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Creation and sharing of credits through the clean development mechanism under the Kyoto Protocol

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DISKUSSIONSPAPIER

Creation and Sharing of Credits through the Clean Development Mechanism under the Kyoto Protocol

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Creation and sharing of credits through the Clean Development Mechanism under the Kyoto Protocol

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Paper presented at the experts workshop "Dealing with carbon credits after Kyoto" in Callantsoog, The Netherlands, May 28-29, 1998. The authors wish to thank participants of the Conference for helpful comments

Papers published in this series are preliminary. Comments and criticism are welcome. If you wish to quote from a paper please contact the author beforehand

Summary

The implementation of activities aimed to mitigate global greenhouse gas emissions is more cost-efficient in developing countries than in most of the industrialized world. Thus it has been a major, but contentious topic in the climate negotiations to allow crediting of emissions reduction in developing countries towards domestic emission targets of industrial countries. The Kyoto Protocol instituted a Clean Development Mechanism (CDM) that is to assure that the interests of all parties from industrialized and developing countries are equally represented. Many issues concerning the structure of the CDM remain to be decided. Crediting critically depends on these decisions. Credits should accrue only after verification. A crucial issue that influences all decisions on creation and distribution of credits is whether they are tradable. Concerning credit creation, it would be advisable not to set quotas on the share of CDM credited toward Annex-B targets as they give no dynamic incentive for innovation. To reach the latter goal, crediting should be gradually reduced in the long run. Crediting should also be related to externalities and thus be differentiated according to project categories. In a fund model, the reduction of credits could be evenly spread over all investors. In a clearing-house model it would have to be related to each project. Uncertainties should not be covered through discounting but through a compulsory insurance. Credit sharing leads to higher costs for the investors and a lower demand for CDM projects. Free negotiation of the credit sharing ratio will lead to a competition between host countries. In case of tradability, host countries could set up projects with own funds to earn credits they can sell. Such a de facto extension of emissions trading could work against the goal of inducing developing countries to voluntarily adopt emission targets. This could be promoted by making credits non-tradable but allowing banking against future targets.

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1 Introduction

The issue whether industrial countries have to reach their greenhouse gas emission targets by domestic action alone or are allowed to credit emission reduction reached through projects abroad has been a major issue in the international climate negotiations from their beginning. From an economic point of view, it is efficient to give countries with emission targets a maximum of flexibility concerning the location of emission reduction. As greenhouse gas emissions mix globally, there is no hot-spot problem. Thus, the cheapest measures should be taken first regardless where they take place. However, incentives for long-term innovation have to be provided to ensure that short-term savings do not lead to higher long-term costs (Michaelowa/Schmidt 1997).

The 1992 UN Framework Convention on Climate Change (UNFCCC) recognizes the principle of global cost-effectiveness of emission reduction in Art. 3 (3) and thus opened the way for flexibility. As it did not fix a binding emission target for any country, the need to invest in any emission reduction was not pressing. In 1997, though, industrial countries and countries in transition (Annex B countries) agreed legally binding emission targets at the Kyoto Conference. As these countries now have to start emission reduction in earnest, they are interested in cost effectiveness and strive for possibilities to earn credits through cheap reductions abroad.

Concerning the organization of emission reduction abroad, three distinct possibilities have been allowed by the Kyoto Protocol (UNFCCC 1997). The first and most far-reaching is an agreement on joint targets or “bubbles” (Art. 4). This is done by the European Union which has negotiated a joint target and distributed it to the member states. As the developing countries currently do not wish to set targets, this way is only open to industrial countries. Nevertheless, it opens interesting possibilities - such as a US-Russia bubble. Here no explicit crediting is necessary.

The second possibility is emissions trade - but after Kyoto this is also only open to industrial countries (Art. 17). Trades will be done in “Emission Reduction Units” (ERUs). The rules remain completely unclear, though, and will be subject to further negotiations.

Thus, the third option is most relevant concerning world-wide cost minimization — project-oriented emission reduction credited to the investing country. This possibility was named “Joint Implementation” (JI) in the negotiations leading to the Rio Conference. We will stick to this term even if a number of new terms for the same principle has been created since.

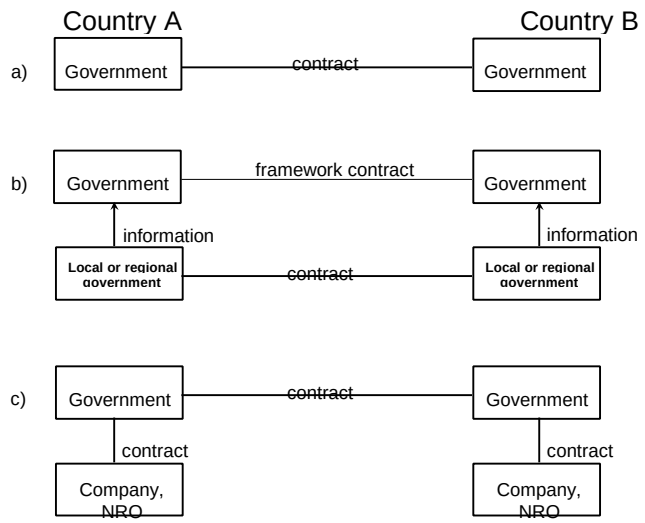
In the case of the bubble compliance will be dealt with on two occasions: first between the partners, later between the partners and the Conference of the Parties. This may act as a dou-

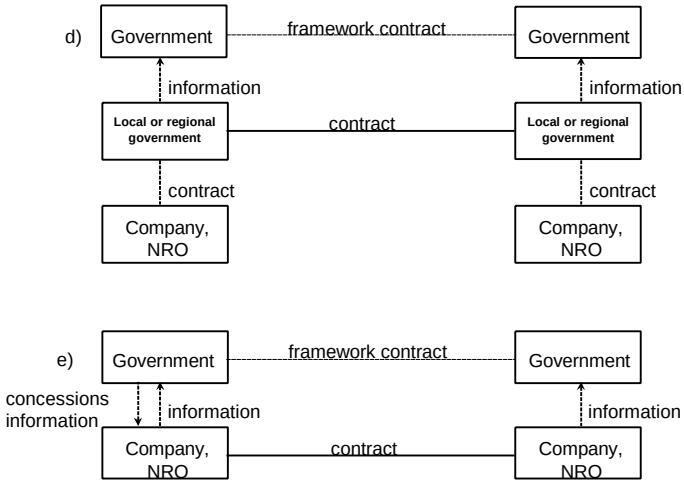
ble control against failure. When the flexibility instruments only involve countries with targets in a “closed” system, the only concern is how to enforce the targets. Emissions trading or JI, on the other hand, increases the risk of non-compliance, as the selling country at the time of the transfer does not know exactly if it will be within its budget by the end of the target period (Center for Clean Air Policy, 1998, p. 7). If the initial US position in Kyoto - to set emission limits to all parties of the Climate Convention - would have prevailed, it would have led to a global “closed” system. Developing countries would have received a limitation target superior to their actual emissions in order not to obstruct development. The monitoring of individual projects could have been left to their initiators as in the case of failures the country would have been responsible for missing the target. The disadvantage of this approach is the "tropical air problem" which comes up if limitation targets allow higher emissions than a realistic baseline would have forecast. Trading of the difference would lead to a weakening of the global target compared to a baseline. This "tropical air problem" is comparable to the existing "hot air problem" resulting from the weak target for many countries in transition.

Nevertheless, in the long run, a global closed system would be the best approach to reach a global emissions budget formulated on a scientific basis. The budget would be distributed to all parties to the Climate Convention and decline on an annual basis down to a sustainable level. Flexibility instruments would no longer lead to higher emissions, as the problems of “hot” and “tropical air” would vanish over time. Similar problems could arise in the future, though, if economic shocks lead to an sudden downturn in the emissions baseline in one or a group of countries.

There are two general options for JI: - bilateral and multilateral. The bilateral option allows countries to negotiate a framework agreement setting criteria and rules for crediting (see Figure 1). Projects are negotiated freely between entities of both countries.

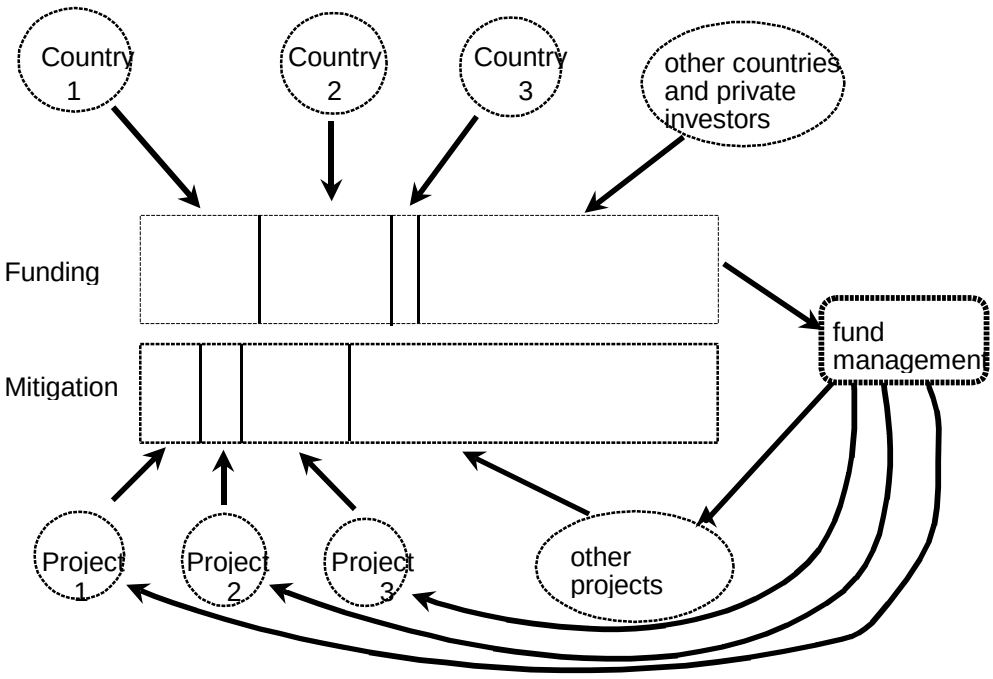
Figure 1: Bilateral Joint Implementation: Forms of contractual agreement





In the multilateral option investing countries make contributions to an independent fund (see Figure 2). Other countries can now offer JI projects and so compete for the fund's resources. Projects are selected according to their emission reduction efficiency, with positive externalities being taken into account in the case of equally efficient projects. For the duration of the project, each investor country receives a credit proportional to its share of the project portfolio. Project risks would also be pooled with the investor countries being required to pay a corresponding insurance surcharge. The necessary verification could be carried out multilaterally or by private auditors (Mintzer 1994, p. 46 under the term "mutual fund").

Figure 2: Multilateral Joint Implementation



The Kyoto Protocol (UNFCCC 1997) allows both forms of JI between industrial countries. Credits arising from verified emission reduction or sequestration from JI projects will be issued as ERUs that can be traded according to rules to be determined.

Until developing countries take up limitation targets, JI with them is linked to the so-called "Clean Development Mechanism" (CDM), which has been defined only rather vaguely in the Kyoto Protocol (Art. 12). Its main task is to prevent overstating emission reductions resulting from emissions transfers in an open system between countries with and without emission targets.

This paper discusses how credits can be allocated between investor and host countries, how this allocation depends on the design of the CDM and how externalities can be covered through discounting and differentiation in credit allocation.

2 The issue of credits in the history of climate negotiations

During the last years the question of JI has dominated many sessions of the international climate negotiations. Originally, the concept was launched by Norway and Germany in 1991. Full crediting of emission reduction abroad was envisaged (Hanisch 1991). Then, it did not encounter much resistance. At Rio 1992, JI was included in the UNFCCC as Art. 4 (2a) but not defined properly. There were no rules for crediting. In 1993, a strong dissent on the meaning and application of JI arose at the 8th session of the Intergovernmental Negotiating Committee (INC), as the developing countries rejected the concept outright and a lot of OECD countries expressed reservations (INC 1993). Many countries, e.g. France, Netherlands and Germany called for ceilings in the share of targets to be achieved via JI, i.e. minimum quotas for domestic emission reduction. For the following years there was a lot of bargaining, as the Berlin Conference of the Parties in 1995 had to decide on criteria for JI. Despite heavy opposition from the developing world, the Berlin Conference took the decision to install a pilot phase for joint projects ("Activities Implemented Jointly", AIJ) (UNFCCC 1995). This was due to the pressure of some Latin American countries, notably Costa Rica, that had already started with such projects. The reductions reached through these projects cannot be credited towards the national target of the investing country, though. In 1999 the crediting issue is to be reconsidered using experience from the pilot projects (UNFCCC 1995). While the pilot phase started only slowly because of lacking incentives, the US made clear that they would accept legally binding emission targets only if flexibility would be allowed through emissions trading and JI. While in the run-up to Kyoto the developing countries still strongly rejected both notions, the Kyoto Protocol surprisingly retained the option of JI with crediting involving developing countries. This was once again due to insistence of Costa Rica that managed to convince the hitherto skeptical Brazilians to table a proposal for multilateral JI. To appease the opponents of JI once again the term was changed to "Clean Development

Mechanism" (CDM). Because of the lack of time in the final days of negotiations many crucial points were left open and have to be decided at future meetings of the negotiation bodies.

3 The provisions of the Kyoto Protocol concerning the creation of credits through the Clean Development Mechanism

The CDM has a very important function as it oversees the relation between the (more or less) closed Annex B target system and the outside world. Art. 12 of the Kyoto Protocol outlines the CDM. The project criteria remain the same as for AIJ (Art. 12 (5)). Each project has to prove its additionality to business as usual (Art. 12 (5c)). It remains open who does certification of emission reduction but verification shall be done by independent bodies (Art. 12 (7)).

Investing countries get credit for certified emission reductions from CDM projects provided "benefits" accrue to the host country (Art. 12 (3a)). Credits here are called "Creditable Emissions Reductions" (CERs) (Art. 3 (12)). Credits accrue already from 2000 (Art. 12 (10)) in contrast to ERUs from JI between Annex I countries and emissions trading that accrue only in the commitment period 2008-2012[1]. Crediting shall be only allowed until a certain percentage of the emission target is reached (Art. 12 (3b)) that remains to be defined. It is unclear whether crediting up to this quota is in full or only partial. Besides countries, companies are allowed to invest and execute projects (Art. 12 (9)).

The CDM shall cover its administrative budget through "project revenues". Moreover, a "part" of these revenues shall be used "to assist developing country Parties that are particularly vulnerable to the adverse effects of climate change to meet the costs of adaptation" (Art. 12 (8)). This provision was included in the Protocol due to pressure of the Association of Small Island States (AOSIS). This amounts to an adaptation tax on CDM projects.

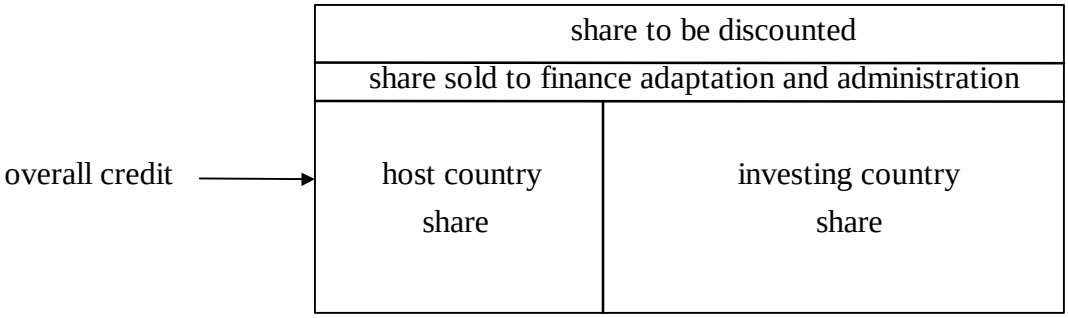
CDM rules described above can be interpreted to allow the following creation, allocation and distribution of credits, assuming credits are tradeable according to Art 3 (12):

- allocating credits only after discounting (see 5. below);
- allocating credits only after a share has been deducted and sold to finance adaptation projects and administrative expenses (Art. 12 (8));
- allocated credits accrue to the investing country in full: if the interpretation of "benefits" accruing to the host country (Art. 12 (3a)) means investment capital and project externalities only (see 4.1 below);

[1] Parkinson et al. (1998) analyze the implication of full crediting versus partial and no crediting during the period 2000-2007. Obviously, crediting over 8 additional years gives CDM projects an advantage compared to the other flexibility mechanisms. However, this advantage is offset by the financing of adaptation projects and administrative costs of the CDM.

- allocated credits are shared between investing and host country: “benefits” (Art. 12 (3a)) mean a share of the credits (see 4.3 below);
- An interesting, but daunting option would be to set the share of the investing country at zero if the host country finances the project on its own (see 4.2 below);
- allocated credits accrue to the investing country only until a quota is reached (Art. 12 (3b)), (see 5.4 below).

Figure 3: Possible credit allocation and distribution



4 Possible distributions of credits

So far the issue of distribution of credits has not been discussed intensively compared to the issues of baseline determination and verification of JI projects. Nevertheless, it has been dealt with right from the beginning of the debate. Already the second academic paper dealing with the issue of JI (Vellinga et al 1992, p. 7f) discussed the issue of credits in quite high detail. It called for a discounting of credits because of baseline uncertainties. Moreover, it discussed sharing credits and concluded that only countries with targets would be interested in a share assuming non-tradeability of credits.

In the discussion of INC 8 design of crediting was discussed to some extent but the main issue was whether to credit at all. Some NGOs proposed that companies might only receive credits after subtracting “debits” from additional emitting activities abroad (NRDC 1993). Australia called for free agreement on credit sharing between investor and host country (INC 1993, p. 8).

4.1 Credits accruing to the investing country

JI often is understood to involve the following type of transaction: a government or a private entity of a country with an emissions target finances a project in another, the host country. Credits from the emission reduction accrue only to the investor. The positive externalities from the project (see below) are deemed sufficient as incentive for the host country. If credits are fully tradable domestically and internationally, they should accrue to the entity investing,

even if it is a private company. If there is no domestic trading system, the credits should accrue to the government which, in turn should compensate the investor through emission tax reductions or reductions in regulatory requirements (Michaelowa 1996).

4.2 Credits accruing to the host country

The host country will be interested in credits when one or more of the following applies:

- it is subject to an emissions target
- it does not have an emissions target now but wants to bank credits for future commitments
- credits can be traded on a market

Allocating all credits to the host country would make no sense for a rational JI investor. Of course, the host country then could finance the project on its own and sell credits earned. No rule of Art. 12 would prevent this. Costa Rica has already pioneered this kind of trade by financing umbrella forestry and energy projects through a fuel tax and trying to sell certified tradeable offsets (CTOs).

Such a general participation of host countries in creating and trading credits would certainly lower the price of credits and ring alarm bells in many quarters, especially if credits could be traded from 2000 onwards. As host countries have no targets they have an incentive to maximize credit sales. Here the baseline issue becomes crucial: it has to be avoided that there is a reward for developing countries if their policy promotes high emissions. This is due to a perverse effect of the additionality rule: Emission reduction measures are cheapest where there is a lack of a national sustainability policy (Michaelowa/Dutschke 1997, p. 46). The CDM would have to be extremely cautious concerning baseline verification.

This problem could only be fully solved by setting an incentive for developing countries to adopt limitation targets and participate in emissions trading and JI under Art. 17 and 6. Such an incentive could be to prohibit the trading of host country credits now but to allow them to bank credits against future targets. One could also envisage a quota for credit trades for each country and banking for additional credits created.

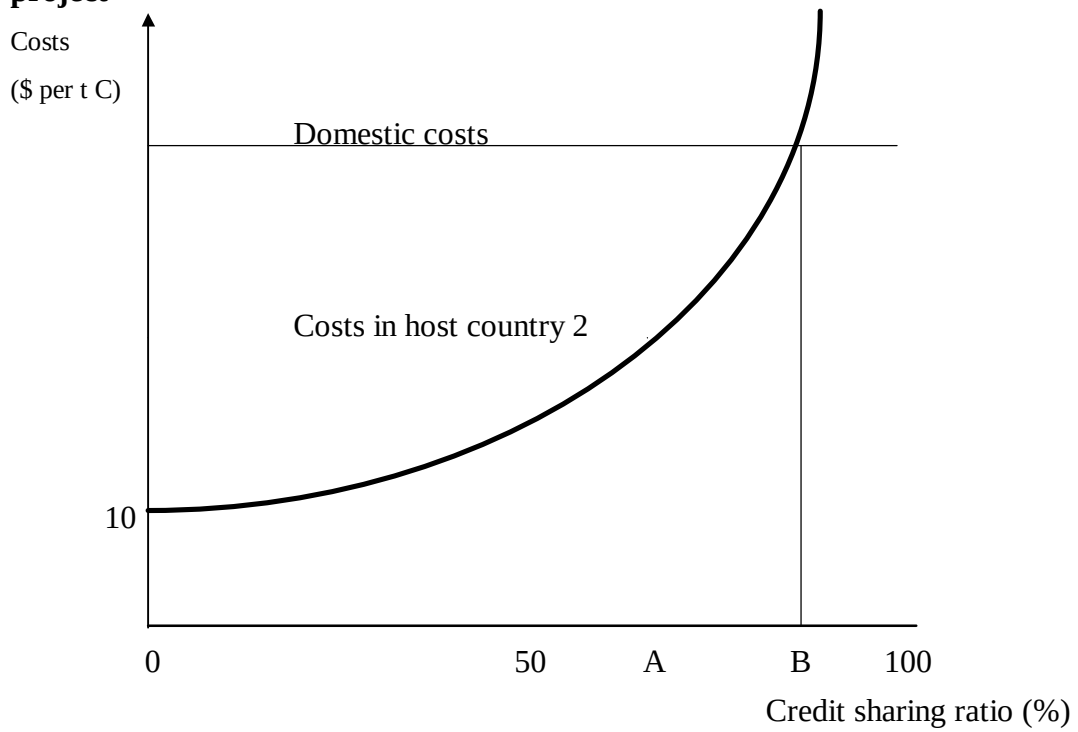
The national emission targets should be derived from national baselines developed using common rules and procedures. Any improvement in environmental legislation will then be beneficial for future compliance.

As in the case of the investing country, credits could either accrue to the entity involved in the project or the government. The former would be only relevant if credits could be traded freely. The decision on that issue could have important distributional consequences.

4.3 Credit sharing arrangements

Art. 12 (3a) could be understood to provide for a form of credit sharing and it seems that the U.S. understood it in this sense during the negotiations (Schipulle 1998, S. 2). Obviously, the investor is interested in minimizing his cost per credit unit. Any form of credit sharing raises this cost. Thus, the investor will look for other hosts where net costs after credit sharing are lower. It will no longer be interested in any JI project if credit sharing leads to a cost per credit that is higher than costs of domestic reduction (see Figure 4).

Figure 4: Influence of the credit sharing ratio on the individual decision to invest in a JI project

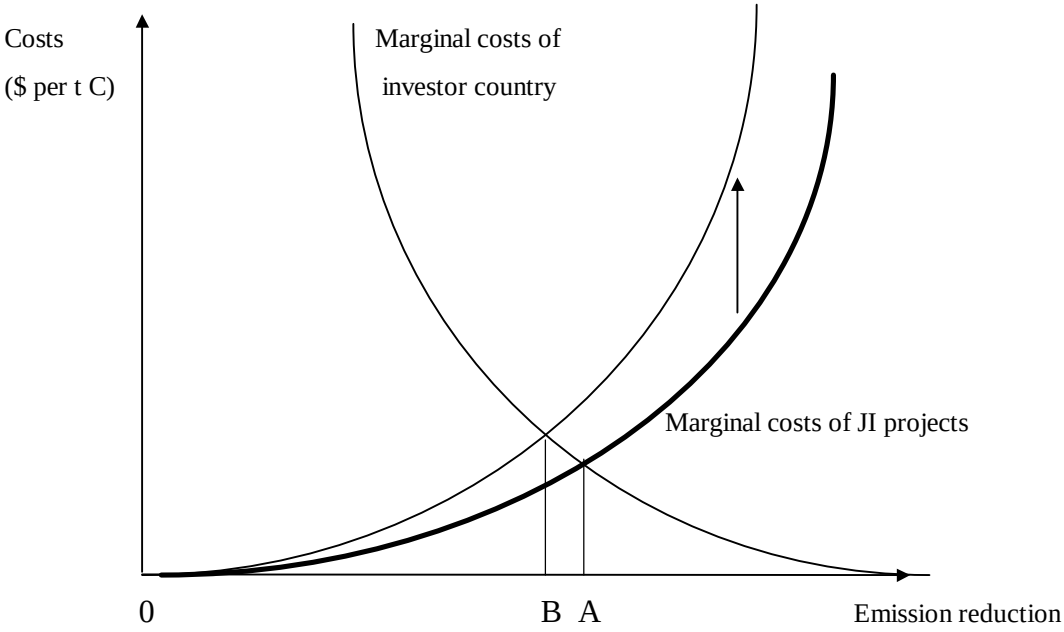


The project costs are 10 $/t C in host country 1, 30 $/t in host country 2 and 50 $ in the investor country. Costs per credit depending on the credit sharing ratio are shown by the bold line. If the credit sharing ratio surpasses A, the investor will choose host country 2 and if it surpasses B he will choose domestic options.

If one aggregates the decisions of individual investors, credit sharing will act like a tax on JI projects:

Thus the credit sharing ratio is a policy variable for the host country that needs to be chosen carefully. Competition with other host countries with lower credit sharing ratios would arise. The gains of selling or banking credits have to be balanced against the loss in demand for JI projects. This applies even if a uniform credit sharing ratio is prescribed by the COP as it could be circumvented by side-payments. Another argument against a uniform credit sharing ratio in the case of banking-only would be that less developed countries that are unlikely to adopt targets would not be able to make any use of their banked credits.

Figure 5: Effect of credit sharing on the overall demand for JI projects



Credit sharing raises the marginal costs of JI projects and thus reduces the amount of implemented JI projects from A to B.

5 Taking externalities and uncertainties into account

Crediting of CDM projects should take external effects into consideration. The focus should be on significant positive externalities which are unconnected with climate protection. It is very difficult to quantify these externalities. Most of them are interlinked and operate on different time scales. Feedback depends on the local situation.

While it is obvious that JI will lead to capital and foreign currency transfer the net effect on jobs is unclear. The transfer of modern technology could well lead to a loss of jobs, at least locally and in the short and medium term. Formation of human capital is a long-term effect and dependent on the social and political framework.

Tentative calculations (Ekins 1996) show that the benefits of emission reduction through reduction of local pollutants, especially SO_2, are comparable to the value of carbon credits under a high carbon tax of 20-200 US-$/t C. Thus externalities of carbon emission reduction would in fact be higher than the credits from JI reduction accruing to the emitter under a moderate domestic climate policy regime. As the critical loads of local pollutants have not yet been reached in many developing countries, the benefit stemming from carbon emission reduction would be lower compared to industrialized countries. Nevertheless, it seems that reduction of local pollutants will be a relevant externality particularly for densely populated countries in transition and newly industrializing countries, for example in Asia.

Biodiversity will only be protected if the social and political framework is conducive to forest protection and prevents relocation of damaging activities. Thus, only countries with a strong administrative capacity are able to take advantage of biodiversity-related JI. Costa Rica is an example for such a trend as it heavily focuses on extension of national parks through JI funds (Michaelowa/Dutschke 1997, pp. 16).

It is likely that the capital and technology transfer will be decisive for those host countries where official development aid is declining. Countries with high private capital flows will try to use JI funds to maximize positive environmental and social externalities.

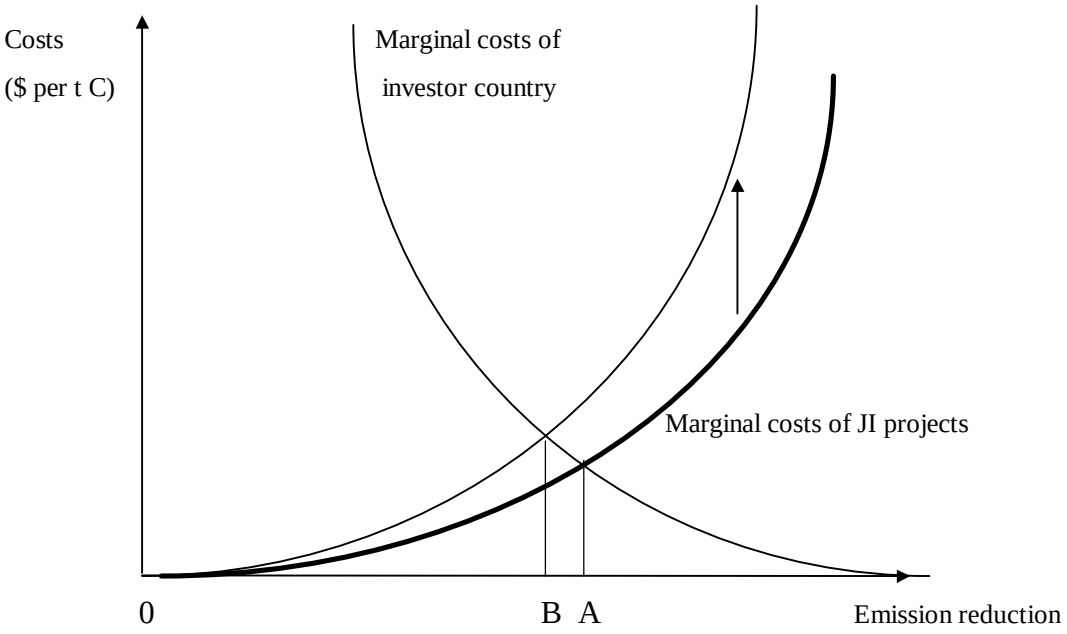
The most critical negative externality of JI could be that it reduces incentives for innovation. For a detailed discussion of this aspect see Michaelowa/Schmidt (1997). Other negative externalities could include displacement of people and loss of arable land in the case of large-scale hydro and afforestation projects. Many negative externalities are linked to poor management and an unstable political situation.

5.1 General discounting of credits

Often, general discounting of credits by a certain percentage is proposed to cover uncertainties of baseline determination, enhanced project risks etc. (see e.g. Parkinson et al. 1998). Tattenbach (1997, p. 10) has argued for a 50% discounting of the credits to achieve maximum global greenhouse gas reduction. Discounting has the same effects on project demand as credit sharing but does not lead to enhanced revenues for the host country (see Figure 6).

General discounting does not take into account differences between uncertainties and risks of projects and countries. Therefore, it is an inefficient mechanism and should not be introduced. A compulsory insurance of project risks would be a more efficient mechanism to lower risks. An approach trying to set project-category-specific discount factors to cover issues that cannot be solved through insurance is outlined below in 5.3.

Figure 6: Effect on general discounting on an investor's decision



Discounting raises the marginal costs of JI projects and thus reduces the amount of implemented JI projects from A to B.

5.2 Quotas for domestic emission reduction

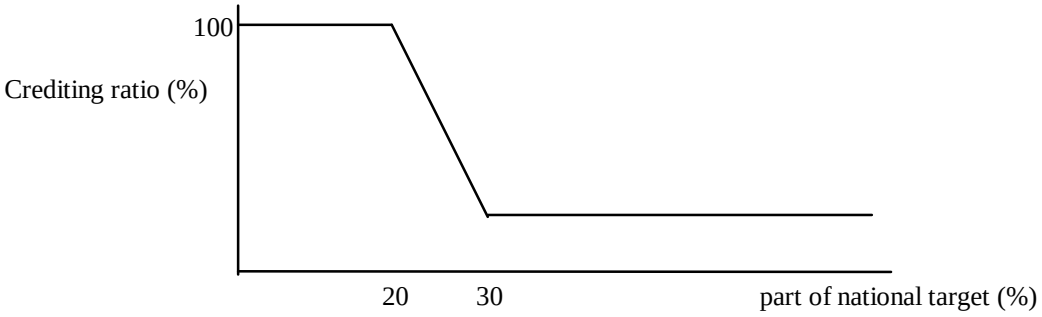
An argument against JI is that it could reduce innovation as costs of emission reduction are lowered and thus research activities are reduced. Thus quotas were discussed to guarantee a minimum amount of domestic reduction. Originally, the demand for quotas came from developing countries which felt industrialized nations might act immorally by buying their way out of their own climate obligations. The German environment minister Merkel proposes a 50% quota. Still it is an unanswered question if emissions trading among Annex-B countries is in this sense considered domestic or if the quota applies to the trading of assigned amounts as well. If the contribution of CDM measures to a national target was limited through such a quota, the following problems could arise:

- Credits from a CDM project accrue only until the quota is filled (Dudek/Wiener 1996, pp. 48-49).
- All credits from CDM projects of one investing country could loose their value if the quota had already been filled through emissions trading and JI with Annex-1 countries.

The first problem could be attenuated by setting a "soft" quota which slowly discounts the carbon credits achieved beyond this point. For instance, the quota for CDM credits could range between 20% and 30% of the national emission budget. The rule would be "first come first served", so that projects declared first would be fully credited. This would give an incen-

tive for early reductions. After reaching of 20% of the budget, the credits would be gradually discounted to a minimum of the initial value when the 30% mark of the national emission budget is reached. Any credit beyond this line will still be accounted for at the minimum rate. Thus domestic reduction would be promoted while the global reduction would be enhanced.

Figure 7: Soft quota



Another possibility would be to allow banking of credits for the next commitment period after the quota is filled. These credits would get preference in filling the next quota. Projects with long duration would thus be penalized less.

An alternative would be to treat all projects equally and to freeze all credits until the end of the target period. The government would then calculate the aggregated amount of credits. If the quota had been surpassed it would discount all credits proportionally to exactly reach the quota. If the quota was 1 million tons C and aggregated credits were 2 million tons, credits would have to be discounted by 50%. Obviously this rule would lead to high ex-ante uncertainty about the real price of credits. This uncertainty could be alleviated by banking the discounted amount for the next target period.

Besides this, discretionary filling of the quota would also be possible. Criteria could be diversification of host countries, positive externalities, degree of technology transfer etc. Such a system would lead to high transaction costs, intransparency and uncertainty, though.

Generally, it is doubtful whether a quota will lead to enhanced innovation as it has no dynamic component. Moreover, developing countries seem to have reduced their pressure for setting quotas related to the CDM as they fear that Annex-1-JI and trading might reduce transfers. One German delegate to the Kyoto Conference, Hans Schipulle, was surprised that G 77 countries did not support the EU in its effort to set a clear percentage for quotas in Art. 12 (Schipulle, 1998, p. 2). Thus we propose an alternative approach below.

5.3 Discounting of credits over time

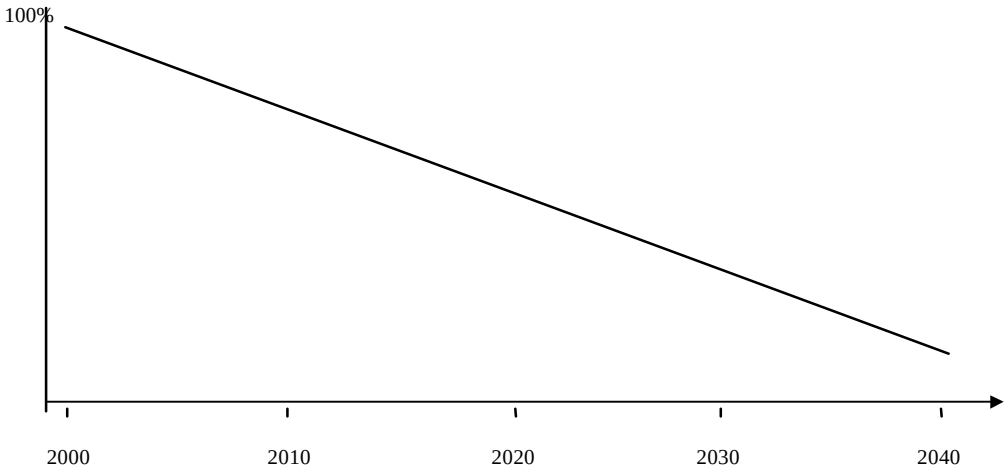
Concerning innovation, on the one hand there have to be incentives for induced innovation to reach long-term efficiency gains. On the other hand short-term efficiency gains through JI

have to be allowed. A "strategic" climate policy could entail a gliding reduction of exploitable short-term efficiency gains while raising an emission tax in the long run. This could be achieved through a gliding reduction of crediting of JI (see Figure 6). In the same period, either domestic carbon taxes are raised with a steadily rising tax rate in the industrialized countries or a system of tradable permits with a steadily sinking supply is introduced.

This policy has the following advantages:

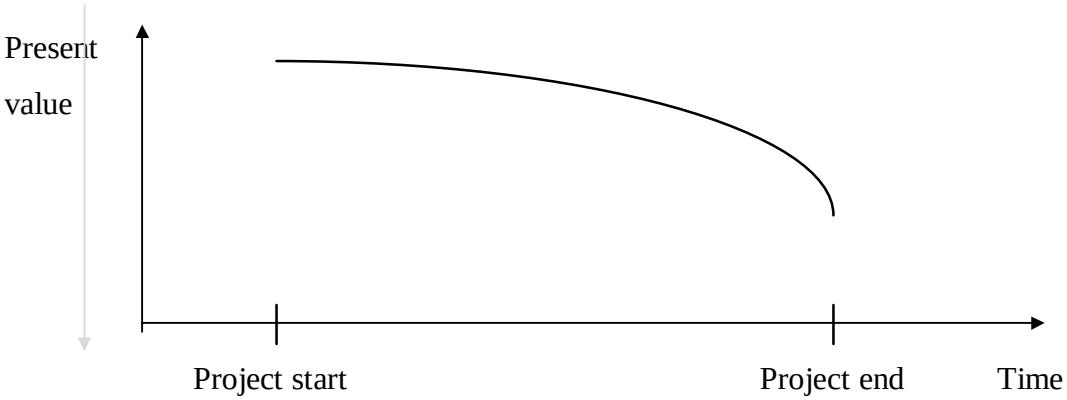
- Investors receive long-term planning data.
- Investors can get full crediting for JI reduction in the beginning which allows them to invest into long-term emission reduction strategies.
- The incentive to reduce domestic emission grows steadily as crediting falls while the emission tax rises/ the permit supply falls.

Figure 8: Decreasing crediting ratio



An indirect discounting over time is due to the date of accrual of credits (Varming et al. 1998, p. 531): if a project is credited for its whole lifetime in advance, of course, the implicit value of the credits is much higher than if it is only credited after monitoring and final verification. In the former case, credits could be sold immediately and the proceeds invested at the market interest rate. Such “up-front”-crediting would not be advisable from a monitoring and enforcement point of view. An intermediate solution would be annual issue of credits on the base of annual verification.

Figure 9: Effects of timing of credit accrual



5.4 Differentiating project categories

It is probable that many projects will have a mixture of positive and negative externalities. The question how to weight them will be crucial for the success of these projects. An exact quantification is impossible and the situation is different for each project. Because of high transaction costs, it is not advisable to calculate externalities for each project. Nevertheless, certain project types are more likely to entail positive externalities than other ones. Fossil power plants will create less jobs than demand side management programs. Renewable energy will mean no emission of local pollutants compared to fuel substitution. Forest protection projects and afforestation are unlikely to further technology transfer. The former are likely to entail biodiversity protection while the latter are not. Large-scale projects are more likely to disrupt local life and displace people than small-scale ones. The following preliminary general conclusions can be used to categorize projects and differentiate crediting, provided insurance is compulsory:

- Demand-Side-Management, production of renewable energy and forest protection can be credited fully.
- Large-scale projects such as new fossil power plants are only credited partially.
- Afforestation should be credited at a low rate as it rarely entails technology transfer and leads to land use constraints.

6 Positions of different actors concerning the design of the CDM and the creation of credits

The provisions of the Kyoto Protocol leave much space for interpretation and clarification. Thus, it is possible that the CDM is stifled by prohibitive quotas, credit sharing and financing requirements for adaptation projects that raise the costs for investors to levels that make JI unattractive. On the other hand, the CDM can be a small, efficient clearinghouse or only a

project exchange lowering transaction costs for investors. From an economic point of view, the latter option is clearly preferable. Nevertheless, there are different groups of actors that influence the design of the CDM. Each one is defined by its own set of interests, including the CDM as an institution. This is why a game-theoretical approach may help to understand the field of tension in which the Mechanism will have to move (see Lee et al. 1997).

6.1 What is at stake?

There are different rewards for the actors that could be classified as follows:

1? global climate change mitigation benefits through emission reduction or sequestration

2? credits

3? positive externalities, such as formation of human capital, transfer of technology, capital transfer, foreign currency transfer, job creation, improvement of distribution, reduction of local pollutants, protection of biodiversity for the host country part (Michaelowa 1997) and market entry, product diversification or publicity gains on the investing country's side. Last not least, JI projects offer the opportunity of microeconomic profits.

The actors will make use of the both possible JI approaches, project-related bilateral and fund based multilateral, according to the different goals they pursue.

6.2 The CDM as an actor

The CDM institution serves as a linkage between industrial countries´ investors and developing countries´ hosts. It is responsible to the UNFCCC and supervised by an executive board (Art. 12(4)). The latter is supposed to represent the global community´s demand for the prevention of a major man-made climate change. The CDM's performance will be measured against the parameters of

- number of projects approved,
- cost-efficiency,
- "real, measurable, and long-term benefits related to the mitigation of climate change" (Art 12(5b)).

Thus the CDM will permanently be torn between two extremes: Lax approval of as many projects as possible, disregarding verification and control vs. over-controlling, costly, bureaucratic procedures.

Given the nature of organizations, the second case seems more probable. CDM executives will promote the idea of a clearinghouse, because it tends to offer them more institutional

power. As they have no problem in securing their budget because it will be covered through the sale of credits, they have no incentive to streamline their operation.

Clear rules can prevent such an outcome. Incentives for the CDM employees could consist in a bonus over each project's lifetime proportional to the climate benefits it produces. Additionally a time limit for approval could give planning security to investors and hosts. In order to prevent the suspicion of one-sidedness, the CDM executive board should balance both interests involved in the Mechanism.

6.3 National JI institutions

During the JI pilot phase each participating country had to establish a JI body which approved the projects and reported the results to the UNFCCC secretariat. It was not specified in the decision which organizational form they should choose. In most cases JI offices form part of the national government, in other cases — like the US — the JI body is formally independent though it represents the official policy. Apart from governmental pressure, there is no possible incentive for a national JI body to disapprove a proposed project. Host country JI bodies will compete among themselves for approving as many projects as possible, in order to attract investors. This competition will be even stronger if they receive part of the credits. The balance of power between national and supra-national JI institutions should be weighted carefully in order to prevent a mutual blockade.

The existence of JI with developing countries and hence the CDM is important for these organizations as it will enhance their resources. A multilateral fund structure could reduce their influence and will therefore be objected by them.

6.4 Investing countries

Generally, investors will be interested to minimize the share of credits accruing to host countries.

6.4.1 Governments

Governments of Annex I countries are interested in credits through the CDM as far as they can reach the country's emission target in a publicly credible way and reduce the need for public funds. JI even offers the opportunity to act without necessarily attracting public attention. Some governments may hope for keeping climate policy off the political agenda. Keeping the public uninformed about JI activities may be motivated by different strategies (or any combination of them):

- Climate policy puts into question the growth scenarios which governmental promises are based upon.
- The government fears that by promoting a change in lifestyle it may not win the next elections. On the other hand, the government feels that climate policy is too complicated an item as to be understood at all.
- At global climate conferences too much public attention can narrow down the government's negotiation margin. This could be observed in the case of the US position at the Kyoto Conference which nearly led to the deadlock of the whole process.

Governments of big emitters will favor a small-scale CDM as transaction costs for the bilateral approach are likely to be small if many JI projects are developed. Moreover, the bilateral approach allows them to achieve positive externalities such as trade promotion that would not be provided by a multilateral fund. Small country governments would prefer the multilateral solution as it would reduce their transaction costs.

6.4.2 Big private investors

Big investors from industrial countries are typically emitters, like energy utilities, that face a domestic trading system, high domestic emission taxes or strong regulation. They will tend to develop emission reduction projects on their own, because they expect positive externalities to occur and will choose low-risk countries that offer good commercial prospects. They will be interested in credits on a short or medium range time-scale. As an international clearinghouse will increase transaction costs, it will be rejected by big investors that will prefer a pure project exchange. They will thus lobby for the bilateral approach. The big investor may take joint action with NGOs both in the investing and the host country in order to gain public opinion for the project implementation.

6.4.3 Small private investors

Small investors have no chance to develop bilateral JI projects on their own. They are interested in credits insured against failure and which bear no unexpected transaction costs. Moreover, they should be usable to cover own emission reduction obligations as well as tradeable. A multilateral fund supervised by an UN organization would fulfill all these criteria and be an ideal solution for small investors.

6.4.4 Non-governmental organizations

The term non-governmental organization (NGO) is poorly defined. Supposing a benevolent environmental NGO, it may represent the common goal of sustainable development[2]. Such NGOs seem so far to be the only players to take an interest in real global climate change mitigation benefits. In the beginning, many NGOs did not like the idea of collaborating in emission trading activities. This may be explained by the fact that the NGO's only capital is its moral authority and by joining an unfair game it could easily lose it. For the other players' public image the NGO's participation is highly interesting. Therefore they offer it material and immaterial incentives, the latter being influence in identification of the projects or accounting. As now legally binding targets exist, NGOs are more likely to participate in JI, especially if it is linked to positive developmental externalities. In order to maximize these externalities and prove activity to its members and the general public, the NGO's choice will be a concrete project-based cooperation rather than an anonymous participation in a multilateral fund. If credits that accrued directly to an NGO will be retired from the market, it can achieve a truly additional emission reduction. NGOs with development focus will lobby for allocation of a high share of credits to the host country unless they are actively involved in JI projects and fear that their revenues could be reduced. Environment NGOs could fear that free trading in credits will undermine overall emission reduction. So they will press for restrictions on trading.

6.5 Host countries

6.5.1 Governments

The host countries governments' top priority is assumed to be the prevention of social unrest while maximizing own income. Thus they will try to maximize their share of credits without deterring potential investors. Credits shall be freely tradeable. While a more equal distribution of wealth could harm the elites the government depends on, neo-liberal economies try to attract foreign investment, hoping for the wealth to "trickle down" to the population. Global climate change will typically be far beyond developing country governmental consideration, except if climate change threatens the country in a serious way such as in the case of small island states. Greenhouse gas mitigation may even be regarded as a "spleen" of the industrialized world. In general, host country governments attach most importance to externalities such as the attraction of foreign direct investment or alleviation of local pollution.

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2 Because of the great variety of organizations a classification of NGO is especially prone to generalization. For instance, many so-called NGOs are in reality mere commercial pressure-groups and thus represent emitters.

Governments of big countries with relevant domestic markets and strong relations to potential big bilateral investors will press for a high share of credits even if they are not tradeable as they are likely to adopt targets in the mid-term. They prefer the bilateral approach. Small country governments would opt for the multilateral approach as it leaves more space for a coordinated national program. In case it leads to higher prices per ton of gases reduced, this tendency will be reinforced as the revenue of small countries would rise. Whether revenue of the big countries would fall depends on demand elasticity. Less and least developed country will be only interested in a share of the credits if they can be traded as they will not adopt targets anytime soon.

6.5.2 Private companies

Due to the debt burden the developing world carries, the lack of finance is typical for host country enterprises. This leads to high interest rates and thresholds of profitability. Many projects profitable in the long run are not carried out because the investor is not able to provide foreign exchange. This is why any kind of joint venture will be welcome. While a fund solution offers more autonomy to the host country partners, the transfer of know-how could be fostered more easily in a project cooperation. Companies would not be in favor of allocation of credits to governments as they fear loss of potential investment. If credits are tradeable they will press for an allocation to themselves.

6.5.3 Non-governmental organizations

The "typical" NGO in developing countries tends to have its roots in a specific region or a specific community. It hopes to increase wealth by creating better living conditions, job opportunities or local environmental benefits. On many occasions, NGOs represent ethnic groups whose living conditions depend on the preservation of nature.

As the greenhouse effect does not range high on the political agenda of most host countries their NGOs cannot be expected to advocate global mitigation effects. The NGO's existence depends on the specific human rights situation and is marked by a constant lack of means and of external communication. A potent partner, be it at home or abroad, can be of vital importance. NGOs often hold more legitimacy than local governments. This is the asset they offer. Their support for a emission reduction or sequestration project will depend mainly on its externalities, not on the way it is financed. They would possibly demand that revenues from sales of credits accrue to the local population.

6.5.4 Theoretical conclusions

The preceding discussion shows that maximum credit creation is a goal common to most interest groups involved. In contrast, credit sharing is an issue where there is a certain collision of interests between investor and host country groups. While investing country groups press for full allocation of credits to the investor, host country governments and NGOs will call for credit sharing if they can be traded. Both bilateral projects as well as a multilateral fund are supported by a wide range of actors. That would suggest offering both possibilities.

7 Crediting and different forms of the Clean Development Mechanism

The exact allocation of credits depends on the design of the CDM. The initiators of the CDM proposal clearly envisaged a multilateral fund. Its properties concerning crediting will be discussed below compared to bilateral JI. Intermediate solutions such as a clearinghouse or an information exchange are also covered.

In any institutional structure, the CDM could provide a central or standardized insurance against the financial risk of failed JI projects. It should nevertheless differentiate its premiums according to the kind of project[3]. This insurance could be financed by retaining part of the credits and selling them on the market. Despite higher administration costs, a central insurance system can be more efficient for the individual contract partners than decentralised insurance. By spreading the insurance risk across all JI and by standardizing procedural analysis, cost reductions can be achieved which will probably lead to lower premiums than could be offered by an individual project insurance. On the other hand, lack of competition could result in inefficiency and pure economic profits for the monopolistic central insurer.

7.1 Multilateral fund

Given a multilateral solution, credits would accrue to the CDM which distributes them to investors according to their share. The multilateral approach spreads project risks among all the investors, thus giving even conservative investors and investors with little capital a chance to participate. To raise funds for adaptation measures and administrative expenses, several possibilities exist:

- a part of credits created would accrue to the CDM and sold on the market
- a fixed percentage of the investors' payments could be deducted

[3] This seems important, in order to prevent externalizing the high risks of e.g. forestry projects to other projects which are more expensive but carry lower risks.

- the CDM could set a fixed price for credits and cover adaptation and administration costs out of the difference between project costs and the fixed price.

From a transparency point of view, the first solution would be preferable.

Credit sharing could be easily introduced. Either the CDM would negotiate shares with every country where CDM projects take place or a general sharing ratio would apply to all projects (see discussion above). Investors would be subject to the average credit sharing ratio.

7.2 Clearinghouse

Besides operating as fund, the CDM could also work as international "clearinghouse", operating in the same way as a broker or as pure project exchange.

A CDM clearinghouse would accept and evaluate project proposals and invite possible investors to bid for projects (Hanisch 1991, Mintzer 1994, p. 46 under the term "Managed Market"). Credits accrue to the bidder who got the award. Credit sharing rules would apply in the same way as in the fund solution: shares of host countries would be deducted in advance. Bidders would have to provide proof of insurance. Successful bidders would have to pay a charge for administration and adaptation purposes.

Alternatively, the CDM could set a minimum price per ton of greenhouse gas prevented. The difference between this sum and a project's actual cost would be used to finance administrative costs and adaptation projects. Fixing a price in this way could also be intended to prevent host countries offering projects at dumping prices (Sanhueza et al. 1994, p. 17). This assumption disregards economic calculation; host countries will then propose only projects whose declared reduction costs are equal to the minimum price. The difference between the minimum sum and actual costs then accrues to the host country itself. A further characteristic of this concept is that below the minimum sum there is no longer any incentive for investors to carry out JI projects at all. It is, therefore, a covert quota for emission reductions in the investing country since reduction activities with lower costs per ton than the minimum sum are only carried out at home. Thus, a minimum price should not be set.

7.3 Project exchange

The leanest option for the CDM would be a project exchange where any interested party could gather quick, extensive information on all the JI projects currently available as well as on corresponding financial opportunities for funding the projects. The projects are all collected in an international database, access to which via Internet is free of charge (Mintzer 1994, p. 46, who gave this model the nice name "Hackers' Delight"). A fee is paid by the participants for successful matching to cover costs and raise adaptation project funds. Credit sharing would be

negotiated between contract partners or a fixed percentage would be deducted like an exchange tax.

8 Recommendations for future negotiations

The Kyoto Protocol has set the framework for JI with developing countries but did not define how the CDM shall work. A crucial issue that influences all decisions on creation and distribution of credits is whether they are tradeable.

Concerning credit creation, it would be advisable not to set quotas on the share of CDM credited toward Annex-B targets as they give no dynamic incentive for innovation. To reach the latter goal, crediting should be gradually reduced in the long run. Crediting should also be related to externalities and thus be differentiated according to project categories. In the fund model, the reduction of credits could be evenly spread over all investors. In the clearinghouse model it would have to be related to each project. Uncertainties should not be covered through discounting but through a compulsory insurance.

Credit sharing leads to higher costs for the investors. Free negotiation of the credit sharing ratio will lead to a competion between host countries. In case of tradeability, host countries could set up projects with own funds to earn credits they can sell. Such a de facto extension of emissions trading could work against the goal of inducing developing countries to voluntarily adopt emission targets. This could be promoted by making credits non-tradeable but allowing banking against future targets.

There are three distinct possibilities for the design of the CDM: the fund, clearinghouse and information exchange model. As the latter will not be palatable to the JI skeptics from the developing world and NGOs only the first two models are feasible. From an economic point of view it would be preferable to use both models simultaneously as each has advantages for certain constituencies. Small investors will prefer the fund as they are not able to invest in a whole project. Moreover, their risk is lowered through the portfolio effect. Big investors will prefer to invest in whole projects as they can have synergy with other interests such as market development or technology transfer.

Very critical is the provision that adaptation projects shall be financed out of CDM money earned either by retaining and selling part of the credits or a charge on investors. This completely distorts investment and biases it against CDM as domestic projects and Inter-Annex-1 JI do not have to bear such an "adaptation levy". The funding of administration costs is acceptable if there are sufficient incentives to keep these costs down such as performance-related salaries.

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