Implementing the Climate Change Regime's Clean Development Mechanism

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The Clean Development Mechanism (CDM) of the Framework Convention on Climate Change seeks to reduce the costs for industrialized states of reducing greenhouse gas emissions while supporting abatement efforts in developing countries. Implementing an effective CDM system (whether under the Kyoto Protocol or any agreement that replaces it) will require recognizing that projects may fail because of intentional nonperformance by participants, the withholding of necessary cooperation by nonparticipants, adverse external events, or any combination of these. Maximizing the benefits to the climate change regime will require establishing project criteria and monitoring procedures that distinguish project-related from participant-related risk. Rather than adopting an exclusively adversarial approach focused on identifying and punishing those causing project failure, effective implementation will benefit from facilitative measures to avert failures before they occur and will reward projects that succeed under adversity. The CDM system's ultimate success also will require progressively evaluating and refining the system as a whole, as well as individual projects.

Political developments in early 2001 make it increasingly unlikely that the Kyoto Protocol to the Framework Convention on Climate Change (FCCC) will enter into force. Although disappointing to many analysts, the failure to implement the Kyoto Protocol is likely to postpone rather than prevent international efforts to address climate change. Efforts to revise or renegotiate the protocol are already under way. Existing pressures, particularly from the United States, suggest that any new protocol will require developing states to accept emission reduction obligations, creating a much different agreement than that which emerged from Kyoto. Yet, one element likely to reappear in any such agreement is a "Clean Development Mechanism" (CDM), under which industrialized states could receive credit toward their greenhouse-gas emission reduction targets under Annex 1 by funding abatement or sequestration projects in developing states. Despite the misplaced optimism that led us to frame what follows in terms of implementing the Kyoto Protocol's CDM system, we believe our argument applies to any CDM-type system that may emerge from future climate change negotiations. Any agreement is likely to have some system designed to create incentives for firms and organizations in industrialized (Annex 1) countries to undertake re-

Journal of Environment & Development, Vol. 10, No. 2, June 2001 125-146

duction projects in partnership with governments, firms, or other organizations in developing (non–Annex 1) countries. These CDM partnerships will attempt to induce developing state governments, and sub-state actors within them, to reduce their emissions beyond any levels that may be required of them in a new protocol.

The CDM is one of four mechanisms in the Kyoto Protocol that give Annex 1 countries flexibility in meeting their targets. In addition to reducing emissions domestically, Annex 1 countries may (a) pool their national targets in their entirety (the "bubble" in Article 4 of the protocol); (b) exchange agreed quantities of allowed national emissions with other Annex 1 countries ("emissions trading" in Article 17); (c) acquire credit for reductions achieved by projects in other Annex 1 countries ("joint implementation" in Article 6); or (d) acquire credit for reductions achieved by projects in non-Annex-1 countries, which have no reduction targets (the CDM in Article 12). Although these flexibility mechanisms promise savings as large as 50% in the cost of attaining a specified global abatement goal (see, e.g., Kuik, Peters, & Schrijver, 1994, p. xii; Metz, 1995; Parson & Fisher-Vanden, 1999; Weyant et al., 1996), they also present complex implementation challenges.

In this article we analyze problems of implementing the project-based reductions authorized by the CDM, the only flexibility mechanism that promotes reduction efforts in Non-Annex-1 countries. As with other market-based policy mechanisms, the CDM offers to reduce abatement costs by relying on decentralized decision making to identify low-cost opportunities. However, this same reliance on decentralized decision making poses significant implementation challenges and risks of nonperformance or project failure (Trexler, 1995). Appropriate assignment of liability has been recognized as one means of reducing these risks (Kerr, 1998), but a liability regime alone cannot address all sources of risk or constitute a complete implementation system. We propose additional components of a system for implementing the CDM to balance system effectiveness and efficiency based on an analysis of the incentives involved in CDM projects and a taxonomy of types of project risk.

Explaining the CDM and Its Adoption

The CDM is designed to help industrialized, Annex 1 countries meet their targets at lower cost than otherwise possible while engaging developing, Non-Annex-1 countries in processes that mitigate climate change and foster sustainable development. The CDM assumes that Annex 1 governments adopt domestic policies that require or encourage domestic actors to reduce emissions but allow them flexibility in how they do so. These actors will wish to minimize the costs of meeting regulatory

obligations or qualifying for receiving incentives. In many cases, lower cost abatement opportunities will be available in Non-Annex-1 countries than domestically, but with no reduction obligation in force in these countries, substate actors there will only participate in reduction projects if remunerated.

For nonstate actors in Annex 1 states to have incentives to participate in the CDM, two conditions must be met. First, Annex 1 governments must establish policies that make reducing emissions more attractive than not doing so. This may be accomplished by regulating or taxing emissions, with corresponding sanctions for noncompliance, or by providing rewards for reducing emissions. Of course, any such approaches require that governments monitor emissions so that penalties or rewards reflect actual performance. Second, Annex 1 governments must allow domestic actors to meet their obligations or earn their rewards indirectly, by funding reductions undertaken by others. Granted such flexibility, these actors will have incentives to seek opportunities to reduce emissions more cheaply than they can themselves. Although domestic flexibility measures allow firms to search for such low-cost reduction opportunities at home and three of Kyoto's flexibility mechanisms allow them to search in other Annex 1 countries, only the CDM allows the search to include potentially still lower cost projects in developing countries.

Allowing abatement in Non-Annex-1 countries under the climate regime is promoted as necessary to attaining stringent global abatement goals and as beneficial in significantly reducing the cost of more modest goals. Doing so through the CDM poses novel implementation challenges, however, which are more serious than those associated with other flexibility mechanisms. The other three mechanisms involve exchanges of national-level emission obligations among Annex 1 governments and so pose challenges that are more familiar and tractable. In contrast, the CDM's project-based emission reductions and cost savings depend far more on the performance of the substate actors expected to finance, implement, and oversee projects. The CDM involves a fundamental novelty: Where treaties conventionally use sanctions to induce compliance by member governments, the CDM uses rewards to recruit participation by substate actors in nonmember states. It seeks to attract nongovernmental participation in dragger states rather than punish governmental noncompliance in pusher states.

The ultimate success of the climate regime will depend on engaging most or all nations in emissions reduction, despite the current lack of incentives for many developing governments to contribute to this project. In other environmental arenas, powerful concerned states have been willing to threaten reluctant states to induce their participation (DeSombre, 2000). Thus far in the climate case, however, concerned states have sought to attract, rather than coerce, participation. The CDM

pursues that goal, seeking to create attractive opportunities for Non-Annex-1 states to participate rather than imposing obligations on them. It was explicitly established to "assist Parties not included in Annex 1 in achieving sustainable development and in contributing to the ultimate objective of the Convention" (Article 12.1) while ensuring that they "benefit from project activities resulting in certified emission reductions" (Article 12.3a). In addition to funding projects, the CDM system requires government approval for projects in their territory and requires that some share of project proceeds be used to "assist developing country Parties that are particularly vulnerable to the adverse effects of climate change to meet the costs of adaptation" (Article 12.8). Thus, the CDM avoids threatening Non-Annex-1 states' sovereignty, places no obligations on them, and allows them to participate a la carte, approving only those projects they deem beneficial. This "opportunities for benefits" approach contrasts with the ozone regime's "obligations but no costs" approach, which required developing countries to reduce use of ozone-depleting substances but paid the incremental costs of doing so.

As a voluntary system that relies largely on private firms, the CDM does not oblige governments to incur any undesired costs. It offers developing states the option of attractive voluntary participation and offers industrialized states the opportunity to reduce the cost of meeting their reduction targets while still allowing both to reject projects that they judge against their interests. It appeals to current theories of regulation that seek to replace traditional command-and-control approaches with more flexible, economically efficient approaches. Although Annex 1 governments will likely be involved in the independent auditing and verification of project activities, the protocol does not make them responsible for sanctioning or rewarding Non-Annex-1 governments or project participants. Consequently, they bear little of the risk associated with the CDM. If it fails, they face the same set of abatement opportunities domestically—and in other Annex 1 countries—as they would have in the absence of the CDM. If it succeeds, they benefit from lower abatement cost for their nationals, "laboratories" to identify and test reduction opportunities, and the prospect of progressively increasing developing countries' commitment to the climate regime by initially engaging their governments and substate actors on a voluntary basis.

The Origins of Project Failure

Designing strategies to foster the success of the CDM system, and of individual projects, requires defining project success and failure and identifying their causes. Those funding or implementing individual projects will likely define success as delivering the expected surplus of

private benefits over costs, but this does not capture all relevant public interests in the system. The CDM system will pursue several goals: to encourage widespread participation in abatement, including in countries without national targets; to abate or sequester a large quantity of emissions, at low cost; and to encourage innovation in project technology, structure, and management, so that they become increasingly effective and efficient over time.

Although projects may fail for multiple reasons, we can identify three *ideal types* of project failure: nonperformance, noncooperation, and exogenous risk. First, projects may fail through project participants' intentional nonperformance of their obligations.[1] The very value of the CDM system is predicated on involving participants whose primary interests are economic not environmental. Unfortunately, efforts to link the former to the latter will always be imperfect. All actors will at times have, and some will at times succumb to, incentives to renege on their project obligations or implement them in ways that sacrifice abatement to other private goals. Economically motivated investors in Annex 1 countries and implementers in Non-Annex-1 countries will seek to maximize the difference between their return and their costs, a goal that will often conflict with maximizing emission reductions. Implementers of a reforestation project might plant less land than promised or plant it badly; investors might fail to provide promised funding, training, or other resources.

Second, projects may fail due to a lack of expected cooperation from nonparticipants. To succeed, many projects will require cooperation from actors not involved in project negotiations and not bound by explicit obligations to the project, particularly host-country government agencies. For example, projects may fail because a government agency does not provide water, energy, or transport infrastructure that implementers had assumed would be available. Of course, those actors whose cooperation is critical to project success should be involved in project negotiation. That said, project risks may arise when reasonably anticipated circumstances do not materialize, leading to emission reductions below expectations despite participants' good-faith efforts. Such situations are particularly likely in the resource-poor contexts of Non-Annex-1 countries. Analysts have attributed considerable environmental treaty noncompliance to the unanticipated inability of states to fulfill their commitments (Brown Weiss & Jacobson, 1998; Chayes & Chayes, 1995). Careful planning may reveal potentially serious weaknesses in a host government's resources, infrastructure, or knowledge base, but demanding explicit assurances about future resources during project negotiation might preclude many worthwhile projects. Indeed, the CDM specifically hopes to engage developing states to achieve

1. The most striking evidence of these sorts of intentional nonperformance comes from Soviet violation of whaling quotas and Russian violations of the Montreal Protocol (Victor, 1998; Yablokov, 1994).

short-term political and long-term environmental benefits, a goal that must be balanced against such short-term project risks.

Third, projects may fail due to risks that have nothing to do with such causes. The desire for innovation in project technology, organization, or application makes CDM projects particularly vulnerable to inherent project-related risks (Mintzer, 1994, p. 44). Required project inputs may be higher than expected and higher than the relevant actor is able or willing to provide. Parties to a project might accept technical assumptions about the relationship between inputs and emission effects that turn out to be mistaken. Both uncertain knowledge and random events may make the actual context for project implementation quite different than that assumed during negotiation. A reforestation project may fail because difficult site conditions demand more time or resources than participants predicted; because a planted species takes up carbon more slowly than predicted; or because fire, drought, civil war, or recession intervene (Metz, 1995, p. 170).

Maximizing System Performance by Managing Risk

These sources of project failure produce two distinct types of threats to project performance: project-related risk and participant-related risk. Project-related risk consists of uncertainty in performance even if project participants implement the project perfectly because of technological risk, external events, or reliance on nonparticipants. For low-risk projects, the relationship of effort to outcomes is sufficiently well known that shortfalls in outcome can be readily attributed to failures of the project participants. For high-risk projects, the relationship of effort to outcomes may be either intrinsically stochastic or poorly understood, so that identifying causes of failure will require considerable investigation. Figure 1 dichotomizes these two types of risk, to identify four categories of projects. Maximizing the benefit of the CDM system will require attracting a diverse collection of projects and participants and tuning implementation approaches to respond to these differences: for example, rewarding low-risk projects that generate near-term reductions while also encouraging high-risk projects that may involve innovations that point the way to larger future reductions. Managing these differences in risk among projects involves four key CDM implementation processes: (a) setting project criteria, (b) monitoring project performance, (c) responding to project outcomes, and (d) evaluating the system as a whole. Although the Kyoto Protocol is not yet in force and the parties to the convention have not yet defined what existing or new entities will perform these functions, we describe them all as performed by a

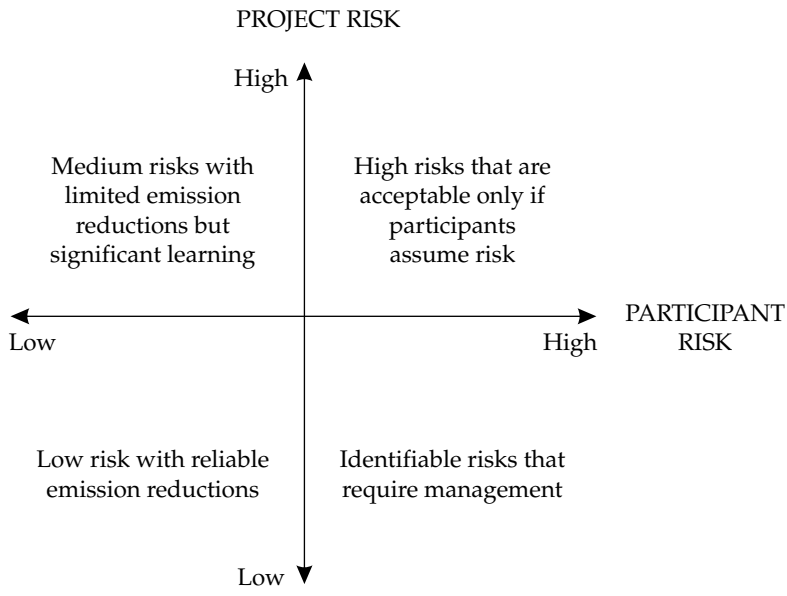

Figure 1: Threats to Successful CDM Project Performance

hypothetical CDM "authority," regardless of what entity will actually discharge them. In what follows, we identify an ambitious set of tasks and goals for the authority. We recognize that establishing an adequately competent and impartial authority will represent a significant challenge and that the political, financial, and technical resources that governments grant the authority will surely constrain its ability to achieve the goals we have identified. We contend, however, that the challenge is tractable, particularly in view of the fact that the CDM authority will not deploy coercive power or exercise any authority over state actors. Rather, its power will ultimately rest solely on the ability to grant or withhold abatement credits or to deploy other noncoercive incentives for nonstate actors.

ESTABLISHING PROJECT CRITERIA TO REFLECT PROJECT RISK

Under the CDM, actors undertake reduction or sequestration projects in exchange for certified "credits," which are valuable because they grant relief from regulatory burdens and consequently can be sold to actors facing such burdens or others (nongovernmental organizations or governments) willing to pay for emission reductions. Credits must be certified as representing real emission reductions, which requires

comparing project performance to some agreed-to set of standards. Through its power to define the terms under which credits will be granted, the authority can powerfully influence the type of projects that are undertaken, and, consequently, their contribution to overall system success. Promoting system success will require that the authority establish project criteria that are responsive to variation in the level and type of project risk.

Project criteria constitute a contract between project implementers, project investors, and the authority. Three aspects of criteria can be adjusted to balance the goals of attaining real, measurable near-term reductions and encouraging the innovation necessary to gain larger long-term reductions: (a) when and how criteria are set; (b) how the criteria define project performance and hence allocate risk between participants and the CDM system; and (c) the extent and intrusiveness of monitoring requirements.

First, the authority can establish general rules and procedures for how project criteria are developed. They could accomplish the competing goals of performance and innovation through a multipart approach, applying a minimal set of criteria to all projects, standard criteria to low-risk projects, and negotiated case-by-case criteria for high-risk projects. For low-risk projects, a few sets of standard criteria could be established for different project types. Such boilerplate criteria would give prospective participants clear information about the potential costs, benefits, and risks of undertaking a CDM project. Once a project was proposed, these standard criteria would be adjusted only during project initiation and only as needed to meet particular exigencies of that project, allowing quick and uncomplicated approval. Thus, one might imagine criteria for projects to replace coal-fired power plants with gas-fired ones. This approach would avoid project-by-project approval in these cases, reducing transaction costs and promoting system efficiency. In contrast, criteria for high-risk projects would be individually negotiated to reflect their unique features and risks. These standards could also be renegotiated after project initiation to better reflect exogenous changes likely to influence performance. This approach would promote innovation by ensuring that criteria adequately reflect the character and risk profiles of different projects.

Second, in awarding performance-based credits, project criteria can define performance in terms of either emissions or behavior. Defining performance by an emissions, or "effectiveness," standard offers several advantages. It grants participants flexibility to reduce emissions by any methods that minimize cost. By linking rewards directly to environmental outcomes, it maximizes participants' incentive to avoid project failure, regardless of its cause. Making participants responsible for all project risks, including risks they cannot control such as technical uncertainty or noncooperation of nonparticipants, may improve the

performance of those projects that are undertaken. Unfortunately, such an approach also tends to deter participation and innovation in the program. Behavioral standards, by contrast, would award credits for performing specified actions and defending against eventualities specified at the time of project approval (Kerr, 1997, p. 2). Such standards would require those observable behaviors judged most likely to maximize project effectiveness, making participants responsible only for those risks they explicitly accept. Clear behavioral standards remove some or all project-related risks from participants, encouraging risky but innovative projects that would otherwise be unlikely to be undertaken. Rewarding risk-taking projects that are carefully designed and implemented, even if they fail to reduce emissions as much as expected, shifts these risks to the CDM system as a means of promoting innovations that may improve system efficiency over the longer term. Whereas effectiveness and behavioral standards have both strengths and weaknesses, the dual goals of rewarding effectiveness while encouraging innovation suggest the use of effectiveness standards for lower risk projects and behavioral standards for high-risk projects that offer considerable learning but less assurance of reductions.

Whichever type of standard is defined, there are several options for linking its attainment to the awarding of credits. Either type of standard requires a baseline relative to which actual emissions or behavior are measured for purposes of awarding credits, which is typically presumed to approximate the counterfactual, that is, the emissions or behavior that would have occurred without the project. Although this true counterfactual cannot be definitively assessed, making baselines vulnerable to manipulation, reasonable baselines for many project types may be defined that are sufficiently resistant to arbitrary manipulation to provide appropriate incentives, even if not fully accurate (Parson & Fisher-Vanden, 1999).[2] The awarding of credits can be binary, granting all credits if a specified target is attained and none otherwise, or graduated, with more credits being granted the greater the improvements from the baseline. Indeed, the authority could define credit schedules that combine emissions and behavioral standards. For example, there could be credits for project completion combined with credits per unit reduction at constant or variable rates, or some combination. Although simple binary schemes for granting credits are frequently proposed, graduated and multipart schedules appear more promising for aligning private actors' incentives with CDM objectives. The structure of credits for a project would be determined prior to project approval, in conjunction with the plan for allocating credits and associated liability among project participants. Although the standard CDM project model

2. Problems associated with defining baselines have received considerable attention and are largely separable from the monitoring and response issues that we consider here.

involves an exchange in which a single investor receives credits and a single implement is paid for generating them, as the CDM develops, some projects may come to be structured with multiple participants on the investor side of this equation, with credits being allocated among them as part of the project design. The allocation of both credits and liabilities should give incentives for responsible implementation and oversight by the participants with the capacity to effectively promote project success, a goal most likely achieved in many instances by conferring a substantial share of liability on project investors (Kerr, 1997, 1998).

Third, the criteria established at project approval should facilitate the authority's subsequent ability to monitor and respond to project performance. Criteria could, for example, specify terms for monitoring or require posting of performance bonds. For example, the U.S. pilot-phase program on joint implementation required projects to provide monitoring and verification plans, to accept third-party verification of reductions, and to provide annual performance reports (Dixon, 1997, pp. 141-143). Because those who plan to shirk their responsibilities are likely to reject such provisions, requiring them at project initiation may deter fraudulent proposals. Such provisions also will impose some costs and inconvenience on responsible implementers, of course, but are more likely to be viewed as acceptable, effective, and legitimate if these provisions and clear conditions for credit certification are agreed to at the outset.

As experience with CDM projects accumulates, the authority could establish "low-scrutiny" and "high-scrutiny" approval processes. Proposals for conventional, simple, or low-risk projects could receive low-scrutiny approval involving standardized, preapproved monitoring and response provisions. Such standardization of requirements would provide adequate scrutiny to ensure project performance while minimizing administrative costs and would increase the ability to compare results between projects of the same type. Proposals for novel, complex, or high-risk projects could receive high-scrutiny approval with careful negotiation of project-specific performance criteria and monitoring and response provisions.

MONITORING PROJECT PERFORMANCE

CDM managers must design project monitoring systems to ensure, evaluate, and improve the performance of both individual projects and the CDM system. Although most analysts have stressed the certification function of monitoring—comparing actual emissions or behavior to the baseline or target—monitoring in the CDM system will also have other purposes (Dixon, 1997, pp. 138-142; Metz, 1994, pp. 29-30; Wexler, Mintzer, Miller, & Eoff, 1995, pp.126-127). It should help identify the causes of project success and failure, even when these are not required to

award credits; facilitate cross-project analysis of these causes; and allow evaluation of the effectiveness of different monitoring and response strategies. The monitoring system must balance these goals against the participants' transaction costs and the authority's administrative costs. To this end, it should collect only task-relevant and risk-appropriate levels of information, rely on those with existing incentives to monitor and increase their capacity to do so, and adopt a facilitative rather than adversarial style of monitoring.

CALIBRATING MONITORING TO PROJECT RISK

What is useful to monitor, how often, and with what precision depends on the characteristics of a project and its participants, and on the project criteria. To minimize intrusiveness and expense, the amount and quality of information gathered should reflect the anticipated risks of nonperformance. Monitoring must provide the information needed to support the system's response to a project, including but not limited to the awarding of credits. In particular, the CDM should avoid the experience of many environmental and human rights regimes that gather both too much and too little data: too much that lacks relevance to regime criteria, too little to understand what is occurring and why (Arts, Peters, Schrijver, & van Sluijs, 1994, p. 61). Projects operating under effectiveness standards may require only monitoring overall emissions, or some easy-to-observe surrogate such as fossil-fuel inputs. Projects operating under behavioral standards will require monitoring the behaviors defined to constitute good faith implementation. Projects whose credits depend on whether participants were responsible for shortfalls will require monitoring that is adequate for drawing judgments of responsibility. Monitoring should also gather data relevant to assessing diverse project outcomes and actors' behaviors, intentions, and capacities—even when not needed to award credit—to identify systematic trends as well as opportunities to refine and improve system design.

Different project types dictate different monitoring approaches. Innovative projects with behavioral standards will require monitoring that follows crucial behaviors, supports interim progress evaluations, and allows identification and responses to precursors of failure. Projects with long-lived evidence trails may require only intermittent monitoring, such as periodic evaluation of the forest cover of a reforestation project. Projects with more transitory evidence trails will require more continuous and consistent monitoring, such as ensuring a power plant is operated and maintained in ways that minimize emissions. Even when credits are to be awarded based on an end-of-project evaluation, precompletion monitoring can be designed to identify problems and help projects deviating from a successful trajectory with small, early responses at points at which failure is still avoidable (Michaelowa,

1995b, p. 105). Alternatively, project criteria can be renegotiated to reflect changed circumstances or to incorporate improved strategies for meeting project goals.

Monitoring requirements could be matched to project and participant risk as illustrated in Figure 2. Project innovation, technology reliability, processes employed, and similar factors that drive project risk can be estimated from the past performance of similar projects. Participant incentives, capacities, expertise, and similar factors that drive participant risk can be estimated from past performance of the same or similar participants. Over time, the authority could devise monitoring packages involving alternative levels of stringency, including the frequency and intrusiveness of inspections, the quantity and quality of data collected, and the access to project operations and accounting required (Selrod & Torvanger, 1994, p. 9). Projects low on both types of risk would face minimal monitoring, with the low costs borne primarily by project participants. Subsidies of monitoring costs could encourage low-risk participants to undertake innovative projects requiring extensive monitoring, perhaps through the protocol's arrangements for assisting certified project activities (Article 12[6]). High-risk participants would be allowed to undertake low-risk projects, but would have to bear the costs of extensive monitoring to ensure their full performance.[3] Projects high on both participant and project risks would be rejected as involving excessive risks of failure.

ADDRESSING INCENTIVES AND CAPACITY FOR MONITORING

A successful monitoring system requires that those observing and reporting information have both the incentives and capacity to do so—frequently, completely, and accurately. Because the authority is unlikely to control many resources directly, it will have to rely on a combination of first-party reporting by implementers and investors, second-party monitoring by the authority or national governments, and third-party inputs from nonparticipating actors (NGOs or corporations; Graham, 1995, p. 180; Klaasen, 1996, p. 296). Improving the information system will require providing incentives to those with existing capacities to monitor effectively as well as increasing the monitoring capacity and authority of those who have incentives to monitor effectively.

First-party self-reporting raises obvious concerns about the completeness and accuracy of the information provided. The structure of

3. Although discriminating based on participant risk may appear invidious and politically difficult, many analysts have endorsed such discrimination, based on such characteristics as participation in related commitments or demonstrated compliance with other obligations of the regime (Heller, 1996, p. 340; Metz, 1994, p. 31). Establishing a record of successful project implementation would allow high-risk participants, over time, to gain the benefits of less intrusive monitoring.

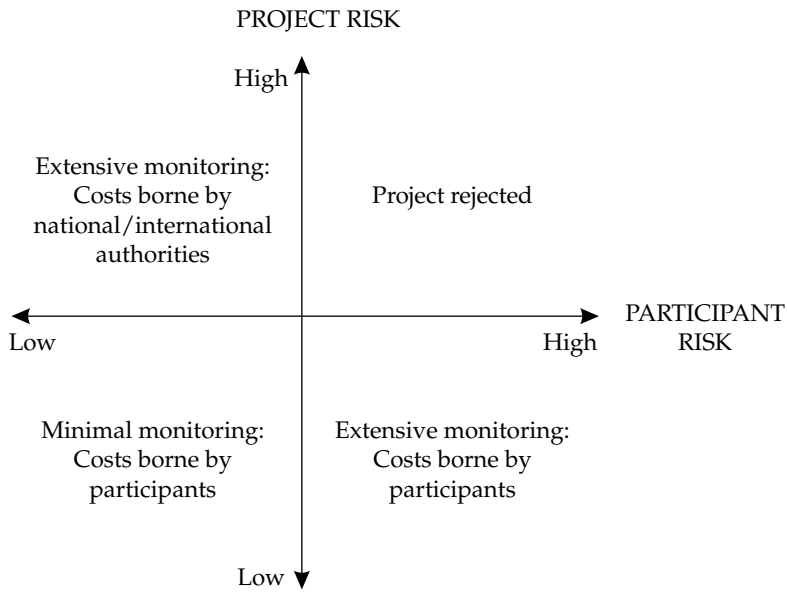

Figure 2: A Risk-Based Monitoring Strategy

CDM projects can help to mitigate these problems, however, by making the awarding of credits dependent on implementers providing evidence of project performance that the authority deems satisfactory. This creates incentives for accurate reporting by implementers, who have access to the required information, can report it at low cost, and are uniquely able to report on various circumstances unobservable by outsiders. When project failure puts economic as well as environmental benefits at risk, even project investors may report on problems in an effort to obtain assistance before complete project failure. The authority could provide useful operational and diagnostic information in exchange for project information and access. The authority could also facilitate information exchange among projects, provide training and analysis to solve problems early or identify unrecognized opportunities, and publicize successful projects to build participants' reputations. In short, a properly designed monitoring system could make participants willing, rather than reluctant, information providers.

The risk that self-reporting will be unreliable suggests that the CDM will need additional sources of information. Second-party monitoring by the authority or its agents is likely to be limited by resource constraints but may well be valuable in cases where the risk of project failure and the gains from direct intervention are high. Rather than seeking to develop a large monitoring capacity internally, the CDM could benefit

by engaging third-party monitors such as local communities or governments, NGOs, corporations, universities, auditing firms, or others (Dixon, 1997, pp. 141-142; Goldberg & Stillwell, 1997, p. 7; Mintzer, 1994, p. 49; Wexler et al., 1995, p. 128). These actors vary considerably in their incentives and capacity for monitoring but offer the possibility for significant contributions to CDM monitoring. Some third parties have incentives to monitor and report performance because they support regime goals, as in NGO monitoring of species preservation treaties (Climate Network Europe, 1997, p. v; Dudek & Tietenberg, 1992, p. 32; Greene, 1993, pp. 168-169; Subak, 1997). Other parties will monitor and report because they directly benefit from project success or are harmed by project failure. Even host governments unconcerned about climate change may monitor and report on projects whose failure would risk loss of local economic or political benefits. Third parties may have more freedom of action than either governments or the authority but may need to be provided appropriate rights of access and legal authority. The CDM authority can help increase third-party inputs by ensuring their access as a condition of project approval; by defining monitoring needs clearly and simply enough to match prospective monitors' capabilities; and by providing training to, and facilitating learning among, prospective monitors (Dudek & Tietenberg, 1992, p. 21; Intergovernmental Panel on Climate Change, 1996).

RESPONDING TO PROJECT PERFORMANCE

The power of monitoring stems from implementers' expectations that success will be rewarded or failure punished. An effective response system should respond to both successes and failures, remaining attentive to effects of responses on implementers of the project under scrutiny and on the wider audience of current and prospective CDM participants. Although providing or withholding credits at project completion is usually viewed as the primary lever of influence, interventions during project implementation can help participants avoid failure or take advantage of new opportunities.

STRESSING POSITIVE INCENTIVES RATHER THAN SANCTIONS

One model of response would evaluate projects only on completion, thereby granting implementers maximum flexibility. Such a model would promote project success through implementers' expectations that they will be rewarded or sanctioned according to clear criteria agreed to at the outset. The primary mechanism of reward or sanction will be the awarding or withholding of credits. Projects that fail to meet agreed emission reductions or other criteria should clearly not receive credits that were conditional on meeting those criteria. To avoid granting

unearned credits, participants suspected of shirking their responsibilities should be required to demonstrate full performance before credits are disbursed.

Some analysts have proposed additional sanctions, such as publicizing poor performance, restricting future CDM participation, discounting or revoking credits previously granted, or restricting government participation in the convention (Center for Clean Air Policy, 1997, p. 8; Dudek & Goffman, 1997; King, 1997, p. 66; Michaelowa, 1995a, p. 171; Selrod & Torvanger, 1994, p. 9). Such sanctions clearly increase incentives to ensure project success. By imposing risks on project participants (whether through buyer or seller liability) in excess of the risk of simply not receiving desired credits, however, additional sanctions would deter participation and innovation. Moreover, even in instances when project failure is unambiguous, such sanctions are likely to be difficult to impose, and may not have the desired effect (Arts et al., 1994, pp. 64-65; Axelrod & Keohane, 1986; Hufbauer, Schott, & Elliott, 1990; Martin, 1992; Schrijver, 1995, p. 139).

In view of the limited applicability of sanctions and the associated risks, the authority should deploy incentives principally to encourage and reward project success rather than deterring failure. It could, for example, award "bonus" credits in certain cases. These would not be merited when low-risk projects implemented under favorable conditions meet their targets. In such cases, the initially agreed-on credit schedule should provide adequate incentive and compensation. However, high-risk projects, or those that meet expectations despite unfavorable conditions, might receive such bonus credits. Alternatively, projects that fall short of their criteria (whether behavioral or effectiveness) might be granted "good faith" credits under fairly restrictive conditions if the authority judges that the shortfalls arose from unfavorable conditions outside participants' responsibility or control. Rather than applying strict liability rules to project failures clearly outside participants' control, providing a system that allows discretion for unusual situations would help maintain the system's credibility.[4]

Another way, albeit a risky one, for the authority to deploy appropriate incentives would involve granting it the power to allocate credits among project participants in exceptional cases. Because allocation of credit and liability among participants will be negotiated in advance, the power to override these agreements should exist only in extreme cases. However, this could be an appropriate response to projects that earn credits despite some participants egregiously shirking their responsibilities, enabling the authority in extremis to sanction nonperformers without harming good-faith performers. Exercising such power would pose

4. Of course, avoiding the pitfall of such a discretionary system becoming overly politicized would require further attention to institutional design.

serious risks to the authority's impartiality, however. The terms of its exercise would have to be carefully limited and open to scrutiny and appeal. Even with such controls, the risk of politicizing the authority might be judged too great to grant such discretion. In that case, a similarly restricted power to award extra credits to individual participants for extraordinary performance could provide a similar ability to differentiate incentives among project participants with lesser risk of politicization.

The authority can increase both participation and success levels by linking the terms of current or future participation to past performance. Projects by implementers with strong performance records could be offered simpler monitoring, more generous credit schedules, or expedited approval. Exemplary projects could be singled out for well-publicized awards, increasing incentives for participation and success as well as raising awareness of the CDM program. Conversely, participants whose past performance indicates they are high risk could be required to build up or purchase a "bank account" of credits to offset projects that fall short (Center for Clean Air Policy, 1997, p. 8) or to post performance bonds with the authority. Similarly, participants found to be knowingly seeking undeserved credit—for example, by falsifying emission reports—could be barred from future participation.

In its overall relations with project participants, the CDM system will benefit from combining positive incentives with negative sanctions. Rather than making actors responsible for outcomes they may not be able to control (as in a strict liability arrangement), a more discriminating approach would appear to offer greater success even while involving greater administrative burdens. An adversarial system that assumes nonperformance is intentional and that implementers and investors will cheat and self-report dishonestly whenever they can may prevent the worst abuses but will also tend to lead to the covering up of even minor or unintentional problems. By contrast, a facilitative system that assumes participants act in good faith and nonperformance is inadvertent may prompt actors to raise project problems before they threaten performance but may well fall victim to cases in which those assumptions are violated. A balanced approach should assume that project implementers act in good faith but often have less than perfect control over attendant outcomes, while being alert and responsive to cases in which the evidence suggests otherwise. Such a system should balance the twin risks of erroneously penalizing good-faith performers and letting cheating go unpunished. Obviously, such a system's success depends on the authority having low-cost access to reliable information and being able to discriminate between projects without expending excessive resources monitoring and evaluating every project. Yet, such a balanced approach seems likely to avoid the pitfalls of either a fully adversarial or a fully facilitative approach.

RESPONDING TO PROJECTS IN PROGRESS

Increasing the likelihood of project success requires responses that provide incentives for such success as well as the resources to facilitate it. Much discussion of the CDM and other joint implementation systems has focused on responses to project outcomes once they have been realized and verified. Whereas such responses are crucial to the enterprise, excessive reliance on them can miss crucial opportunities to improve project and system implementation. Responding to projects in progress, before credit-linked behaviors or outcomes have been fully realized, can help identify factors putting a project at risk and avert cases in which incapacity problems, other actors' noncooperation, or external events are putting a project at risk. Doing so can also reveal opportunities to help a project already meeting expectations to perform better.

Interactions during project implementation can help projects succeed, avoiding project failure rather than punishing it, and thereby increasing system effectiveness and reducing costs. This approach is valuable even when it is third parties, rather than project implementers, who bring early problems to the authority's attention. The authority can aid projects at risk, tailoring them to the type of difficulty and its origin (e.g., participant incapacity, nonparticipant noncooperation, or external events). Thus, the authority could provide technical assistance itself or make expert consultants or trainers available—in particular, veterans of successful similar projects—to trouble-shoot a project in difficulty. Finding mechanisms to fund such support, or competent actors willing to provide such support pro bono, will be an important task of designing and managing the CDM system. Over the long term, such an approach would help develop an effective system in which information and experience are widely shared and participants are willing to reveal problems to the authority before they cause projects to fail.

PROMOTING AND EVALUATING SYSTEM-WIDE SUCCESS

The CDM will require enough early successful projects to begin building the system's credibility and legitimacy. Its initial implementation mechanisms should be carefully designed to promote such project success. However, the CDM is such a novel initiative that initial design decisions are unlikely to prove optimally effective. The long-term success of the system will require a strategy to observe, evaluate, and modify the characteristics of the CDM system as a whole. Assessments of individual projects will be necessary contributions to such an ongoing assessment of the system's criteria for project approval, procedures and technologies for monitoring, and strategies of response, but they alone will not be sufficient. Rather, these will require a management system self-consciously designed to evaluate and refine the overall system. Such a

strategy should evaluate the CDM program against multiple goals, including but not limited to aggregate reductions achieved, and should include both internal evaluation mechanisms and evaluations by NGOs and other interested outside actors.

A primary measure of the CDM's contribution to the climate regime will be the aggregate emission reductions achieved by approved projects. Maximizing this aggregate reduction will require managing a mixed portfolio of projects, including innovative and high-risk ones, of which some—or many—will fall short of expectations. As with individual stocks in an aggressive stock portfolio, careful approval of projects considering their effect on the total portfolio can help avoid individual failures threatening a trend of increasing overall reductions. Lessons drawn from the performance of individual projects and from patterns across projects should be used in designing and implementing subsequent projects. This will require making performance data, assessment results, and project analyses widely available to prospective project participants, interested governments, and outside critics. The authority should support this dissemination of knowledge by maintaining open, diverse lines of communication with multiple audiences.

Lessons drawn from patterns across multiple projects should be used to improve overall CDM system procedures. Such evaluation might, for example, reveal systematic causes and magnitudes of biases in estimating project baselines or expected performance. It might reveal that one type of project consistently underperforms expectations while another consistently overperforms, suggesting revision of project criteria and targets. In improving system performance over time, identifying such aggregate patterns of variation will be even more important than diagnosing why a particular project exceeds or falls short of average performance for projects of its type. Drawing useful guidance from such system-wide experience will require a focus on lessons learned rather than placing blame, and will also require open communication with multiple audiences. Such interchanges are likely to facilitate real program improvements, even if these improvements prove difficult to quantify.

Conclusions

The CDM constitutes a unique attempt to attract participation in the Framework Convention on Climate Change. Leaving sovereignty unthreatened, the CDM presented few reasons for governments unconcerned about climate change to object because it allowed them to veto any projects they do not approve while offering them the possibility to reap political and economic gains from those they do approve. For

concerned governments, the CDM offered the possibility of reducing the costs of achieving the goals to which they had committed.

Assuming that some protocol to the Framework Convention on Climate Change containing some CDM-type mechanism is negotiated and eventually does enter into force, the novel implementation challenges posed by a CDM-type system mean its contribution to reducing both emissions and their costs will be by no means assured. Successful implementation will require an integrated, carefully designed system to perform four fundamental functions: setting project criteria, monitoring projects, responding to project outcomes, and evaluating the overall system. Project criteria should be adjusted to reflect the likelihood, ex ante, of a project being faithfully implemented. They should reflect risk arising from both projects and participants. Credits for riskier and more innovative projects should be based on behavioral compliance, whereas those for more commonplace projects should be based on actual emissions. Reliable implementers should be offered less demanding and intrusive reporting requirements for low-risk projects but should still be required to allow access for monitoring and evaluation by others as necessary. Less reliable implementers could be allowed to participate in low-risk projects but should bear the expense of more stringent monitoring terms than those applied to similar projects undertaken by more reliable implementers.

Any CDM system should engage a range of actors in monitoring programs. Implementers themselves can be encouraged to self-report honestly by appropriate design of initial project criteria that includes requiring them to adequately demonstrate project success as a condition for receiving credits. In addition, the system should strengthen the incentives, capabilities, and authority of NGOs and other actors to monitor and assist project performance. As a whole, the system should adopt a balanced approach of responding to project performance, awarding credits on successful project completion, providing additional credits when projects outperform expectations or succeed in the face of exceptional difficulties while withholding credits for underperformance, and conducting interim assessments to address prospective failures with needed resources, knowledge, and training. Finally, the processes of project criteria-setting, monitoring, and response should themselves be evaluated systematically to ensure high and increasing effectiveness for a CDM program over time. A CDM system will inevitably face obstacles, failures, and growing pains, but developing internal processes for continual improvement can help it become a major contributor to the climate regime.

Manuscript submitted November 8, 1999; revised manuscript accepted for publication December 26, 2000.

Acknowledgments

We gratefully acknowledge financial support from the United States Environmental Protection Agency's Office of Policy, Planning, and Evaluation. The views expressed in this article are those of the authors and do not necessarily reflect those of the Environmental Protection Agency or of the authors' institutions. We thank the editors of *JED* and an anonymous reviewer, as well as Lisa Carter, Henry Lee, Reimund Schwarze, and David Victor, for helpful comments.

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