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Reforming the CDM for sustainable development: lessons learned and policy futures

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ABSTRACT

The Clean Development Mechanism (CDM) has successfully demonstrated that market-based mechanisms can achieve some cost effective emissions reductions in developing countries. However the distribution of CDM projects has been extremely uneven across countries and regions, and a few technologies and sectors have dominated the early stages of CDM experience. This has caused some to question whether the CDM has fallen short of its potential in contributing to sustainable development. We review the broad patterns of CDM project approvals and evaluate 10 CDM projects according to their sustainability benefits. The difficulty of defining ''sustainable development'' and the process of defining criteria by individual non-Annex 1 governments has meant that sustainable development concerns have been marginalized in some countries. Given these observed limitations, we present possible CDM policy futures, focusing on the main proposals for a post-2012 climate regime. Five options for enhancing the sustainable development benefits in the CDM are discussed, including proactive approaches to favour eligibility of emission reduction projects which ensure such co-benefits.

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1. Introduction

The 1997 Kyoto Protocol obligates industrialized countries to reduce their greenhouse gas emissions to specific targets by 2012. A core principle in the Protocol is to protect the climate system ''for the benefit of present and future generations of humankind, on the basis of equity and in accordance with their common but differentiated responsibilities and respective capabilities'' (Article 3.1). The U.N. Framework Convention on Climate Chance (UNFCCC), by incorporating the principle of global cost-effectiveness of emissions reductions (Article 3.3), encouraged geographic and temporal flexibility to achieve

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these reductions (Dutschke and Michaelowa, 1998). Developing ('non-Annex 1') countries, exempt from the Kyoto Protocol's binding limits, are able to participate in the global emissions market by hosting projects under the Clean Development Mechanism (CDM).

The CDM enabled developing nations to participate in the treaty by selling carbon credits, termed 'certified emissions reductions' (CERs) and measured in tons of CO_2-equivalent, to Parties with emissions commitments. These CERs are subject to a process of verification and certification by a U.N. accrediting body before issuance and sale. Unlike allowance trading in which Parties are granted a quota of emissions and may then trade under this cap, the CDM is a project-based approach, with new credits continuously being created as new projects are verified. CERs are fungible with other carbon credits under the Kyoto framework and mostly[1] fungible with the currencies of the European Emissions Trading Scheme (ETS). It was intended from the beginning that the CDM would create sustainable development benefits for developing nations. Indeed the first statement in the Kyoto Protocol that defines the CDM says clearly, "the purpose of the Clean Development Mechanism shall be to assist Parties not included in Annex I in achieving sustainable development and in contributing to the ultimate objective of the Convention. . .." (KP 12.2), an ordering which gives clear priority by the negotiators to sustainable development.

Five years into the implementation of the early CDM projects, the mechanism is now widely viewed as an imperfect but useful approach to encourage the development of emissions–reduction projects in developing countries. However, many questions have been raised about the inequitable distribution of projects across the developing world (Wara, 2007). For example, China is the world's second largest greenhouse gas emitter after the US. Nevertheless, it has received much of the carbon finance and accounted for 73% of transacted CER volume in 2007, due to the relatively low cost of emissions abatement in China (World Bank, 2008). Many forecasters believe that China will continue to capture the majority of projects in the near future. On the other hand, sub-Saharan Africa has gained little from technology transfer from the CDM to kick start development activities, hosting only 1.4% of CDM projects.

The difficulty of defining sustainable development and the issue of sovereignty have also resulted in the decision to allocate to host governments the responsibility for setting sustainable development criteria, which has meant in some countries sustainable development has been overlooked because of the considerable economic value of CDM finance (Cole, 2007). Subsequently, many proposals have been put forward to improve the CDM for the post-2012 climate policy framework, or to adapt it to new arrangements in the post-Kyoto round agreement. In this paper we provide an overview of the CDM's current status and near-term outlook for creating sustainable development, assess the literature on the CDM's successes and failures from multiple perspectives, and summarize the main proposals for post-2012 improvements. We conclude by evaluating some of the potential benefits and pitfalls of possible future scenarios for the CDM.

[1] CERs generated from land use, land-use change and forestry (LULUCF) projects are excluded from the EU ETS.

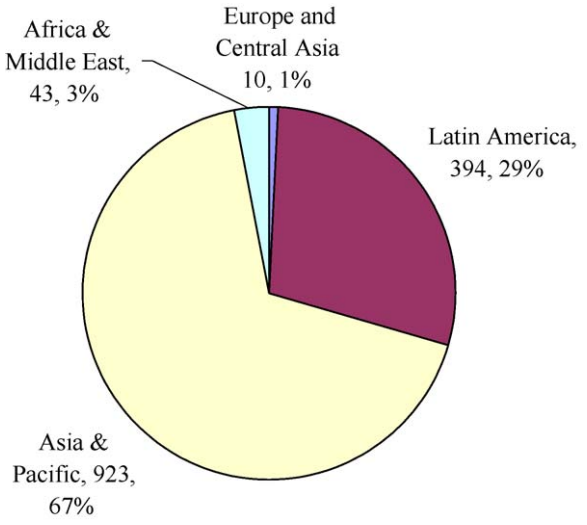

Fig. 1 – Global distribution of registered CDM projects. Number and proportion (%) of CDM projects per region. Data as of February 2009, from UNEP-Risoe (2008).

2. CDM status, distribution and sustainable development aspects

To date, the CDM has spurred the development of 4586 projects in 76 developing countries (Fennhan, 2009). These projects are expected to reduce global greenhouse gas emissions by up to 2.91 Gt CO_2-equivalent by 2012. CDM projects are at various stages of registration, validation and review in the CDM 'pipeline'. As of February 2009, 1370 CDM projects were registered and a further 324 were in the registration process. Our analysis of the projects registered up to February 2009 shows that these were unevenly distributed across regions, as shown in Fig. 1. Projects have been concentrated in Asia and Latin America, with a 67% and 28% share of project numbers, respectively. Africa and the Middle East have been poorly represented so far. Sub-Saharan Africa hosts only 28 registered projects as of February 2009, accounting for 2.97% of registered CER volume up to 2012. Brazil, Mexico, India, China, South Africa and Israel have benefited most within their respective geographical regions (see Table 1).

Looking to projects in the pipeline before registration, Asia is set to further dominate the CDM market, increasing its share from 67% to 76.6% of the reductions. The share of Latin America, in contrast, will diminish from the current 29% to 19%. Countries in Africa and the Middle East look to continue to host a small and declining fraction of projects. Quantities of expected reductions (i.e. CERs) do not correlate strongly with the number of projects in a given country or region. So far, Asia's 67% share of the total number of registered projects provides 77% of expected CERs until 2012. Currently, China hosts 28% of registered CDM projects, yet provides 51% of global CERs. India, in contrast, provides only 15% of emission

Table 1 – CDM projects by region including leading countries.

Region and country	Registered February 2009	Requested registration + under validation	Total	% Share of the region	% Share of the CDM portfolio
Latin America	**394**	**455**	**849**		**19**
Brazil	150	203	353	41.6	7.9
Mexico	110	90	200	23.6	4.5
Asia and Pacific	**923**	**2513**	**3426**		**76.6**
India	392	789	1181	34.5	26.4
China	395	1265	1650	48.2	36.9
Africa and Middle-East	**43**	**103**	**146**		**3.3**
South Africa	14	13	27	18.5	0.6
Israel	13	21	34	23.3	0.8
Europe and Central Asia	**10**	**33**	**43**		**1**
Georgia	1	5	6	14	0.1
Armenia	4	4	8	18.6	0.2
Total (all countries)	**1370**	**3104**	**4474**		**100**

Data as of February 2009, from UNEP-Risoe (2009).

reductions despite hosting a similar number of registered projects. A similar phenomenon occurs in Africa and the Middle East. While South Africa and Israel host 41% of CDM projects in the region, it is one project in Nigeria and one project in Qatar, which account for 37% of the region's expected 2012 CERs from registered projects. Within Latin America, Brazil provides 41% of total expected emission reductions from registered projects.

For the current pipeline of CDM project, renewable energy projects account for slightly more than 1/3 of the expected CERs to 2012, followed by industrial gas decomposition (of HFC, N20, and PFCs), which constitute about 1/4 of the expected reductions (Fennhan, 2009). The difference between the number of projects hosted per country and their emission reductions potential is a result of different project types and technologies. Fig. 2 shows that two relatively insignificant project types in terms of project numbers, HFC and N_2O reduction projects, dominate the provision of CERs. Eleven of the 23 HFC projects are located in China, partially explaining the country's substantial contribution to the global CER market. These are large-scale projects; though, there is a nearly even distribution of registered small- and large-scale CDM projects (46% small-scale; 54% large-scale; see Fig. 3).[2]

2.1. *A brief review of sustainable development contributions*

The principles of the CDM are outlined in Article 12 of the Kyoto Protocol, which states that CDM activities should contribute to sustainable development in the host country. The Marrakech Accords (UNFCCC, 2001) emphasise that it is the host country's prerogative to define whether a project contributes to sustainable development. In most countries this has meant that a governmental Designated National Authority (DNA) evaluates project documentation against a set of pre-defined criteria, which tend to encompass environmental, social and economic aspects of sustainability (Schneider and Grashof, 2007). Recent studies suggest that CDM's contribution to 'local' sustainable development has been limited (Olsen, 2007; Lohmann, 2006). In some large-scale CDM projects with very limited benefits to local people, developers have committed to use a percentage of CER revenues to fund local development projects (Capoor and Ambrosi, 2006; Ellis et al., 2007). On the host-country level, China instituted a 65% CER tax on revenues from HFC decomposition projects, which is supposed to fund sustainable development activities (Pew Center, 2007). For CDM small-scale projects, Brunt and Knechtel (2005) show that financial investments in small-scale CDM projects are often insufficient to cover the high CDM transaction costs. For this reason, it has been argued that a future CDM framework should attempt to rectify this by project bundling under programmatic CDM, sectoral crediting approaches and the use of Overseas Development Assistance to foster local capacities, which would contribute to reduce small-scale projects' transaction costs (Begg et al., 2003; Egenhofer et al., 2005).

The CDM in principle offers a suite of potential contributions to sustainable development. Rural energy provision projects are particularly positive but are rare in the pipeline. A popular project type, biomass energy, can directly benefit local farmers through the sale of crop residues, and provide the indirect health benefit of reducing diesel pollutants. Energy efficiency, transport, agriculture, and other projects can help develop local infrastructure. Renewable energy, fuel-switching, and biomass projects increase resource security and can often improve local air quality. And most projects have the potential for local income generation and technology transfer.

Experts are beginning to systematise the sustainable development contribution of CDM projects. For example, Sirohi (2007) examines 65 project design documents (PDDs) for CDM in India and attempts to elucidate the effect of each project's stated contribution to sustainable development. In his final analysis, Sirohi concludes the PDDs ''offer just lip service regarding expected contribution to socioeconomic development of the masses, particularly in rural areas''. In

[2] Small-scale projects include renewable energy project activities and energy efficiency improvement project activities which reduce energy consumption, on the supply and/or demand side. There are different types of small-scale projects with different applicability conditions which are: Type I: 15 MWe or 45 MWth, Type II: 60 GWh and Type III: 60,000 CERs/year.

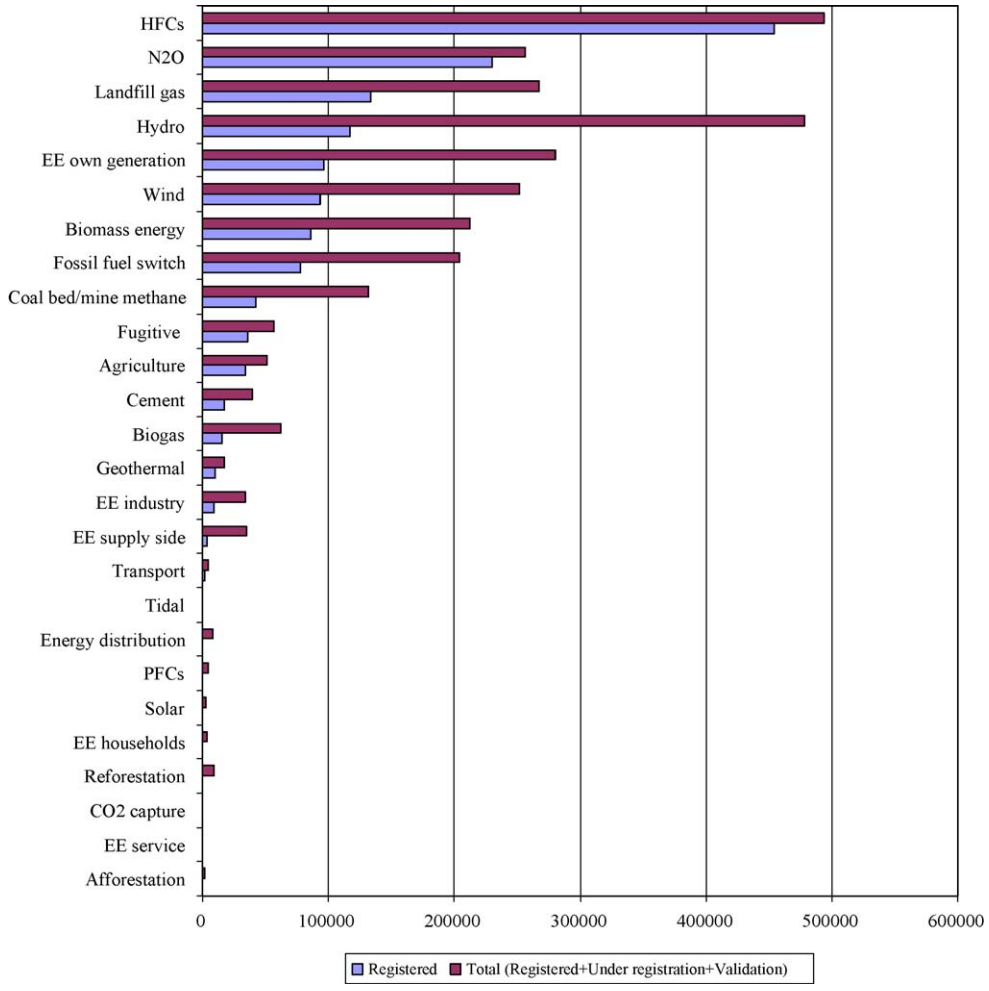

Fig. 2 – Contribution of CDM project types to emission reductions (kCERs up to 2012).

another study, Sutter and Parreño (2007) again use PDDs to review the integrity of emissions reductions and the sustainable development contribution of the first 16 registered CDM projects. To gage the sustainable-development contribution, Sutter and Parreño examined local employment generation, the distribution of carbon revenue (based on the project's ownership structure), and local air-quality effects. They find a stark contrast: 72% of purported GHG reductions are reliable in scientific terms, while less than 1% of projects contribute significantly to sustainable development.

To provide a window into these macro-analyses of PDDs, and to better understand how project developers are envisioning their projects' contributions to sustainable development, we review a random sample of 10 cases that capture specifically (a) diversity of CDM project types that include biomass, waste heat recovery, hydroelectricity, fuel switch, land fill, construction and biogas and (b) regions. We subjectively evaluate them according to qualitative measures of direct and indirect benefits based on sustainable development criteria such as employment, health and environmental benefits (see Table 2.) The cases are located in India, Brazil, the Republic of South Africa, and China – which are all leading CDM host countries in their respective regions – as well as Peru, to capture the distinctive approach of its DNA to the project approval process. The aim of the review is to provide a broad-brush insight into sustainable development benefits at the project level; it was conducted by reviewing relevant PDDs for evidence of sustainable development benefits. Given that many projects are in the early stages of implementation, the review must be considered preliminary, but we hope that there will be further in depth evaluation at a later stage in the project cycles.

In this review, 'direct benefits' are considered as those that arise directly from the project, for instance through the provision of employment to develop and operate the project, as occurred in the Poechos I project in Peru where 200 local people were hired during the construction phase and 30 permanent jobs were created. 'Indirect benefits' reflect the case where there is an improvement in environmental and social conditions locally, e.g. from the use of renewable energy reducing air pollution and energy efficiency reducing expenditures for the poor. When the benefits of a project appeared to be negligible, these are classified as ''little'' direct or indirect benefits. The Ganpati PDD, for instance, claims that there will be some (unspecified) employment opportunities in material

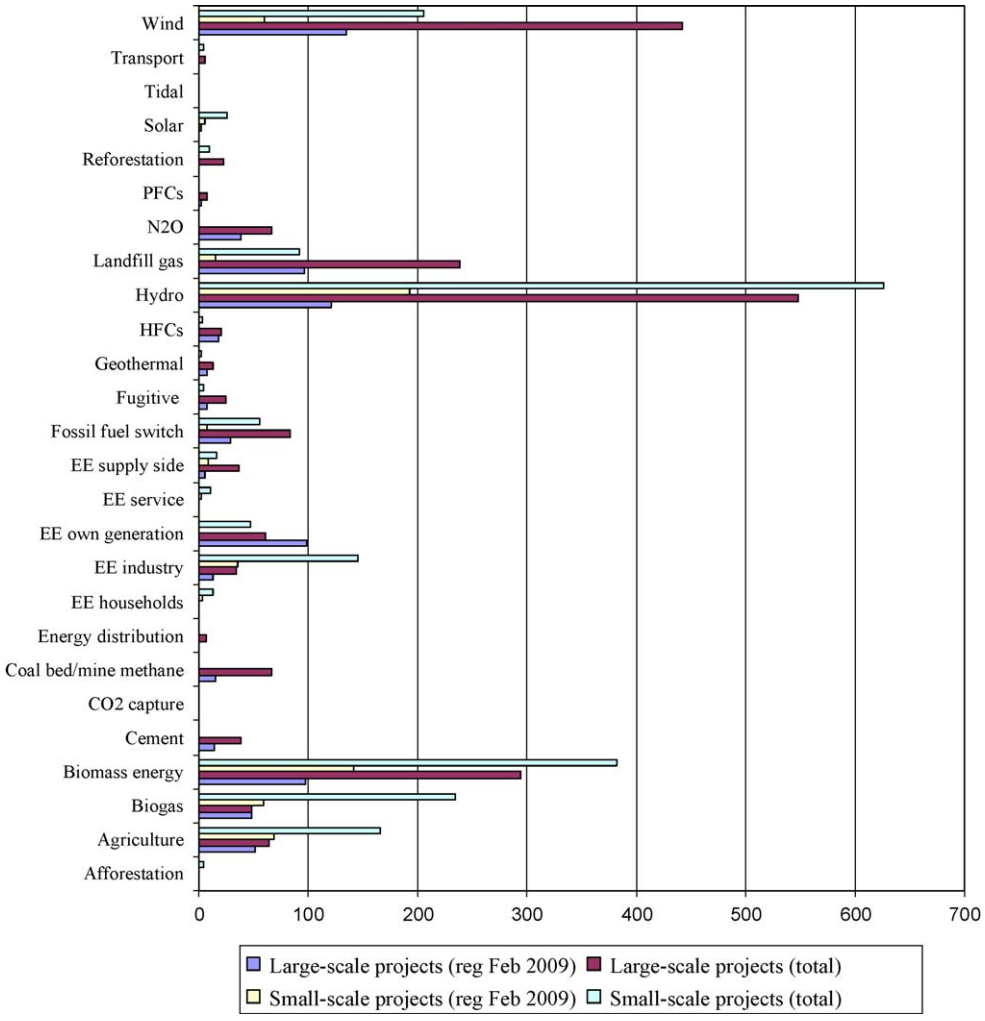

Fig. 3 – Number and scale of CDM projects across project types as of February 2009, data from UNEP-Risoe (2009).

collections, which will, however, be minimal at the plant's operational stage.

All of the cases appear to make significant emission reductions while falling short in delivering direct local benefits. Several cases also highlight tensions between divergent private, government, or NGO perspectives, which might be attributed to differences in development expectations (Boyd et al., 2007). Landfill projects use the captured methane gas, which would have negative effects on local health, to produce electricity and improve landfill management, thus reducing surface and groundwater pollution. However, such projects provide few direct employment or other benefits. In fact, the Bisasar landfill CDM project in South Africa, which aims to extract methane from a landfill to generate 45 MW of electricity for dispatch to the national grid, has been criticised by environmental groups and local activists, who claim that carbon finance is contributing to postpone the closing down of the waste disposal site, which for the past two decades has not addressed its negative impacts on local people's health and environment (Lohmann, 2006: 287–292). Fuel switching projects tend not to generate direct social benefits either, as they do not involve construction or the creation of specific jobs.

Sponge iron projects, such as the case of Jindal Steel and Power Ltd. (JSPL) in India, are similar in this respect. They only provide indirect environmental benefits by reducing emissions on-site, and CDM finance does not bring additional employment or social benefits (Lohmann, 2006). In fact, one of the biggest Indian sponge iron companies involved in a CDM project has been sued in the state High Court by concerned individuals and NGOs who claim that the company is putting pressure onto local villagers to sell their land and to appropriate local water resources for the expansion of the company facilities and its business. This example points to the problematic of *accountability* in CDM projects, although this is not a direct criticism of CDM projects per se. The question is whether accountability is adequately addressed by Designated National Authorities. Other sponge iron companies across the country have also been subject to severe criticisms, and in some cases local revolts have taken place to protest against employees' bad working conditions (Lohmann, 2006: 259–261). Environmental benefits across the renewable energy projects are achieved by displacing fossil-fuel generation and only in

Table 2 – Select CDM projects for sustainable development review.

Project	Project summary	Environment and development benefits						
		Environment	Economic	Tech transfer	Health	Employment	Other social	Education
Ganpati (India)	Expansion/modernisation of the biomass co-generation facility at Ganpati Sugar Industries Limited (GSIL) sugar mill, India. The biomass to be used as fuel would consist of bagasse generated by the sugar mill	(√)	√-	√		√-, (√)-		
TSIL (India)	Waste heat recovery of the waste gas generated to produce steam at the Tata Sponge Iron Limited (TSIL), which is further utilised to generate 7.5 MW power meeting the electricity demand of the factory. The surplus power generated is exported to the state electricity grid	(√)	(√)-			√-		
Santa Lúcia II (Brazil)	7.6 MW run-of-river hydroelectricity project that does not include a reservoir. It replaces a diesel powered thermal plant that originally supplied electricity to a remote area in the State of Mato Grosso	(√)						
Klabin Piracicaba (Brazil)	Switching fuel oil to natural gas in four steam boilers, at Klabin S.A. in the plant of Piracicaba, São Paulo	(√)						
Durban (RSA)	Collection of landfill gas at two landfill sites of eThekwini municipality and the use of the recovered gas to produce electricity, which will be fed into the state grid	√				√-		
Rosslyn Brewery (RSA)	Replaces the equipment at the boiler room of Rosslyn Brewery plant to use natural gas and biogas, which is generated in an anaerobic digester of the industrial facility and is currently flared	√			(√)-	(√)-		
Huitengxile (China)	Construction and operation of a wind park of 95 wind turbines generating 266.1 million kWh/year, which will supply electricity to the State grid in north China	(√)		(√)	(√)-	√-		
Nanjing Tianjingwa (China)	Landfill gas collection and utilization project in Pokou District, Nanjin City, to produce electricity for export to the state grid	√		(√)	(√)-	√-		
Turucani I (Peru)	49 MW hydroelectric power station, operating from an existing water regulating reservoir, in Querque. It displaces electricity generated from oil, diesel, coal and gas-fired plants	(√)	(√)		√	√	√	
Poechos I (Peru)	15.2 MW hydroelectric power station, operating from the existing reservoir. The energy generated will be sold to Electronoroeste S.A., a state-owned company	(√)	(√)			√	√	(√)

√: direct benefits; √-: little direct benefits; (√): indirect benefits; (√)-: little indirect benefits.

the Peruvian projects can we find direct benefits in terms of health and employment.

This illustrative review shows divergences and no causal relationship between project types and sustainable development outcomes. In most cases, outcomes seem constrained to some modest direct employment creation, but little diversification in local economies. The analysis also reveals that it can be misleading to assess projects performance only through project documentation, as local struggles and other development and climate mitigation alternatives may remain invisible. This can be the case because project developers may be biased in selecting participants for stakeholder consultations, thus under-representing critical views in project reports (Sutter, 2003; Cole, 2007; Corbera and Brown, 2008). Moreover, the fact that the PDDs are open to public scrutiny only through the Internet before their final approval by the CDM Executive Board limits the number of people who can practically participate in such process, as most people in developing countries have difficult access to the internet (Corbera, 2005). This underscores the importance of conducting further research in planned and ongoing projects in order improve future sustainable development benefits through the CDM.

3. Reconsidering CDM architectures for sustainable development

Informed by these case studies one can look ahead to how the CDM may evolve in the next few years. Negotiators face a number of alternative possibilities, which we outline in this section and evaluate with respect to sustainable development. We first consider the broader range of possibilities for the Kyoto Protocol post-2012, since these will have direct implications for any version of the CDM that exists. Any changes to the CDM will in turn have significant implications for the larger Kyoto framework. The CDM issues then break into the broader questions of sustainable development benefits and public participation, and important technical decisions and potential institutional possibilities of how the CDM will be organised and run in the future. Within these categories we lay out what we believe are the key questions facing negotiators.

3.1. *Alternative post-2012 frameworks*

An increase in climate change mitigation efforts involves two questions: (a) what kind of overarching framework or regime will govern these efforts? and (b) what kinds of instruments or mechanisms might be used? Many proposals for a post-2012 regime, addressing both GHG mitigation and adaptation to climate change, have been made in the academic and policy literature. Michaelowa (2006) classified the approaches and proposals into seven categories. The strategies and approaches underlying these categories can be summarised by dividing them into two basic groups: quantified emission reduction targets with emission trading (including potential modifications of the existing Kyoto Protocol architecture) and non-target based approaches (see Table 3). Binding emission targets can be based on (a) the continuation of 'Kyoto-style' absolute emission targets or (b) intensity targets (e.g. emissions per unit of GDP) or (c) flexible types of emission targets. Non-target based approaches could involve technology development and transfer, sectoral agreements (including sectoral intensity agreements), policy based approaches (e.g. Policies and Measures, PAMs), equity and development approaches, and a variety of financial measures. We here discuss briefly what these potential post-2012 architectures might mean for the future of the CDM.

A direct continuation of the Kyoto-project mechanisms would involve quantified emission limitations with binding targets, emissions trading, and the continuation of a CDM-style mechanism (which might include tighter sustainable development and technology transfer provisions). This could be augmented by including similar quantified emission limitations on certain rapidly developing countries or other new signatories. If quantified emission limitations are not agreed upon by major developing countries, a number of alternatives could be considered for this group of countries. These include non-binding or voluntary, flexible commitments or targets, intensity targets, and benchmarks. This could then result in national programmes with unilateral CDM projects that would contribute to such voluntary or flexible commitments, with measurable impacts. The approach could otherwise be similar to the CDM, but rely on voluntary trading (see Bodansky, 2004; Sterk and Wittneben, 2005; Van Schaik and Egenhofer, 2005; Figueres, 2005; Michaelowa, 2005; Ellis, 2006).

Many other alternatives for the post-2012 regime exist (Table 3). Post-Kyoto architectures that are based primarily on international policy coordination may not include a prominent role for a trading mechanism because they would not compel nations with commitments to meet quantified targets. While a detailed discussion of these is beyond the scope of this article, each has potential impacts on the stability of the CDM and other carbon trading markets; many, in fact, reduce the demand for carbon permits or eliminate the need for a CDM entirely.

In evaluating these alternative post-2012 frameworks, negotiators need to consider whether they create sustainable development benefits within host developing countries while lowering the overall cost of reducing greenhouse gas (GHG) emissions released to the atmosphere. To fulfil the joint objectives of the CDM, new frameworks must meet the key over-arching principle of ''common but differentiated responsibilities''. Put plainly, in the grand bargain in the run-up to the Kyoto agreement, the CDM was designed to create the flows of wealth and technology so that developing nations could reduce their growing environmental impact of greenhouse gas emissions without sacrificing their economic development. In particular, weakening quantified targets or creating non-target approaches post-2012 risks the collapse of the CDM and the substantial financial flows, which are just beginning to gain momentum. This is important given the predicted shortfall in the investment that will be available for energy infrastructure in developing countries in the coming decades—on the order of $US10 trillion dollars will be needed over the next 25 years (International Energy Agency, 2006). If the CDM is to make a significant contribution to such investment needs post-2012 it could be argued that quantified targets should be significantly tightened.

Table 3 – Overview of the main post-2012 climate change mitigation proposals and approaches. Policies are grouped by mitigation approach—for example, whether explicit targets are included in the eventual regime.

Main mitigation group	Approach	Type of mechanisms/targets	Impact on the CDM
Quantified emission reduction targets with links to a credit-based system	1. Absolute emission reduction targets with emissions trading (continuation of Kyoto-style emission targets)	1a. Deeper fixed, binding emission targets for developed countries;	CDM remains in a similar form, may increase in importance and scale
		1b. Expansion of fixed, binding emission targets to (at least some) developing countries	
		1c. Voluntary absolute targets (i.e. REDD)	Questionable, depending on nature of voluntary targets
	2. Alternative indexed flexible emission targets with emissions trading	2a. Positively binding targets	CDM remains in its current form. Demand uncertain
		2b. Dual targets	CDM remains in current form? Demand uncertain
		2c. Price cap (safety valve)	CDM remains subject to caps? Demand uncertain
		2d. Dynamic targets (variables GDP, physical production)	CDM remains in its current form
		2e. Targets based on per-capita allocation	CDM remains in its current form
		2f. Voluntary flexible targets	CDM remains subject to nature of voluntary targets
No absolute emission reduction targets			
Technology	3. Enhanced technology development and diffusion of technology	3. Technology agreements and standards (i.e. alternative technology based protocol)	No CDM
Policy	4. Coordinated policies and measures (harmonized and non-harmonized)	4a. Charges	No CDM in its current form [CDM could re-appear in the context of the charging structure]
		4b. Taxes on emissions	Same as above
		4c. Incentive based instruments	Same as above
Sectoral	5. Sectoral agreements and initiatives (e.g. international agreements on energy efficiency)	5. Non-target based initiatives Establishment of a voluntary 'no-lose' intensity targets	No CDM, or sectoral CDM is added
Financial measures	6a. Mandatory financial contributions by developed countries to technology transfer funds for developing countries		No CDM
	6b. Mandatory multilateral fund to help disseminate and deploy new technologies in developing countries		
	7. Non-mandatory financial contributions by developed countries to technology transfer funds		No CDM
Equity and development based	8. Sustainable development policies and measures: implementation of national policies for sustainable development		No CDM

As of now, with market incentives rewarding volumes of CERs and not development benefits, a host country's criteria for project approval become important for sustainable development. Ellis et al. (2007) suggest that the provision of additional benefits is a consequence of the process by which countries approve their projects. In a recent paper comparing CDM projects in Brazil and Peru, Cole (2007) concludes that these countries have established different social development goals, with Brazil emphasising employment and income distribution objectives, and Peru pursuing more general local community needs. They have also chosen contrasting regulatory approaches. Peru has chosen an ad hoc regulatory approach whereby the DNA visits project sites and asks local communities about their needs and their potential contribution to the project. Brazil, similar to India and South Africa, developed a set of generic criteria, and applied a desk-based 'checklist' approach. In many cases, this has resulted in PDDs where project developers' existing (business-as-usual) activities were sufficient to meet the prescribed criteria. China has chosen sustainable development criteria which aims to advance its energy policy. While the Chinese regulations are procedurally similar to Brazil, India and South Africa, their goals appear to be quite different. The Chinese projects have a stronger focus on promoting national economic growth over the local dimension of sustainable development.

Assuming the basic structure of the CDM remains intact, the options for systematically addressing sustainable development benefits in the CDM include at least five alternatives:

Alternative 0 (current system): Nations continue to determine their own sustainable development requirements.[3] This approach would protect national sovereignty but risks a 'race to the bottom' to attract CDM investments.

Alternative 1: Minimal global standards for SD benefits, for example that they generate employment or at least 'royalties' for local or national government services. These minimal SD benefits could include employment generation, local development, tax revenues and energy infrastructure development, among others. These minimal standards could be similar to the Gold Standard expectations of voluntary offset projects, or could be more carefully detailed.[4]

Alternative 2: Establish a global checklist of SD benefits to which nations can add or waive certain types. This could be described as a system of 'global norms with local flexibility'.

Alternative 3: Establish a global point system for different types of beneficial development aspects of CDM projects. More points could be allotted to the most desirable projects, but all projects would have to reach a minimum number of points for sustainable development benefits to be accepted. Certain elements could be made mandatory if they were considered too important to be left out.

Alternative 4: Policy-based adjustment to CERs to favour high sustainable development projects and provide disincentives to those with high CERs but low SD or distributional benefits. That is, certain types of projects in key regions or sectors could gain double or triple CERs, while others creating few SD benefits would be awarded half or a third of the number currently awarded. This would be an intentional distortion of the market to favour high-benefit projects, but would require a balance of projects with low and high CERs.

In all cases, the overall scientific/environmental integrity of the total amount of allotted CERs must be maintained, so some types of projects or locations would clearly have their CDM project profitability (and potential commercial viability) reduced. Some nations or industries with heavy involvement in these types of projects may (or may not) object to a policy-based re-allocation of CERs.

Each of the above scenarios involves better defining, enforcing or enticing, and/or rewarding contributions to sustainable development. However, equally important is ex post verification of the project's sustainable development contribution (Bozmoski et al., 2008). Currently, the criteria are only reviewed at the outset by the DNA and validating Designated Operational Entity (DOE), and not by the DOE at verification. In other words, a project claiming to create 100 jobs that fell short and created 50 jobs will not be penalized at the verification stage of the project cycle.

Another procedural challenge is engaging civil society participation, which is written in the CDM guidelines, but participation has been sporadic. In going forward, negotiators must consider whether there should be specific rules to ensure civil society participation in the process of project approval or national CDM policy, and whether there are useful lessons from participation in other environment and development projects. How can the level of societal participation be evaluated and guaranteed? How can the capacity of NGOs be enhanced so they can make comments on CDM proposals in a timely and technically informed manner? Does the amount of time for public comment need to be extended beyond the current 30 days? More broadly, who speaks for ''civil society''? Can the group of potential commenting groups be expanded while still maintaining a workable process?

The value of CERs depends fundamentally on the perception that the assets represent real reductions that will hold value into the future. The value of CERs in the future, moreover, depends fundamentally on the continued existence of an international policy architecture that commands the broad support of both developed and developing countries. One of the factors underpinning developing country support is the sense that the CDM is not simply a market tool but is a market tool that delivers concrete benefits in the form of sustainable development on the local and national levels. Therefore it appears to be in the interest of both project developers and the international community to mind the sustainable development benefits of projects and thereby bolster the credibility of the market. Real citizen participation is needed to drive sustainable development, but the capacity of NGOs clearly needs development. Here some lessons may come from the requirements by many international donors for local NGO participation in the creation, management and evaluation of regional development efforts.

3.2. *The architectures and sustainable development*

Current CDM projects have treated sustainable development in divergent ways across geographical regions. For example, in Peru sustainable development criteria are prioritised by the DNA, while in Brazil and India they are a less clear priority. In Africa, CDM prospects for development are also uncertain—concerns were already raised about this in the wake of Kyoto (Grubb et al., 1999). With regard to the proposed alternatives, Alternative 0 (do nothing) is not an option for Africa, which continues to lose out on the sustainable development component of North-South cooperation in the CDM. Alternatives 1–3 provide potential benefits to Africa, however governance questions of international standard setting remain uncertain, in particular as to who should establish the checklist/point system and who allocates the points (project developers, the DNA when evaluating projects). Sustainable development is a matter of national sovereignty; therefore the voluntary standards proposed in Alternative 1 raise potential concerns about the accountability of non-state actors participating in the CDM. This makes Alternative 1

[3] As effected by Item 40(a) of the Modalities and Procedures for a Clean Development Mechanism as defined by Article 12 of the Kyoto Protocol adopted by the parties as Decision 3 of COP 11/MOP 1 in Montreal in 2005.

[4] To some extent offset project developers may decide to maintain standards irrespective of national criteria, in order to maintain confidence and avoid criticism.

probably unlikely in a regulated CDM. Alternatives 2 and 3 provide interesting guidance, in the form of checklists and point system; still the matter of national sovereignty remains unequivocally challenging. Alternative 4 is a most attractive option as it could be treated within the UNFCCC, although it poses problems with regards to determining the nature and scope of adjustments and the identity of the party with the authority to approve the corresponding adjustments.

More promising for sustainable development is perhaps the programmatic CDM. Programmatic CDM takes into consideration the bundling of many projects (which deals with the matter of scale) and in that way aims to bypass transaction costs of smaller projects. The sustainable development aspect should – technically – be better addressed as programmatic CDM aims towards this more integrated approach to creating local benefits. However, whether the operationalisation of the programmatic CDM will be any different to how the CDM is being implemented remains to be seen.

With regards to 'compensated reductions' (such as for reducing emissions from deforestation), measuring and rewarding emission reductions would take place across a whole sector in a country, rather than in a conventional CDM project. Because there is still widely divergent preferences among countries on whether they prefer sectoral or more conventional project-based approaches to the CDM, there may be a mix of these two mechanisms. This would require significant institutional amendments to the CDM or to the post-2012 Kyoto framework. Designing and coordinating sectoral CDM is ripe with technical and policy challenges that must be sorted out before this option is viable.

4. Beyond CDM futures

The above broad questions of the role of sustainable development criteria and civil society participation may be at the core of the debate about the CDM after 2012. However other significant questions remain, such as whether the CDM should remain as a project-level mechanism or move towards a policy focusing on sectors or programs. Including new sectors and technologies in the CDM opens new possibilities and complexities. For example, crediting for avoided deforestation could be particularly supportive of social and environmental sustainable development, but suffers from difficult technical and social issues. Another candidate is carbon capture and storage (CCS, i.e. the capture of CO_2 from combustion processes at source and its burial under ground). Rather than switching from fossil fuels to renewable energy, CCS would allow the 'greening' of the former, creating energy sources such as 'clean coal'. This has raised criticisms from those concerned about locking in existing energy structures, as well as about the security and permanence of the stored carbon. On the other hand, the realistic potential that many countries will rely to a great extent on fossil fuels for their projected economic growth leads others to view CCS as a necessary component of climate change mitigation. In particular, China possesses vast reserves of coal and current developments indicate that its use could more than negate emission reduction efforts in many other areas. So the road to sustainable development must address the role of coal and whether CCS can be part of a just solution to climate change.

Several other key issues addressed above remain to be tackled. First, integrating the so-called 'Plus 5' nations – China, Brazil, India, South Africa, and Mexico – into a quantified emission limitation scheme might vastly change the availability and marketability of CERs, and participation in CER markets if those nations became buyers, rather than sellers, of CERs. This also raises the question of whether the CDM has taken advantage of the 'low hanging fruit' of easy reductions, and how this can be addressed if developing countries accept some carbon emission reduction commitments. Second, the CDM is currently a short-term arrangement (5–7 years periods), but investment decisions in large infrastructure such as energy production need long-term continuity. Third, the relationship between CDM and voluntary emissions reductions (offsetting) is entirely unspecified but increasingly interrelated, as the voluntary market tests new methodologies, provides interim credits for projects awaiting CDM approval, and competes for high quality projects. Thus, significant market uncertainty will preclude major new investments until the policy community resolves these issues. Other concerns include the relationship between the CDM and adaptation, and whether the CDM should remain the only trading mechanism 'taxed' for adaptation funds.

The recent success of voluntary offsets raises the question of whether a new CDM architecture can borrow some elements of the voluntary market while still retaining political and regulatory integrity. An early critique of the CDM process is its complexity and associated high transaction costs, which is a huge deterrent to project developers to take on small-scale projects. By contrast, many private voluntary carbon offsetting projects are very agile, providing streamlined processes to get sometimes beneficial projects up and running. On the downside, these projects are usually seen as riskier, all other things equal, since they do not have standardised and technically capable regulatory oversight. One possibility which should be considered would be to enhance and simplify further the registration requirements for small-scale project activities, including an expansion of the applicable project activities, in order to streamline processing and approval through official CDM channels. It is essential that small-scale project activities continue to be ''bundled'' to allow a streamlining of their approval, but even this can increase transactions costs and reduces profitability.

A final possibility is to remove the CDM from the overall Kyoto structure, placing it directly under the UNFCCC, which served as a guiding new treaty without specific national targets. This might enable the renegotiation of a treaty that places the CDM at the centre of an effort to bring sustainable development to poorer nations while designing a new strategy for reducing global emissions. The broadest question, then, is whether the CDM should be included under alternative Kyoto futures, such as the expansion of 'Kyoto-style' absolute emission targets to rapidly developing countries. And will the CDM survive in the many architectures based on flexible types of emission targets?

5. Conclusion

The CDM in its current form has not realized sustainable development benefits envisaged in its creation: ''The CDM

states as its guiding purpose 'sustainable development' and that by general acceptance includes a measure of equity'' (Grubb et al., 1999: 239). For instance, the distribution of CDM projects has largely been concentrated in two continents: Asia and Latin America. Only 2.5% of CDM projects have been established in Africa, and the dominant project types are HFCs and N_2O projects, with half of all HFC projects located in China. From an illustrative review of 10 CDM projects, we suggest that further research is needed of existing and planned projects to provide insights into the improvement of the CDM after 2012.

As the CDM continues into a new phase, we propose five alternatives for systematically addressing sustainable development benefits of the CDM post-2012. Despite the attractiveness of distorting the market to incorporate the value of sustainable development into the CER price, the most politically feasible likely scenario is one that lies in between 'not doing anything' to 'politically favouring' CERs which ensure high sustainable development projects. In our view, negotiations debating exactly which project types, would benefit from what subsidies may be very contentious. New hopes are riding on the financial and governance opportunities that may be opened up by including avoided deforestation proposals and other sectoral 'compensated reductions' in the CDM. There remain, however, many highly technical and institutional challenges to be addressed by the international community. Especially, post-2012 negotiators must address the broad questions of how to secure the sustainable development benefits which were promised by the establishment of the CDM (Roberts and Parks, 2007), while building opportunities for host country governance and civil society participation. Voluntary offsetting and regional carbon trading markets are opening new opportunities for developing nations in creating local benefits while addressing climate change; the next steps are critical ones.

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