The Clean Development Mechanism's Contribution to Sustainable Development
A review of the literature

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Abstract
The challenges of how to respond to climate change and ensure sustainable development are currently high on the political agenda among the world's leading nations. The Clean Development Mechanism (CDM) is part of the global carbon market developing rapidly as part of the Kyoto response towards mitigation of global warming. One of the aims of the CDM is to achieve sustainable development in developing countries, but uncertainty prevails as to whether the CDM is doing what it promises to do. Close to 200 studies on the CDM have been carried out since its birth in 1997 including peer-reviewed articles and reports from the grey literature. However, no overview of the different debates and key issues in the CDM exists. This review of the literature serves to assess the state of knowledge on how the CDM contributes to sustainable development (SD) including poverty alleviation. The main finding of the review is that, left to market forces, the CDM does not significantly contribute to sustainable development. The paper, commissioned by Research Network on Environment and Development (ReNED), will facilitate a discussion during the ReNED conference October 27, 2005, on how to respond to this challenge, the role of aid strategies and recommendations for new research are suggested.

Introduction

"We face serious and linked challenges in tackling climate change, promoting clean energy and achieving sustainable development" the leaders of Eight Nations agreed when they met in Gleneagles, Scotland on July 6-8, 2005. The challenges of climate change and sustainable development are presently at the top of the political agenda among the world's leading nations. In parallel to the G8 dialog on climate change and sustainable development, the majority of developed countries have committed to targeted emission reductions through the Kyoto Protocol of 1997, which entered into force in February 2005. Accordingly, a carbon market is developing rapidly as a step towards the stabilization of greenhouse gas concentrations in the atmosphere to avoid dangerous global warming. The Clean Development Mechanism is part of the emerging carbon market and aims to achieve both sustainable development in developing countries and cost-effective reduction of greenhouse gasses in developed countries. In spite of its stated objective uncertainty prevails as to whether the CDM is doing what it claims it will do in terms of achieving sustainable development.

An extensive literature has developed covering close to 200 studies on economic, political, methodological and sustainable development aspects of how the CDM works. However, no overview of knowledge exists on the different aspects and debates of the CDM. This review of the literature focuses on sustainable development aspects of the CDM and it serves to communicate to the readership an assessment of the state of knowledge on how the CDM contributes to sustainable development.

Methodologically the review is based on selected studies from the wider analytical literature on the CDM, including both peer-reviewed articles and reports from the grey literature. The literature was accessed and reviewed between June and July 2005 using three sources: 1) The American based Web of Science gave 102 hits on peer-reviewed articles on the CDM. The list of

journals had a bias towards American journals and did not include important journals such as International Environmental Agreements and Mitigation and Adaptation Strategies for Global Change. 2) The IISD cyber library gave 171 hits including both peer-reviewed journals and reports from the grey literature. 3) In addition, the grey literature on CDM was searched via the Internet using Google. For an overview of the sources of literature see the ReNED web site (http://www.rened.dk/static.asp?page=CDMoverview), which provides an overview of the CDM resource base including research institutions, NGOs, development agencies, government institutions, private companies, multilateral agencies and newsletters.

The review is structured first to provide the context and historical background for the debate on how the CDM contributes to sustainable development. The origins of the CDM are explored against the wider debate on climate change and development, and in the peculiar circumstances during negotiations of the Kyoto Protocol leading to its birth in 1997. Second, the analytical literature on how the CDM contributes to SD is assessed, focusing on research findings within four groups of studies: forward looking, sustainability impact, carbon forestry and a small mixed group of studies. Thirdly, developments in the CDM project portfolio and the current status of the CDM market are briefly outlined as the context for assessment of achievements for sustainable development. Finally, for the purpose of serving as an introductory presentation for the ReNED conference, 'The Clean Development Mechanism – Linkages to Poverty Reduction and Sustainability', October 27, 2005, the review ends with recommendations for the role of development aid strategies and new research to inspire further discussions at the conference.

The origins of the Clean Development Mechanism

The birth of the CDM has its history in the process leading up to the Kyoto negotiations. After adoption of the Kyoto Protocol in 1997, including article 12 defining the CDM, the 'baby' has been called many names: 'the Kyoto surprise', 'the win-win mechanism', 'a bridge between North and South' and 'the front-runner of the Kyoto Regime' (Grubb, Vrolijk et al. 1999; Matsuo 2003). The names reflect the optimism and high expectations for the CDM to reconcile major differences between the North and the South over climate change and development. The dual aim of the CDM to achieve sustainable development in developing countries and cost-effective reduction of greenhouse gasses in developed countries can be seen as both a source of synergy and conflict. This section explores the background of the conflict of interests.

Key issues and conflicts in the debate on climate change and development

The historical divide in climate change and sustainable development discourses

The debates on climate change (CC) and sustainable development emerged in research and policy in the late 1980s. The concept of sustainable development became popular with the report 'Our Common Future' (1987) by the World Commission on Environment and Development later known as the Brundtland Report. Climate change and the risks of man-made global warming were brought to the attention of policymakers at a conference organised by the World Meteorological Organisation in 1988. In spite of similarities between the two concepts - both have gained prominence at the same time and deal with human impacts on the environment - they have remained largely divided for a long period of time. While the climate change debate has been natural science-driven, the sustainable development debate has been framed in a more social and human science oriented approach. For about 14 years from the late 1980s to early in this decade the two debates have run largely in parallel and were played out in different institutional arenas with little cross-fertilization. The historical divide between the two concepts is well analysed and described in the

literature (Cohen, Demeritt et al. 1998; Michaelis 2003; Najam, Rahman et al. 2003; Swart, Robinson et al. 2003). In a discourse analysis of the CC and SD debates Cohen, Demeritt et al. (1998) document the separate research cultures and disparate approaches to science, politics and practice. To enrich both debates new research is recommended to integrate the two debates and explore linkages between CC and SD. The analysis has inspired several other studies that follow up on this recommendation and look for examples of greenhouse gas mitigation in light of strategies for sustainable consumption (Michaelis 2003) and concrete linkages such as alternative development paths and ancillary benefits of climate change policies (Swart, Robinson et al. 2003). The two debates continued separately until around 2001-2002, when the International Panel on Climate Change (IPCC) Third Assessment Report and the World Summit on Sustainable Development created platforms to direct the focus towards integration and linkages between CC and SD.

The literature on linkages between climate change and sustainable development

Since then an emerging and growing literature has dealt with a range of issues identifying synergies and trade-offs between CC and SD. A characteristic of several contributions (Davidson, Halsnæs et al. 2003; Swart, Robinson et al. 2003) is the effort to formulate climate change as a development problem rather than an environmental problem. In relation to the IPCC Third Assessment Report 2001 it was suggested that a supplement report on linkages between CC and SD be written. The idea did not materialise but instead inspired the young journal 'Climate Policy' to publish a special supplement on the topic in 2003 (Grubb 2003). An overview of lines of conflict and key issues includes the following sub-debates: 1) Views from the South, 2) Equity, 3) Adaptation and Poverty and 4) The sustainability impact of CDM projects. As the latter issue is the focus of the paper it will be analyzed in more detail and length in the section on research findings.

Along the well-known line of conflict between a Northern focus on CC as a global environmental problem and a Southern focus on CC as a development problem, some fruitful analysis and '*views from the South*' (Sokona, Najam et al. 2002) have emerged. According to Najam, Rahman et al. (2003) analysis on linkages is particularly driven by developing country researchers for whom a common theme is that sustainable development concerns are consistently missing in the climate regime. In an historical overview of the evolution of the IPCC assessment process three key issues are highlighted that have been the focus of the first (1990), second (1995) and third (2001) IPCC assessment reports respectively: cost-effectiveness, equity, and alternative development paths. The fourth assessment report is scheduled for 2006 and the authors strongly recommend that SD is integrated into the conceptual and organizing framework of the report. A conclusion of the Third Assessment Report was that the ultimate goal of the Climate Convention, namely stabilization of atmospheric greenhouse gasses, is dependent on development paths and socio-economic choices at least as much as on climate policy. This conclusion is profound and one of the main arguments used for framing climate change within a sustainable development framework. Other contributions from the South use similar arguments,such as the 'development first approach' (Davidson, Halsnæs et al. 2003) or point to the lopsidedness of a policy architecture which favours cost-effectiveness of CO_2 reductions over equity, mitigation over adaptation, and global carbon trade over sustainable development (Huq, Sokona et al. 2002). Two contributions raise the issues of how geographical circumstances impact on climate change as a highly variable factor influencing the prospects for SD (Wilbanks 2003) and the need for taking regional and local policy contexts into consideration when analysing synergies and trade-offs for mitigation policies in developing countries (Beg, Morlot et al. 2002).

Equity has been a key issue since the beginning of the debate, revolving around notions of fairness and justice at the heart of the global conflict over emission reduction targets. Studies focus on the different principles for equity forwarded by various stakeholders in arguments over target allocation as well as their consequences for burden sharing (Metz, Berk et al. 2002; Ghersi, Hourcade et al. 2003). Three of the main principles of equity are: *Responsibility* - emission reductions must be proportional to the contribution to the problem; *Capability* - emission reductions must be proportional to the capability to contribute based on income, technology etc.; and *Need* - emission reductions must leave room to develop and eradicate poverty. A more equitable climate regime, it is suggested, can be obtained by framing equity principles in a sustainable development context rather than a climate change context focusing narrowly on emission reductions. In the Kyoto negotiations, debate over what constitutes a 'fair' and 'equitable' climate regime did not result in a rational outcome. Rather, the Kyoto regime represents a strictly political deal mixing principles for burden sharing. The debate on equity will remain central to the global problems of CC and SD as new targets for emission reductions must be agreed upon after the Kyoto commitment period 2008-12. In other studies equity is treated as part of the social dimension in the sustainable development concept (Najam, Rahman et al. 2003) and applied to other aspects of climate policy, for example the achievement of sustainable development at the local level when implementing mitigation projects in developing countries (Brown and Corbera 2003).

Adaptation and poverty is the most recent sub-debate. During the first decade of negotiations under the United Nations Framework Convention on Climate Change (UNFCCC) from 1992 until around 2001 focus largely centred on mitigation policies, as CC was seen as a medium- to long-term problem (50-100 years time) and therefore prevention (mitigation) was prioritised over cure (adaptation). In the Third Assessment Report 2001 it was highlighted that some impacts may already be discernible, and especially since the Conference of the Parties (COP7) in Marrakech 2001 adaptation responses have risen high on negotiators' and donors' agendas. Donors in particular have taken up the climate change challenge as adaptation measures are fundamentally related to poverty. The impacts of climate change are felt in vital sectors such as water, agriculture, health and infrastructure and developing countries are expected to be the worst affected due to poor people's disproportionate vulnerability because of dependency on e.g. rain fed agriculture and their lower capacities to adapt. One of the main issues raised in policy and research agendas is the mainstreaming of adaptation into national development policies (Huq and Reid 2004) including relevant sector policies (Bloom 2004; Burton and May 2004; Devereux and Edwards 2004). Recommendations for mainstreaming have in this case quickly found their way into donor programmes with two recent publications, one multilateral report (Bank, Bank et al. Undated) and another bilateral report, the 'Danish Climate and Development Action Programme. Climate Proofing Danish Development Cooperation. Draft version for consultation' (Danida 2005) providing the framework for integrating adaptation measures into development programmes in order to 'climate proof' development aid to the poor.

The birth of the CDM in the Kyoto Negotiations

The process of negotiating the Kyoto Protocol and the CDM started years before the actual agreement was struck in Kyoto in December 1997. Originating in negotiations for the UNFCCC and the larger debate on climate change and sustainable development, the process of negotiations spanned 30 months from COP1 in Berlin 1995 to COP3 in Kyoto 1997 (Grubb, Vrolijk et al. 1999). In hindsight it was a combination of the idea of Joint Implementation, the pilot phase of Activities Implemented Jointly (AIJ) and a curious interaction between the US and Brazil that created the

fruitful circumstances for creating the Clean Development Mechanism (Michaelowa 2002; Matsuo 2003).

Joint Implementation and the Activities Implemented Jointly pilot phase

The Group of 77, an alliance of developing countries, and China had for years during the negotiation process rejected the US proposal for a clearer definition of Joint Implementation (JI) allowing industrialised countries to buy emission reductions abroad (as described in Art. 4, 2a of the UNFCCC 1992) based on the argument that industrialised countries must first take domestic action. Reasons for this were based on industrialised countries being the main emitters and developing countries concerned about growth if they were to be limited in their emissions of greenhouse gases (Cigaran and Iturregui 2004). As no agreement could be reached among developed and developing countries, negotiators at COP1 in Berlin 1995 decided to start a pilot phase of Activities Implemented Jointly (AIJ) until 1999. About 150 greenhouse gas reduction and sequestration projects have been developed since then with no carbon credits generated, which is taken to explain the small size and only partial implementation of many projects (Michaelowa 2002). In spite of this the pilot phase was prolonged without giving an end date at COP5 in 1999, as the AIJ programme was seen as a laboratory for gaining experience with CDM and JI projects.

From a Clean Development Fund to the CDM

In the negotiation process prior to COP3 in Kyoto 1997 the major alliances and stakeholders had submitted proposals for the negotiation text. The chairman of the ad-hoc group preparing and facilitating the negotiations, the Argentinean Ambassador Estrada, had been mandated to create a consolidated negotiation text reducing many proposals to only 22 pages and 3 annexes. Excluded from the consolidated text was a complex proposal from Brazil proposing penalties on Annex 1 countries, i.e. developed countries and countries in transition to a market economy listed in Annex 1 to the UNFCCC, 1992, if they did not comply with emission reduction targets. The idea seemed far-fetched, as the debate about enforcement mechanisms had barely begun and the idea of penalties was strongly opposed by Annex 1 countries (Grubb, Vrolijk et al. 1999). However, the Group of 77 had united around the idea of financial penalties and insisted that it be reinserted into the text. Towards the end of the pre-Kyoto negotiations in October 1997 the US discovered the similarities between the Brazilian proposal on a Clean Development Fund (CDF) and the US proposal on JI. If penalties on Annex-1 countries were to be allocated to non-Annex-1 countries in support of reducing their emissions and to support adaptation to climate change, the CDF was not too different from the JI. Words were changed in the CDF proposal from ‘penalty for not complying’ to ‘contributing to compliance’ and the original idea was transformed from a fund into an investment mechanism for companies (Grubb, Vrolijk et al. 1999, 103). Since the introduction of AIJ individual smaller countries had left the G77 common position against JI and adopted a more open approach. The unexpected changes to the initial ideas of JI and CDF happened in the final stages of the negotiation process and together with internal disagreement in G77, Article 12 of the Kyoto Protocol defining the CDM was agreed upon. However, there was little time left to discuss terms and conditions and the CDM was decided upon without provisions on how to operate.

Expectations of the CDM and outstanding issues

Several studies have since highlighted the special role of the CDM in bridging different priorities around CC and development between the South and the North (Fichtner, Graehl et al. 2002; Michaelowa and Dutschke 2002; Matsuo 2003). The dual purpose of the CDM reflects the compromise and also the implicit assumption that synergy and win-win opportunities will constitute the basis for success of the mechanism. Accordingly, the CDM was widely welcomed and raised

expectations (Kaupp, Liptow et al. 2002; Bhandari 2003), especially in developing countries, for delivering sustainable development benefits including investments, technology transfer and contributions to poverty alleviation. However, despite the fact that most developing countries were enthusiastic, they were also concerned about modalities and procedures to be determined for the CDM (Cigaran and Iturregui 2004). Article 12 of the Protocol defines in the CDM, for example, that emission reductions must be 'real, measurable and long-term' and 'additional to any that would otherwise have occurred'. Furthermore, an Executive Board (EB) shall supervise the CDM, the Conference of Parties/Meeting of Parties (COP/MOP) shall elaborate modalities and procedures at its first session, and proceeds from certified project activities shall be used to cover administrative expenses and the costs of adaptation in developing countries. Not included in Article 12 was the question of whether sinks should be allowed, and the elaboration of, for example, methodologies for baselines, how to determine additionality, and the CDM institutional set up was postponed for later. This turned out to be much later, as it was not until COP7 in Marrakech 2001 that the EB was established and the main part of the 'rule book' of the CDM decided upon. In subsequent COPs definitions and modalities for sinks and small-scale projects have been developed. The process of rule-making is still ongoing with proposals for, for example, a compliance mechanism to be discussed at the upcoming COP11 in Montreal, Canada, November 28 to December 9, 2005. In spite of its importance, this review does not include an account of the institutional design, nor of the rules and procedures of the CDM, as this would outgrow the scope of the paper.

Analysis of how the CDM contributes to sustainable development

As the key issues and lines of conflict in the wider debate on climate change and development show, the assumed synergy and win-win aspects of the dual aim in the CDM do not reflect the whole picture. This review of the literature on CDM and SD shows a number of poor fits and conflicts. Common to the studies is an attempt to add to existing knowledge on linkages between the CDM and SD. To provide an overview of the literature with regard to the research questions raised, the approaches and data used and, most importantly, the key findings, the literature can be divided into four groups: 1) Forward-looking studies trying to predict future SD impacts. 2) Methodological development of criteria and indicators to assess the sustainability impact of CDM projects. 3) Forestry carbon projects analysed with regard to their sustainable development contribution, and lastly, 4) other studies raising different questions using different approaches. The number of studies in each group varies and reflects a high research interest in carbon forestry projects, whereas other project types such as energy or industrial projects have received less attention as case studies. Within the last 2-3 years the number of CDM projects has increased rapidly. The last section therefore takes stock of progress with regard to the CDM project portfolio, market trends and achievements for sustainable development. Lastly, key challenges emerging from the analysis are highlighted. Before reviewing the literature for research findings a note of clarification on the conceptual basis for studying sustainable development is useful, as well as how it is linked with the CDM and poverty alleviation.

Conceptual clarification

Theoretically different approaches and definitions of sustainable development exist, but going into this field will lead too far from the operational and practical use of the concept, which is the focus of this review. For a theoretical introduction see chapters 2 and 3 in Markandya and Halsnæs (2002). Operationally in the methodological literature there seems to be a consensus that sustainable

development encompass at least three dimensions: the social, the economic and the environmental (Kolshus, Vevatne et al. 2001; Najam, Rahman et al. 2003; Olhoff, Markandya et al. Undated). Examples of general SD criteria for each of the dimensions are: 1) Social criteria: poverty alleviation, equity and improved quality of life. 2) Economic criteria: financial returns to local entities, a positive balance of payments and technology transfer. 3) Environmental criteria: reduction of GHGs and the use of fossil fuels, conservation of local resources, improved health and reduced pressure on local environments (Olhoff, Markandya et al. Undated, p. 18). However, when it comes to practical and concrete assessments of sustainability impacts of CDM projects there is no single, authoritative and universally accepted approach or methodology applicable to any CDM project regardless of project type and location. Mandated in the Kyoto Protocol it has been decided that it is within the prerogative of National Authorities (DNAs) designated by non-Annex I countries to confirm whether a CDM project assists in achieving sustainable development or not. This means that actual definitions of what constitutes sustainable development vary according to what different host countries consider as their development priorities. Several problems with this pragmatic approach to defining sustainable development are identified in the literature. One problem is the fact that different stakeholders prioritise different aspects of SD (Brown and Corbera 2003; Kim 2003). As power relations among stakeholders are unequal it is often the resource-strong stakeholders who are able to define the terms for the carbon trade (Nelson and de Jong 2003). A second problem is the tendency of competition among non-Annex I countries to attract CDM investments and create an incentive to set low sustainability standards, which can lead to the early identified problem known as 'a race to the bottom' (Sutter 2003). Recently it has been found that SD criteria are not clearly defined by DNAs (Brown, Adger et al. 2004), which reopens the questions of who should assure the sustainability of CDM projects and how. Below, the literature addressing these questions is assessed.

Research findings on how the CDM contributes to sustainable development

Forward-looking studies

Early studies from 2000-2001, before the Marrakech Accords, try to analyse the possible future contribution of the CDM to SD. Three studies aim to predict, respectively, how far the CDM will advance SD goals (Austin and Faeth 2000), whether the CDM will further or impede SD (Banuri and Gupta 2000), and whether the CDM can be a leverage for development (Mathy, Hourcade et al. 2001). A fourth study argues for the inclusion of community forestry projects in the CDM based on significant co-benefits such as rural development and biodiversity (Klooster and Masera 2000). Common to the studies is a lack of CDM project data, as it is too early in the CDM's development for evidence to be available. Instead, the studies use data based on, for example, literature reviews from potential CDM projects in Brazil, India and China (Austin and Faeth 2000), simulation and modelling of the leverage effect of CDM investments on development (Mathy, Hourcade et al. 2001), or assessments of the impact of CDM investment on SD using three different economic approaches (Banuri and Gupta 2000).

None of the studies conclude with certainty the questions raised. Findings, however, tend to be positive about the prospects for SD and point to the possible, significant co-benefits CDM projects can bring to developing countries such as investments, technology transfer, addressing local and regional environmental problems, and advancing social goals. The conclusions also raise and discuss problematic aspects of how and how much the CDM can contribute to SD. An issue raised in several studies is the need to recognise and respond to the non-carbon benefits of CDM-projects, as only the carbon benefits are valued on the carbon market. In cases of trade-offs rather than

synergy between the dual aims of the CDM, as in when the carbon price increases in order to secure sustainable development benefits, the incentive is reduced for buyers to pay extra for sustainable development.

Sustainability impact studies

How to assess the sustainability impact of CDM projects using criteria and indicators is the common research question in this group of studies (Kolshus, Vevatne et al. 2001; Fichtner, Graehl et al. 2002; Huq 2002; Markandya and Halsnæs 2002; Begg, Parkinson et al. 2003; Sutter 2003; Anagnostopoulos, Flamos et al. 2004; Olhoff, Markandya et al. Undated). Differences between the methodologies arise when it comes to selection of specific criteria and indicators for measurement, which tend to vary with the type of project assessed and whether the assessment of impacts applies to project/local level, regional or national level. For example, Anagnostopoulos, Flamos et al. (2004) and Fichtner, Graehl et al. (2002) have developed approaches especially oriented towards energy sector CDM projects, applicable respectively at project level and to a portfolio of projects. Begg, Parkinson et al. (2003) focus on small-scale CDM projects using examples of different types of energy projects in Tanzania, Kenya and Ghana, whereas Sutter (2003) aims to improve existing SD assessment tools with his contribution, 'The Multi-Attribute Utility Theory for CDM Project Assessment'. The main differences exist in the way indicators are constructed and weighed against each other for evaluating the different aspects of SD using qualitative or quantitative methods, or a mix of the two. Olhoff, Markandya et al. (Undated) and Sutter (2003) both review advantages and disadvantages of different approaches available to evaluate the sustainability of CDM projects. Among seven partly overlapping categories of approaches, the most common referred to and used are checklists and multi-criteria assessments, or a combination of the two. For an overview of the remaining five categories of approaches, namely cost-effective analysis, cost-benefit analysis, ranking methodologies, guidelines and negotiated targets, see Olfhoff, Markandya et al. (Undated, p. 46-53) and Sutter (2003, p. 32-38). One example is the SouthSouthNorth Matrix tool (SouthSouthNorth 2004), a combination of the checklist and multi-criteria approaches. It is based on a scoring system, where qualitative values are assigned to each criterion based on selected quantifiable indicators. The scores can be added and generate a total score for each CDM project assuming equal weights to all indicators. A critique of the tool is that, while relatively simple to use, it is based on subjectively assigned scores. Another example is the well-known World Wide Fund for Nature (WWF) Gold Standard (Board 2004), a label for high quality CDM projects and a variant of the multi-criteria approach. In addition to requirements of positive benefits using the sustainability assessment tool adopted from the SSN Matrix Tool, an environmental impact assessment and explicit public participation must be conducted.

A general finding from applying any of the sustainability assessment tools to case studies of CDM projects is that trade-offs exist between the two objectives of the CDM in favour of cost-effective reductions of greenhouse gasses (Kolshus, Vevatne et al. 2001; Markandya and Halsnæs 2002; Sutter 2003). The conclusion is profound, as it shows that the initial assumption of the synergy and win-win relationship between the dual aims of the CDM does not hold for many projects studied in the literature. Each of the studies has different suggestions of how to respond to the built-in conflict. Kolshus, Vevatne et al. (2001) point to the importance of tools to assess the nature of the trade-off and for identifying 'critical indicators' such as poverty that must at least be neutral, and preferably positive. Sutter (2003) identifies three groups of actors that can play a direct, but not mandated role in fostering sustainable CDM projects through 'good behaviour'. Project developers can, through the design of projects, ensure a premium quality. Certified Emission Reduction (CER) buyers can choose to pay a premium to avoid reputation risks, and Annex 1 governments can set additional SD

requirements for the use of CERs. Indirectly, NGOs and research institutions can play a role as 'watchdogs' ensuring that high SD criteria are adhered to, or as 'rewarding institutions' administering, for example, the Gold Standard. Another suggestion is to introduce international standards for sustainable development rather than, as now, leaving it for host countries to decide. In sum, the studies show that methods for assessment of CDM projects' sustainability impact are useful and necessary but not sufficient to change the tendency towards the favouring of pure climate oriented CDM projects, which reduce CO2 emissions the cheapest and most cost-effective way, over more development oriented CDM projects, where the costs of ensuring SD are not valued in the carbon market.

Carbon forestry studies

The common research interest for this group of studies is the local sustainable development contributions of forest carbon sequestration projects. Originally, sinks projects were not included in the CDM and later policy discussions on how to account for the temporary character of many forests proved a controversial issue. In Marrakech 2001 it was decided that only afforestration and reforestation projects would be included under land use, land-use change and forestry activities (LULUCF). Later it was agreed that conservation activities would be excluded, and that a cap would limit the amount of carbon that can be credited through sinks projects to 1% of base-year emissions of the claiming Party, times five. Feeding into this process of policy development, research projects have highlighted the importance of carbon forestry sinks' potential link with poverty alleviation and other development benefits at the local level (Brown, Adger et al. 2004; Leach and Leach 2004). Common for most of the studies is a geographical focus on Latin American countries and the use of case studies from early AIJ, CDM or other carbon forestry projects including conservation (Brown and Corbera 2003; Nelson and de Jong 2003; Brown, Adger et al. 2004; May, Boyd et al. 2004). The exception is one study from India Gundimeda (2004) analysing data from almost 70,000 households to study the potential implications of using forests for CDM projects for the livelihoods of rural poor.

Conclusions from the studies reviewed point to many problematic aspects of realizing the promise of sustainable development at project and local level. One conclusion is that it cannot simply be assumed that development priorities of forest and resource users are furthered through CDM forestry projects (Brown, Adger et al. 2004). The conclusion is related to a fundamental and far-reaching critique questioning the ability of the carbon market itself - and market mechanisms in general – to provide real and equitable benefits for sustainable development. A basis for the critique is, as mentioned above, the observation of trade-offs between the dual objectives. Carbon sequestration is often prioritised in both project design and implementation to the detriment of development criteria. It is observed in several studies and expressed in different ways. Brown and Corbera (2003) find through stakeholder analysis that different stakeholders have different priorities in terms of the carbon, environmental and development criteria of SD. While this comes as no surprise, as a general conclusion it has significant implications for the balance between the dual objectives of the CDM. From following over time 'Fondo Bioclimatico', a carbon mitigation project in Mexico, Nelson and de Jong (2003) find there has been a decoupling of sustainable development benefits from carbon credits in order to prioritise economic concerns over keeping the costs down. Goals of community development were separated from the carbon contracts and instead SD initiatives are addressed by a farmers organisation. Using the same project in their analysis Brown, Adger et al. (2004) arrive at the same conclusion, and also May, Boyd et al. (2004) find that trade-offs exist between adoption of rigid SD criteria and the number and type of investors a country can attract. A second set of conclusions regards local equity issues in the distribution of

costs and benefits from CDM forestry projects. Evidence indicates that middle-income communities and relatively well-off farmers with property rights to forests are more likely to be among the beneficiaries than poor households or women-headed households with no land titles and less formal rights to access forest resources (Brown and Corbera 2003; Brown, Adger et al. 2004; May, Boyd et al. 2004). A third set of conclusions regards the role of institutions for managing, negotiating and supporting CDM projects. So far it has been difficult to establish effective institutions for mediating different and unbalanced stakeholder interests. Cross-sector and cross-scale institutional frameworks are found to be necessary for ensuring equity and sustainable development objectives. Without such politically designed institutions, and left to the market mechanisms, Brown, Adger et al. (2004) conclude that the CDM may exacerbate social inequalities. Related to the role of institutions is the finding by May, Boyd et al. (2004) that the designated national authority (DNA) plays a crucial role in defining and monitoring clear SD criteria. How successful the DNA is will be shown in the extent to which CDM projects reflect SD concerns in their design and implementation. From another part of the world, in India, Gundimeda (2004) arrive at a similar conclusion about the importance of mediating institutions to ensure CDM forest carbon projects result in equity and SD for local people. A mechanism for benefit sharing is proposed among investors and user groups of common property resources (forests), as otherwise benefits are most likely to be grabbed by influential households. Only if CDM carbon forestry projects are carefully designed can the aim of SD for the local people be achieved. Otherwise the CDM can result in negative welfare implications for the poor. In summary, the studies of early pilot AIJ and CDM forestry carbon projects show that, left to the market, existing institutions for management and support of CDM projects are unlikely to achieve the objectives of local equity and sustainable development.

Other studies

This group of three studies is characterised by its differences rather than commonalities in their choice of analytical approach and use of data. One study is a case study of South Africa based on interview data analysing the disparity of views and expectations to the CDM between local stakeholders and investors (Kim 2003). Another study analyses how market structures can impact on the level of development benefits to developing countries, but the analysis is not empirically grounded (Humphrey 2004). A third study is an assessment of the CDM regarding the balance of achieving its dual aims, primarily based on readings of policy and legal texts describing the CDM and the Kyoto Protocol (Halvorssen 2005).

Findings, however, are partly overlapping and confirm earlier conclusions. From analyses of stakeholder perceptions, Kim (2003) finds that disparate views and expectations between national stakeholders and international investors are likely to be a stumbling block for the CDM. Government representatives have taken a reactive rather than a pro-active approach to the CDM based on a profound scepticism of the principles of the mechanism dating back to early international negotiations. For example, it is feared that the CDM will be used to harvest the ‘low hanging fruits’, i.e. exhaust the cheapest and easiest means of reducing emissions, and leave the more expensive for later, when developing countries might have to commit to emission reduction targets. Other key stakeholders from the energy and mining sectors fear that the CDM will impact negatively on the domestic coal market and domestically developed technology including schemes for nuclear power. Investors, on the other hand, perceive the issue of equity to be the least relevant to the CDM, contrary to users of CDM projects from, for example, a solar homes CDM project, which ranks development benefits the highest. From a different type of analysis of the market structures developed by the CDM, Humphrey (2004) arrives at a similar conclusion. CDM projects need to be oriented more towards generating development benefits, as trade-offs between profit

maximising investors and the SD objectives are evident. Furthermore, host countries and their DNAs may have little to bargain with when defining SD standards, due to the global scope of the CDM and investors' wide choice of location. Extra means are therefore needed to increase the development impact. Suggestions within the current CDM regime are certification of 'development friendly' investment funds on the supply side, and branding of a 'fair CDM' label or 'green certificates' separating the project from the label on the demand side. Contrary to these critical conclusions on the performance of the CDM in realising its SD objective, Halvorssen (2005) concludes that assuming host country systems are put in place and other implementation procedures are ironed out, the CDM looks like a promising tool.

The current status of the CDM

Research findings on how the CDM contributes to SD have so far been primarily on a project-by-project basis. The following studies analyse the existing portfolio of CDM projects and the emerging carbon market focusing on the contribution of credits from the CDM. No methods or available data exist for measuring the total contribution of the CDM to sustainable development. However, indirectly the achievements for SD can be discussed against the trends for development of the CDM project portfolio and the carbon market. Based on recent analysis taking stock of progress with the CDM, key challenges and options for the future are identified.

Overview of the CDM project portfolio

Recent studies have used the fast growing numbers of CDM projects in various phases of project development to get an overview of where the CDM is moving in terms of types of projects, the volume of CERs generated, and geographic distribution (Ellis, Corfee-Morlot et al. 2004; Ellis and Gagnon-Lebrun 2004; Cosbey, Parry et al. 2005). Rapid changes have occurred in the project portfolio during 2003/04 and a few large projects have changed the relative importance of different countries and sectors. For example, in little more than one year's time the volume of CERs rose four times from about 13 Mt CO2e/ year in September 2003 to about 52 MtCO2e/year in November 2004 (Ellis and Gagnon-Lebrun 2004 p. 12, figure 1). Studies vary in their use of data. In an OECD report taking stock of progress under the CDM, Ellis, Corfee-Morlo et al. (2004) use data from Project Design Documents (PDDs) and Project Identification Notes (PINs) from 160 *proposed* CDM projects. Just five months later the portfolio had increased to 201 proposed CDM projects (Ellis and Gagnon-Lebrun 2004). In the most recent overview of the CDM project portfolio Cosbey, Parry et al. (2005) use the roster of 92 CDM projects in the process of validation (88 projects) and those that have been registered (4 projects) as of April 6, 2005. In spite of different ways of counting the CDM project portfolio, more or less the same overall trends for development emerge.

Characterised by project type, the portfolio looks quite different whether it is described by numbers or by volumes of credits. Described by numbers of projects the majority of projects (80%) are hydropower (30%), biomass power (26%) and landfill gas capture (24%) (Cosbey, Parry et al. 2005, p. 9, figure 2). Other categories are energy efficiency, wind power, geothermal, HFCs and others. Described by volumes of credits, however, the most important types are landfill gas capture (44%) and F-gas projects (30%). This is from just two projects in India and South Korea, together comprising 74% of total CERs generated (Cosbey, Parry et al. 2005, p. 10, figure 3). A skewed pattern emerges when the portfolio is characterised by the distribution of CDM projects across countries. Measured by the number of projects hosted by each country the top 5 countries are Brazil (28), India (14), Honduras (7), Chile (7) and Mexico (4) (Cosbey, Parry et al. 2005, p. 11, table 1). Measured by percentage of total yearly credits the picture looks different, with the top 5 countries

being Korea (27%), India (15%), Brazil (10%), China (9%) and Indonesia (7%) (Ellis and Gagnon-Lebrun 2004, p. 13, figure 3). The different ways of measuring geographical equity reveals the trend that Asia is taking the lead from Latin America with the development of a few large F-gas projects. Africa, the Middle East and the former Soviet Union countries are marginalised with only a few projects (4 for validation as of April 2005) and few generated credits (8% of total in November 2004).

Trends on the carbon market

The carbon market, including estimates of price, supply and demand of carbon credits for the first commitment period 2008-12 has been analyzed in several studies (Grubb 2003; Haites 2004; Langrock and Sterk 2005). In an exhaustive analysis of the carbon market potential the demand for carbon credits in 2010 has been estimated in the range of 50 to 500 MtCO2e at a price of $11.40/tCO2e, an average of 250 MtCO2e per year in the five year commitment period 2008-12 (Haites 2004). The estimated demand arises from a gap between OECD countries' Kyoto targets and the potential for domestic reductions, and it assumes Russia and Ukraine will maximise their profits from the sale of their Kyoto units by restricting supply in order to raise the price. Unrestricted, the Assigned Amount Units (AAUs) from Russia and Ukraine, also known as 'hot air', can potentially cover the shortfall in emission reductions from OECD countries, as emissions from former Soviet Union countries have declined since 1990 and are well below their Kyoto Allowance (Grubb 2003). Only emissions from the New World Economies (USA, Canada and Australia) have grown as expected since Kyoto 1997, while emissions in the EU and Japan have remained roughly static. Regarding the above-estimated 'marker price' of a carbon credit, it is likely that many diverse prices will develop for different types of carbon credits, including a possible premium for credits with a higher SD contribution. This conclusion is based on an analysis of the politics behind buyers' behaviour (Grubb 2003). Grubb argues that the EU is not likely to be a least-cost buyer due to political and strategic concerns with carbon trade, including strong ties with many developing countries. Japan is also not likely to be a least-cost buyer, as it does not have good relations with Russia. Rather, Japan is likely to exercise buyer sovereignty over whomever it wants to trade with and on the terms for maintaining good relations with developing countries, particularly in Asia. Canada, on the other hand, will treat the carbon market like any other competitive market and is likely to show less resistance to large-scale emissions trading using AAUs. A sign that the latter might happen is seen in a recent presentation by the President of the influential Canadian based NGO, the International Institute for Sustainable Development (IISD). The President of IISD argues that it will be more effective for Canada to buy AAUs from Ukraine through a Green Investment Scheme, where the revenues from carbon credits in the seller country are earmarked for the purchase of climate-friendly technology in the buyer country (Runnalls 2005). The argument is based on the observation that "serious concerns have been raised regarding the viability of the CDM" (ibid, p. 3).

As of January 1, 2005, the EU emissions trading scheme (ETS) has entered into force. The 'linking directive' legislated in November 2004 allows CERs to be used for compliance starting in 2005, whereas Emission Reduction Units (ERUs) from JI are allowed starting in 2008. From a legal perspective a number of issues regarding the requirements for CER transactions must still be addressed before the market for CERs can develop smoothly (Langrock and Sterk 2005). The demand for carbon credits was boosted with the entry into force of the ETS, and in May 2005 price differentiation could be observed. The price range for CERs traded between 5-9 Euros per tonne CO2e and the price for EU allowances traded at a higher level in the range of 14-17 Euros per tonne CO2e (Cosbey, Parry et al. 2005, p. 8).

Achievements for sustainable development

While the above descriptions of CDM projects and market developments do not indicate how much the CDM contributes to sustainable development, they constitute the context within which the success of the CDM can be assessed. With regard to project types, it is widely recognised that there are no direct development benefits from, for example, large F-gas projects (Humphrey 2004; Cosbey, Parry et al. 2005). This is a general problem and also applies to other end-of-pipe options for capturing and decomposing non-CO2 greenhouse gasses like N2O and CH4, which have high global warming potentials and stem from 'brownfield' sites such as landfills or industrial processes. These types of projects are attractive purely from a low-cost emission reduction perspective, and increasingly this is what buyers prefer (Ellis, Corfee-Morlot et al. 2004; Ellis and Gagnon-Lebrun 2004). Furthermore, the potential supply of cheap credits from these types of projects is estimated as significant, especially in Asia. Indirectly, the development implications may even be negative in terms of lowering the price of CO2e further (to around $0,50 per t/CO2e) making it less likely that renewable energy projects with higher investment costs and higher development benefits will be economically viable under the CDM. From a sustainable development perspective "the CDM does not work" in that it does not drive SD and does not fund renewable energy projects or carbon forestry projects with high development co-benefits (Pearson 2004). However, the problem can be turned around. The real problem is that the CDM works perfectly! It produces the lowest-cost emission reductions. Left out of the market are the sustainable development benefits. While rhetorically mandated in the Kyoto Protocol, they are not monetized and therefore play a limited role in directing investments.

Phrased in a different way, a consensus does seem to exist; the CDM is beginning to do what a true market is meant to do. It is widely documented that this involves trade-offs between the two goals of the mechanism in favour of producing low-cost emission reductions at the expense of achieving sustainable development benefits (Brown, Adger et al. 2004; Ellis, Corfee-Morlot et al. 2004; Cosbey, Parry et al. 2005).

Key challenges and options

In a report partly financed by Danida, entitled 'Realizing the Development Dividend: Making the CDM Work for Developing Countries', the problem has been phrased this way: "Will the CDM's sustainable development objective become a victim of the success of its market mechanism?" (Cosbey, Parry et al. 2005, p. 16). The aim of the report is to assess the extent to which the CDM is fully exploiting its potential to link development benefits with greenhouse gas reductions. In a second phase (forthcoming) the results of the analysis will be taken further to contribute to policy debates and decisions about the future of the CDM both within the current commitment period and post-2012. Based on interviews with 50 key stakeholders representing different groups of actors in developed and developing countries, supplemented with analyses of the CDM project portfolio (outlined above), and a literature review, five challenges are identified: 1) Defining sustainable development, 2) Lowering transaction costs, 3) Managing the market (the biggest challenge), 4) Access to finance and use of overseas development assistance (ODA) and finally, 5) Negotiating the CDM post 2012. These challenges summarise the key issues of concern around how the CDM is failing to achieve sustainable development as mandated in the Kyoto Protocol. Suggestions for how to respond to the challenges raise issues such as proposals for policy-based or sectoral CDM (Bosi and Ellis 2005) discussed in the forefront of the wider policy debate on the future of the CDM and SD.

Discussion

In the review of the literature on how the CDM contributes to sustainable development, including poverty alleviation, the main research findings have been extracted. Based on the findings, the possible role of aid strategies in addressing the shortcomings of the CDM as well as key issues for new research are recommended. The recommendations are meant as an introductory presentation for further discussions during the workshop on October 27, 2005. Informed by the research literature the recommendations are based on the author's best judgement as to what issues and questions are relevant to discuss further. As such they do not claim an elevated scientific status as 'the way forward,' nor do they represent the views of Risø or Danida.

The role of aid strategies

Aid strategies must respond to the main challenge, as identified in the literature review, that the CDM left to the market forces does not significantly contribute to sustainable development in developing countries. An important implication is that CDM projects with high development benefits are often the ones that find access to finance the most difficult. ODA can be considered as a source of finance for the projects that produce the CERs. However, the use of ODA easily comes into conflict with the Marrakesh rule on 'no diversion of ODA'. OECD has interpreted this rule in the way that CERs received in connection with an ODA-financed CDM project must lead to an equivalent deduction from ODA (Committee 2004). Responses to the main challenge can be grouped into strategies for the short term (1-3 years, 2005-08), medium term (4-7 years, 2008-12) and long term (post-2012).

Short term:

In continuation of Danish aid strategies already in practise, the following suggestions can contribute to an increased focus on achieving sustainable development.

- Dedicated investment funds; both bilateral and multilateral funds for the buying of CERs. The idea is to buy carbon credits of a high quality, meaning the contribution of the CDM project must be known to have a high sustainable development impact in the host country. Rather than pursuing the strategy of purchasing the most emission reductions for the lowest cost, the challenge is to strike a balance where the development impact of emissions reductions is maximised for the lowest cost.
- Premium purchasing is a related strategy. It can imply buying already branded carbon credits of a high sustainable development quality such as the Gold Standard. It can also be based on criteria set by the buying country for the types of projects, from which it will purchase credits with preference for the projects following their definition of sustainable development.
- Mixed credits can be used in two stages: 1) National banks lend on condition 2) that they re-lend to CDM projects.
- Capacity development for the CDM in developing countries: Much development aid has already been spent on capacity development for the CDM in developing countries, including setting up DNAs and supporting project development. For an overview see (Michaelowa 2004). To respond to what is happening now, that the CDM is diverging from what many had expected and hoped it would bring Capacity development can be targeted to DNAs in support of a strong definition of sustainable development with clearly enunciated criteria. It has been suggested that the COP could agree on authoritative SD criteria for all DNAs, but at the same time it has been found politically unrealistic as no one size fits all with regard to

development priorities (Cosbey, Parry et al. 2005). The difficulty is also one of not being able to quantify and monetize the SD benefits adequately, and that doing so on a project-by-project basis is prohibitively expensive (Pearson 2004).

Medium term:
That the 'low-hanging fruit' (the low-cost carbon credits) are exploited first are 'other things equal' signs of a healthy market. The problem is 'other things' (the sustainable development benefits) are not equal and the low-hanging fruit do not deliver SD benefits. It is suggested this problem can be addressed through measures boosting the attractiveness of investments that deliver more development benefits.

- Support Green Investment Schemes for end-of-pipe, brown field projects that otherwise have little or no SD benefits
- Support unilateral CDM projects
- Support small-scale projects
- Explore options for mainstreaming of climate change mitigation policies into sector programmes based on the ideas of 'sectoral CDM' (Bosi and Ellis 2005) or policy-based CDM (Cosbey, Parry et al. 2005). Both strategies are top-down approaches for setting either policy-based standards or baselines for a sector. Any operation that makes investments result in emission reductions compared to the baseline will get credits.

Long term:
Uncertainty about post-2012 is already having an impact on the affordability of investing in CDM projects due to long lead-times.

- The suggestion is straightforward, namely to start negotiating a post-2012 regime sooner rather than later.
- Sinks are currently very restricted. In a future climate regime rules and modalities can be renegotiated as a number of project types, such as avoided deforestation, forest conservation and agricultural sinks, which have high local development potentials, especially in poor African and Latin American countries.

Recommendations for new research
To add new insights and knowledge to the existing body of research literature analysing linkages between the CDM and SD, the following topics are proposed. The proposals are separated into two groups; one is targeted at informing ongoing policy debates and decisions and is especially inspired by Cosbey, Parry et al. (2005), while the other is inspired by Crubb (2003) and Klein, Schipper et al. (2003) and oriented towards the development of new frameworks for further reintegrating the historically separate debates on climate change and sustainable development .

Policy oriented research:

- Reforms of the Executive Board and the CDM project cycle:
- Analyse the likely effects of lowering transaction costs and the additionality bar
- Explore whether small-scale CDM projects are better at delivering sustainable development than large scale CDM projects
- Changing procedures and modalities:
- Explore the potential of emission reductions and development benefits under a scenario that allows policy-based or sectoral CDM
- Explore whether unilateral CDM projects generate more development dividends than bilateral or multilateral CDM projects

- Prioritise sustainable development:
- Assess the current status of definitions of SD by DNAs in non-Annex 1 countries
- Find new ways to value and incorporate the development co-benefits of CDM projects
- Explore the needs for cross-scale institutions to facilitate a higher sustainable development impact at local levels

Basic research:

- Development of new conceptual frameworks for analysing climate change within a sustainable development context:
- Analytical methodologies such as cost-benefit analysis, Integrated Assessment Models, and scenario calculations all have limitations as the basis of providing knowledge for policy decisions. The need to further reintegrate conceptual and analytical approaches for analysing climate change and development persists.
- Mainstreaming of mitigation policy into development policy and sector frameworks:
- What are the opportunities and constraints on implementing mitigation measures as part of sectoral policies?
- What constitutes a justifiable mix of mitigation, adaptation and development policy, and how can it be achieved?

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