8. Outlook on Climate and Development Policies

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HOW TO INDUCE DEVELOPING COUNTRIES TO ACCEPT FLEXIBLE INSTRUMENTS

Most of the developing world has been seeing flexible instruments as a pretext for industrialized nations to go on burning the earth's fossil fuel reserves while denying the developing world the benefits the industrialized countries have enjoyed until now. Others do not see any need at all for climate policy and think it diverts interest from development matters. The fact is that there are still doubts on the magnitude of the damage caused by greenhouse gases in the atmosphere, while the dangers of poverty, social inequity and pollution are proved daily.

However, there is a high degree of probability that today's developing countries will suffer most from climate change. The tropics are highly affected by disastrous climatic irregularities, like hurricanes, floods and droughts that are likely to grow in number and magnitude.

Equity is an issue as well for the present and future distribution of emission rights. Development indicators being positively linked to GHG emissions, it is only natural that developing nations feel deprived of their right to development by the demand to limit their emissions. This is one reason why industrialized countries should go ahead and demonstrate that wealth can be achieved and maintained while decreasing GHG emissions (Engelmann, 1998). Only then will the catchphrase of 'technological leapfrogging', as illustrated in Chapter 7, become a credible option. Consumption patterns can only change globally, because the national elites of developing countries usually copy the industrialized countries' life style. In Kyoto emission rights were 'grandfathered' among the developed nations according to historical emissions and negotiation power. If in future commitment periods developing countries are expected to commit themselves to meaningful contributions, other distribution modes will be needed to determine each country's contribution to worldwide GHG emissions. Among these, there should certainly be a per capita ratio for emission rights. Or, to put it the other way around: only because a nation does not need its fair share of emission rights should it not be precluded from trading with it.

Any solution to the dilemma over emissions reduction and development has to address all the legitimate interests involved. In international climate negotiations, all the different actors have their hidden agenda as well. While, for instance, the power industry seizes the opportunity to promote its much-disputed nuclear plants, OPEC representatives try to obstruct the process in order to keep up their oil sales. Many representatives of the developing world see a chance for bargaining for new development aid. It must be reiterated that climate cooperation in itself has nothing to do with official development assistance (ODA). Theoretically, it should be an exchange on equal terms between unequal partners. This is why international conventions have to provide for a level playing field. This chapter recapitulates the major benefits induced for either side.

Thus, in order to make the flexible instruments acceptable to the developing countries which have rejected them so far, it is crucial that the industrialized countries take climate policy action at home, parallel to investing in JI, CDM and emission trading. They have an array of reduction measures at their disposal which are profitable for the national economy ('no regret' measures) (sse Figure 8.1.) and which have not been implemented until now solely because of institutional impediments, lobbying activities and information deficits. These measures could not only result in a substantial emissions reduction, but also increase each nation's economic performance.

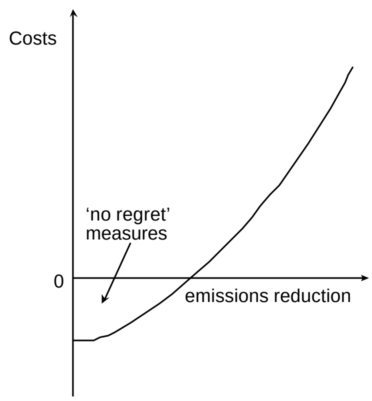

Figure 8.1: Economically profitable domestic emission reduction

Owing to political and economical factors, however, the implementation of these measures is extremely difficult, since it involves an intrusion in a web of protective measures which has evolved over a period of decades around politically sensitive branches of industry with powerful lobbies. Dismantling hard coal subsidies in Germany and other European countries, for example, would eliminate associated distortions and benefit the national economy to the tune of several billions.

If however, the industrialized countries are striving for a broad application of the flexible instruments they must go beyond 'no regret' measures and, indeed, are virtually compelled to introduce tangible instruments such as a greenhouse gas tax with substantial rates of taxation. In such a context, the CDM would provide an opportunity to lead the developing countries, which even today cause more than half of the world's greenhouse gas emissions if land use change is included (Center for Clean Air Policy. 1994, p.2), on a path of climatically acceptable economic growth from the start (see Figure 8.2).[1] Many low-cost methods of reducing greenhouse gases cannot currently be used in the developing countries and the countries in transition because of financial bottlenecks (Trexler and Kosloff 1993, p.3). The procurement of profitable technology often fails for lack of foreign exchange reserves. The financial mechanism of the Framework Convention on Climate Change do not provide sufficient capital. Therefore liquidity should be enhanced by offering incentives for private sector investment. Furthermore, successful CDM projects in the developing world can increase awareness of the climate issue and strengthen domestic efforts in these countries (Parikh, 1994, p.15). Developing countries can avoid costs for the future transition from an energy-intensive growth based on fossil fuels to a climatically acceptable economy, which sooner or later will be inevitable for them (Loske and Oberthür, 1994, p.5). At the same time, the flexible instruments will reinforce the massive structural change necessary in the industrialized countries by reducing transitional costs and allowing time for adjustment. Very high-cost measures can be postponed. In this way, structural change can be achieved smoothly and without severe adjustment crises.

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1. In all of China, the fossil fuel power generation capacity is to be increased by 10GW p.a., hydroelectric power capacity by only 5GW. Coal's share of electricity generation is to held almost constant at 73 per cent (Li and Chen 1994, p.720). CDM projects could lead to an increase in efficiency at the new power stations and push forward replacement of carbon-rich fuels. Coal-fired boiler efficiency could be increased by over 30 per cent nationwide by supporting such simple measures as the use of coal bricks instead of raw coal (Heidelberg Conference, 1994, pp.53f).

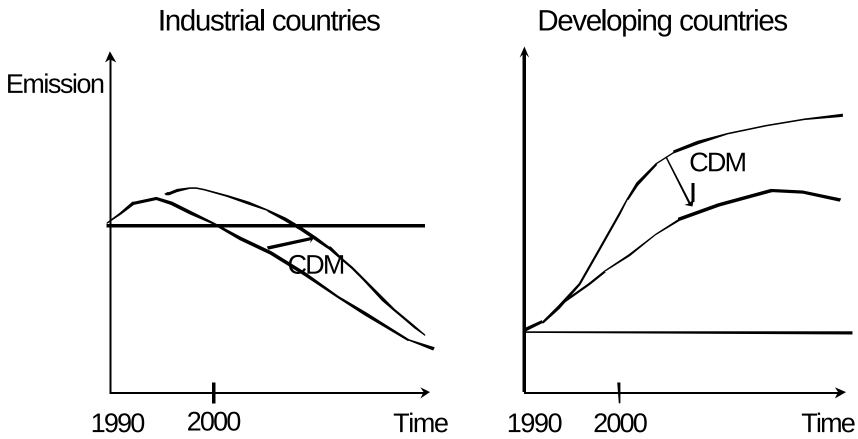


Figure 8.2: Cushioning structural change in the industrialized countries by increasing efficiency in the developing countries through the CDM

Emission reductions in the industrial countries can be spread over a longer time period while the emission efficiency of production growth in the developing countries is substantially improved. Given unchanged worldwide emission reduction costs, the CDM facilitates a higher global emissions reduction than is possible under climate policy which is restricted to the industrialized countries. If the political aim is to achieve the same emissions reduction with CDM as without it, then the costs of this reduction will be lower. The question of whether to aim for a higher level of emissions reduction at the same cost or the same level of emissions reduction at reduced cost requires a political solution.

SOLVING CRITICAL ISSUES IN THE DESIGN OF THE CDM

The CDM can become a vehicle to combine climate and development goals if negotiators never leave both objectives out of sight. A fair solution requires the determination of an institutional structure, baseline scenarios and how to share benefits resulting from climate cooperation.

Institutional Structure

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

- a part of credits created would accrue to the CDM and be sold on the market,
- a fixed percentage of the investors' payments could be deducted,
- the CDM could set a fixed price for credits and cover adaptation and administration costs out of the difference between project costs and the fixed price.

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

Besides operating as a fund, the CDM could also work as an international clearing house, operating in the same way as a broker or as pure project exchange. A CDM clearing house would accept and evaluate project proposals and invite possible investors to bid for projects (Hanisch, 1991; Mintzer 1994, p.46). Credits accrue to the bidder who is succesful. Bidders would have to provide proof of insurance. Successful bidders would have to pay a charge for administration and adaptation purposes.

The leanest option for the CDM would be a project exchange where any interested party could gather quick, extensive information on all the climate 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 the internet, is free of charge (see Mintzer, 1994, p.46, who gave this model the nice name of 'Hackers' Delight'). A fee is paid by the participants for successful matching to cover costs and raise adaptation project funds.

In any institutional structure, the CDM could provide a central or standardized insurance against the financial risk of failed JI projects. It should nevertheless differentiate its premiums according to the kind of project.[2] This insurance could be financed by retaining part of the credits and selling them on the market. Despite higher administration costs, a central insurance system can be more efficient for the individual contract partners than decentralized insurance. By spreading the insurance risk across all

2. This seems important, in order to prevent externalizing the high risks of forestry projects for example, to other projects which are more expensive but carry lower risks.

climate cooperation projects 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.

In our view, it would be preferable to allow all types of institutional structures to compete on the basis of minimum rules set by the executive board. As the pure information exchange will not be palatable to the sceptics 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 them simultaneously as each has advantages for certain constituencies. Small investors will prefer the fund as they are not able to invest in a whole project. Moreover, their risk is lowered through the portfolio effect. Big investors will prefer to invest in whole projects as they can have synergy with other interests such as market development or technology transfer.

Determination of the Baseline

From a systematic point of view, the CDM is a loophole because it allows the industrial countries to inflate their cumulative targets. It is imperative to avoid this and ensure real and measurable emission reductions. The amount of emission reduction, obviously, depends on the emissions that would have occurred without the project:-the 'baseline' of the project (Pearce, 1995, p.27). Obviously, cheating will be widespread if baseline determination is not subject to clear and strict rules. The longer the project's duration, the higher the uncertainties about its baseline. If the CDM host countries had quantitative targets themselves, there would be no need for baselines. Allowing the sale of credits on the international market for emission permits requires firm baselines and puts strict requirements on certifiers.

Often there is confusion about the differences between the definitions of 'additionality' and 'baseline'. We define the baseline as the overarching concept. The determination of whether a project is additional or not comes from calculating the difference between the verified emission of the project and the baseline emission. If the latter is higher, the project is 'additional'.

A major obstacle to defining a baseline is that the emission levels have to be forecast for the entire lifetime of the related project. In the case of carbon sequestration projects, the lifetime can be up to a century. Forecasting emission levels for such a long period amounts to guesswork. But, even for short-term projects (lasting five to ten years), it seems impossible to calculate an accurate baseline. The difficulty of business cycle forecasting is well known. Structural shocks can wreak havoc with a forecast: take, for example, an Eastern Europe development forecast in 1988 or an East Asian growth forecast of 1996. The question is, on the other hand, whether requirements for the CDM baseline have to be higher than for the Kyoto targets. These targets, fixed in December 1997 for emissions in the years 2008-12, are themselves based on a high degree of uncertainty.

The problems in establishing country-related baselines have already been felt in the business-as-usual projections in the national reports under the U.N. Framework Convention. Country baselines are necessary for determining reduction targets within the framework of international negotiations. Substantial evidence can be found that countries tend to overstate business-as-usual emissions, which can be used to negotiate from a position that offers a high reduction from the spurious baseline (Jochem *et al.*, 1994). If realistic baselines cannot be established, not only the CDM, but any other form of controlled greenhouse gas reduction policy, becomes impossible. Thus Heller (1998, p.12) argues for baselines that prevent the prolonging of inefficient economic structures. Cheating by individual project participants would become difficult if country-related baselines were used; but in that case, the host country government could try to set the parameters in a way that amounted to political distortion–that is, cheating on a macro scale.

Deliberate overstating of emission reduction would become rather difficult if a single standardized methodology for designing forecasting models and collecting data was required, to be drawn up by the Subsidiary Body on Scientific and Technological Advice (SBSTA) of the Convention (for a first preliminary collection of guidelines, see UNFCCC 1997, pp.2-7). Baseline development should be subject to the review of independent certifiers: any creation of credits would take place only after examination of the baseline. It is also important to guarantee transparency and NGO participation in the process of setting baselines (Chomitz, 1998, pp.53ff). The SBSTA states that 'all AIJ require project-specific baselines. The methodologies used in calculating the baseline scenario may be sector-specific, technology-specific or country-specific' (UNFCCC, 1997, p.2).

Even if there is no deliberate attempt to cheat, different types of uncertainties exist concerning the baseline:

- political uncertainties, for example whether subsidies will be phased out;
- economic uncertainties, for example whether good policies put the country on a higher growth path or an external economic shock occurs;
- technological uncertainties, for example which technologies might have been chosen without the project;
- cost uncertainties, for example whether the project is a 'no regrets' project.

One has to take into account that these uncertainties occur on different levels of aggregation: while the first two are primarily relevant on a country level, the third relates to the sectoral level and the fourth to the project level. But the first two can have effects on the project level too, depending on the level of capacity utilization. It is impossible to develop baselines with no uncertainty whatsoever. However, we can evaluate them on the basis of whether they have a higher inherent uncertainty than a domestic climate policy.

Treatment of 'no regrets' projects

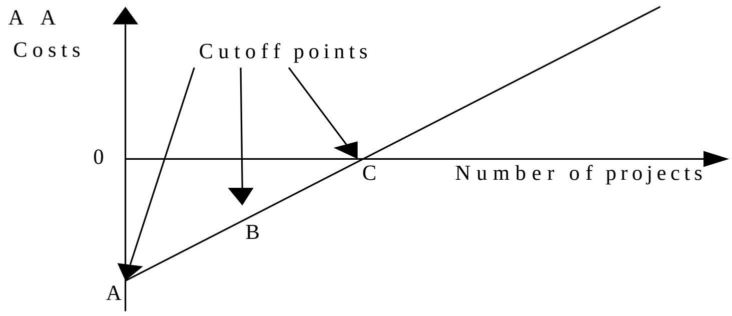
The economic additionality of a project – determining whether it has positive costs compared to a commercially attractive alternative - is the most difficult issue in the context of baseline determination and has led to a heated debate (see Baumert, 1999; Rolfe, 1998 for an overview). Formerly, the whole baseline debate started from the definition of additionality (Carter, 1997).

Additionality can be seen on two levels: the country and the company level. Because of indirect effects, they will differ. A project that is clearly additional for a company may not be additional for a country as a whole. Under fossil fuel subsidies, for example, a wind power plant might be clearly additional because of higher costs compared with the subsidized fossil fuel. If the subsidy was phased out, it could become non-additional. Thus non-additionality at a country level will enhance the supply of projects that are additional at a company level.

Moreover, despite the theoretical profitability of many options, they face regulatory and legal obstacles, or are encumbered by a lack of information or skilled personnel, or by organizational rigidities. It is often reported that managers do not invest in promoting energy efficiency, even if its internal rate of return is much higher than the prevailing market interest rate. The main reasons are probably short planning periods, requirements for a minimal rate of return much higher than market interest and lack of capital. Another factor is the investor's planning security as far as political and fiscal conditions are concerned. It is not surprizing that private households have even higher thresholds for internal rates of return. In particular, this applies to countries in transition and developing countries. Often an investor cannot appropriate a gain as it is an externality accruing to others. Therefore it seems that 'no regrets' opportunities at the company level are quite scarce, whereas on a country scale there are many. In a similar vein, Heller (1998, pp.11ff) contends that transaction costs often inhibit 'no regrets' projects.

Additionality at the company level could in theory be measured according to a number of criteria (see Figure 8.3). They assume that the discount rate and the degree of risk are known, which allows a calculation of risk-neutral costs.[3] (For a good 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).
2. Prove that the project removes barriers. A list of 'accepted' barriers could be defined (International Energy Agency, 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 shows that they have been extremely difficult to apply.
5. Prove positive costs of the full project (for example by investment modelling) (Bedi, 1994).



Notes:
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 and positive alternative rates of return.
C: Only positive cost projects are accepted

Figure 8.3: Determination of the economic additionality of a project

If cost data do not exist (for example, for confidentiality reasons) the following approaches might be helpful:

1. Use of a behavioural model (Chomitz, 1998)
2. Definition of project categories that are 'a priori' additional (Luhmann *et al.*, 1997).

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

Determining additionality at a company level may be impossible owing to the possibility of overstating cost figures (Torvanger *et al.,* 1994, p.21). A narrow additionality definition 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, country-level additionality might be easier to assess. Such an assessment would also have the advantage that there are no perverse incentives to prolong inefficient policies. The best approach would be to phase in strong country-related additionality rules over a certain period of time, such as five years, to allow countries to change policies. In that period, all projects that prove a greenhouse gas reduction from status quo for a period of five years should be accepted to account for higher transaction cost and barriers in the set-up phase of the CDM. That would kick-start the CDM and reward those businesses that have already started plans for less emission-intensive projects. Heller (1998, pp.15ff) even goes further, arguing that that a qualitative screening for transaction costs and barriers should be a sufficient criterion for key projects that prevent lock-in of energy-intensive infrastructures on a substantial scale to qualify for CDM.

Already many emission reduction projects are profitable to undertake – either for a company or for a country as a whole. The profitability for the latter includes externalities, such as the reduction of other pollutants. Now the question arises as to whether these so-called micro- or macroeconomic ‘no regrets’ projects – projects that would seem to be profitable on their own – should be included in the baseline. So far, the question of ‘no regrets” has led to heated debates in the economics community. Some say that there can be no ‘no regrets’ projects because such opportunities would have already been exploited (Sutherland, 1996). Others estimate that 10 per cent - 30 per cent of today’s emissions could be reduced by means of ‘no regrets’ projects (IPCC, 1996).

Until now, the ‘no regrets’ issue has been typically referred to in very general terms in the debate on the CDM and AIJ. While some authors say that all ‘no regrets’ projects have to be included in the baseline and therefore excluded under the CDM (Bedi, 1994), others would accept all of them (for example, Rentz, 1998). Chomitz (1998, pp.3ff) presents a macroeconomic analysis of their inclusion. In this analysis, overstated baselines result in increased emissions, reduce the gains from CDM and divert rents away from projects with positive costs.

If microeconomic ‘no regrets’ projects were excluded from the CDM, an investor would have an incentive to raise costs artificially to demonstrate that his project has positive net costs (Torvanger *et al.,* 1994, p.21). Therefore even that distinction cannot be applied. The International Energy Agency (1997) tries to define barriers to project implementation. It suggests that a project be accepted under the CDM if it promises to overcome technological, financial or institutional barriers. This is the best proposal to evaluate the 'no regrets' issue, but even here one can define barriers quite arbitrarily. Chomitz (1998) tries to quantify the barriers through behavioural and financial modelling. He states, however, that the parameters from which to create these models are known only to the project sponsor and can easily be manipulated. Thus he argues for default specification of these parameters on a country-by-country basis.

Constant versus revised baselines

The problems created by fixing baselines for projects with long lifetimes could be alleviated through revising baseline calculations regularly to take policy and macroeconomic changes into account (Andrasko *et al.,* 1996). This would result in increased uncertainty for the investors, because the credited emission reduction would depend on the adjustments of the baseline (UNFCCC, 1997, p.3). However, baseline regulations should limit, but not abolish, the entrepreneurial risks (and chances!) the investor takes. Emission reduction benefits should be useful for overcoming initial investment barriers, but they must not serve as a subsidy for an otherwise unprofitable project over its entire lifetime. Revising baselines could even fulfil the developing countries' demand for the transfer of state-of-the-art technology, by discouraging 'dumping' of outdated technology on the host country. If, for instance, a CDM project consists of the replacement of a coal-fired power station by an efficient renewable plant, the difference will not only be higher, but also longer lasting, than just retrofitting the old plant.

A possible compromise would be regular updating of the baseline – once every five years, for instance – or the option of a fixed, but more conservatively calculated, baseline (Hagler-Bailly, 1998, pp.1-9). The maximum lifetime of a baseline could be set at a decade. While annually updated baselines could be rewarded by certifying 100 per cent of the emission reductions, this portion could decline for projects with longer updating periods. In the second year of use of a baseline, for instance, 95 per cent of the emissions reductions would still be recognized as certifiable. Following this example, in year 10, only 55 per cent of the emission reductions calculated against the old baseline would be certified. Starting with year 11, a new baseline would have to be established for the project.

Country wide baselines

An ideal country baseline would be an overall emission cap, comparable to the industrial country targets. Intra-country leakage would be zero and the 'no regrets' issue sidelined. Nevertheless this is not politically feasible, because host countries are wary of committing themselves to anything like a cap. It still seems very appealing to calculate a baseline for a whole country and then aggregate the effects of the different CDM projects (Rentz *et al.*, 1998). For CDM host countries, we would expect a growth baseline. Reliable, quantified measurements of *actual* emissions are an important prerequisite for establishing such a baseline. A number of very different approaches are currently used to this end, producing highly divergent results. Hamwey (1997) simply averages historical emission factors. The study by Rentz *et al*. (1998) used energy systems models to derive baselines for Russia and Indonesia. However, because of the lack of data and data reliability problems, the Russian model does not consider industry and the household sector (ibid., p.160): it covers only the energy supply and forestry sector. Obviously, such a baseline will be misleading. The Indonesian model at least covers the electricity demand side, but not transport fuel or heat demand (ibid., pp.184ff). Countrywide baselines could be necessary if macroeconomic reforms such as subsidy phase-out were allowed to count as 'projects' under the CDM (Center for Clean Air Policy, 1998).

Sectoral baselines

A growing strand of literature (Carter, 1997; IEA, 1997) proposes sector-specific baselines. This conceptually simple, politically difficult solution would establish sectoral or national caps, and measure offsets against these (Carter, 1997). This is particularly appealing for large-scale level projects with significant sectoral effects. For instance, a decision to build a generating plant can affect gridwide expansion and generation plans. Similarly, project-based efforts to protect particular forest plots from subsistence-oriented conversion may merely divert the farmers to another location. For large-scale energy and forestry projects, it could be desirable to compute sectoral level baselines and look at sectoral level effects. Sectoral baselines would have to be developed beforehand by the host country's institutions. This activity could be financed by the Global Environment Facility (GEF), thereby lowering transaction costs for potential investors.

Among the several severe difficulties of pursuing this approach is establishing the overall cap. This could be accomplished through the use of a complex model of the energy sector or of land use, based on prior emissions levels, adjusted for population or economic growth. In general, agreement on such a cap might be very difficult. A second difficulty arises in allocating the rights to create offsets against this cap. Moreover, the informational requirements can be very high, especially in a developing country context. Finally, it is unclear where sector boundaries should be set. Nevertheless, the sectoral approach should be chosen in the context of sink projects where leakage through simple relocation of forest destruction or degradation is very likely.

Benchmarks

Benchmarks (Hagler-Bailly, 1998) are quantitative emission factors per unit of output such as 'CO_2 emission per kWh of electric energy'. This would not limit the absolute rise of emissions and would therefore address developing countries' fears of being hampered in their economic growth. The advantage of benchmarks is highlighted by the extreme case of a power plant that is built but never operated: it would not yield any credits. Using benchmarks, increased sector production would lead to higher credits for the investing country only if the plant increased the overall efficiency. As high energy efficiency is a precondition for limiting CO_2 emissions, benchmarks could be used as common (and perhaps voluntary) targets for all parties to the Convention. However, this condition is necessary but not sufficient. The whole industrialization process has been marked by an increase in resource efficiency, which led to higher profits instead of diminished pressure on the resources. It would be counterproductive if industrialized countries were allowed higher absolute emissions while non-Annex countries increased their absolute emissions as well. Apart from damaging the atmosphere, this would erode the value of credits. Therefore mixing qualitative and quantitative targets in the long term does not lead to the desired results, but can be an intermediate strategy to integrate developing countries in the climate policy regime.

Nevertheless, benchmarks would motivate host countries to press for higher efficiency standards when accepting a CDM project. With the absolute emission reduction credits going to the investing country, the host country would profit by attaining its qualitative goal.

Project-related baselines

Taking into account the uncertainties of country-related baselines, *project-specific* baselines have been proposed as an alternative (Michaelowa, 1995, pp.65ff). The calculation of the baseline has to account for likely changes in relevant laws and regulations, the overall trend for efficiency improvements, and changes of other basic variables, such as development of markets for products of the project. It is possible to define either a 'median' baseline or a set of baselines with different assumptions weighted according to their probability (Andrasko *et al,*. 1996). For example, if a power station project does not replace existing plant but creates additional capacity, the baseline depends on the fuel that could have been used in an alternative solution. The alternative to a hydroelectric power station can be a coal-fired power station, for instance, burning either hard coal or lignite and producing very different emissions. For practical reasons, the host country's average fuel mix should be chosen for calculating the baseline in such cases (Michaelowa, 1995, p.65). The choice of such benchmarks is discussed by Hagler-Bailly (1998, pp.3-11ff), who discusses four ways of defining benchmarks: historical, forward-looking, and small and large samples.

The problem of defining an alternative project does not arise if, for example, an existing plant is to be replaced. In that case, the question of the remaining lifetime of the replaced plant has to be answered. Chomitz (1998, pp.6ff) lists a number of parameters that influence this value and finds them hard to observe, and subject to misrepresentation, strategic manipulation and autonomous change. Before the quantitative impact of a sequestration project can be estimated, relevant sources and sinks of greenhouse gases must be identified. Moreover, a quantification of past emissions is necessary. Demand-side management (DSM) projects pose special challenges, as they rely particularly on behavioural parameters. Nevertheless, the experience with US DSM has led to valuable progress in determination of actual energy savings that can be transferred to baseline determination (ibid., pp.14ff, 39ff).

To correct the estimates for 'free-riders' (those who would have installed the subsidized measures anyway) – evaluators often use survey instruments. Remarkably, a significant proportion of the respondents acknowledge that they would have adopted the measures without any incentives. Another approach uses control groups. For instance, if high-efficiency light bulbs were subsidized through a CDM project in one city but not in an otherwize completely comparable control city, monitoring the latter would provide baseline information about the spontaneous rate of adoption of the bulbs in the absence of incentives. However, valid control groups are difficult to find because valid statistical comparisons require a large sample size for modest changes in emissions to be detected. Moreover, in many cases, the project facility may be unusual, and it may be difficult to find a large enough or similar enough control group to permit these comparisons. The control group has to be ineligible for, and likely to be unaffected by, the project.

Leakage

Project-specific baselines do not take into account indirect effects that can arise, for instance, when the project no longer produces but buys goods whose production caused greenhouse gas emissions. Emissions can also be influenced by price effects. For example, when carbon-rich fuels are replaced by low-carbon fuels, the price of the former tends to fall while the price of the latter will tend to increase. This price effect, in turn, tends to stimulate greater use of carbon-rich fuels and to lead to an increase in emissions. Demand-side energy savings would also cause energy prices to fall.

Another indirect effect would be the alleviation of energy supply shortages in host countries (Heister and Stähler, 1994). This argument is static, however. If one assumes rising incomes in these countries, these shortages would be alleviated in any case without emission reduction policies. It is possible, though, that industrial countries could try to push strongly for the extension of electricity supply in developing countries to enhance their own export markets for power supply technology. In this case, even the supply of efficient, state-of-the-art technology would lead to additional emissions compared to a business-as-usual path. Nevertheless, the emissions from additional electricity use would certainly be at least partly offset by reduction of emissions from unsustainable fuel-wood collection.

Therefore, an indirect effect of CDM projects might be to raise emissions in the short term but to lower them in the long term. It is likely that the latter effect would be greater. However, these indirect effects can only partially cancel out the emission reduction achieved by a CDM project. The effects described above arise in any sort of climate protection projects and not just in the case of CDM. Moreover, improved access to modern technology through the CDM can contribute to emission reductions. The same applies if products of the project sequester greenhouse gases and replace energy-intensive goods. It is impossible to specify whether indirect effects will lead to more or less emission reduction than the project-specific baseline scenario suggests. Thus, in the case of undistorted markets, there is no systematic trend for project-specific baselines to show excessive emission reductions. This is not taken into account by SBSTA (UNFCCC, 1997, p.2), which states that ‘system boundaries for AIJ projects should be appropriate to the scale and complexity of the activity, so as to incorporate consideration of possible leakage’.

Nevertheless, leakage could be taken into account by deducting a certain percentage of leakage by default from the certified emissions reduction, depending on the type of project. The penalty such an approach exacts from low-leakage projects could be reduced by allowing project participants to get up to the full amount of certified emission reduction units if they can prove that leakage is lower than the default specification.

Besides indirect effects, a problem with project-related baselines arises if the host country distorts fuel and electricity markets by granting production or consumption subsidies. A project-related baseline cannot take into account changes in these subsidies that would alter a country-related baseline. As tight public budgets and liberalization of energy markets lead to subsidy cuts, project-related baselines would show greater emission reduction because of the higher incentive to save energy when energy prices rise. Thus, after phase-out of subsidies, we would forecast a lower countrywide baseline. A solution to this problem could be to prescribe a combination of a countrywide baseline with project-specific ones, which would allow for adjustment of the latter if the subsidies were phased out. This combination should be used only in cases of high subsidies or market distortion. It should be taken into account, however, that such a solution would provide a disincentive to phase out subsidies, because the amount of credits would be positively linked to the amount of subsidies.

Project lifetime

SBSTA proposed that projects with equity financing should use engineering or operating lifetime of the project, whereas projects with debt financing should use amortization or depreciation lifetime of the project (UNFCCC, 1997, p.3). Choosing the operating lifetime could eventually lead to running an outdated plant only because it generates emission reduction units. The amortization lifetime is usually too short a period to make use of the equipment´s full benefits. We therefore propose the commercial lifetime of the project's hardware, an intermediate measure, in order to keep the investment certifiable as long as it remains commercially profitable.

Credit Sharing

CDM rules described above can be interpreted to allow the following creation, allocation and distribution of credits, assuming credits are tradable according to Article 3.12 (see Figure 8.4):

- allocating credits only after discounting (see below);
- allocating credits only after a share has been deducted and sold to finance adaptation projects and administrative expenses (Art. 12.8);
- allocated credits accrue to the investing country in full: if the interpretation of 'benefits' accruing to the host country (Art. 12.3a) means investment capital and project externalities only;
- allocated credits are shared between investing and host country: 'benefits' (Art. 12.3a) mean a share of the credits;
- An interesting, but daunting, option would be to set the share of the investing country at zero if the host country finances the project on its own;
- allocated credits accrue to the investing country only until a quota is reached (Art. 12.3b).

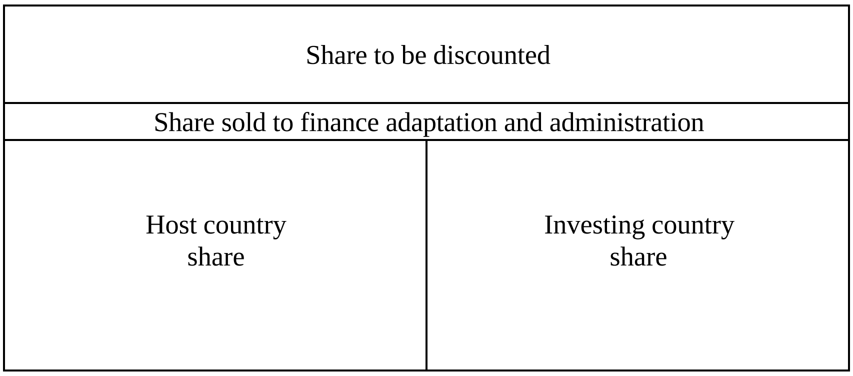

Figure 8.4: Possible credit allocation and distribution

CDM is often understood to involve the following type of transaction: a government or a private entity of a country with an emissions target finances a project in another, the host country. Credits from the emission reduction accrue only to the investor. The positive externalities from the project (see below) are deemed sufficient as incentive for the host country. If credits are fully tradable domestically and internationally, they should accrue to the entity investing, even if it is a private company. If there is no domestic trading system, the credits should accrue to the government which, in turn, should compensate the investor through emission tax reductions or reductions in regulatory requirements.

The host country will be interested in credits when one or more of the following applies: it is subject to an emissions target; it does not have an emissions target now but wants to bank credits for future commitments; credits can be traded on a market.

Allocating all credits to the host country would make no sense for a rational CDM investor. Of course, the host country could then finance the project on its own and sell credits earned. No rule of Article 12 would prevent this. Costa Rica has already pioneered this kind of trade by financing umbrella forestry and energy projects through a fuel tax and trying to sell certified tradable offsets (see Chapter 5).

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

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

The national emission targets should be derived from national baselines developed using common rules and procedures. Any improvement in environmental legislation will then be beneficial for future compliance. As in the case of the investing country, credits could either accrue to the entity involved in the project or the government. The former would be only relevant if credits could be traded freely. The decision on that issue could have important distributional consequences. To sum up: credit sharing leads to higher costs for the investors. Free negotiation of the credit sharing ratio will lead to competition between host countries.

CREATING SYNERGIES: SUCCESSFUL INTERTWINING OF CLIMATE AND DEVELOPMENT GOALS

Positive externalities are the only incentive for host countries to engage in CDM unless they receive a part of the credits and are able to sell them. The following externalities are relevant:

- formation of human capital,
- transfer of technology,
- capital transfer,
- foreign currency transfer,
- job creation,
- improvement of distribution,
- reduction of local pollutants,
- protection of biodiversity.

It is very difficult to quantify these externalities. Most of them are interlinked and operate on different time scales. Feedback effects depend on the local situation. While it is obvious that CDM projects will lead to capital and foreign currency transfer, the net effects on jobs are 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 US$20-200 per ton of Carbon. Thus the value of externalities of carbon emission reduction would in fact be higher than the credit value from CDM projects 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. Projects which offer such benefits will be preferred. In fact, the first AIJ project in central Europe, the Decin project in the Czech Republic, was promoted by the local authorities for precisely that reason.

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 CDM. Costa Rica is an example of such a trend, as it focused especially on extension of national parks through AIJ funds. 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 CDM funds to maximize positive environmental and social externalities.

It is crucial to minimize negative externalities. The most critical negative externality of climate cooperation projects could be that they reduce incentives for innovation. For a detailed discussion of this aspect, see Michaelowa and Schmidt (1997). It would be advisable not to set quotas on the share of CDM credited towards industrial countries' targets as they give no dynamic incentive for innovation.

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 of how to weight them will be crucial for the success of these projects.

Crediting and Externalities

From the preceding discussion it is obvious that there is no general rule for the sign and size of externalities. 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 others. Fossil power plants will create fewer jobs than demand side management programmes. Renewable energy projects will mean zero emission of local pollutants compared to fuel substitution projects that still lead to a - however reduced - emission. Forest protection projects and afforestation are unlikely to entail technology transfer and human capital formation. The former are likely to entail biodiversity protection, while the latter is not. Large-scale projects are more likely to disrupt local life and displace people than small-scale ones. The following general conclusions can be used to categorize projects and differentiate crediting.

1. Demand-side management and production of renewable energy can be credited fully.
2. 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. Alternatively, these risks could be covered by a compulsory insurance.
3. 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.

Moreover, the host country can grant incentives on its own. For example, in the case of private enterprise sequestration projects, state grants should help make diversified reforestation projects more attractive. This sort of procedure is beneficial for the economy as a whole, since more diversified projects involve greater positive externalities. The preservation of threatened areas of primary forest can bring even greater positive externalities.

Crediting of externalities should be explicit if there are other incentives such as subsidies for biodiversity protection not payable to CDM projects. Even if externalities were not credited explicitly, an investor would profit from a project with many positive externalities inasmuch approval and execution of the project would be smoother than otherwise.

Concerning innovation, on the one hand there have to be incentives for induced innovation to achieve long-term efficiency gains. On the other hand, short-term efficiency gains through CDM 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. 8.5 shows a sliding reduction of crediting of CDM. 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.

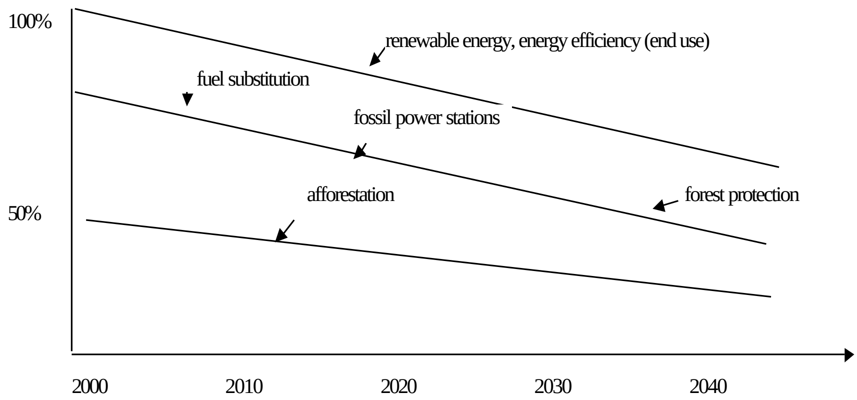

Figure 8.5: Decreasing credit ratios

This policy entails the following advantages:

- Investors receive long-term planning data.
- Investors can get full crediting for CDM 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.

Towards Global Emission Trading on an Equitable Basis

In the long run, a global system of emission trading will be the most efficient way to reduce greenhouse gas emissions. Developing countries will only accept such a system if it takes into account equity. In general, an equitable climate policy should mean that each inhabitant of the world has equal rights to the atmosphere. In economic terms, that means that everybody would be entitled to the same quota. The target could also take into account historical emissions which have not yet decayed and therefore stress the long-term nature of the problem (Agarwal and Narain, 1991). To divide annual emissions into the number of people, calculating an average and thus allocating emission permits is straightforward. A global reduction target would then mean a proportional devaluation of every permit. As population changes are not tracked every year, reallocation should occur only every five years. There should be a mechanism to prevent inflation of population numbers such as an independent evaluating team. If climate policy is also used for population policy purposes, the population could be fixed at a date where the climate problem became politically relevant (for example, 1992; see Bohm, 1995, p.26). One could also choose the population before the onset of the demographic transition, but fixing the date by consensus will be difficult.

To redress historical inequities in emissions, cumulated emissions have to be taken into account. There could be different formulae concerning the cumulated emissions. A strict one would divide the cumulated emissions (minus natural decay) into the number of people living or having lived in the period. Then one could calculate a global average of cumulative emissions per capita and calculate emission debtors and creditors. Accordingly, the allocation of emission permits would be changed.

From a responsibility point of view, one could limit the calculation of past emissions to the year where the connection between greenhouse gas emissions and climate change became obvious beyond purely scientific circles. A suitable date would be the First World Climate Conference in 1979. For a calculation of different allocation modes, see Box 8.1.

Box 1: Equity-based allocation and reduction necessity per group of countries

The allowable global emission[4] of 6000Gt CO_2 must be distributed over time. The higher the peak emissions, the less natural decay can reduce the concentration and the higher the risk that a critical threshold is passed. The WBGU emission path (WBGU 1996) would mean that global emissions would be reduced from the current value of 22 300Mt by 1 per cent p.a., that is initially 223Mt. Compared to the business-as-usual rise of 1.7 per cent p.a., the necessary reduction will be a further 380Mt. It is assumed that the ocean sinks are treated as a global resource that does not belong to a particular country. How can the emissions be allocated equitably?

<u>1. Per capita allocation of future emissions, population 'frozen' at 1990 level</u>
If the current emission is allocated equitably, each person has the right to emit 4.2t p.a. All industrial countries and NICs would have to reduce their emissions by a factor of two to five to reach that value. Most developing

4. Gt: billion metric tons, Mt: million metric tons. Including other greenhouse gases would shift the balance in favour of the industrial countries as their emissions are more broadly distributed. As the database for emissions of those gases is still incomplete and unreliable, a calculation of the mitigation commitments is impossible. The principles explained above could be extended to these gases as soon as the data become more reliable.

countries with the exception of some OPEC countries, do not reach the threshold. To reduce incentives for further population growth, the allocation should be fixed at 1990 population figures. To reach the threshold, industrial countries can at first use the CDM. Taking into account a 'no regret' potential of 10-20 per cent in the industrial world, the OECD could reduce per capita emissions at home from currently 11.2t to 9.5t with economic gains. Then, annually about 5000Mt would have to be reduced either via CDM or at home. As the emissions of developing countries and countries in transition which currently are 10 000Mt, could not realistically be reduced by 50 per cent, bilateral contracts on the temporary lease of unused emission permits of developing countries could be concluded. At a later stage these emission permits could be made tradable and industrial countries could buy surplus permits from developing countries.

With an annual reduction of 1 per cent, global emissions would be below 21 500Mt in 2000, below 20 000Mt in 2007 and below 17 500Mt in 2020. By then, world population will have reached 8.1 billion and the real per capita allocation accordingly will have almost halved to 2.2t p.a., while, taking into account that the population shares are fixed at the 1990 levels, the 1990 weighted value would be 3.3t. Many developing countries will have crossed that threshold and the permit surplus will be limited to a few countries.

In the long run, decay of CO_2 could lower the restrictions and allow a residual emission that has been quantified by WBGU at around 15Gt. This value would be reached by 2035.

2. Per capita allocation including accumulated emissions since 1980 (weighted with 1990 population)

Since 1980, global warming has been discussed widely, so every country has to bear responsibility for its emissions over this period. The OECD countries emitted more than 100Gt in the 1980s, accumulating a 'debt' of more than 100t per capita. A similar relation applies for the countries in transition. The corresponding value for the rest of the world is only a fourth and the global average about 42t per capita. It would be appropriate for countries which have emitted less than the global average to receive an additional allocation which is 'financed' by an additional reduction commitment of those countries which have overused the resource. The compensation should be extended over a period of several decades to prevent financial strain. If the OECD countries had to mitigate their additional share of 56Gt over a period of 40 years, their additional annual commitment would be 1.4Gt, or about 13 per cent of current OECD emissions. This would not be achievable without huge economic costs. Therefore a period of a century would be appropriate, that is, 0.6Gt per year (6 per cent of current emissions).

<u>3. Per capita allocation including accumulated emissions since 1950 (weighted with 1990 population)</u>

If the 'polluter pays principle' was accepted, emitters would have to be hold liable for all greenhouse gas emissions that are still in the atmosphere. Accordingly, emissions would have to be discounted by the natural decay factor and then cumulated. As the database for country-specific emissions extends only to 1950, the predating emissions cannot be assigned to each country. Furthermore, there are difficulties concerning the allocation of emissions of colonies: should they be allocated to the colonial power or the territory? A pragmatic approach would therefore entail a calculation of the cumulative emissions. The calculation below does not entail a decay factor and therefore is biased against those countries which had high emissions in the earlier part of the period. A territorial approach is chosen. If the global total of 557 050Gt is allocated to the population living in 1990, a global average of 105 t per capita can be deduced. The OECD average would be 320t while the average of the rest of the world would be 55t. Allocating the debt according to (2). the additional commitments of the OECD would be 202Gt. The compensation should be extended over more than a century to keep annual mitigation rates below 2Gt.

From the moral point of view, the developing countries should press for an immediate per capita allocation. Because of the political and economic power of the industrial countries, it is unlikely that these will accept the equity-based allocation in the near future, unless well organized NGO activities worldwide lead to a climate conducive to strong redistribution. In the case of industrial country resistance, the climate policy debate could be compared with the debate on the New Economic Order in the 1970s. That was a time when a subset of developing countries (OPEC) could put real pressure on the industrial countries. Still, the debate ended in a dead end. Another example of high demands by the developing countries and an ensuing stalemate is the negotiations on the Law of the Sea which took over a quarter of a century before the Convention on the Law of the Sea finally entered into force – much watered down. Moreover, if time is lost in that way, the industrial countries will surely point to the rapidly rising emissions from the developing countries, thereby reducing allocation of permits and transfers. Despite the dismal record of technology transfer in aid or environmental agreements so far, there is a good chance that self-interest of the industrial countries will lead to a better outcome.

If the right incentives are offered to CDM investors, money and technology will start to flow in on a large scale. Developing countries should therefore press for a system of tradable permits that could start with an allocation not much different from the existing one, but with a well-defined path (such as a sliding 20 per cent reduction compared to 1990 of the industrial countries´ permits until 2010, 50 per cent reduction until 2030, and 70 per cent until 2050) towards the per capita allocation.

Therefore developing countries should adopt a step-by-step approach. The first step is CDM, as it gives the developing countries implicit entitlements which can be exchanged against capital and technology transfers. This step should begin in 2000, as originally envisaged under the Kyoto Protocol. As a second step, national permit systems could be introduced before the global system of tradable permits is introduced. Of course, under the CDM transparency is lower and investment depends on the incentives granted by the governments of industrial countries. The amount of transfer to the developing countries also depends on the negotiating skill of developing country actors. From the discussion above, it has become obvious that there are many obstacles to an efficient, first-best application of the CDM in an international as well as a national context. A CDM regime which is in the hands of interest groups could lead to a number of distortions.

1. The emitters in the industrial countries use the regime to purport that they are doing something about climate change and to prevent strong domestic instruments of climate policy.
2. Emitters in industrial and developing countries join forces to claim spurious reductions.
3. Politicians in industrial countries want to reduce development aid and see the CDM as a valuable substitute.
4. Emitters in industrial countries lobby for less costly instruments. Subsidies and voluntary commitments are therefore more likely to be the basis for CDM than the more efficient emission taxes or tradable emission permits.
5. Emitter interests still being better organized than NGO interests, the gains of CDM projects might accrue disproportionally to the former. They will use the CDM to lower costs instead of achieving higher emission reductions.
6. Large projects are preferred by the emitters in the investing countries and the politicians of the host countries. NGO and local interests in small-scale projects with high positive externalities will be defeated.

In order to combat these distortions, pressure groups must be prevented from appropriating the CDM for their special interests. As in all political fields, this can only be guaranteed through a system of checks and balances, which, however, takes away some of the efficiency properties. Two main principles can be found which imply some restrictions on the application of the CDM. Therefore, in comparison with the efficiency-oriented solution, one can speak of a second-best solution. It is characterized in the following way: (a) through *transparency*, the actions of participants can be subjected to close scrutiny, distortions are less likely and the regime will gain credibility; (b) political action must be *rule-oriented* and should not be discretionary; interest groups find it more difficult to change rules than to change single decisions. If the rules are strong, policy makers cannot intervene easily. For a second-best application of the CDM these mechanisms should be established at the national and international level to counterbalance lobbying activities.

As early as possible, a global system of permits should be instituted that will be the most efficient, transparent and equitable way to reach the long-term target of stabilizing greenhouse gas concentrations. The permit price will give the same incentive to reduce emissions all over the world. The permits would be traded by governments, companies and individuals and form a kind of money. They would be issued by a global clearing house that steered the quantity of permits according to the optimal global emission path. To prevent political deadlocks, the clearing house should be operated by a council of directors according special voting rules. For example, they could specify that a majority of both permit creditor and debtor countries is required for important decisions. In monetary terms, an independent central bank has proved to be successful in stabilizing the value of currencies. Accordingly, a climate central bank could help enforce quantitative goals by limiting the absolute number of emission rights (Dutschke *et al.,* 1998). As long as developing countries stay outside the system, the 'climate bank' could administrate the aggregate of emission rights, in order not to inflate the system. Each emission reduction unit created outside the system (that is, by the CDM or by sequestration measures within committed countries) would be allocated free to the investor. On the other hand, it would have to be withdrawn proportionally from the aggregate of the committed countries' budget.

However, the allocation rule should operate on a per capita basis as soon as possible, in order to include developing countries. Taking into account the political realities, a gradual change from grandfathering to a per capita rule seems most promising. In the long run, the accumulated emissions debt would also have to be 'repaid' (see Box 8.1). To prevent an 'emission permit debt' problem which could be created if corrupt governments raise short-term revenue by selling the whole futures stock of emission permits, futures trades by surplus countries could be limited to a period of, for example, five years. The role of CDM will then have finished, as there is no further need to organize emission reduction projects on a bilateral or multilateral basis: they will be automatically induced by the permit price. The price depends on the emission targets and the allocation. Via futures markets, national development strategies could be secured against variations in the permit price.

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