Project-based Instruments: Economic Consequences of the Kyoto and Buenos Aires Framework and Options for Future Development

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Abstract

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 the Kyoto Protocol allows industrial countries to finance emission reductions in developing countries through the clean development mechanism (CDM). It also allows joint implementation (JI) between industrialized countries. Both instruments will likely attract billions of dollars per year. Nevertheless, there are differences that will impact on the attractiveness of the instruments and might lead to a lower flow of funds to developing countries than expected. The major differences are the early crediting of CDM reduction while JI is not subject to an adaptation tax. On the basis of the Protocol one cannot decide which instrument is more attractive – that remains open and will depend on the decisions of future rounds of negotiation that might align the two mechanisms. It depends particularly on the decision whether the CDM will allow uni-, bilateral or only multilateral project implementation. Moreover, the attractiveness of both mechanisms depends on the stringency of baseline methodologies.

Flexibility Mechanisms in the Climate Negotiations

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 due to the global mixing of greenhouse gas emissions. 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) and/or detrimental social-economic effects on the country where they take place.

The issue whether 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. The United Nations Framework Convention on Climate Change (UNFCCC) recognizes the principle of global cost-effectiveness of emission reduction in Art. 3, 3. Thus it 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. As industrial countries and countries in transition agreed legally binding emission targets in the Kyoto Protocol, they now have to start emission reduction in earnest, and therefore are interested in cost effectiveness and flexibility. Concerning the organization of emission reduction abroad, four distinct possibilities have been allowed by the Kyoto Protocol (UNFCCC 1997) – two on a macro and two on a micro level. Many rules remain unclear but the 4th Conference of the Parties (COP4) in Buenos Aires could not take a decision on clarification. Instead, it elaborated a workplan to fix open issues by 2000.

The first and most far-reaching macro mechanism 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. The second possibility is emissions trade – but after Kyoto this is also only open to industrial countries (Art. 17). These two mechanisms are covered by several presentations – I will concentrate on the two distinct ways of micro or project-oriented emission reduction credited to the investing country. The first possibility is only applicable between industrial countries and named "joint implementation" (JI) (Art. 6). One has to be careful not to mix it with the general concept of JI discussed already in the negotiations leading to the Rio Conference and ever since. The second possibility is applicable to host countries without emission targets, i.e. developing countries. It shall be coordinated by a so-called "clean development mechanism" (CDM) that has only vaguely been defined (Art. 12). The detailed rules are described below.

The provisions of the Kyoto Protocol concerning the Clean Development Mechanism and Joint Implementation

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 and other entities 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 it shall be done by independent bodies (Art. 12, 7). The project criteria remain the same as in the 1995 decision on a pilot phase for JI projects without credits (activities implemented jointly, AIJ) (Art. 12, 5).

Joint Implementation

Article 6, 1 allows industrial countries to acquire emission permits through investment in emission reduction or sequestration projects in other industrial countries. The criteria for projects are the same as in the AIJ pilot phase (Art. 6, 1a and b). Emission permits created in that way are to be considered equal to emission permits from emission trade under Art. 17 (Art. 3, 10 and 11). Emission permits cannot be acquired if annual reporting requirements have not been met or the reports do not comply with the binding rules (Art. 6, 1c). If a review team has doubts about the compliance of the host country the permits shall still be tradable but are "frozen" until the doubts are resolved (Art. 6, 4).

Evaluation of obvious differences between CDM and JI

Even if the provisions of the Kyoto Protocol leave much space for interpretation and clarification, some major differences between the CDM and JI can be recognized:

While CDM credits accrue from 2000, JI credits only accrue from 2008[1].

JI credits are subtracted from the host country emission target while CDM hosts have no targets.

While it is only generally stated that acquisition of JI credits shall be "supplemental" to domestic action acquisition of CDM credits shall only cover a "part" of the emission target. The latter is clearly more stringent if supplementarity is defined in loose, qualitative terms while the "part" is fixed as a percentage. If supplementarity on the other hand is defined as a fixed quota being less than 50% of the emission reduction and "part" is a quota higher that 50% the latter is more loose. For the discussion of different quota types see 4.4. below.

While JI credits are freely tradable this is not clear for CDM credits – at least many observers state that host countries should not be allowed to trade in CDM credits while secondary trade of credits accruing to the investor countries cannot be prevented.

While JI credits can accrue from sequestration projects (e.g. afforestation) this is not clear for the CDM.

CDM projects have to pay an adaptation tax and an administration fee which is not the case for JI projects.

CDM credits come into being only after certification by an independent body; this is not clear for JI.

JI credits cannot be acquired if the investor country does not meet the Kyoto Protocol requirements for reporting its national emissions; no such rule exists for CDM credits.

JI credits will be frozen if a participating country's compliance with the rules of the Kyoto Protocol is in doubt.

The CDM will have some institutional structure, at least an Executive Board, while there are no compulsory multilateral JI institutions.

The effects of these differences on the attractiveness of the instruments will be summarized in Table 1:

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1 This is challenged by a number of countries and experts that argue for early JI crediting (see e.g. CCAP 1998c)

Table 1: Impact of rule differentials on relevant parameters

	Costs per credited ton of emission reduction	**Integrity of the climate regime**	**Trans-action costs**	**Size of positive project externalities**	**Attractiveness of long-term projects**
Early CDM credit	lower	no impact	lower	no impact	higher
No target for CDM host countries	lower	lower	no impact	higher	no impact
Stricter CDM supplementarity rules	higher	no impact	higher	higher	lower
Restricted trade in CDM credits	higher	no impact	higher	no impact	lower
Sequestration credits in JI	lower	lower	no impact	lower	higher
CDM adaptation tax and administration fee	higher	no impact	higher	no impact	no impact
CDM credit certification	higher	higher	higher	higher	higher
JI credit blockade if reporting is not met	higher	higher	no impact	no impact	no impact
Freezing of JI cre-dits if non-compli-ance is suspected	higher	higher	no impact	no impact	lower
Compulsory CDM structure	higher	higher	higher	higher	higher

The table shows that there is no clear-cut disadvantage for any instrument – the rule differences work in both directions. The overall effects of the rules will depend on their exact definition. It can be stated, though, that transaction costs of JI will be certainly lower than those for the CDM.

Possible development of CDM and JI taking into account unclarified rules

The following will discuss the spectrum of scenarios that is possible under the Kyoto rules. One major unknown factor that will not be discussed in detail is the development of emissions trading under Art. 17. If an easy system of emissions trading comes along, it is likely to crowd out JI to a big extent as it will be much easier for potential JI host countries to organize the emissions reduction themselves and then trade surplus emission permits. Surely, "hot air" trading with countries in transition would be the cheapest possibility[2].

Advantages for JI

It is unlikely that JI will be burdened with much regulation as the overall target level for industrial countries would remain unchanged in case of lax baselines. Thus in any case verification and certification costs will be higher for the CDM than for JI. Another general point is that capacity building needs will be higher under the CDM than in the case of JI due to the better human capital in countries in transition.

The CDM could be stifled by prohibitive financing requirements for adaptation projects that raise the costs for investors. The Brazilians proposed (Gylvan Meira Filho 1998:42) that the respective adaptation tax should be set at 3% while business representatives asked for a tax around 1% and environmental non-governmental organizations (NGOs) for at least 10% (Greenpeace 1998). Estimates for administration costs vary widely between 1 and 15%; the Brazilians set the fee at 3%.

Many host countries fear the CDM reaps "low-hanging fruit" that will not be available when they take up commitments in the future. This consequence will only arise, though, concerning projects that can be "stored" until the date where the commitment is taken. This applies to land-use projects such as forestry, but not to investments in infrastructure with fixed lifetimes that expire before the commitment is taken. In any case, host country governments could require project proponents to pay a tax that enters a compensation fund to be disbursed when a commitment is taken. Such a tax would be a disadvantage.

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2 The term "hot air" refers to emission targets for transition countries that even given a major economic upswing will not attain the historic emissions of 1990 during the commitment period. This will enable them to trade with part of their assigned amounts which are not backed by real emission reductions.

Small country governments would prefer a compulsory CDM institution as it would reduce their transaction costs and make more probable that they get a share of the projects. Small investors have no chance to develop bilateral 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 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.

CDM performance would 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. This would especially apply if the idea of Haites (1998) would be implemented that the Executive Board should take the decision of certification of each project's credits. Crucial is also how the methodology to calculate baselines will be designed. For a discussion of the baseline issue see Michaelowa (1998).

A CDM that does not accept sink projects would lead to a major advantage for JI as the sink potential in CDM countries is much higher.

Advantages for the CDM

A major advantage that more than weighs up the disadvantages is the early crediting of CDM. Moreover, infrastructure built up during the AIJ pilot phase can be reused while it seems unlikely that it will be kept in place in the JI countries where crediting only begins in 2008.

If the CDM was a small, efficient clearinghouse or only a project exchange lowering transaction costs for investors, it would have a distinct advantage compared to JI. Governments of big emitters will favor such a small-scale CDM as transaction costs for the bilateral approach are likely to be small if many 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. The same applies for governments of big host countries with relevant domestic markets and strong relations to potential big bilateral investors. Big investors from industrial countries are typically emitters, like energy utilities, that face high domestic emission taxes or

strong regulation will also lobby for the bilateral approach. 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, big investors that will prefer a pure project exchange will reject it.

Estimated demand for JI and CDM projects

Haites (1998), Vrolijk (1998), Austin *et al.* (1998), Victor *et al.* (1998). and Figueres (1998) have collected estimates of annual demand for reductions during the commitment period for the total Annex B that range between 462 and 1350 Mt C. The supply of "hot air" is seen between 3-344 Mt – the former being the official Russian estimate, the latter an estimate of International Institute for Applied Systems Analysis (IIASA) (Victor *et al.* 1998). One can find values all over this extremely wide range. Low-cost JI potential in economies in transition is seen at 185 to 305 Mt C while the models see JI and trading around 100 Mt. The range is also wide for CDM market share which is seen between 19 and 57% of the total flexible instruments, ranging from 67 to 723 Mt C. Prices per ton would range from 13 to 42 $ and annual financial flows from 2.8 to 17.4 billion (see Table 2).

Table 2: Estimates for the potential of the flexible mechanisms

Annex B reductions from business-as-usual	580 to 1350 Mt C; median around 1000
"Hot air"	3 to 344 Mt C
JI and other emissions trading	64 to 110 Mt C, median around 100
CDM	67 to 723 Mt C, median around 400
CDM market share	19 to 57%
CDM prices per ton carbon	13 to 42 $, median around 20
CDM total financial flows	14 to 85 billion $

Sources: Austin *et al.* (1998), Haites (1998), Vrolijk (1998), Figueres (1998), Victor *et al.* (1998).

Who will get these flows? In a CDM without sinks China would be the main beneficiary, receiving 57-70% (mean 63.8%), followed by India (7-14%) (Austin *et al.* 1998).

Rigid ceilings for both instruments

The European Union (EU) and many environmental NGOs have lobbied hard for a strict definition of supplementarity through fixed ceilings on all flexibility instruments. There are different possibilities to implement a ceiling and the proposals discussed so far have been very unclear as to their exact implementation, especially for countries with stabilization or growth targets. The ceiling could be defined as follows:

- x% of the emission reduction target excluding countries with stabilization or growth target (Rule a)
- x% of the respective emission budget (Rule b))
- x% of the average target of Annex B countries (5.2%) (Rule c))
- x% of the reduction from a business as usual path (Rule d))
- Every imported emission permit will be discounted by x% (Rule e))
- A mix of the above such as the EU Proposal of May 1999 that allows the choice between two formulae.

Gylvan Meira Filho (1998) argues for rule b) with x=2.5. Haites (1998) calculates that under x= 49 rule a) would lead to a restriction of the CDM to 30 Mt and of JI to 10 Mt. Rule d) would allow a CDM of 260 Mt and JI of 70 Mt.

Moreover, it is unclear whether the ceiling applies to all flexible instruments together or whether specific ceilings apply for each instrument. Figueres (1998) calculates a CDM-specific ceiling with x=49 under Rule d) that would lead to a CDM of 490 Mt and JI of 250 Mt. Any quotas would lead to an effort to import as much cheap JI and CDM credits instead of selling domestic assigned amount that can be banked.

If a ceiling is introduced, quota allocation to private entities has to be as efficient as possible. Several procedures concerning the activities of private entities could be chosen:

"First come, first serve". Companies can buy permits until the ceiling is filled. Afterwards, permits can still be bought but only be used in the next commitment period. CDM projects would be advantaged as credits already accrue from 2000. Nevertheless, the following problems could arise: Credits from a JI/CDM project accrue only after the quota is filled. All credits from JI/CDM projects of one investing country could loose their value if the quota had already been filled through emissions trading. This procedure would disadvantage long-term CDM and JI projects and projects with long gestation periods.

Discounting proportional to the demand surplus. Companies can buy permits until the end of the commitment period. Then the government calculates the aggregate amount of acquired permits – provided they contain the name of the issuing country and project. If it surpasses the ceiling, every permit is discounted according to the demand surplus, e.g. if the quota is 1 Mt of carbon and the

permits bought amount to 2 Mt, each permit is discounted by 50%. This method would lead to a high risk concerning the real price of the acquired permits as it is only known after the commitment period and depends on decisions of other companies. Thus risk-averse companies will not invest in permits. Allowing banking part of permits for the next commitment period instead of discounting could reduce the uncertainty. These banked permits would get preference in filling the next quota. Projects with long duration would thus be penalized less.

Discretionary allocation of the quota according to criteria such as positive externalities, degree of innovation of the projects, diversification of sources of permits etc. Transaction costs, intransparency and uncertainties would be high.

All these allocation modes would disadvantage the project-related mechanisms CDM and JI. They could be attenuated by setting a "soft" quota, which slowly discounts the carbon credits achieved beyond a certain percentage of the domestic target. Any credit beyond another, higher percentage will still be accounted for at a minimum rate. Obviously, this mechanism would not fix the ceiling at an exact value. But domestic reduction would be promoted while the global reduction would be enhanced. But even better would be to discard the idea of ceilings completely.

Efficiency properties of different forms of the Clean Development Mechanism

There are two general options for project-oriented emission reduction: – bilateral and multilateral[3]. The bilateral option allows countries to negotiate a framework agreement setting criteria and rules for crediting. Projects are negotiated freely between entities of both countries.

In the multilateral option investing countries make contributions to an independent fund. Other countries can now offer 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

[3] There also exists a purely unilateral option – i.e. a Non-Annex I country finances projects on its own, has emission reductions certified and sells them to Annex I countries. As this needs no specific institutions, I do not discuss it further.

could be carried out multilaterally or by private auditors (Mintzer 1994:46 under the term "mutual fund").

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

Multilateral fund

Compared to bilateral CDM, 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. The multilateral approach spreads project risks among all the investors, thus giving even conservative investors and investors with little capital a chance to participate. 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 Global Environmental Facility's (GEF) experience in climate protection projects and the World Bank group's accumulated expertise could facilitate the selection and evaluation of projects if the CDM was situated at the World Bank. Then the CDM could also use the preparation done to set up the Prototype Carbon Fund. The concerns of developing countries using these structures could be alleviated through allowing for a double majority voting system right from the beginning.

A multilateral fund could be less efficient than bilateral CDM projects due to the different preferences of individual industrial countries as well as "rent seeking"[4] on the part of the host countries. 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. Moreover, 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 the

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

investors cover its administrative costs, 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.

Some of 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 should 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 down. Free amendment agreements for each of the various sectors are conceivable here for example.

The CDM should also streamline verification procedures by having all projects verified through independent auditors. An expert panel of the UNFCCC Subsidiary Body for Scientific and Technological Advice (SBSTA) could then do spot checks.

Clearinghouse

Besides operating as fund, the CDM could also work as international “clearinghouse” that 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 world wide and investors can then submit applications. The emission reductions are credited to the successful applicant's home country (Hanisch 1991, Mintzer 1994:46 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 costs 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 CDM 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*. 1994:17). 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 CDM 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 CDM 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 1994:46, who gave this model the delightful name “Hackers' Delight”). The participants pay a fee for successful matching to cover costs and raising adaptation project funds.

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.

The baseline issue

Under both project-related mechanisms emission reductions can only be calculated from a reference basis of emissions, the baseline. An overall definition of a baseline would be the emissions level if the project had not taken place. Art. 6 and 12 of the Kyoto Protocol state that reductions in emissions shall be additional to any that would occur in the absence of the project.

By definition, a baseline cannot be observed and thus cannot be proved to be correct. The aim for climate policymakers should thus be to arrive at a consensus on

sensible rules for baseline-setting that build upon criteria derived from a set of policy targets. Then it can be tested whether a proposed baseline has been set up according to the rules.

On the one hand, baselines shall be set in a way to prevent fictitious emissions reductions that would lead to exaggerating the emission budget of Annex I countries. On the other hand, baseline setting shall not reduce efficiency. It will not be possible to reach both targets perfectly – there is an inevitable trade-off!

Investors and hosts of CDM projects – companies as well as countries – want to get a maximum certified emission reduction through the project. They may therefore overstate the possible emission reduction by setting a high baseline. In the case of JI the host country will not have an incentive to do so as the credited emission reduction from JI will be subtracted from its domestic budget. Any overstated baseline will thus lead to the need for higher domestic abatement to be in compliance.

Critical parameters for baseline-setting

There are three critical parameters for baseline setting: determination of additionality, of leakage and lifetime of a project.

The economic additionality of a project – determining whether it has positive incremental costs – is the most difficult issue in the context of baseline determination and has lead to a heated debate (see Baumert 1999 and Rolfe 1998 for an overview). Additionality can be seen on two levels – a macro and a micro level. Due to externalities, they will differ. A project that is clearly additional from a micro-economic point of view may not be macro-economically additional. Under fossil fuel subsidies, for example, a wind power plant might be clearly additional due to higher costs compared with the subsidized fossil fuel. If the subsidy was phased out, it could become non-additional. Thus non-additionality on a macro-level will enhance the supply of micro-level additional projects while strong macro additionality will reduce it.

Micro-economic additionality could in theory be measured according to the following criteria (see Figure 1). They assume that the discount rate and the degree of risk are known, which allows a calculation of risk-neutral costs[5] (for a nice discussion of the effect of different discount rates see Varming *et al*. 1998):

1. Accept all projects that reduce or sequester emissions (as argued for by most of the business community and succinctly stated by Rentz 1998).

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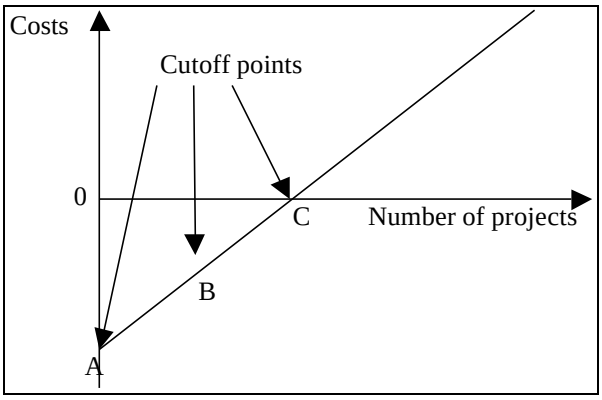
5 Obviously, this is difficult to achieve as discount rates will be different from country to country and perceptions of risk are highly subjective.

2. Prove that the project removes barriers. A list of "accepted" barriers could be defined (IEA 1997).
3. Prove that the internal rate of return (IRR) of the project is lower than that of a commercial alternative.
4. Prove positive "incremental" cost of the emission-reduction related part of the project similarly to procedures used by the Global Environment Facility. The loosening of these procedures in 1998 show that they have been extremely difficult to apply.
5. Prove positive costs of the full project (e.g. by investment modelling) (Bedi 1994, Philibert 1999)



A: All projects that reduce greenhouse gas emissions compare to status quo
B: All projects above a negative cost threshold to account for non-monetary barriers or alternative rates of return
C: Only positive cost projects are accepted

Figure 1: Determination of the economic additionality of a project

Determining micro-economic additionality may be impossible due to a high cheating potential. A narrow approach might lead to the choice of marginal technologies that are not always appropriate and depend on having an undistorted market, which often is not the case in host countries. Experience from AIJ shows that autonomous technology shifts depend on hard-to-observe parameters. On the other hand, macro-economic additionality might be easier to assess. Such an assessment would also have the advantage that there are no perverse incentives to prolongate inefficient policies. The best approach would be to phase in strong macro additionality rules over a certain period of time, e.g. 5 years, to allow countries to change policies.

Leakage determination quantifies positive and negative indirect influences on emissions elsewhere such as technology spillovers (positive) or emissions increases through reduction of market prices of services or commodities that leads to higher demand (negative). The higher the degree of spatial aggregation of a baseline, the more leakage will be covered by the baseline.

Lifetimes of a baseline (see Figure 2) can range from the full project duration ("static" baseline) over revision in case of major "surprises" (i.e. policy or economic shifts) to periodic revision or an ex-ante limited life. Revisions might change the slope or ratchet down a horizontal baseline. The more frequent the revisions and the lower the lifetimes, the higher are costs and risk for project participants. On the other hand, revisions allow to reduce uncertainties that grow with the duration of an unrevised baseline.

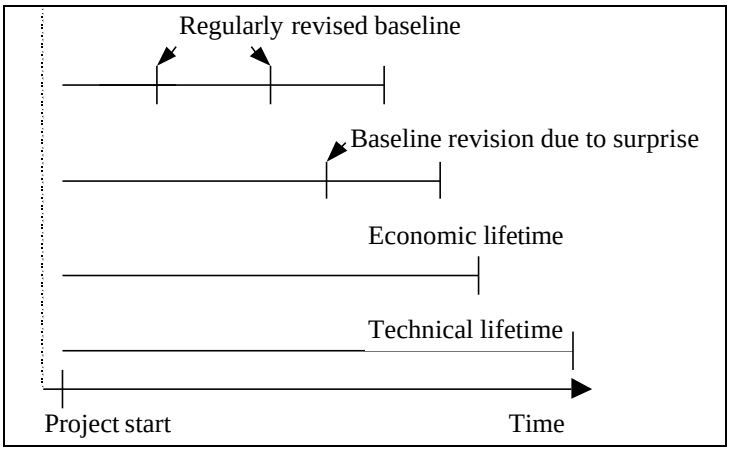


Figure 2: Lifetimes of baselines

Lessons from practical experiences in baseline development during the AIJ pilot phase

In the past five years, 113 AIJ projects have been approved world wide, and a sizeable share has already been implemented. Therefore, the theoretical debate on baselines can be supplemented by examples from "real life". Nevertheless, part of the database is inadequate, and remains to be improved before the end of the pilot phase. Generally,

project-related baselines were used. Often, the baseline methodology is not explained in detail.

Some of the national AIJ programs developed criteria for baseline definition. The criteria of the US Initiative on Joint Implementation (USIJI) are the most detailed ones (Carter 1997). They state that baselines have to be consistent with:

prevailing standards of environmental protection in the host country
existing business practices within the particular sector of industry
trends and changes in these standards and practices

They also stipulate that baselines must include indirect effects such as activity shifting, price effects, and life-cycle effects in products, and that they provide information on other environmental effects of the project.

Nevertheless, USIJI project baseline development was of highly uneven quality and rarely managed to fulfill any of the criteria set above. Indirect effects have not been covered to any extent. For example, renewable project baselines did not include life-cycle emissions of the plant material. Changes in the legal framework were covered only in some projects. Others did not take them into account.

Additionality determination was not really tackled in the AIJ pilot phase with the exception of some Dutch and Norwegian projects (which showed that several projects were clearly non-additional under some definitions discussed above). The baselines of all current projects do not include negative cost-options. Many Swedish small-scale boiler conversion projects in the Baltic states take the status quo before project implementation as baseline. This does not take into account subsidies and market distortions. A phase-out of the subsidies would make many of these projects profitable and thus non-additional if strictly defined. A similar situation applies in the case of the co-generation project in Decin in the Czech Republic which projects a decrease of heat demand by 13% in 2001 and a constant demand thereafter. The existing coal-fired power plant was taken as baseline for heat production. Moreover, the existing average emission factor of the Czech electricity production was taken as baseline for the electricity production of the new plant. That seems to be over optimistic as this emission factor will surely be reduced in the business-as-usual case because of reduction of subsidies.

An even more distorted situation exists in the case of the USIJI RUSAGAS project which entails sealing of valves on natural gas pipelines, takes current emissions as the baseline and estimates a lifetime of 25 years. This baseline clearly shows the importance of micro- versus macroeconomic additionality. So far, the Russian gas company is paid only for the quantity of gas extracted but not for the quantity delivered. If the latter situation applied because of regulatory changes, the incentives to seal the valves would be very high for the company. That means that the baseline would then have to be set to zero.

An interesting consequence of an overly strict definition of macroeconomic additionality occurred in the case of the renewable energy projects in Costa Rica. Due to the Costa Rican Government's commitment to phase out fossil fuel electricity production by 2001, the baseline is zero emissions after 2001. USIJI and independent observers doubt whether the government commitment can be fulfilled, but nevertheless required the baselines to take this commitment into account. This means that renewable energy projects in Costa Rica will not become creditable under the CDM regime after 2000. Therefore, all the renewable energy projects now approved are certainly profitable, thus micro-economically non-additional projects.

To sum up: most of the AIJ pilot phase baselines did not cover indirect effects. Their treatment of the additionality issue was haphazard. Lifetimes were chosen arbitrarily (Ellis 1999). Especially in countries experiencing a rapid change from distorted to deregulated energy markets project baselines have had relevant shortcomings.

Simplified methods – no panacea

Due to the experience from the AIJ pilot phase, many researchers (Rentz *et al.* 1998, CCAP 1998a, b) have argued for the development of highly-aggregated baseline methodologies that involve modelling or setting of quantitative, performance-related benchmarks. While reducing the costs for the end user, their development would need a huge public investment and sufficient human capacity. While aggregation might lower the potential for cheating by individual project participants (micro cheating), it could lead to cheating in the choice of parameters for modelling (macro cheating). The aggregated approaches still need a decision about spatial and temporal degree of aggregation (see Figure 3 on the latter).

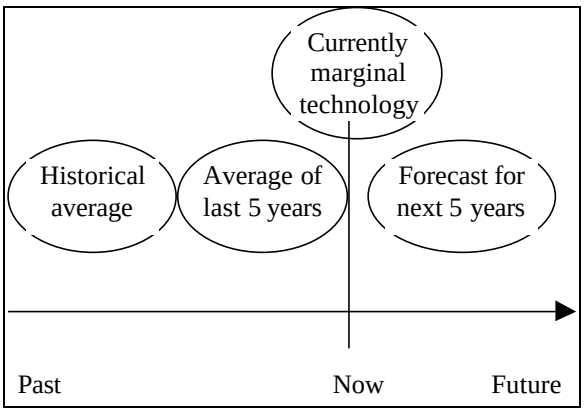


Figure 3: Temporal dimension of benchmarks

To capture the differences of specific technologies and the spatial problems described above a matrix of countries and benchmarks/emission factors for a set of baseline technologies could be defined (Jepma 1997). This could be even more simplified by using project categories instead of technologies (Michaelowa 1998, Michaelowa & Dutschke 1999). The lowest degree of aggregation would be standardized parameter setting for project baselines (Begg *et al*. 1999). This would include rules to ensure environmental integrity such as monitoring, baseline revision, limited crediting life. Matsuo (1999) suggests a stepwise standardization which starts from purely project specific baselines and tries to use the experience to define project categories that can use the same methodology.

It seems that depending on the situation and project type there are different types of "optimal" baselines:

Forestry, infrastructure, policies, large number of projects in all sectors: highly aggregated, benchmarks

Large projects, many projects in a specific sector, fuel substitution: sector-specific, technology or default matrix, project-related standardization

Small projects such as renewables, retrofits, small number of projects: project-related standardization, technology or default matrix

To test what approach is most appropriate it might be useful to let baselines compete. This might lower transparency, though and risk "crowding out" of good baseline methodologies by bad ones. A possible solution might be: As long as COP has not decided on final rules for CDM, one could test different approaches in practical project settings and simulation on the basis of existing (AIJ) projects. It would have to be made sure that no methodology would be unfairly penalized after the decision has been taken.

The final decision might decide on different baseline methodologies for different situations. The decision could use thresholds to determine the change from one to another baseline methodo logy such as:

If the share of CDM project investment in the annual investment of a country exceeds x%, the baseline methodology shall be switched to a country-/benchmark approach, or

If the share of CDM project investment in the annual investment of a country's sector y exceeds x%, the baseline methodology shall be switched to a sector-specific approach

An alternative might be that the decision allows the CDM Executive Board to set such thresholds and to develop the methodology in detail.

Options for future development

The differences between CDM and JI could be reduced by decisions taken at COP 6. In fact, there are some tendencies to align the two mechanisms:

Extension of the adaptation tax to all mechanisms

Many NGOs have argued for an extension of the adaptation tax to all flexible mechanisms. These demands have been taken up by representatives of developing countries. Recently, they have got support from the research community. Grubb *et al.* (1999:222f) argue for a tax of 5 $/t on all transfers of emission permits. Any such proposal, however, will encounter strong opposition from both prospective buyers and permit sellers under Art. 17.

Early JI to reduce "hot air"

Principally, early JI would work as follows (see Figure 4): Early JI credits are given to investors in form of futures on the first budget period where they have to be subtracted from the host country budget. Otherwise the host country would have an incentive to maximize early JI that is not additional and thus the Annex B budget would be blown up. If JI leads to a reduction from business-as-usual by the amount A, the same amount has to be deducted from the host country budget to avoid non-compliance.

In this case, one might think that JI reduces the amount of "hot air" by the credited emissions reduction. This was done by the Swiss delegation at the fourth Conference of the Parties in Buenos Aires which circulated a non-paper that argued for early crediting of JI exactly for this reason (Switzerland 1998). This argument holds if "hot air" is defined as the amount of allocated permits exceeding the initially forecast emissions for the budget period. However, if only domestic efforts are considered to determine the amount of "hot air" – what in my view is more appropriate – , the business-as-usual emissions path has to be adjusted due to JI activities since JI should be classified as a non-domestic effort – JI is carried out in the host country but financed by the investor country.

With this definition in mind, a reduction in "hot air" through early JI would require A>B in Figure 4. This depends on baseline setting, induced change in the future emissions path and especially on the start of the program. Therefore, we would argue that the amount of "hot air" is likely to increase (A<B) if early JI is truly additional as the business-as-usual path is shifted downwards. Furthermore, if the program starts before the year 2003 it runs longer than the first commitment period resulting in a longer period of time where early credits can be accumulated.

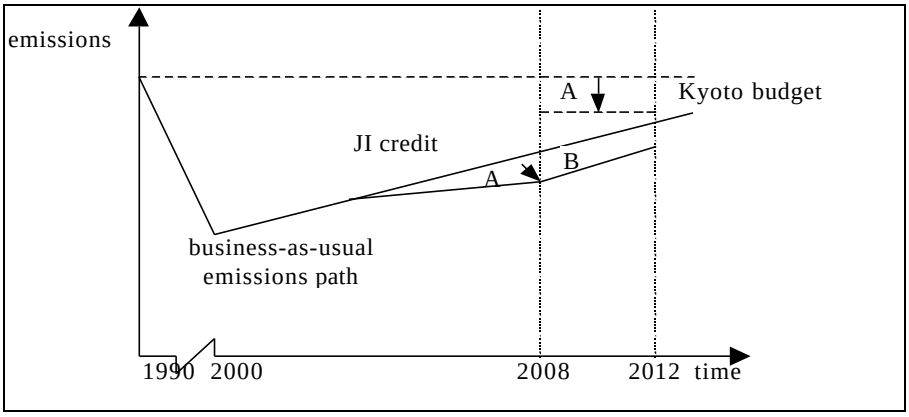


Figure 4: JI early crediting in a host country with "hot air"

Only in case of non-additional JI the amount of "hot air" – taking our definition into consideration – seems to fall but this is only due to a "laundering" of the "hot air". Non-additional JI would not be attractive as it would reduce the saleable quantity of "hot air" by the same amount and presumably entail lower transfers.

Notwithstanding the design of such a program or whether the amount of "hot air" will decline or not – as long as there is a subtraction from the host's target, the total Annex B budget remains unchanged.

Recognizing the problems of the earlier approach, Switzerland further developed its proposal for the June 1999 session of the climate negotiations by stating that revenue from early JI credit sale should be reinvested in emission reduction projects (UNFCCC 1999).

Conclusions and recommendations for future negotiations

The flexible instruments of climate policy have to be both statically and dynamically cost-efficient. This is not assured as the Kyoto Protocol stands today. While it allows project-related crediting of emissions reduction abroad, it has set up different mechanisms – JI for projects among industrialized countries and the CDM for projects with the rest of the world. There are substantial differences in the rules for these instruments. A major one is that CDM credits accrue from 2000 while JI is only credited from 2008. The CDM is subject to an adaptation and administration tax while JI is not. CDM credits come into being only after certification through an independent body. While the CDM will be supervised by some kind of multilateral organization, no such organization is foreseen for JI. Two rules potentially explosive for JI state that credits only accrue if reporting requirements are met and there are no official doubts about compliance. The exact impact of these differences cannot be estimated today as many of the rules remain to be clarified. It is clear, though that there is no obvious bias in favor of one instrument. Applying the same rules to both mechanisms would eliminate any bias. Indeed there are tendencies in the climate negotiations to move into this direction.

It would be advisable to use both a multilateral and bilateral CDM simultaneously as each has advantages for certain constituencies. The competition of both modes would reduce transaction cost. Concerning crediting, it would be advisable not to set ceilings for CDM and JI investment. Development of and decisions on baseline methodologies will be a crucial point that might determine the competitive position of CDM and JI towards emission trading.

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