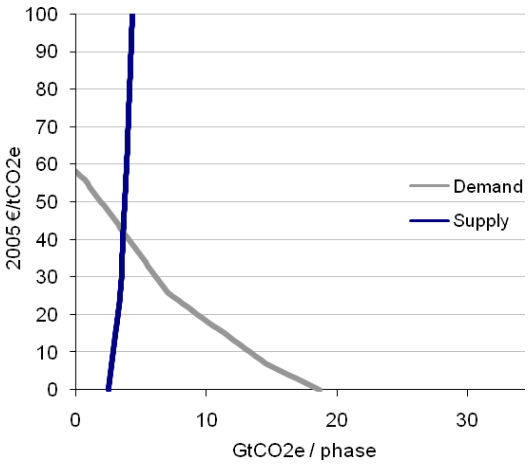

CDM baseline - D1
2005 €/tCO2e
GtCO2e / phase
Demand
Supply


CDM baseline – D2
2005 €/tCO2e
GtCO2e / phase
Demand
Supply

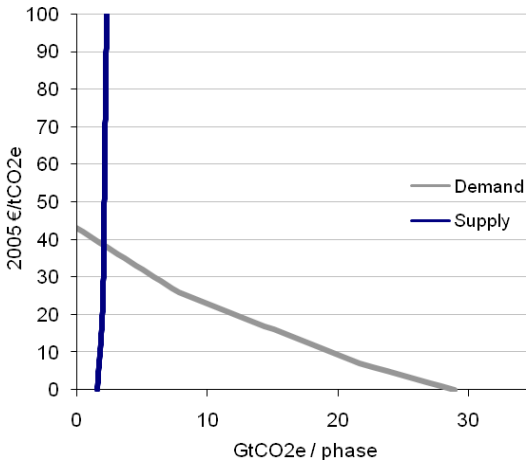

Discount by host country - D1
2005 €/tCO2e
GtCO2e / phase
Demand
Supply


Discount by host country – D2
2005 €/tCO2e
GtCO2e / phase
Demand
Supply

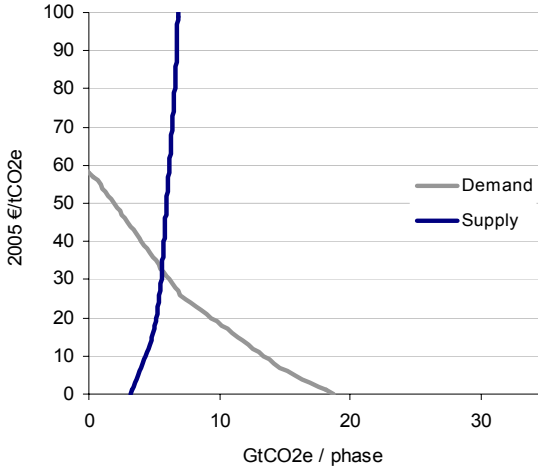
Discount by project type - D1



Discount by project type – D2



CER purchase and cancellation - D1



CER purchase and cancellation – D2