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Interest Groups and Efficient Design of the Clean Development Mechanism under the Kyoto Protocol

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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. A Clean Development Mechanism (CDM) is to assure that the interests of all parties implicated in Joint Implementation between industrialized and developing countries be equally represented. This mechanism was decided upon on the Kyoto Conference of the Parties to the Framework Convention on Climate Change, but no provisions on the construction of the CDM were taken. The authors propose it to take the form of a clearinghouse and a project fund. In the light of game-theoretical analysis and practical experience collected during the pilot phase for Activities Implemented Jointly which started in 1995, they advocate a clearly defined set of rules and incentives in order to balance the variety of interests involved and at the same time make the CDM an efficient instrument in preventing man-made climate change.

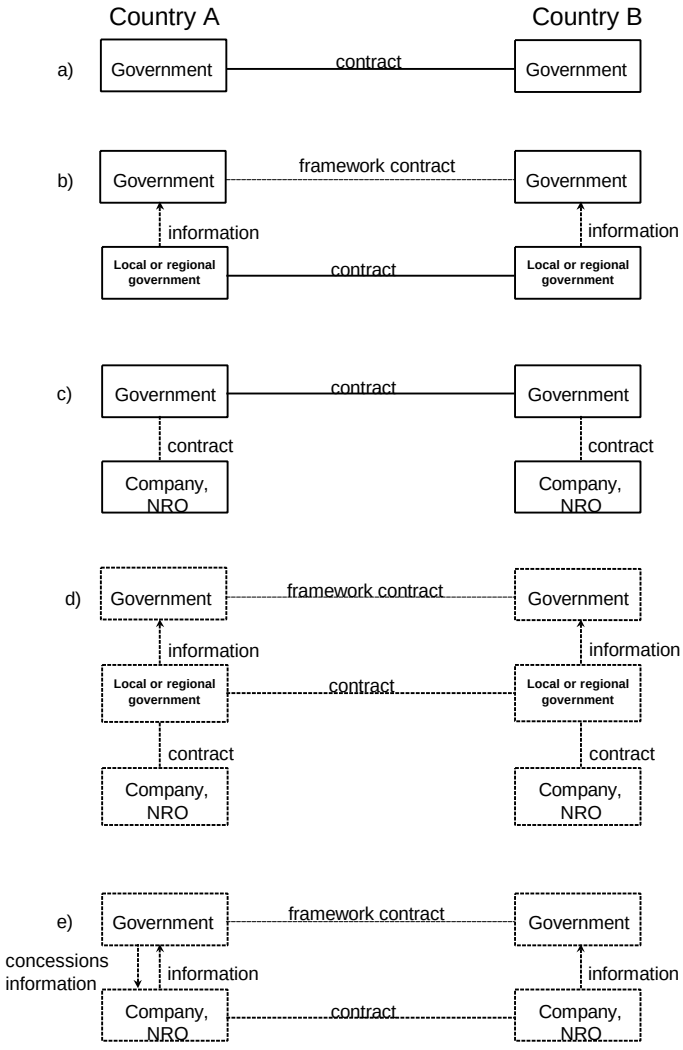
1. Introduction

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 U.N. 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 foreign emission reduction was not pressing. In 1997, though, industrial countries and countries in transition 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 flexibility.

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.

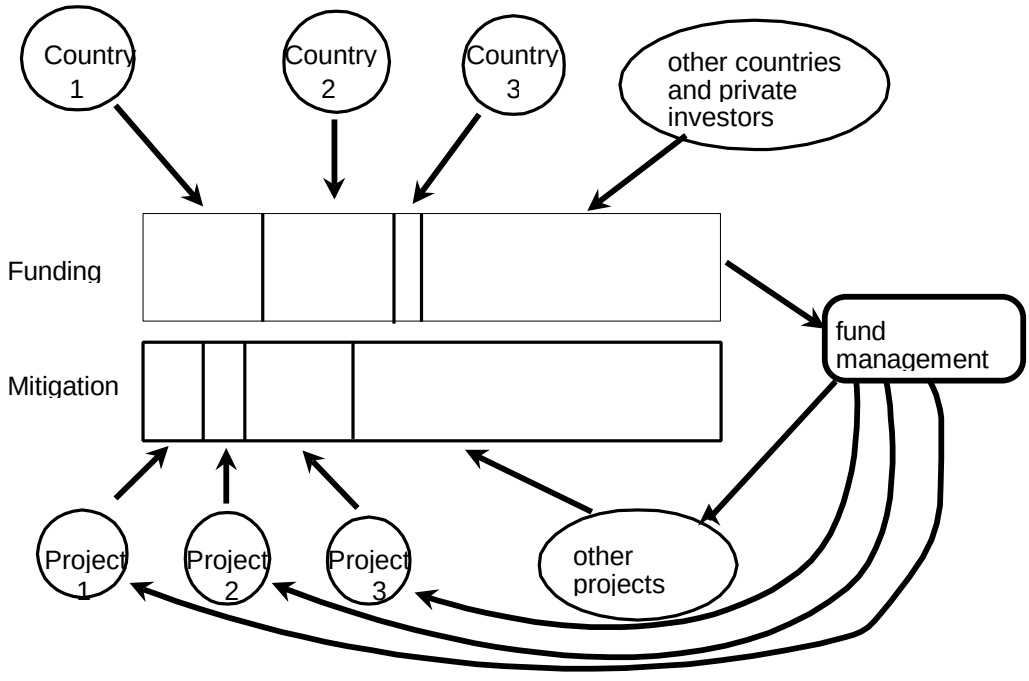
Figure 1: Bilateral Joint Implementation: Forms of contractual agreement



The second possibility is emissions trade - but after Kyoto this is also only open to industrial countries (Art. 17). Thus, the third option is most relevant concerning worldwide 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. 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.

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) opened JI up also for cooperation between industrial countries. With developing countries, both forms are linked to the so-called "Clean Development Mechanism", which has been defined only rather vaguely (Art. 12). This paper outlines a structure for its design taking into account efficiency aspects.

2. Negotiating history - from Joint Implementation to the Clean Development Mechanism

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 (Hanisch 1991). Then, it did not encounter much resistance. At Rio 1992, it was included in the UNFCCC as Art. 4 (2a) but not defined properly. 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). 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 shall 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 Clean Development Mechanism

Art. 12 of the Kyoto Protocol outlines the CDM. It states in paragraph 3 that investing countries get credit for certified emission reductions from CDM projects provided "benefits" accrue to the host country (Art. 12 (3a)). 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)).

It remains open who does certification of emission reduction but verification shall be done by independent bodies (Art. 12 (7)). The project criteria remain the same as for AIJ (Art. 12 (5)).

4. Positions of different actors concerning the design of the CDM

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 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).

4.1 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. individually creditable emission reduction or sequestration

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.

4.2 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 (UNFCCC, 1997, 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" (UNFCCC, 1997, 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.
- 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. Incentives for the CDM consultant employees could consist in a prime 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.

4.3 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. Contrarily to the CDM, the scarcity of reduction certificates on a global level is no criterion to national institutions. Host country JI bodies may even compete among themselves for approving as many projects as possible, in order to attract investors. 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.

4.4 Investing countries

Governments

Governments of Annex I countries are interested in emission 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 favour 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.

In any case, promoting mitigation measures abroad is easier than promoting mitigation at home with internal instruments. This explains why the JI pilot phase did not imply any political enforcement in the field of domestic policy of the investing country partners.

Big private investors

Big investors from industrial countries are typically emitters, like energy utilities, that face 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 creditable emission reduction or sequestration 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.

Small private investors

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

Environmental 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.[1] 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

1 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.

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, they could therefore 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.

4.5 Host countries

Governments

The host countries governments' top priority is supposingly to prevent social unrest while maximizing own income. 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. An extreme case would be that a country like Costa Rica could try to "join the club" of countries with emission targets in order to take advantage of an extended emissions trading opportunity. But in general, host country governments attach most importance to externalities such as the attraction of foreign direct investment or alleviation of local pollution. Governments of big countries with relevant domestic markets and strong relations to potential big bilateral investors would prefer the bilateral approach. Small country governments would opt for the multilateral approach as it leaves more space for a coordinated national programme. 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.

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.

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.

Theoretical conclusions

The preceding discussion shows that both bilateral projects as well as a multilateral fund are supported by a wide range of actors. That would suggest offering both possibilities. Depending on the nature of the JI projects there will be positive externalities on the investing and on the host country side. It will be important to offer all participants a balanced bargaining position. The provision that the activities are voluntary at any stage is a good basis to assure this. Thus a trade-off between the different goals the actors pursue can be achieved.

The most striking notion is that with the exception of the environmental NGOs no actor's role depends on the mitigation of climate change. Therefore accounting, monitoring and verification of emission reduction or sequestration is crucial to avoid fictitious reductions. Consequently, internationally recognized environment NGOs like Greenpeace, Friends of the Earth or the World Wide Fund for Nature could be offered seats in the board of executives of the CDM, independently of their participation in JI projects. A

special case only implicitly mentioned in the above paragraphs about governments is the Association of Small Island States (AOSIS). The interest of these states to keep the sea level stable by globally mitigating the emission of GHG is so vital they should supervise the CDM as well.

5. Lessons from the Global Environmental Facility and the JI pilot phase in Costa Rica

The discussion on the proper design of the CDM can profit from experiences of a multilateral fund investing in emission reduction projects - the Global Environment Facility (GEF). Moreover, the first results of the JI pilot phase can be taken into account. We use the example of Costa Rica, as this country has the longest experience of JI projects and developed the most elaborate host country JI structure.

5.1 The Global Environmental Facility

The coordination of transfers under the UNFCCC from the industrial countries to the developing countries is done by the GEF which is located at the World Bank. According to the UNFCCC, however, the GEF is to finance only the costs of climate protection projects which go beyond the normal costs of commercially calculated projects. The definition of incremental costs is very difficult as it depends on the project baseline. Already early financing of JI projects was discussed in this context (Newcombe/deLucia 1993), but the GEF and also the developing countries wanted to keep JI a distinct issue. While in the beginning developing countries were very skeptical of the GEF as they tended to regard the GEF as under the control of the industrialized countries, a restructuring of participation rights took the reservations of the developing countries into account in 1994. The "double majority" system (60% of the member and donor countries representing at least 60% of contributions) gives both the developing countries and the industrialized countries a de facto right of veto. Until 1997, the GEF had disbursed over 600 million US-$ for climate change issues, 440 million of which were spent on emission reduction and sequestration projects (GEF 1997).

Besides the GEF, the World Bank has recently begun building a Global Carbon Initiative (GCI) that is envisaged to function as multilateral JI fund. Several countries and companies have pledged 110 million US-$ for the GCI.

5.2 The Costa Rican experience

Within the ongoing JI pilot phase, Costa Rica has developed a dual mode for JI which bears some resemblance to the proposed CDM on a national level:

On the one hand, some projects have been able to obtain project-related financing and are operational despite the fact that reductions achieved during the pilot phase are not being credited to the investors.

On the other hand, the National Forestry Development Fund (FONAFIFO) serves OCIC, the national JI body, to collect funding for the remaining projects. OCIC offers third-party monitoring and guarantees the emission reductions in case of the failure of one project. Investors receive carbon bonds, so-called "Certifiable, Transferable Offsets" (CTOs). These documents state the following:

> *"Through the emission of this certificate, the government of the Republic of Costa Rica commits itself to maintain the validity of the amount of greenhouse gas emissions offsets specified in this certificate during the next 20 (twenty) years, and guarantee replacement offsets if it is demonstrated that the offsets here certified have not been produced in the amount indicated on the certificate."*

CTOs accrue to the reductions achieved in the year prior to their emission and are guaranteed for a period of 20 years. Thus, the mechanism is binding for the Costa Rican Government for a time margin of the longest lasting project (40 years) plus the 20 years of guarantee (given no new projects would be started in the meantime). CTOs were emitted at an initial price of 10 US-$ per metric ton of carbon mitigated in shares of 1.000 tons. Due to high verification costs this price was increased to 20 US-$ (Rada 1998, p. 1), still without the existence of a real trade. For the investing part CTOs have the advantages of offering small shares at a minimized risk and that transaction costs are already included.

As private investment has not been forthcoming during the pilot phase because of lack of domestic incentives, this is as far as the Costa Rican model goes. Up to the present, CTOs have only been emitted to country partners (Norway, US), which is not really the way they were meant. The lion's share of the investment placed by the Forestry Fund stems from a part of the internally raised fuel tax.

While most of its problems result from the investors' reservations, others may be seen as general. The latter are:

- As there is no general accounting scheme for carbon gains, specified for every type of projects, every proposal was calculated against a different baseline.[2]
- Because of their huge theoretical potential, forestry projects had the advantage over energy-related ones. On the one hand, this results from the baseline presumption projecting existing deforestation into the future, on the other hand, the risk of removal was not adequately taken into account.
- Energy related projects were additionally constrained by a national energy policy aiming to abolish fossil-fuel electricity generation by 2001. This target is widely perceived to be unrealistic.
- Each national JI body is interested in carrying out projects, regardless of their real climate benefits. There is a need for an institution which counterbalances this interest.

As far as baselines are concerned, priority should be given to dynamic ones that adapt to the change of surrounding circumstances over static baselines that are fixed at the start and never again adapted. In order to prevent penalizing sustainable national policy goals, a limited banking of internally achieved carbon gains onto a future emission target should be allowed to developing countries. This would at the same time address the issue of the supposed "loss of low-hanging fruit" by countries that allow JI projects on their territory.[3] However, in order to alleviate the uncertainties, the establishing of a country's emission target has to be put on a rational basis rather than on supra-national bargaining.

6. Efficiency properties of different forms of the Clean Development Mechanism

The initiators of the CDM proposal clearly envisaged a multilateral fund. Its efficiency properties will be discussed below compared to bilateral JI. Intermediate solutions such as a clearinghouse or an information exchange are also covered.

6.1 Efficiency disadvantages of a multilateral fund

2 On top of it, both the Costa Rican and the US JI bodies failed in checking against the calculations.

3 This objection has been put forward by developing countries in the climate negociations. They fear that, the cheap mitigation options having been opened to foreign investors, once they will have a reduction target themselves, they will only achieve it at much higher costs, the cheap mitigation options having been sold to foreign investors.

If the CDM is set up as multilateral fund, it could be less efficient than bilateral JI due to the disparate preferences of individual industrial countries as well as "rent seeking"[4] on the part of the host countries discussed above. Given a multilateral solution, it is not possible for the investor countries to select projects according to their own preferences. This, together with the likelihood of large-scale projects being preferred because of their lower administrative costs, reduces project variety. The multilateral approach spreads project risks among all the investors, thus giving even conservative investors and investors with little capital a chance to participate. However, the incentive for project partners in the host country to minimize reduction costs would be lost as the difference between the price of emission reductions negotiated by the CDM and the investor country and the corresponding marginal reduction costs accrues to the CDM. A bilateral solution, which generates greater identification with the project in hand, would encourage technological innovation and provide stronger profit incentives for the host party.

Furthermore, there is a danger of institutional inefficiency similar to that witnessed in some subsidiary organizations of the UN. As the CDM has a guarantee that its administrative costs are covered by the investors, its incentive to keep these costs low is very small. Moreover, the diversion of a share of project revenues for climate change adaptation measures raises the cost of JI and thus lowers global abatement efficiency. To raise these funds, several possibilities exist. The CDM could deduce a fixed percentage of the investors' payments to raise these funds.

6.2 Efficiency advantages of the fund

Compared to bilateral JI, the CDM fund would have efficiency advantages in the following fields: Efficient emission reductions appear possible in principle since projects from any country can be selected. Transaction costs can be reduced significantly, as the CDM has a much steeper learning curve due to the great number of projects than individual investor countries. The GEF's experience in climate protection projects and the World Bank group's accumulated expertise could facilitate the selection and evaluation of JI projects if the CDM was situated at the World Bank. The CDM uses the preparation done to set up the GCI. The concerns of developing countries could be alleviated through allowing for a double majority voting system right from the beginning.

6.3 Efficient design options

4 "Rent seeking" is the economic term used for the attempt to retain monetary resources without offering an economic service in return.

Multilateral fund

The described barriers to an efficient functioning of a CDM fund can be overcome by designing it properly. Salaries of CDM officials could be linked to performance. Transparency has to be ensured through third party auditing by accountancy firms, technical surveillance bodies or environmental associations and publication of project data.

The CDM should develop a standard contract which simply require the addition of specific data and regulations for individual projects. This would on the one hand ensure that the project runs as smoothly as possible, and on the other hand keep the transaction costs to an "acceptable" level. Free amendment agreements for each of the various sectors are conceivable here for example. Standard contracts of this sort should contain the following:

- Quantitative project targets and schedules (project phases, level and duration)
- Financial arrangements
- Contingency plans for unexpected project developments
- Legal footing (liability and sanctions)
- Evaluation and verification.

The CDM should also streamline verification procedures by having all projects verified through independent auditors. Spot checks could then be done by an expert panel of SBSTA.

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 tenders for projects. This approach differs from the fund approach in that projects are not bundled together in a portfolio. Invitations of tenders are posted worldwide and investors can then submit applications. The emission reductions are credited to the successful applicant's home country (Hanisch 1991, Mintzer 1994, p. 46 under the term "Managed Market"). A large-scale project could possibly be split into several lots. Compared to bilateral JI, the administration costs generated by a central institution are more than compensated for by the potential investors' individual cost advantages. The cost of locating suitable partners and information costs are much lower than searching on an individual basis and also reduce market entry barriers. The administration costs of a project, which are shared proportionally by the project partners, will also fall as the number of projects

and participants increases. Smaller projects, where administration costs form a large proportion of the total costs, would benefit in particular. Project brokerage and placement must not be overly restrictive or complicated. The clearinghouse can help to attract additional project hosts and strengthen basic confidence in JI projects.

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.

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 delightful name "Hackers' Delight"). A fee is paid by the participants for successful matching to cover costs and raise adaptation project funds. NGOs in developing countries should be informed in writing about JI opportunities since they often have no access to computer networks.

If the CDM chooses the clearinghouse or project exchange option, it would have to supervise verification rather closely. It should set binding verification standards and accept project proposals only if an independent auditor has already been contracted. The CDM could implement spot checks itself or rely on the SBSTA. In case of project failure, sanctions must be imposed against the project participants. Differentiated handling of individual breaches of contract is required. The causes of a given infringement, such as technical implementation problems or capacity shortfalls, erroneous emission reduction forecasts or intent, must be taken into consideration. The severity of the offense is another relevant factor. Slight deviations from contractual targets are to be tolerated or ig-

nored within a certain margin. It is far more important to recognize and pursue serious infringements. The frequency of contractual contravention (i.e. whether continual or one-off infringements) is also important. Any project partner who deliberately causes a project to fail must be excluded from future JI. In order to minimize project risks and to avoid abuse of JI projects, it would therefore be meaningful to draw up an international "Red List" containing all known deliberate "JI contract breakers".

6.4 Insurance

In any institutional structure, the CDM could provide a central or standardized insurance against the financial risk of failed JI projects. Despite higher administration costs, a central insurance system can produce more economical conditions for the individual contract partners. 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. Political risks could be covered by the World Bank subsidiary Multilateral Investment Guarantee Agency (MIGA), which has already concluded insurance contracts of over 6 billion US-$ since being founded in 1988. Before a project can be approved, proof that the local population is involved in the project development is also required, since the prevention of negative consequences in surrounding areas is of great importance (Selrod/Torvanger 1994, p. 3). This can take place in the form of public hearings for example, or by sending elected local representatives to a project commission. Equally, an environmental impact test should be carried out for each individual project according to standardized criteria. Such tests should not be too detailed, however, otherwise project transaction costs will be too high.

6.5 Taking externalities into account

In all proposed structures, the CDM should take external effects into consideration. To provide benefits for host countries, they should focus 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. Improvement of distribution also depends on the local political and social

situation. 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 that 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.

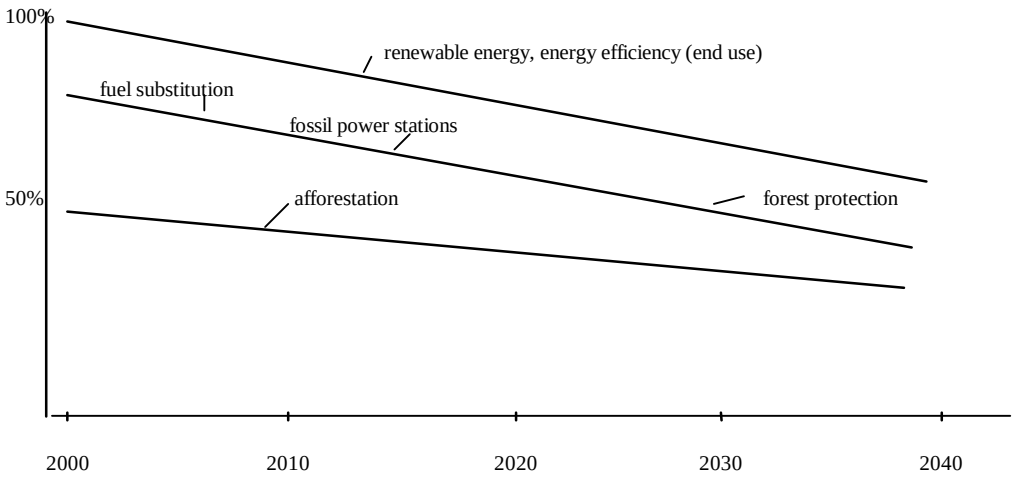
It is probable that many projects will have a mixture of positive and negative externalities. The question how to weight them will be crucial for the success of these projects. An exact quantification is impossible and the situation is different for each project. Because of high transaction costs, it is not advisable to calculate externalities for each project. Nevertheless, certain project types are more likely to entail positive externalities than other. 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 entail 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. These general conclusions can be used to categorize projects and differentiate crediting:

- Demand-Side-Management and production of renewable energy can be credited fully.
- Large-scale projects such as new fossil power plants but also forest protection are only credited partially. The latter are included in this category despite their high biodiversity externality because of uncertainties concerning relocation of deforestation.
- Afforestation should be credited at a low rate as it rarely entails technology transfer and leads to land use constraints. The risks of reversal have to be covered adequately.

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. Figure 3 shows a gliding reduction of crediting of JI. 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.

Figure 3: Decreasing crediting ratios for different project forms



This policy entails 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. Crediting is however linked to the extent of technology transfer.
- The incentive to reduce domestic emission grows steadily as crediting falls while the emission tax rises.

7. 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. The trade of GHG mitigation between industrialized and developing countries implies many different partners that pursue a great variety of goals, least of which is the reduction of the greenhouse effect. These findings result from game-theoretical analysis as from empirical evidence collected in the JI pilot phase which is about to end by the year 2000. There is a need to balance the diverging interests and to enforce the central concern of global climate policy. 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 an 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.

Concerning crediting, it would be advisable not to set low quotas for JI investment. However, crediting should be related to externalities and can 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. In the long run, crediting should be gradually reduced to provide an incentive for innovation. Very critical is the provision that adaptation projects shall be financed out of CDM money. This completely distorts investment and biases it against JI as domestic projects do not have to bear such an "adaptation levy". The funding of administration costs through a fee on investors is acceptable if there are sufficient incentives to keep these costs down such as performance-related salaries.

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