

CLIMATE STRATEGIES REPORT

EMPIRICAL ANALYSIS OF PERFORMANCE OF CDM PROJECTS

AUTHORS

PAULA CASTRO
AXEL MICHAELWA

POLITICAL ECONOMY AND DEVELOPMENT, INSTITUTE OF
POLITICAL SCIENCE, UNIVERSITY OF ZURICH, MÜHLEGASSE
21, 8001 ZURICH, SWITZERLAND, CASTRO@PW.UZH.CH;
AXEL.MICHAELWA@PW.UZH.CH

About Us:

Climate Strategies is a not for profit, limited by guarantee company registered in the UK, registered at Companies House Number 05796323. The UK's Carbon Trust provided a core funding grant in March 2008 to enable the establishment of a secretariat function based at Judge Business School, University of Cambridge, UK.

Who we are:

Climate Strategies is an academic network organisation that acts as a bridge between policy research and its application to international policy challenges in climate change. We aim to help governments to manage the complexities both of assessing the options, and of securing a degree of international and stakeholder/public consensus around them. Our core capacity is therefore to convene international research projects and to give them impact in the international and business communities.

What we do:

Our mission is to assist governments in solving the collective action problem of climate change. We achieve this by convening international groups of experts to provide rigorous, fact-based and independent assessment on international climate change policy, and connecting this capacity to the policy process and public debate. This enables us to raise the quality and coherence of advice provided on policy formation. To effectively communicate insights into climate change policy, we work with decision-makers in governments and business, particularly, but not restricted to, the countries of the European Union and EU institutions.

Climate Strategies has a unique structure. We convene established researchers from different institutions to address specific applied questions – and are not relying on full time in-house researchers. This means that Climate Strategies can deliver fruits of extensive academically-based research across a wide range of topics, much faster than with normal academic research cycles. By ensuring that such research is engaged with policy processes and by providing capacity to integrate, communicate and project the findings, we can achieve far greater impact than is normal with academic research, or indeed consultancy. Our work is ultimately targeted for the public domain and we do not produce consultancy reports to government or business. Our quality control and review procedures, public orientation, and multi-domestic base derived from working with institutions in many different countries, gives us greater intellectual objectivity and political credibility at an international level.

What we have achieved:

In its rapid development since 2006, Climate Strategies has already made significant impact on the development of international policy responses to climate change. With our unique blend of internationally networked research that engages relevant decision processes, our work on allocation issues in the European Trading Scheme – the focal point of our initial 'trial' project in 2006 - provided crucial input to the European Commission decisions on Phase II allocation. Last year's research made important input both to the design proposals for the EU

ETS post 2012, and the wider debate about competitiveness and carbon leakage. The results of our assessment of the international Kyoto project mechanisms will be published shortly.

Outreach to business:

Our research in 2006/7/8 also provided key insight for the UK's Carbon Trust, the organization established jointly between UK government and business to help move the UK to a low carbon economy. Carbon Trust Insights publications are targeted at a business constituency and have drawn increasingly upon Climate Strategies research particularly in explaining the EU ETS and making the case for a stronger system over time.

- *Allocation and competitiveness in the EU ETS (2006)* set out the benefits of emissions trading along with the drawbacks of excessive free allocation and the case for moving towards enhanced auctioning;
- *EU ETS Phase II allocation: implications and lessons (2007)* explained and defended the Commission's interventions to toughen up allocation in Phase II, that had been prompted in part by Climate Strategies research on the draft plans;
- *EU ETS impacts on profitability and trade (January 2008)* summarized extensive research into competitiveness and made the case that potential problems were confined to a few specific sectors, not the wider economy, and that tailored solutions could be developed for these sectors without needing to compromise on the strength of the EU ETS in Phase III.

These reports have proved to be vehicles for wider communication of Climate Strategies research findings, and have strengthened the government's hand in pushing for a tougher EU ETS in part by fostering more broad-based support in UK business for stronger action on climate change.

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Being a network organisation, Climate Strategies has an ability and flexibility to bring in top experts on the topics of interest from various parts of Europe and world wide. It enables Climate Strategies to act promptly and deliver in a timeframe that makes the research results useful for policymaking. In the period 2006 – 2008, Climate Strategies collaborated with over 30 research institutions which are detailed in the attached prospectus. By example these included the Universities of Budapest, Cambridge, Graz, (Austria), Imperial College and Zurich and the Institutes of Oeko , Stockholm Environment , SWP (Germany), PIK Potsdam and Wuppertal .

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Contact: Jon.price@climate-strategies.org
Climate Strategies c/o Cambridge Centre for Energy Studies, A0.03 Judge Business School
Trumpington Street, Cambridge University.CB2 1AG www.climate-strategies.org

Executive Summary

The Clean Development Mechanism (CDM) aims at a cost-effective reduction of GHG emissions and technology and capital transfer from industrialised to developing countries. The CDM has seen a true gold rush period, with thousands of projects being developed in a few years. More and more governments and companies bet on the CDM to fill their compliance gaps.

Many CDM project developers and buyers of CER forwards underestimate the risks related to generation of Certified Emissions Reductions (CERs) from CDM projects. The CDM is governed by an internationally unprecedented set of rules and regulatory institutions administering these rules. The CDM project cycle has a number of serious pitfalls, which can lead to longer than expected lead times, to reductions in the expected CER volume or even to a rejection of a project.

To analyse the likelihood that the registered CDM projects and those currently in the validation pipeline will produce the CER volumes necessary to close the European gaps with regard to the Kyoto Protocol commitments and the EU ETS, to identify the key parameters that influence CDM project success, to inform CER procurement strategies and the discussions about CDM reform, we undertook an empirical analysis of CDM projects, including samples of those registered, in the pipeline, rejected and withdrawn. This was underpinned with in-depth case studies in China, India and Brazil, and the analysis was complemented with expert interviews and secondary information.

We analyse the ratio between actual CERs issued and estimated in the request for registration (CER issuance rate); the time from project submission to validation and project registration (lead time); the likelihood that a project fails in validation (assuming that projects staying over one year in the validation stage are failing); the prevalence of rejections or withdrawals. We try to explain these parameters of project success through possible explanatory variables such as project type/category, project size, consultant, validator and host country, unilateral or bilateral character. We use data from the UNFCCC website and from the UNEP Risø Centre CDM Pipeline, with cut-off date of late June 2007.

We find that many CDM projects have a serious CER underperformance. Consultants and validators tend to strongly overestimate the emission reduction potential of the projects. Each step of the CDM project cycle leads to a downward adjustment of CER levels. CERs forecast at the request for registration stage reached 85.2 million CERs per year. However, only 64.8 million CERs (76% of initial forecast) were actually issued.

The countries where most CDM projects are being developed (China, India and Brazil) are not necessarily the ones with best performance in terms of CER issuance rate. While India has been issued more CERs than expected so far, Brazil has less than expected but still above the world average, and China is below the average. Other countries performing very well are Korea, Egypt, Peru, Malaysia and Chile.

In terms of CER issuance rate, we have not found evidence of a direct effect of host country on project success. However, changes in the countries' emissions factors affect mainly renewable energy projects. This effect has been observed for projects in China and Brazil, but is likely to be present in other countries.

Project lead times up to registration may also affect project success in terms of CER generation, if we do not consider early-start projects. Most projects experience delays in the start of the crediting period. Host country-specific factors, such as overwhelmed DNAs and DOEs, or delays in getting governmental licenses can contribute to longer CDM project lead times, but may not be the only or main causes of project delay.

The host country does not appear to be a relevant factor leading to failure in validation. In contrast, the host country, especially in interaction with certain types of projects, appears to be a relevant factor leading to rejection. India and Brazil host most rejected projects, and in both cases a high share of them are cement blending projects, which were all rejected due to problems with additionality.

Other host-country related barriers found along the study are: governmental interference with CER prices; governmental interference in the decision about who buys the CERs; non-approval of projects by DNA; and investment and regulatory risks.

Bilateral projects are more successful than unilateral ones in terms of CER issuance rate (77% versus 67%). Out of the bilateral projects, those with European participants perform best with 121% success. Possible reasons for the better performance of bilateral projects might be improved access to technology, technical support, quality control and upfront financing.

Unilateral projects have on average shorter lead times (275 days) than bilateral ones (325 days). However, there are many more unilateral than bilateral projects lagging for over a year in the validation stage. Unilateral projects are more likely to be rejected, but considering also the withdrawn projects they are not necessarily more likely to fail at registration. In the country case studies in China, India and Brazil we did not find enough evidence to support or discard the theory that unilateral projects face more barriers than bilateral ones.

Consultants are the main responsible for the estimation of the project potential in the PDD and have an incentive to achieve as many CERs as possible. Performance in terms of CER issuance rate varies greatly among and within types of project developers, and the sample analysed is too small to draw definitive conclusions. The performance of consultants might be related to the project types they focus on, or to the countries they operate in. Interestingly, in-house developed projects perform much better than most consultancies in terms of CER issuance, which would question the facilitating role of external consultancies to some extent.

Project type and general project category have an important influence on CER issuance rates, lead times, and validation and registration success. Waste projects perform worst in terms of CER issuance, with only 31% of CERs forecasted being issued. Overestimations in the waste growth or gas generation models, management and operation problems, and monitoring difficulties are the factors leading to these results. Projects involving industrial processes have a better performance (79%), slightly higher than the overall average. Among them, N₂O projects consistently generate more CERs than expected, and HFC projects have a varied performance. Renewable energy and energy efficiency projects have a decent performance, above average in both cases. Among them, hydro power plants have the best CER issuance rate (93%). These projects benefit from the fact that their monitoring methodologies are not as complex as those for waste projects.

Project performance in terms of CER issuance may improve in time, as shown by the analysis of monitoring reports of four Indian CDM projects. To further improve project performance, monitoring quality should be paid special attention by project consultants and owners. Good

training of the operative staff and presence of the developer also after registration are important.

Validation success appears to be similar in all project categories and types. However, rejections are related to project category and type: most rejected projects are energy efficiency ones, and mainly of the cement blending type. All these projects were located in India and Brazil, and were rejected due to insufficient demonstration of additionality. Although all withdrawn projects are biomass energy projects, withdrawal does not seem to be related to project type.

Project size is relevant for CER issuance rate. In general, the smaller the project the better its performance in terms of CERs issued as compared to those forecasted. Projects generating below 20,000 CERs per year outperform all other project sizes. This may be due to the less complexity and the higher conservativeness involved in small projects. This trend is no longer valid for very large projects, above 540,000 CERs per year. This category includes mainly the N₂O and HFC projects. As seen above, N₂O projects have the best performance among all project types.

Small-scale projects appear to have more problems at validation than large ones. However, experts interviewed for this study hold the view that the bigger the project, the longer it takes to validate it and the more complex it becomes. In line with this opinion, large projects appear to have more problems at registration than small ones. As most withdrawn projects are small-scale, however, no conclusion can be drawn whether project scale has any impact on its registration failure.

The analysis of CER issuance rate by validator shows that the performance of DOEs is related to the types of projects dominating in their portfolios, rather than to a perceived conservativeness of particular validators. An expert interviewed during the study holds the view, however, that the experience of a validator, and also the personal experience of the team in charge has an influence on the requirements set by the DOEs. In his opinion, validators can be arbitrary in setting additional requirements that can take a long time to comply with. Our data are not sufficient to test this claim.

An additional factor affecting project performance, in the view of the experts interviewed, is the role of the project owners, both during project planning and during implementation. Companies with longer experience and from the private sector may perform better. Lack of sufficient training of the local staff may lead to errors in monitoring, which will have an effect on CER issuance.

From the analysis in the three case studies in China, India and Brazil, we conclude that additionality demonstration is still a problem in all three countries, whereas all of them have both good and bad examples of additionality demonstration. Public comments, corrections and clarifications during validation and requests for review are frequently related to issues pertaining project additionality. A good knowledge of the in-country economic and policy context is needed to assess project additionality.

Additionality is the main cause of project rejection. 65% of the rejections were caused – at least in part – by problems in the additionality demonstration. In all of them, the barrier analysis was found not sufficiently convincing or demonstrated. Additionality demonstration seems to be a more critical issue for large projects than for small: while 75% of large projects were rejected due to additionality, only 50% of small ones were. PDDs with only a barrier

analysis for additionality demonstration could have a higher risk of being rejected than those with a full investment analysis, especially in the case of large projects.

There are no specific internationally recognised requirements for ensuring good-quality stakeholder consultation processes in CDM projects, apart from for example voluntary certification schemes such as the CDM Gold Standard. It is up to each host country to establish its own requirements for stakeholder consultation. Neither in China nor in India are there specific procedures for carrying out stakeholder consultations in CDM projects. On the contrary, Brazil has established a standard procedure.

In China, the consultation method mostly used is the written survey or questionnaire, followed by the public meeting. While allowing the participation of a large number of different people, questionnaires gather answers that might not be sufficiently informed and provide limited space for additional comments. Several of the Chinese PDDs do not provide sufficient information on the consultation methods, the people participating or the communication channels they used. This could reflect just the current institutionality in China or also a lack of transparency in the description of the consultation process.

In India there are several procedures that investment projects in general need to follow in order to be allowed to operate, including the approval from the village representative body, the Panchayat. The description of the stakeholder consultation process seems to follow a standard model in Indian projects, although there is no regulation about it. 70% of the PDDs mention having had some kind of consultation meeting. However, several PDDs do not describe the consultation process clearly, and many do not prove that they have undertaken a specific consultation process for the CDM.

The Brazilian DNA has established a mandatory, standard procedure for inviting stakeholders to issue comments to CDM projects, which consists of a written consultation to a defined group of stakeholders. However, less than 5% of Brazilian CDM projects receive any comment from stakeholders, and most of the comments received are not really informing project design. The Brazilian standard stakeholder consultation procedure, with a one-way communication that offers respondents a chance to send written comments themselves, does not seem to be sufficient for gathering potential concerns, expectations or questions from local stakeholders.

We have not been able to draw any links between quality of the stakeholder consultation processes described in the PDDs and the rejection or withdrawal of projects. As the failed CDM projects come from different countries, in some cases these results reflect the national regulations regarding stakeholder consultation processes.

Host countries are the ones defining how CDM projects shall contribute to sustainable development. Although the Chinese, Indian and Brazilian DNA have a definition of the contribution to sustainable development CDM projects should achieve, they fail to include quantifiable indicators to measure it. Nonetheless, the Chinese government differentiates preferred projects from others by establishing levies on CER revenues coming from reduction of gases other than CO₂ or methane.

In many of the cases, especially when referring to employment generation opportunities and positive environmental impacts, the concerns and demands of the population are in accordance with the sustainability benefits that the project developers expect to attain. However, in all three cases, but especially in India and Brazil, the project developers'

expectations regarding contributions to sustainable development far exceed the expectations from the stakeholders whose opinions they managed to gather. This gives the impression that stakeholders are not really informed about the economic benefits brought by CER sales and the benefits that could “trickle down” to them from these revenues.

At least some projects in India and Brazil mention some voluntary, additional contribution to local development among their expected sustainability benefits, or make the effort to provide quantitative indicators of their expected impacts on sustainable development.

The performance of CDM projects in terms of their contribution towards sustainable development does not have any evident impact on their success in terms of CER issuance, lead times, validation or registration success. Buyers do prefer good projects, with sustainability benefits, but they do not have a strong position since demand for CERs is larger than the offer. However, this aspect needs not to be disregarded, if the double aim of the CDM is to be achieved. More detailed monitoring guidelines or measurable sustainability indicators may contribute to improve the sustainability performance of CDM projects.

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List of acronyms and abbreviations

BNDES	Brazilian National Development Bank
CDM	Clean Development Mechanism
CER	Certified Emission Reduction
CIMGC	<i>Comissão Interministerial de Mudança Global do Clima,</i> Interministerial Committee on Climate Change (Brazilian DNA)
CO ₂ eq.	Equivalent to carbon dioxide emissions (in terms of global warming potential)
COP	Conference of the Parties
DNA	Designated National Authority
DOE	Designated Operational Entity
EB	Executive Board
EIA	Environmental impact assessment
ERU	Emission Reduction Units
ETS	Emissions Trading System
EU	European Union
GHG	Greenhouse gases
HFC-23	Hydrofluorocarbon-23
IRR	Internal rate of return
JI	Joint Implementation
N/A	Not applicable
N ₂ O	Nitrous oxide
NGO	Non governmental organisation
PDD	Project Design Document
PROINFA	<i>Programa de Incentivos às Fontes Alternativas de Energia,</i> Financial Support Program for Investments in Alternative Sources of Electric Energy
RIT	Registration and Issuance Team
UNEP	United Nations Environment Programme
UNFCCC	United Nations Framework Convention on Climate Change

1. Introduction

This final report contains the main results and conclusions of the project *Empirical analysis of performance of CDM projects* implemented by Climate Strategies. The detailed background information can be found in eight discussion papers that present the partial results of all studies constituting the project. These papers are all available on the Climate Strategies' website: www.climate-strategies.org.

2. Background of the study

International climate policy has developed in a series of international agreements over the last 15 years. The original treaty, the United Nations Framework Convention on Climate Change (UNFCCC) was signed in 1992. Since it entered into force in 1994, the Parties to the Convention meet annually at the Conference of the Parties (COP). In the framework of the Kyoto Protocol negotiated in Kyoto in 1997, the industrialised countries - also known as Annex B countries as they are listed in Annex B of the Kyoto Protocol¹ - finally adopted legally binding quantitative constraints, in which they agreed to reduce greenhouse gas emissions by 5.2 per cent below their 1990 level on average over a first commitment period of 2008-2012.

In order to allow Annex B countries to achieve their emission targets in a cost-effective manner, the Kyoto Protocol provides three flexible mechanisms: International Emissions Trading (Article 17), which allows for trading of Assigned Amount Units (AAUs) between Annex B countries, and the project-based mechanisms Joint Implementation (JI) (Article 6) and the Clean Development Mechanism (CDM) (Article 12). Whereas JI refers to project activities between Annex I countries, the CDM generates greenhouse gas emission credits ("Certified Emission Reductions", CERs) through investment in emission reduction or sequestration projects in developing countries without emission targets. The emission credits generated through JI are called "Emission Reduction Units" (ERUs). Annex B countries can use AAUs, ERUs and CERs to reach their commitments. It took four years for the international community to agree on detailed rules for the implementation of the Kyoto Protocol in the so-called Marrakech Accords. The Kyoto Protocol finally entered into force in February 2005. It has been ratified by all Annex B countries except the U.S.

Under the Kyoto Protocol, the Clean Development Mechanism (CDM) is thus one of the flexibility instruments aimed at helping industrialised countries to reach their emission reduction commitments in a cost-efficient manner, by purchasing credits from emission reduction projects in developing countries. These credits are less costly than investing in emission reductions within the industrialised countries themselves. At the same time, the CDM has the aim to benefit host developing countries by promoting investment in sustainable

¹ Annex I of the UNFCCC lists the industrialised countries that were members of the OECD (Organisation for Economic Co-operation and Development) in 1992, plus countries with economies in transition, including the Russian Federation, the Baltic States, and several Central and Eastern European States. Under the Convention, these countries agreed to reduce GHG emissions to 1990 levels by the year 2000. Annex B of the Kyoto Protocol lists the industrialised countries that signed the Protocol in 1997 and thus have emission reduction targets for the period 2008-2012. Countries in both lists are the same, except for Belarus and Turkey that do not figure in Annex B.

development and facilitating technology transfer. Due to the fact that CERs are added to the overall emissions budget of Annex B countries, their quality has to be guaranteed². Therefore, the Marrakech Accords defined an elaborate “project cycle” that is overseen by the CDM Executive Board (EB), whose 10 members are elected by the UNFCCC Conference of the Parties. Project ideas have to be *validated* through so-called “Designated Operational Entities” (DOEs), which are mainly commercial certification companies, regarding conformity to the rules. Only after a formal *registration* by the EB, a project gets the status of a CDM project. An independent *verification* of the emission reductions by a DOE is precondition for issuance of CERs.

CERs are not only interesting for government parties under the Kyoto Protocol, who need to meet their emission reduction targets by 2012, but also for private companies covered by the EU Emissions Trading Scheme (EU ETS), which are allowed to use CERs to comply with part of their EU ETS reduction requirements. National Allocation Plans for the EU ETS period 2008-2012 set rather lenient limits for use of CERs from CDM projects for compliance³. Therefore, the price of EU allowances for the period 2008-2012 will strongly depend on the CER supply that will actually materialise.

Currently, there are over 1500 CDM projects submitted for validation and almost 1000 already registered at the UNFCCC CDM Executive Board and therefore entitled to generate CERs. A reduction volume of over 1.3 billion tonnes CO₂ eq. by 2012 is expected from the registered projects.

However, there are still doubts whether these CDM projects will really produce the volumes of CERs estimated during their design and registration and whether they will do it in time for the end of the commitment period in 2012. To make their projects look attractive to potential buyers, project developers tend to overestimate the emission reduction potential of their projects. Moreover, they frequently underestimate the stringency of monitoring requirements as well as delays in project implementation. Therefore, one can expect a lower volume of CERs issued than projected when the project was first developed.

Moreover, there are also doubts about the environmental and social integrity of CDM projects, which could reduce their attractiveness for potential buyers (Lohmann, 2006; Boyd et al., 2007; Ghosh, 2007). The CDM’s second objective is to assist developing countries in achieving sustainable development. As established by the Marrakech Accords, it is the host country’s prerogative to define whether a CDM project contributes to sustainable development (UNFCCC, 2001), and thus international sustainable development standards for CDM projects are absent (Sutter and Parreño, 2007). Information on how many project proposals are rejected by host country DNAs because they fail to satisfy host country requirements is not publicly available. However, as Schneider (2007: 46) points out, “Generally, it can not be observed that host countries prioritize projects with high sustainable

² CERs are used by Annex B countries to offset their own GHG emissions in order to reach their reduction targets. Thus, if CERs do not accrue from CDM projects that reduce emissions below the business as usual baseline, then global emissions would increase as a result of their use. Additionality is thus key for fulfilling the environmental goal of the CDM.

³ The EU ETS directive requires that the use of CERs from CDM projects (and ERUs from JI projects) has to be supplemental to domestic reduction efforts. Member States under the EU ETS have thus been required to introduce a cap to the allowed use of CDM and JI credits, which is calculated as a percentage of the total emission allowance of the member state. However, according to several estimations, this allowed amount of CDM or JI credits may even be larger than the shortage of allowances that EU ETS member states will have, so that the cap will not really impose a constraint to the import of CERs or ERUs. See for example Michaelowa (2007c), Schneider (2007), WWF-UK (2007).

development impacts by rejecting projects with little or no sustainable development impact”. A review on the contribution of the CDM to sustainable development concludes that the CDM, while producing the lowest-cost emission reductions thanks to the economic incentives in place, does not really drive sustainable development benefits because these “are not monetised and therefore play a limited role in directing investments” (Olsen, 2007: 67). Indeed, several studies show that CDM projects are failing to achieve real synergy between emission reductions and sustainable development in the host country (Lohmann, 2006; Boyd et al., 2007; Michaelowa and Michaelowa, 2007; Sirohi, 2007).

The shortcomings of the CDM have prompted a debate about reforming the mechanism. This debate is integrated in the negotiations on a post-2012 climate policy regime that are scheduled to be finalised at the Copenhagen conference in late 2009.

3. Objectives and research questions

On the background of the described status of international climate policy, this project’s general objective is to inform European actors – governments, policy makers and private companies – about the likelihood that the registered CDM projects and those currently in the validation pipeline will produce the CER volumes necessary to match their requirements under the Kyoto Protocol and the EU ETS, and about the key parameters that influence CDM project success in terms of volume and time of CER generation. This information will ultimately enable European governments and companies buying CERs to adapt their procurement strategies towards better-performing project categories. It will also inform the discussions about CDM reform.

To reach these goals, we undertook an empirical analysis of CDM projects, including samples of those registered, in the pipeline, rejected and withdrawn. In-depth case studies have been undertaken for the three countries where most CDM projects are being implemented, i.e. China, India and Brazil. This empirical analysis has been complemented with interviews with international experts and project developers, and with information from the literature and from news reports.

The following parameters have been evaluated in terms of their relevance for project performance:

- Host country
- Unilateral or bilateral character of the project
- Type of project developer
- Project category and type
- Project size
- Designated Operational Entity in charge of validation.

In the in-depth case studies, three further key CDM project parameters have been assessed: the quality of the additionality argumentation, the quality of the stakeholder consultation and the quality of the expected sustainability benefits as stated in the PDDs.

4. Research approach

The research has been undertaken in the form of eight specific studies, whose results and conclusions are presented in this final report. These specific studies comprise:

- An assessment of the *Additionality determination of Indian CDM projects* (Discussion Paper CDM-1, by Axel Michaelowa and Pallav Purohit), based on the analysis of 52 Indian CDM projects registered until May 2006, an in-depth analysis of the barrier argumentation and the validation results in a sub-sample of 19 projects, and detailed case studies of two projects.
- An estimate of *How many CERs will the CDM produce by 2012* (Discussion Paper CDM-2, by Axel Michaelowa), based on the CDM project pipeline in June 2007, four different policy scenarios, and four parameters influencing CER supply volumes: delay of projects, probability that submitted projects get validated, probability that submitted projects are rejected by the CDM EB, and CER issuance rate as a percentage of the CERs forecasted in the PDD.
- An *Empirical analysis of performance of CDM projects from registration to CER issuance* (Discussion Paper CDM-3, by Sebastian Mayr and Axel Michaelowa), which compares the initial estimate of CER volumes in the PDDs sent for registration with the actual volume of CERs being issued in all 203 CDM projects with issued CERs by June 2007. The success parameters analysed are project category and type, project size, project developer, validator and host country.
- An *Empirical analysis of performance of CDM projects: rejections and withdrawals* (Discussion Paper CDM-4, by Paula Castro), which analyses all rejected and withdrawn CDM projects by June 2007 (24 projects) in terms of their host country, project type, type of project developer, unilateral or bilateral character, project size, additionality argumentation and stakeholder consultation.
- An overview of the *Opinions of project developers regarding performance of CDM projects* (Discussion Paper CDM-5, by Paula Castro and Axel Michaelowa), based on telephone or email interviews with seven international CDM project developers. The main topics discussed are the causes of delays and registration problems, factors affecting CER issuance and buyer preferences.
- An in-depth analysis of performance of CDM projects in China (Discussion Paper CDM-6, by Paula Castro), in terms of barriers faced for implementation, lead times and expected CER generation, additionality argumentation, stakeholder participation and sustainability benefits. Both registered projects and projects lagging for over a year in validation have been analysed.
- An in-depth analysis of performance of CDM projects in India (Discussion Paper CDM-7, by Paula Castro and Gudrun Benecke), in terms of lead times and expected CER generation, additionality argumentation, stakeholder participation and sustainability benefits. Both registered projects and projects lagging for over a year in validation have been analysed.
- An in-depth analysis of performance of CDM projects in Brazil (Discussion Paper CDM-8, by Lars Friberg and Paula Castro), in terms of barriers faced for implementation, lead times and expected CER generation, additionality argumentation, stakeholder participation and sustainability benefits. Both registered projects and projects lagging for over a year in validation have been analysed.

This final report combines the results from these eight specific studies in order to reach our final conclusions.

All the studies have been based mainly on the analysis of public CDM project documentation, including Project Design Documents (PDDs) sent for validation, PDDs sent for registration, validation reports, public comments published in the UNFCCC website, monitoring reports, verification and certification reports.

The UNEP Risø Centre's CDM pipeline (2007), which is also based on the public documentation detailed above, has been used as the base for project sampling and database generation. Our database, however, has been complemented with additional parameters required for this research. Cut-off date for all estimations and analyses has been the end of June 2007, unless otherwise stated.

The overall project sample analysed comprises 275 registered CDM projects, 18 projects in validation, 20 rejected projects and 4 withdrawn ones. Some estimates are based on the whole volume of CDM projects in all stages of development from validation till issuance as of June 2007.

Seven telephone interviews were developed with senior CDM project developers from six companies or organisations in five industrialised and developing countries, in order to gather their opinions about the factors leading to delays and problems in project registration and the factors affecting the amount of CERs being issued. However subjective, these opinions are based on senior experience in the CDM sector, and the answers given were to a large extent consistent with each other⁴. In several sections of this report these answers have been used as a starting point for the discussion, this is, as hypotheses or claims that are analysed in the successive paragraphs on the basis of the project sample, and only then supported or rejected.

Three methods have thus been combined for reaching this report's conclusions. Firstly, we made a quantitative analysis of the full CDM project database, in order to characterise the CDM project pipeline, and for identifying the effects of the different parameters under analysis on CER issuance rate, project lead times, validation success and rejection or withdrawal occurrence. This is an inductive approach, whereas from the observed performance of CDM projects in the database we seek to derive hypotheses about possible explanations. Secondly, the qualitative results of expert interviews were used to complement the quantitative analysis. These interviews also provided possible explanations for the performance of CDM projects, which we also handled as hypotheses and thus sought to confirm or reject on the basis of the quantitative analysis. Thirdly, four case studies further broaden and deepen the findings, covering further aspects of CDM project performance: barriers faced by them, the quality of additionality argumentation, and the quality of stakeholder consultation. These case studies, based on the analysis of the documentation of small samples of CDM projects in three countries, are also empirical and inductive in approach. Their results have been, where possible, supported by findings from the existing literature and from direct observation in the host countries, but should be taken with care as the samples were small. The full references and research methods are included in each discussion paper.

The analysis made in this research project has several limitations. As stated above, the samples of CDM projects analysed in the case studies are too small to allow for generalisations. Even in the analysis of the whole universe of CDM projects with issued CERs, some project types and host countries are underrepresented, because the projects being developed within those types and countries have not reached the stage of issuance yet. Thus,

⁴ Read Discussion Paper CDM-5 for further details.

our results represent a static picture of a process still in development, in a system where changes occur fast. Furthermore, this system is very complex, and our explanatory variables are not independent from each other. A host country may choose to develop only unilateral projects, another one to develop bilateral ones, a third one leaves the decision to the market. One country has potential for a type of project, while another one does not. Some project types are necessarily large in size, while others may be small or large. We try to some extent to control for these interactions, or at least to explain and explore them, but this complexity again limits the possibility for drawing generalisations from the empirical observations used. Thus, in order to draw our conclusions, we do not perform a standard statistical analysis, but we perform direct comparisons of, for example, the issuance success or lead time of projects from different countries, types or sizes; or the proportion of rejected or withdrawn projects with a specific characteristic or mix of characteristics (host country, size, type, unilateral or bilateral character) and the proportion of all submitted projects with that characteristic.

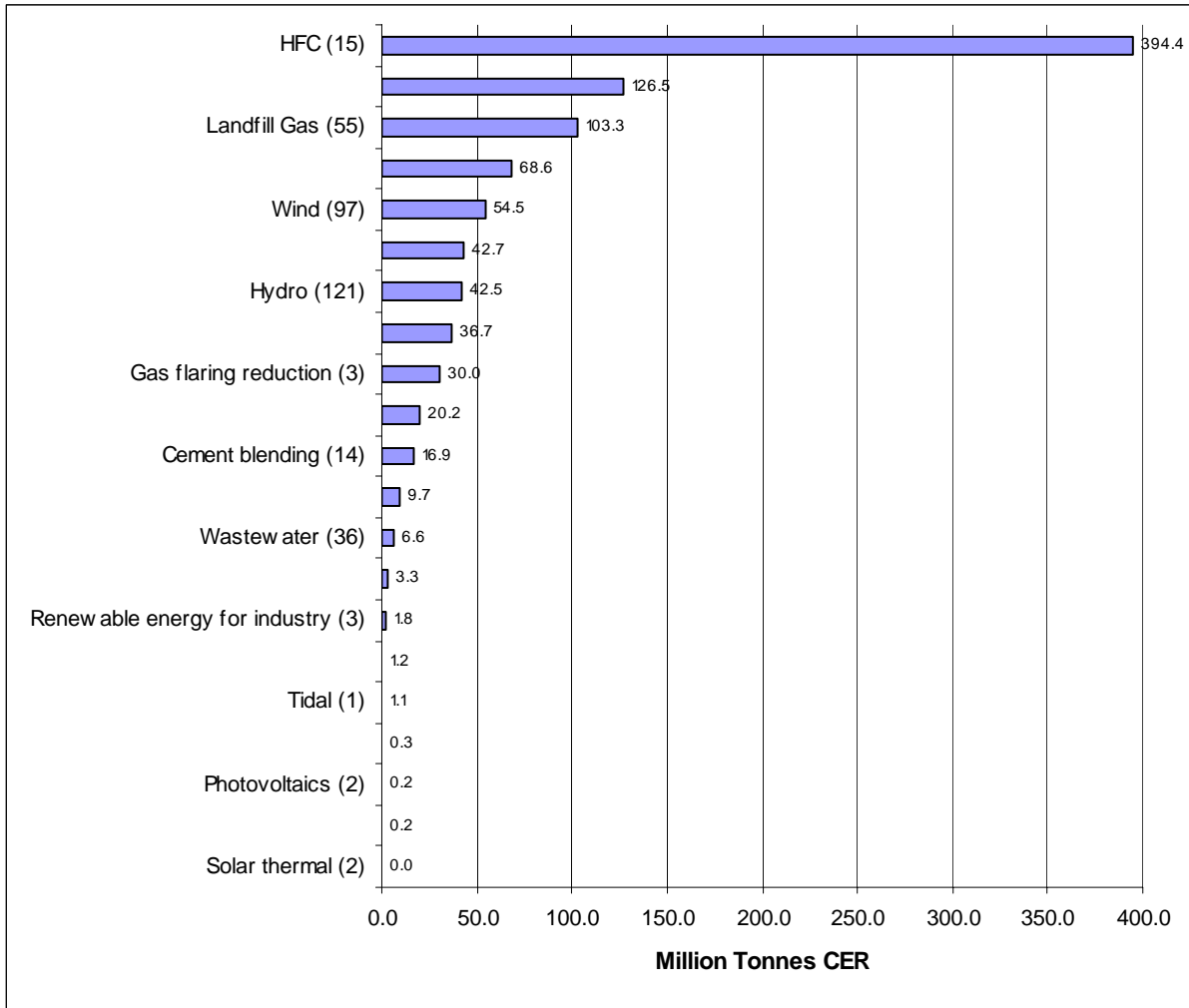
In the following sections we sum up the results derived from the described analysis. Section 5 makes a short description of the situation of the CDM project pipeline as of June 2007. Section 6 outlines our general understanding of CDM project success and discusses the main factors affecting it. Sub-sections 6.1 till 6.9 present the findings related to the effect of following variables on project performance: host country, unilateral or bilateral character, type of project developer, project category and type, project size, quality of additionality argumentation, of stakeholder consultation and of sustainability benefits, and other factors. Section 7, finally, sums up, draws conclusions and formulates the recommendations deriving from this study.

5. The CDM project pipeline in 2007

More than 700 CDM projects have been registered by end of June 2007. They are distributed among more than 20 different project types and project almost 1 billion CERs by 2012. For 203 projects out of them, CERs have been issued. As Figure 1 illustrates, HFC-23 projects make up a large portion of this amount, although the number of projects is small. N₂O and landfill gas projects are also significant but have a smaller share of the total amount of credits. In brackets we provide the number of projects of each type. To provide a historic perspective, Figures 2 and 3 show the evolution of the share of projects and of expected accumulated CERs for the main project categories.

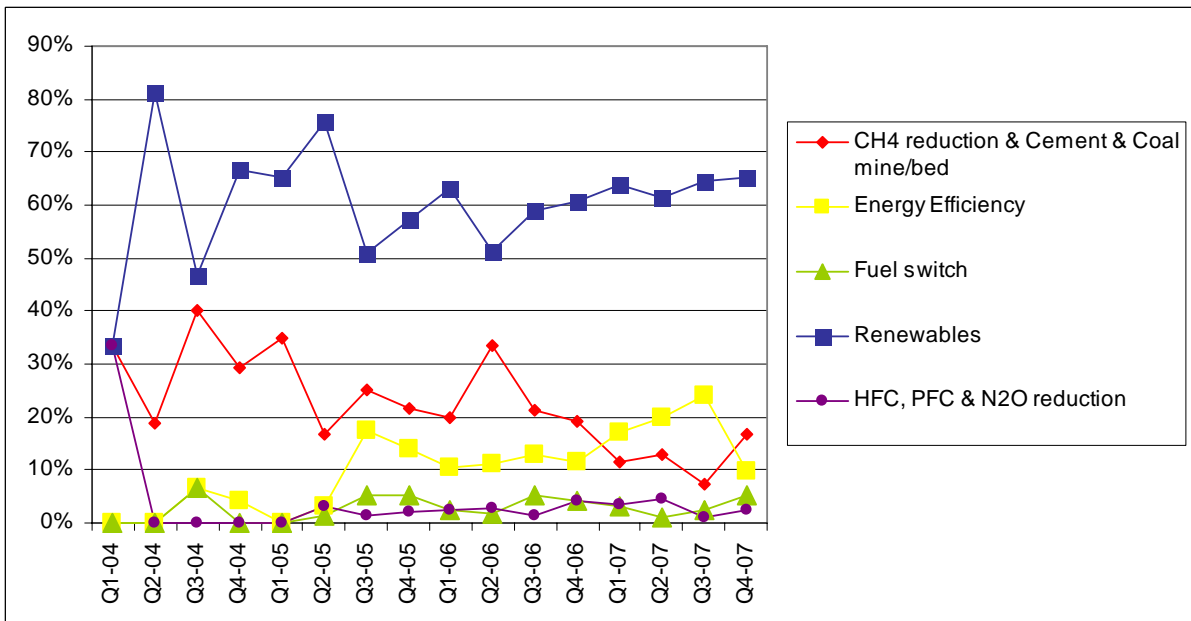
CER supply from inflow of new projects strongly depends on the decisions of the CDM Executive Board regarding baseline methodologies, interpretation of additionality and the attractiveness of programmatic CDM. Forecasts are thus notoriously difficult. Only four years ago, no analyst predicted the key role that industrial gases would play in the CDM; everybody had placed bets on waste management and renewable energy. Shifts of shares of projects have been strong over the years. As most HFC-23 and N₂O projects are already identified and taken, it is likely that the CER volume of “other type” projects will increase in the future.

Figure 1: Types of registered projects, by expected CER volume until 2012



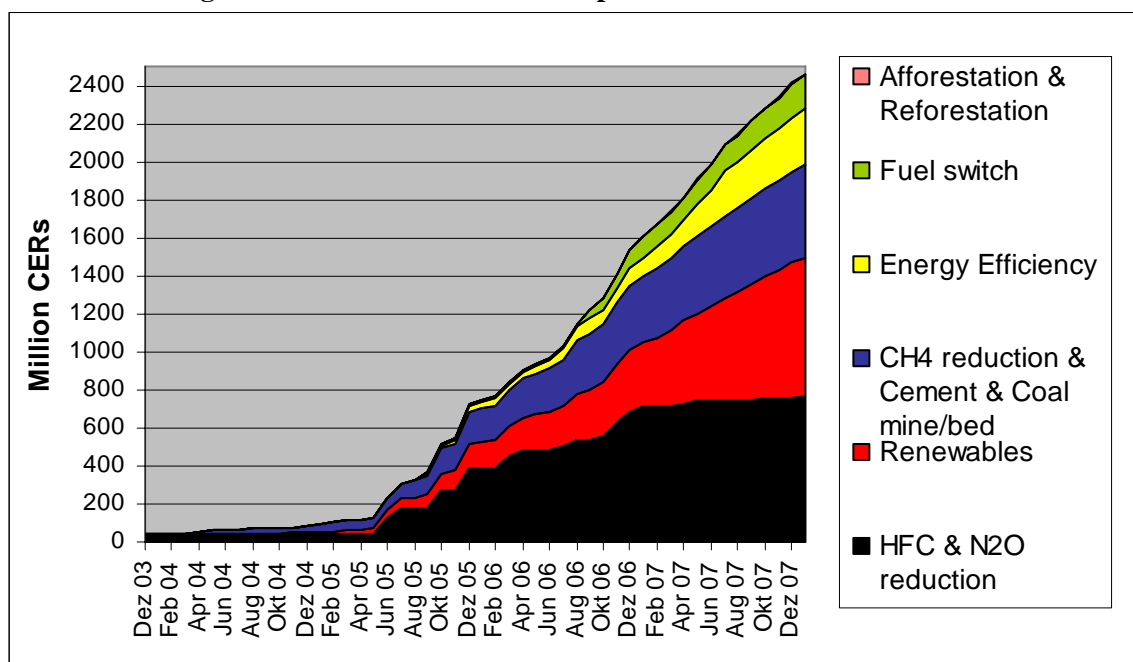
Source: Data from UNFCCC website, cut-off date June 25, 2007.

Figure 2: Evolution of the share of the total number of projects of the 5 largest CDM categories



Source: Taken from UNEP Risø Centre CDM pipeline (01/02/2008).

Figure 3: Evolution of the total expected accumulated CERs till 2012



Source: Taken from UNEP Risø Centre CDM pipeline (01/02/2008).

As the tables below reveal, there is still a steady inflow of new projects, at a rate of over 100 per month. While in 2006 the number of registered projects almost reached the number of submitted projects, the market exploded in 2007. As of end of June 2007, the number of submitted projects exceeded the number of registered projects by three times. This is a clear indication that the expected downturn in inflow of projects due to the post-2012 uncertainty has not yet started.

Table 1: Registered and submitted projects per year

Projects	2004	2005	2006	2007 first half
Registered	1	62	408	243
Submitted	11	124	636	742

Source: Data from UNFCCC website, cut-off date June 25, 2007.

Table 2: Volume of registered and submitted projects per year (million CERs by 2012)

Projects	2004	2005	2006	2007 first half
Registered	2.9	183.9	510.4	268.0
Submitted	3.1	77.1	545.4	591.2

Source: Data from UNFCCC website, cut-off date June 25, 2007.

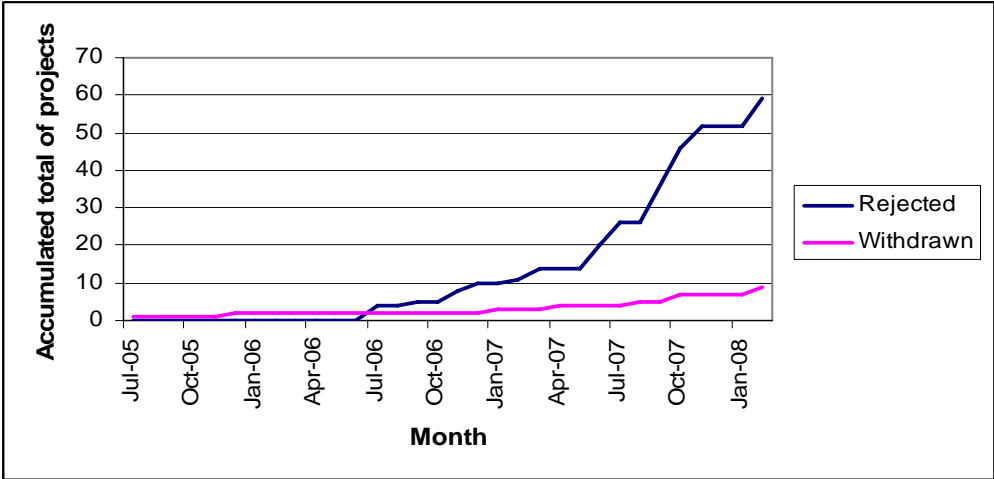
While these numbers are very promising regarding the contribution of the CDM to global greenhouse gas mitigation, the question arises whether the CERs forecast will actually materialise. The next section depicts with more details what factors may affect CDM project success in terms of CER generation.

6. General factors affecting project success

CDM projects registered by June 2007 were expected to yield about 1 billion tonnes CO₂ eq. in emission reductions by 2012. Submitted, but not yet registered projects projected another 1.2 billion CERs. Will these CERs actually materialize? We define CDM project success as their ability to deliver the forecasted volumes of CERs (as stated in the PDDs) in time for the 2012 targets. There are several factors that may affect project success.

Some projects are rejected by the CDM Executive Board and others are withdrawn by the project proponents themselves, and thus never get registered. While these figures have remained low with respect to the number of registered projects (there were only 24 rejected and withdrawn projects, as compared to 715 registered projects up to June 2007), during 2007 they have grown significantly faster than in the preceding years (by December 2007 the number of rejected projects reached 52, while 8 had been withdrawn. See Figure 4).

Figure 4: Monthly CDM project rejections and withdrawals 2005-2008.



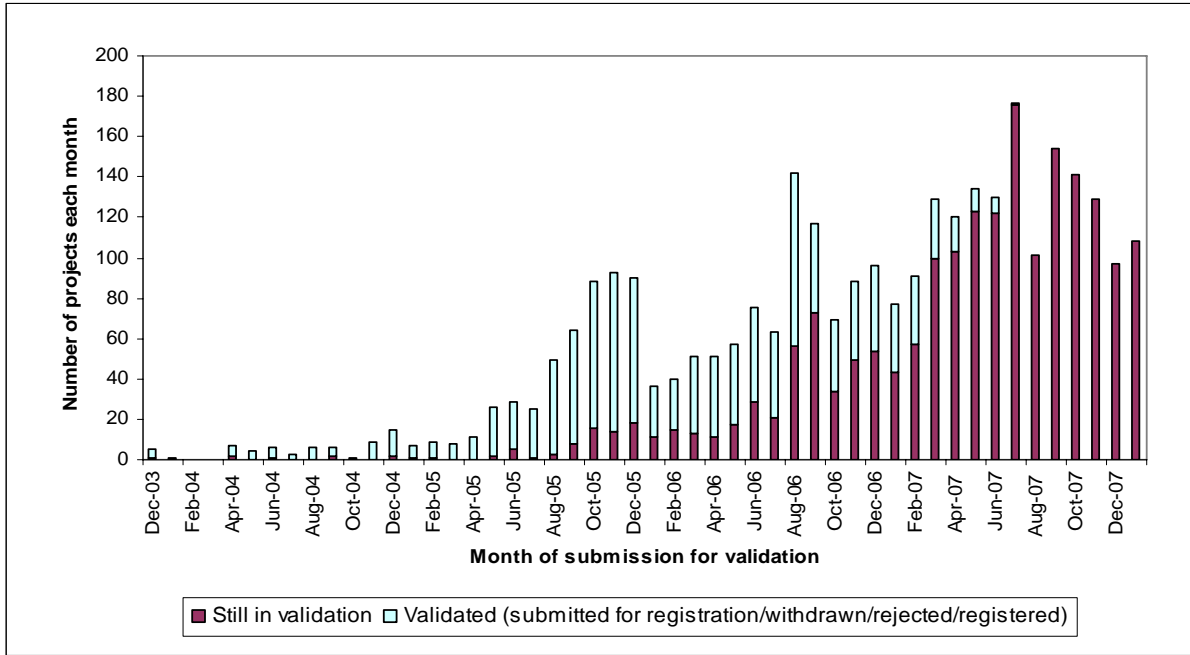
Source: Own calculations based on UNFCCC website.

Secondly, many projects submitted for validation in 2004, 2005 and the first half of 2006 have not been submitted for registration yet (174 projects out of the 872 submitted for validation by June 2006. See Figure 5). This may signal problems of these projects to achieve validation at all.

Thirdly, many CDM projects have, at their design stage, very optimistic expectations in terms of the amount of emission reductions they will achieve⁵. Project developers might want to show high amounts of CERs in order to be able to find buyers or access financing more easily, they might not use conservative enough parameters in their calculations, or they might not foresee possible implementation difficulties. The observed rate of issuance success for all projects already registered and having CERs issued amounts to 76% as of June 2007 (see Discussion Paper CDM-3).

⁵ See Carbon Finance (2007), Point Carbon (2007), and Leoning (2006) for examples of carbon market analyses pointing out the underperformance of some CDM projects in terms of CER generation, especially animal waste and landfill gas projects.

Figure 5: Amount of CDM projects in validation and validated



Source: UNEP Risø Centre CDM pipeline, own calculations.

Finally, not only the volume of CERs generated affects project success, but also the lead times. Lead times can be measured as the time period from the day when a CDM project is sent for validation and the actual registration date. Long lead times may have an effect on the expected project start, with the exception of “early-start” projects, which are allowed to register after their beginning of operations and to claim credits from before the date of registration. In this case, the time required for project registration does not affect project start. Indeed, for many projects, when comparing the forecasts in the PDDs sent for validation and registration with the actual beginning of CER issuance in verification reports, we notice there are delays in the date by which CDM projects really start to generate CERs. In these cases, the CDM project cycle, the in-country required permits and licenses, the financial closure or the construction phase might face unforeseen problems and take longer than expected, thus delaying the start of the crediting period. While these delays may not necessarily affect the overall amount of CERs to be generated by a project, they do affect the volume of CERs issued before 2012.

Estimating overall CER generation

Apart from the project success factors described above, also the inflow of new projects into the pipeline will affect the overall CER generation by 2012, which of course will be affected by the same success factors.

Thus, overall CER generation may be estimated through the following formula, which includes as key parameters the inflow of new projects, the non-validation rate of submitted projects, the rejection rate of validated projects, the performance rate of registered projects and the discounts due to delays:

$$CER_{sum2012} = ((CER_{subm} + CER_{infl})p_{valid} * (1 - d_{delay}) * (1 - p_{rej}) + CER_{reg}) * p_{perf} \quad (\text{eq. 1})$$

where

CER_{subm} = CER volume by 2012 listed in PDDs of currently submitted projects = 1.3 billion
 CER_{infl} = CER volume by 2012 listed in PDDs of projects to be submitted from now until 2012
 d_{delay} = discount of CERs due to delay of projects (% of submitted and to be submitted projects)
 p_{valid} = probability of validation of projects currently submitted and submitted until 2012
 p_{rej} = probability of rejection of validated projects by the CDM EB
 CER_{reg} = CER volume by 2012 listed in PDDs of currently registered projects = 1 billion
 p_{perf} = CER issuance rate in % of CER_{reg}

As commented above, CER supply from inflow of new projects (CER_{infl}) strongly depends on the decisions of the CDM Executive Board regarding baseline methodologies, interpretation of additionality and the attractiveness of programmatic CDM, thus, on policy decisions. As in the past, start-up of new project types such as supercritical coal power plants, carbon capture and sequestration and forestry could lead to rapid changes in the composition of the inflow. For these reasons it is extremely difficult to forecast the total CER volume. Assuming a variation of CER inflow between 1.5 and 5 billion, a probability of validation of 50 to 90%, probability of rejection of 0 to 10% and a performance rate of registered projects of 75% to 85%, total CER volume by 2012 would reach 1.9 to 4.4 billion.

On the other hand, several of the success parameters described above may be linked to project-specific or contextual variables, such as the host country, unilateral or bilateral character of projects, type of project developer, project type, project size, quality of additionality argumentation, quality of stakeholder consultation and quality of sustainability benefits. Also, if the influence of these variables on project success is known, inflow of new projects could be steered accordingly. In the next sections we will look into these variables to find out how they affect project success.

6.1. Host country

The host country is a complex variable. It determines the political and economic context in which a project is executed. Not only the policies regarding the CDM itself – DNA constitution, complexity and duration of project approval process, specific taxes or levies on CDM projects – but also the overall investment environment, and the energy, industry and other sector-specific policies are important in-country factors to be regarded by investors.

So far, most of the carbon capital flow has focused on three countries, namely China, India and Brazil. At first, India clearly dominated the market in terms of volumes of issued CERs as well as in terms of number of registered projects. Nowadays China is at the forefront in terms of CER volumes, followed by India and – already far behind – Brazil. The main reason for the attractiveness of these countries may lie in their geographical and demographical size and the related emission reduction potential due to increased industrial activity. Moreover, the potential for large-scale projects such as HFC-23 and N₂O, the supportive investment environment and CDM facilitating framework as well as CDM awareness and capacity building activities for CDM may have contributed to the leadership of these host countries, too.

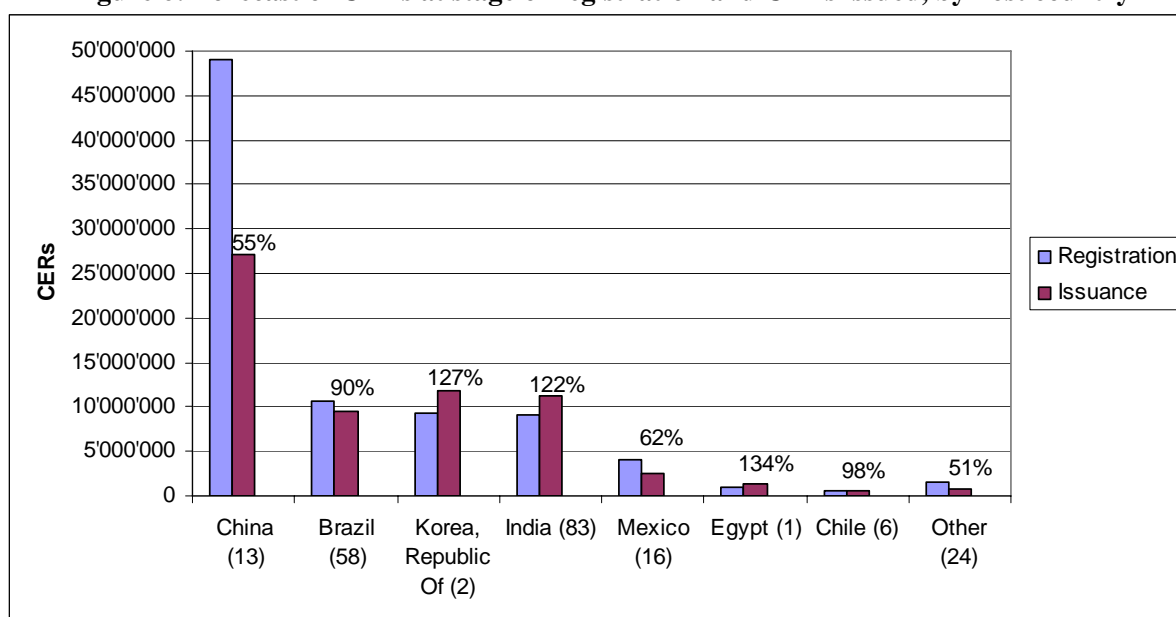
Although these countries dominate with regard to projects in the pipeline and CERs issued, this does not mean that projects are automatically more successful in them. To assess the

success of CDM projects by host country, we will start by analysing the observed CER issuance rate, project lead times, validation success and prevalence of rejections by host country, with special focus on the three main host countries (China, India and Brazil). To complete this section, we will finally look into the barriers perceived by different actors within the CDM for different countries.

Effect of host country on CER issuance rate

Figure 6 shows the performance of several host countries in terms of CER issuance as compared to the amount of CERs forecasted at the stage of registration. To allow for the comparison, amounts of CERs have been standardised to a one-year period starting from the beginning of the crediting period.

Figure 6: Forecast of CERs at stage of registration and CERs issued, by host country



Source: Own calculation on the basis of UNFCCC website and UNEP Risø Centre (2007).

Of the three CDM leader countries, India, Brazil and China, the former is currently the country that promises most with regard to actual CERs issued. Whereas projects in Brazil and China show underperformance of up to 10% and 45%, respectively, projects in India show an overperformance of 22%.

The reason for the overperformance of India is mainly based on two well-performing HFC-23 projects which make up 74% of all registered and 81% of all issued CERs in India, and achieve 32% more CERs at stage of issuance than predicted (see Tables 3 and 4).

Table 3: Share of N₂O, HFC-23 and waste projects of total volume of CERs in Brazil, India and China at stage of registration and issuance

Country		China	India	Brazil
N ₂ O	Registration	N/A	N/A	57%
	Issuance	N/A	N/A	75%
HFC-23	Registration	98%	74%	N/A
	Issuance	99%	81%	N/A
Waste	Registration	1%	0%	28%
	Issuance	0%	0%	10%

Source: Own calculation on basis of UNFCCC website and UNEP Risø Centre (2007).

Table 4: Performance of N₂O / HFC-23 and waste projects in Brazil, India and China

Country	China	India	Brazil
N ₂ O	N/A	N/A	119%
HFC-23	55%	132%	N/A
Waste	15%	137%	33%

Source: Own calculation on basis of UNFCCC website and UNEP Risø Centre (2007).

While China's share in CERs coming from four HFC-23 projects is higher than in India (China's CERs come almost exclusively from HFC-23 projects), the performance of these projects is much worse. HFC-23 projects in China show deductions of 45% at stage of issuance, which is mainly due to two low-performing projects whose registration/issuance ratio, however, has become better since our cut-off date in mid-2007. Brazil's performance is based to a lower extent on large industrial gas projects. In our sample there is only one N₂O project, which accounts for 75% of all CERs at stage of issuance. The share of waste projects is more important in this country, which lowers the performance to some extent.

Besides providing a relatively plausible explanation for the different performances between the three leading countries, the figures do not only show the relatively big market share of N₂O/HFC-23 projects in China and India but also their relative good performance vis-à-vis other types of projects. In all three countries the relative share of these project types is increased at stage of issuance. For example, the relative share of CERs from N₂O projects in Brazil increases significantly with +18%.

The weak performance of Mexico in Figure 6 is mainly due to the waste projects taking place in this country. 14 out of 16 projects in the sample are waste projects. In addition, one big HFC-23 project is performing 23% below the predicted emission reductions. Korea benefits from one very well performing N₂O project and one lower performing HFC-23 project, and Egypt from one N₂O project as well.

Extending the analysis to yet another country with smaller shares of CERs, we find that Chile, for example, performs very well (98% CER issuance rate), with a portfolio composed of two biomass energy projects (where issuance was higher than forecasted), three animal waste projects (where only one received less CERs than expected) and one lower performing fuel switch project (which still performed better than the world average). In this country, we notice that the projects performing better have been developed in-house or by local consultancies. Other countries in the sample performing better than the average 76% are Ecuador (with 3 projects and 78% rate of issuance), Malaysia (2 projects and 100%), Honduras (5 projects and 77%), Guatemala (2 projects and 89%) and Peru (2 projects and 126%). It must be said that in most of these countries performance varied greatly from project to project, so these results do not necessarily mean that all projects in one specific country perform similarly well.

It should also be pointed out that projects usually have a poorer performance during the first monitoring period, until the personnel becomes familiar with the monitoring methodology, or until certain technological or implementation barriers are overcome. As the calculations are based on the already verified monitoring reports, and in several cases this means just the first report, performance in terms of CER issuance rate may still improve when future CERs are verified and issued and considered in the calculations.

From this analysis, we might conclude that host country is not necessarily a variable directly affecting project success in terms of CER issuance rate. On average, some countries' CDM

project portfolios are presently performing better than others' in terms of issued CERs. But we find no evidence that any one country performs consistently better or consistently worse – in all projects – than the others. We rather find, in each country, projects with very different issuance rates. The types of projects prevailing in each country might provide a better explanation (we analyse this factor in Section 6.4), and especially the performance of individual very large projects.

However, there are two factors, related to the individual host countries, that appear to affect CER issuance rate in the in-depth case studies carried out for this research project (Discussion Papers CDM-6 to 8). One of them is changes in the countries' emissions factors: In all Chinese CDM projects analysed, the CER levels had to be readjusted because China's DNA published new standardised emission factors for the country in August 2007. Some of the projects had been developed already in 2005, when there were no standard emission factors for China and so each project developer used their own figures, which were then only checked by the EB for conservativeness. Now, all projects have to use the same standard. Similarly, in Brazil, a wind energy project and a biomass project were affected by a significant reduction in the operating margin carbon emissions factor for the electricity grid, this means, their baseline emission levels were reduced, allowing them to generate less CERs. An expert interviewed for this study also considers that ex-post calculation of electricity baselines will have an impact on CER issuance rates. These revisions of the emission factors are likely to have taken place in other countries and affected issuance there – our database however does not provide this kind of information.

A third alternative – or rather complementary – explanation may be the project lead time until registration. The longer a registration process lasts, the less emission reductions a project can generate up to a certain date. Lead times, however, may serve as an explanation only if retrospective CER issuance (i.e. for reductions achieved before registration takes place) is ruled out. In the following paragraphs we assess this effect for a small sample of projects in China, India and Brazil.

Effect of host country on project delays

In interviews held with several CDM project developers⁶, they suggested that the host country DNA is a key source of delay. For example, the project approval process is not always like it is published in the DNA webpage. Knowledge of the country and its procedures is important for DNA approval. So, experience in the country is an important factor to avoid delays.

Below we assess this perception under the light of delays experienced by a sample of CDM projects in China, India and Brazil. We define here delay as the change in the start of the crediting period of a project, when comparing the dates provided in the PDD sent for validation and the PDD sent for registration. We have found no further delays take place after registration (this is, the beginning of issuance usually corresponds to the start of the crediting period given in the PDD for registration).

To analyse project delays, we first differentiate between early-start and normal projects. In the first case, the project is allowed to register after its beginning of operations and to claim credits from before the date of registration. In this case, delays in the crediting period would normally not be expected to take place, as the project is already operating during the CDM

⁶ See Discussion Paper CDM-5 for more detailed references about the interviews.

registration process. In the project samples assessed, no Chinese CDM projects were early-start, while most Indian (20 out of 23) and little less than half Brazilian ones are early-start⁷.

In the sub-sample of non-early-start projects, an average delay of 222 days in the start of the crediting period is observed when comparing the dates provided in the PDD for validation and in the PDD for registration. The median delay for this sub-sample is 237.5 days. Only two projects out of 14 show no delay in the start of the crediting period.

Longer delays are observed in the case of China (mean 268 days, median 320 days) than in India (mean 260, median 276) and Brazil (mean 145, median 90). These results, however, may not necessarily be related to country-specific barriers of bureaucratic or other nature, as they could also be related to the project types most frequent in each case. The samples used for the calculations are also quite small, and thus these results should be taken with care.

In the Chinese sample, most projects are hydro plants, which typically have a very long planning stage and may face difficulties along the way. In these projects, delays frequently take over a year. The other Chinese projects in the sample are waste heat ones, which experience delays of only around one month. The main reasons for delays in the Chinese CDM projects are mainly of institutional, methodological and financial nature:

- Three hydro projects experienced delays in the DNA approval process.
- The use of a new methodology (either unknown in the country or completely new) caused longer lead times in three cases (waste heat and hydro projects).
- Two waste heat projects had delays in the EB registration process.
- Two hydro projects needed longer time than expected for processing the governmental permits for the project (apart from CDM approval), partly due to the low efficiency of the local administration.
- One hydro project had problems with the financial closure.

According to one expert interviewed⁸, CDM project approval was very fast in China during 2006 (around 4 weeks), but now it can take up to 4-6 months, mainly because there are too many projects presented in that country, and the DNA staff is overloaded. Validation is also regarded as a bottleneck in China, as opposed to other countries where it is not so, probably also because of the high amount of projects developed in this country.

In the Indian case, although from different sectors (cement, energy efficiency, HFC gas), all projects in this sub-sample are industrial, which are usually easier than renewable energy ones: industrial projects usually require smaller investments and less governmental permits, and their baselines can be easier to calculate. Nonetheless, all these projects have delays of over six months. In this case study it was not possible to investigate the reasons for the delays.

In the Brazilian case, finally, the sample is mixed between biomass, waste and wind projects, and thus some of them experience very long delays while others do not have any. In general, the Brazilian DNA issues a Letter of Approval within 4 to 6 weeks, so there is no large accumulation of projects waiting for the national approval. However, due to the large amount of CDM projects in the pipeline, the large DOEs are also having difficulties to cope with the workload. Indeed, two projects in the analysed sample (wind and biomass) experienced delays

⁷ The sampling method is described in detail in the respective discussion papers. Samples of projects were chosen to include the project types, sizes, developers, and character (unilateral or bilateral) most representative of each country within the universe of projects in validation and registered. Early start was not a variable considered during sampling.

⁸ See Discussion Paper CDM-5 for more detailed references about the interviews.

in the CDM registration process, one of them specifically during validation, either because the DOE took a long time in identifying the corrections needed, or because the project participants took a long time in incorporating them. A third project (biomass) experienced delays in project implementation.

For the projects already issuing CERs in all three countries, no delays are observed between the start of project date given in the PDD sent for registration and the beginning of the issuance period. Indeed, at registration projects are usually in a very advanced stage, and so further delays are not usual.

Concluding, most CDM projects in the samples starting issuance after registration experienced delays in the start of the crediting period, several of them of over a year. Host country-specific factors, such as overwhelmed DNAs (e.g. China) and DOEs⁹ (e.g. China and Brazil) or delays in getting governmental licenses (e.g. China) can contribute to longer delays in the CDM project cycle, but might however not be the only or main causes for this.

Effect of host country on validation success and rejection/withdrawal prevalence

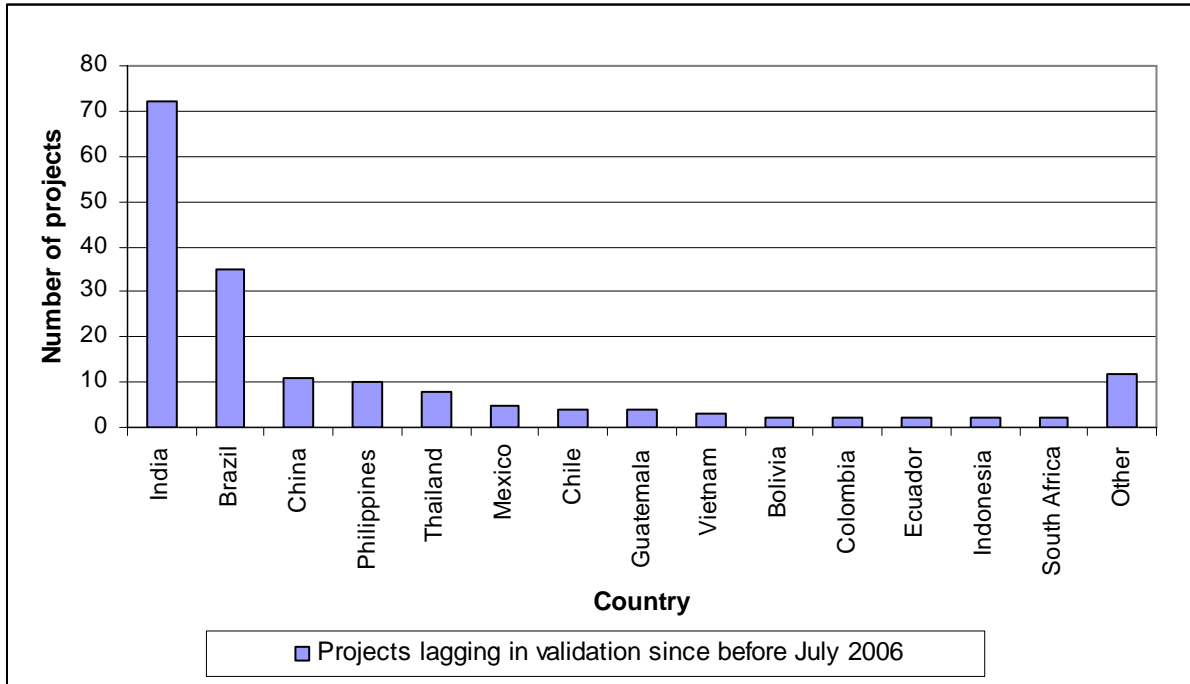
One outstanding issue in the CDM project pipeline is the large number of projects sent for validation in the first years of the scheme and still not sent for registration (thus, still not validated) as shown above in Figure 5. Remaining over a year in this stage, these projects are not likely to be validated at all, probably due to serious deficiencies found by the DOEs.

Figure 7 shows the countries with most projects remaining in the validation stage for over a year, this is, those that were submitted for validation up to June 2006 but were not validated successfully yet. As can be seen, here again India, Brazil and China predominate. However, this is not necessarily a sign of bad performance of these countries. While India hosts 41% of the projects remaining in the validation stage for a year or longer, it also hosts 38% of all projects submitted up to June 2006; Brazil hosts 20% of projects lagging in validation but also 18% of all submitted projects in the same period of time; and China hosts 6% and 9% of lagging and submitted projects, respectively. Among these three most significant cases, host country does therefore not appear to be a relevant factor leading to a possible failure in validation.

With respect to rejected projects, as of June 2007 only 20 of all CDM projects submitted for registration had been rejected by the CDM Executive Board. Out of them, 11 (55%) projects were developed in India and 5 (25%) in Brazil. The other rejected projects took place in Mexico (2), Argentina and Chile (one each). The proportion of rejected projects in India and Brazil is very high, even compared to the high share of submitted and registered projects from these countries (up to June 2007, 28% of submitted and 35% of registered CDM projects were in India, while 10% of submitted and 14% of registered projects were in Brazil. See Figure 8). In contrast, up to June 2007 China did not host any rejected or withdrawn CDM project.

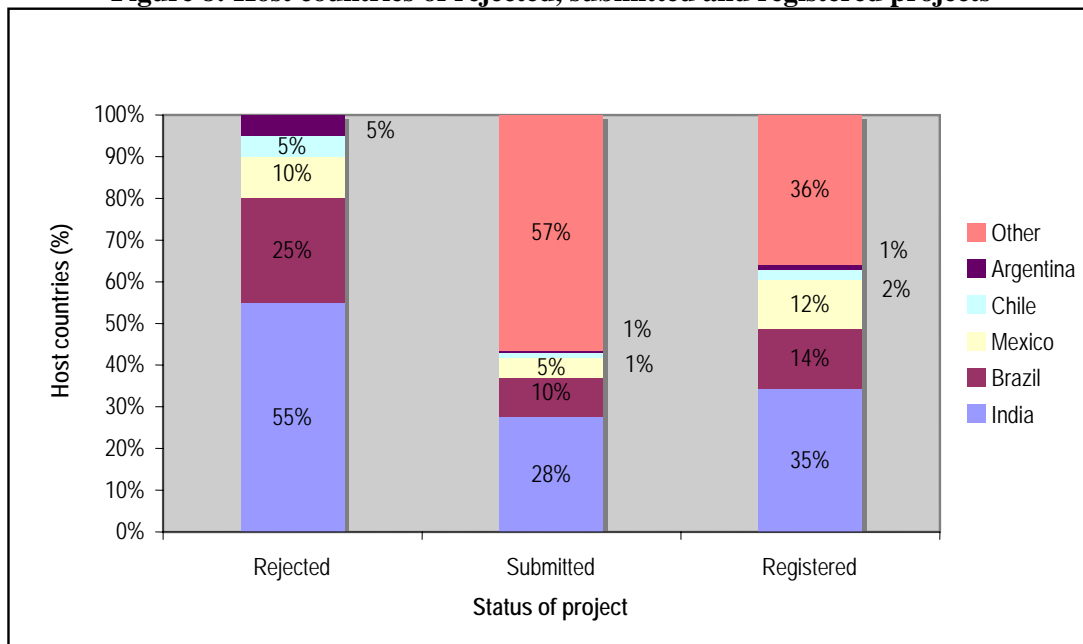
⁹ We further below consider DOEs as an independent explanatory variable affecting CDM project success themselves. Here, however, they have been considered a host country-related factor, assuming that DOEs build validation teams that are specialised in one major country or region. The teams working on China and Brazil may be overloaded due to the large amount of projects coming from these countries.

Figure 7: Projects in validation stage since June 2006 or earlier, by host country



Source: Own calculation on the basis of UNEP Risø Centre (2007).

Figure 8: Host countries of rejected, submitted and registered projects



Source: Own calculation on the basis of UNFCCC website and UNEP Risø Centre (2007).

Further analysis of the projects in India and Brazil shows that in both cases a high share of the rejected projects belongs to the “cement blending” type, and that all these projects were rejected due to insufficient or inadequate demonstration of additionality. Indeed, there seem to be generic difficulties for demonstrating additionality in cement blending projects: of all 22 projects from this type submitted for registration, 8 were rejected, at least partly due to additionality considerations. The number is still small to analyse whether this problem is just project type-specific or also related to the host countries.

The four projects withdrawn from CDM registration up to June 2007 were developed in Brazil, India, Malaysia and Peru, respectively. There is thus no clear predominance of a specific host country among the withdrawn projects.

Host country related barriers

There are other host country-related barriers affecting CDM projects. While these are more difficult to relate to project outcome in terms of CER generation, lead times or registration success, they are likely to affect investment decisions in general. We clearly see that the geographical distribution of CDM projects is strongly skewed towards large, rapidly industrialising and stable countries. Even in the most successful host countries, however, there are still barriers that could limit CDM project development.

For example, in China the government controls the market by unofficially setting a minimum price for the CER. Specifically the Chinese DNA, when screening applications for Letter of Approval from CDM projects, “examines the expected CER price in relation to prevailing international market prices, and defers acceptance for those projects whose CER price is too low” (Guansheng and Liyan, 2007: p. 76). On top of that, the government charges high levies for CER revenues coming from non-CO₂ or methane emissions, as reducing them generally involves simple, relatively cheap technologies, and offers limited social, environmental or economic benefits other than GHG abatement or CER revenues (IGES and CREIA, 2005). Although this control has clearly not affected the amount of CDM projects being developed in China (as of December 2007, China was second in number of registered CDM projects and first in number of projects in validation), it might affect the decisions of CER buyers looking for low prices.

In other countries, like Tunisia, Morocco and Egypt, the DNA exerts an even tighter control on CDM projects, according to project developers. In these countries, the government wants to identify themselves the final buyer of the CERs. The whole process is guided with a top-down approach, the CERs are considered government property, and because of that they want to decide to whom they are going to sell them. It is not only a matter of price, as in China, but about deciding the players. They want to choose certain developers and certain buyers. This is delaying and limiting the registration of projects in those countries, and is likely to discourage potential investors.

In India, a local project developer estimates that about 10 - 15% of the submitted projects never get DNA approval. The government of India’s regulations are clear that DNA approval will be issued if the project meets the sustainable development criteria of the ministry and all necessary statutory clearances for implementation and operations are obtained. The actual decision-making by DNAs is however difficult to prove or to compare among countries, as access to DNA processing results is not everywhere available.

Country-related regulatory risks (such as changes in energy-related policies) or limited access to capital are other frequently-mentioned barriers in project PDDs. We found these arguments when analysing the additionality demonstration section of projects in India and Brazil. Access to finance for renewable energy projects is stated by several Indian national banks to be a challenge to project activities due to the financial institution’s conservative risk approach. However, companies with a known financial performance usually do not encounter severe borrowing constraints. Also, local financial institutions are increasingly developing schemes that include CER revenues as collateral for loans (see e.g. Kumar, 2007; Babakina, 2006). Therefore, in several of the analysed projects in the Indian case study, for which the

investment barrier was substantiated in these terms, the additionality argumentation does not convince.

In the Brazilian case, all nine CDM projects analysed argue having faced investment or financial barriers. A third of the projects perceive that Brazil lacks a long-term debt market, as the only supplier of long-term loans is BNDES, the Brazilian National Development Bank; two PDDs mention the excessively high interest rates existing in the country. As it is generally very expensive to borrow money for projects, most of the funding comes from the companies' own revenues or from equity. Due to an unpredictable energy regulatory environment that has gone through three major reforms and counter reforms in the last 10 years, and due to the innovative character of the technologies used for CDM projects, even if financing can be found investors are cautious and risk averse.

An interesting regulatory feature in the Brazilian case is the relationship between the CDM and the government-led programme PROINFA, launched in 2002 for supporting the establishment of new renewable energy after the massive blackouts during 2001. Its goal is to foster 3,300 MW of new renewable energy generation capacity from wind, biomass and small hydro. In 2006 the Brazilian Government enacted a Decree establishing that all CERs earned by independent power producers that are also participating in the PROINFA programme would belong to Eletrobras, the state utility that manages PROINFA. This has been loudly contested by project developers and is being challenged in court. As of November 2007, CDM projects approved by the DNA have been more successful than PROINFA in promoting the creation of new renewable energy capacity in Brazil, more than 2,500 MW compared to 430 MW from PROINFA (CIMGC, 2007).

Some countries also face barriers related to human resources. According to an interviewee, most projects in energy efficiency and waste heat recovery in India do not have any kind of risk, but still are not implemented due to the level of inertia of the existing maintenance staff, which in most of the industries in India are headed by people running in late 40 - early 50 age groups. Despite this barrier, these projects would have difficulties in passing the common practice test for additionality argumentation, as the technologies involved are not new.

Some Brazilian sectors apparently also face a conservative industry with little motivation to invest in efficient cogeneration facilities. On the other hand, this country has a large and growing cadre of technical experts who know how to develop CDM projects, there are even newly started university courses for engineers on how to design them. Nonetheless, several of the large project developers and verifiers are struggling to maintain the quality of their staff. Many firms seem thinly stretched and overworked but reluctant to hire more staff as the future of CDM in Brazil seems uncertain. The voluntary market is taking off with banks and gas stations offering offset schemes. The absence of checks and regulations for the voluntary market and the questionable quality of some of these schemes is causing some CDM developers to fear a backlash against all forms of carbon trading and climate projects.

Conclusions for this section

The countries where most CDM projects are being developed (China, India and Brazil) are not necessarily the ones with best performance in terms of CER issuance rate. While India has been issued more CERs than expected so far, Brazil has less than expected but still above the world average, and China is below the average. Other countries performing very well are Korea and Egypt (both profiting from N₂O projects), Peru, Malaysia and Chile.

However, we find no evidence that the host country directly affects project success in terms of CER issuance rate. Some countries perform on average better than others, but there is a large variance in the success rates of projects within individual countries. We find thus that rather the types of projects dominating in each country's portfolio might provide a better explanation of CER issuance success.

However, another factor, more related to the individual host countries, appeared to affect CER issuance rate in the in-depth country case studies: The changes in the countries' emissions factors, which affect mainly renewable energy projects. This effect has been observed for projects in China and Brazil, but is likely to have taken place in other countries, too.

Finally, project lead times up to registration may also affect project success in terms of CER generation. The longer a registration process lasts, the less emission reductions a project can generate up to a given target year. Lead times may serve as an explanation of project performance only if retrospective CER issuance (early-start projects) is not considered.

In a small sample of Chinese, Brazilian and Indian CDM projects (non early-start), only two out of 14 did not experience delays in the start of the crediting period and the average delay was 222 days. Host country-specific factors, such as overwhelmed DNAs (China) and DOEs (China and Brazil) or delays in getting governmental licenses (China) can contribute to longer CDM project lead times, but may not be the only or main causes of project delay.

Host country does not appear to be a relevant factor leading to failure in validation, as the countries with the most projects lagging for over a year in validation (India, Brazil and China) are also the projects with most submitted CDM projects.

In contrast, host country appears to be a relevant factor leading to rejection. India and Brazil host most rejected projects, while the third large CDM host country, China, does not have any rejections.

Other host country-related barriers found along the study are: governmental interference with CER prices (fixed minimum price in China); governmental interference in the decision about who buys the CERs (Tunisia, Morocco, Egypt); non-approval of projects by DNA (case of India mentioned by one interviewee, although this statement has been contested by other sources); and investment and regulatory risks (India – also opposing opinions here – and Brazil).

6.2. *Unilateral or bilateral character of CDM projects*

There is a general perception that especially small CDM projects and unilateral ones – this is, projects developed without participation from an Annex I country – might face more barriers for implementation than large or bilateral ones, respectively (Ellis and Kamel, 2007). They may have more difficulties gathering the financial means needed, or have insufficient technological know-how.

On the other hand, unilateral projects could represent a better opportunity for host countries to promote sustainable development: An interviewee from a host country saw bilateral projects as a loss of opportunity for marketing CERs at the best price for the seller. In his opinion these buyers would mostly not really be interested in quality, but in cost. They want the lowest price. Frequently, these buyers are funds and intermediaries, which pay maybe US\$

3.5 per CER, and sell them at US\$ 21. Unilateral projects could have a better financial structure with the CERs securing the long-term financial sustainability of the project. In this way, project developers can also pay good salaries to their workers, pay taxes, invest in good technology... They can make a better contribution to local welfare and development.

Another interviewee claimed “having the feeling” that projects where European buyers, traders or intermediaries are involved are less likely to be reviewed or rejected than unilateral projects or projects with Japanese buyers.

Analysing whether unilateral or bilateral projects are being more successful or are facing more barriers can be enlightening for accepting or rejecting these claims.

Effect on CER issuance rate

In the analysis of all registered projects with issued CERs, we find that unilateral projects (139 in the sample) have on average been issued 67% of the CERs forecasted in the PDDs for registration. This compares to a 121% success of projects with European investors (45 projects), 43% success of projects with investors from other countries (11 projects) and 67% success of projects with multilateral investors (8 projects).

It must be said that multilateral funds, such as those from the World Bank, are frequently funded by individual countries, and thus in the analysis several multilateral projects may have been assigned to the categories “Europe” or “Other countries”. Summing all projects with foreign buyers in one single category (in order to avoid this error) still shows that bilateral projects had achieved 77% of the CERs forecasted, compared to only 67% for unilateral ones.

This result suggests that bilateral projects are indeed being more successful than unilateral ones. As CER issuance rate mainly depends on the quality of monitoring, on the initial emission reduction estimations and on unforeseen technical or implementation problems, the underlying reasons why bilateral projects perform better might be better access to technology, technical support and upfront financing.

Effect on project lead times

In contrast to the results shown above, unilateral projects have on average shorter lead times (275 days) than bilateral ones (325 days). This is the result found when analysing all projects with issued CERs up to June 2007, considering “lead time” as the time between project submission for validation and project registration.

The key reason for this result might be a faster processing by the DNA as domestic companies know better how to deal with regulatory processes of the host country.

Effect on validation success and rejection/withdrawal prevalence

When analysing the projects sent for validation before June 2006 and still in this stage by June 2007 (thus, remaining in validation for one year or more), we find that 68% of them are unilateral. As only 40% of all projects submitted by June 2006 are unilateral, there is a higher share of unilateral projects than bilateral ones having critical projects at validation.

65% of all rejected projects have a unilateral character. This share of unilateral projects is higher than the one among all projects submitted (52%) or the one among the registered

projects (55%). Here again bilateral projects have a better performance, but the difference is not very large. Additionally, as all (100%) withdrawn projects have a bilateral character, the overall proportion of unilateral projects among those failed at registration is 54%, which is not outside the normal proportion.

Related barriers

In the in-depth case studies in China, India and Brazil we did not find enough evidence to either support or discard the theory that unilateral projects face more barriers than bilateral ones.

In the case of China, all projects in the sample were bilateral, and thus none of them faced problems derived from being unilateral. In fact, most Chinese projects are bilateral: only 11% of all registered and 19% of all submitted CDM projects in China have a unilateral character.

In the Indian case, there was no information about the barriers faced by unilateral projects in the sample.

In Brazil, a third of the projects in the sample were unilateral (this is, three projects). Only one project developer mentioned having had barriers due to the unilateral character of the project. The project owner had to fund the whole investment without loans (financial barrier). Despite the existence of programmes to promote investment in renewable energies in Brazil, the requirements of these programmes are allegedly so high, that project developers are usually unable to join them. This is the case of this project, which tried to join the PCH-COM (small hydro plant promotion) programme of Eletrobras and BNDES without success. Had it had a bilateral character, this project could have had easier access to financing from foreign sources. The other two Brazilian unilateral projects analysed are owned by large firms, which have less difficulty in achieving the financial closure for their projects.

Conclusions for this section

Bilateral projects are more successful than unilateral ones in terms of CER issuance rate (on average, bilateral projects have been issued 77% of the forecasted CERs, while unilateral ones only 67%). Out of the bilateral projects, those with European participants perform best with 121% success. Possible reasons for the better performance of bilateral projects might be improved access to technology, technical support and upfront financing.

Unilateral projects have on average shorter lead times (275 days) than bilateral ones (325 days). However, there are many more unilateral than bilateral projects facing difficulties in the validation stage. These opposing results come from the analysis of two different samples: lead times (i.e. the time between submission for validation and registration) were assessed for the projects already registered and issuing CERs, while validation success was analysed in the sample of all projects submitted for validation up to June 2006 but not submitted for registration by June 2007. The unilateral projects that achieved registration probably had a better knowledge of the regulatory processes in the host country and thus could achieve DNA approval more quickly.

Finally, 65% of all rejected projects up to June 2007 are unilateral, but 100% of all withdrawn projects are bilateral. While unilateral projects are more likely to be rejected, overall they are not necessarily more likely to fail at registration.

These mixed results do neither support nor reject the hypothesis brought forward by some actors that bilateral projects are being favoured during the registration pipeline. Thus, without discarding or supporting that opinion, we still may propose that another likely explanation is that bilateral projects may receive better technical support or quality control from the foreign investor.

In the country case studies in China, India and Brazil we did not find enough evidence to support or discard the theory that unilateral projects face more barriers than bilateral ones.

6.3. Type of project developer

The process until registration and issuance of potential CDM projects is complex. The number and specifications of methodologies and UNFCCC regulations have steadily grown over the last years so that the whole registration procedure became more and more inscrutable. As a consequence, the intermediary role of consultants became more important. Consultants help project owners develop the project design documents, methodologies, provide procedural support and sometimes act as a broker once the CERs are generated.

Effect on CER issuance rate

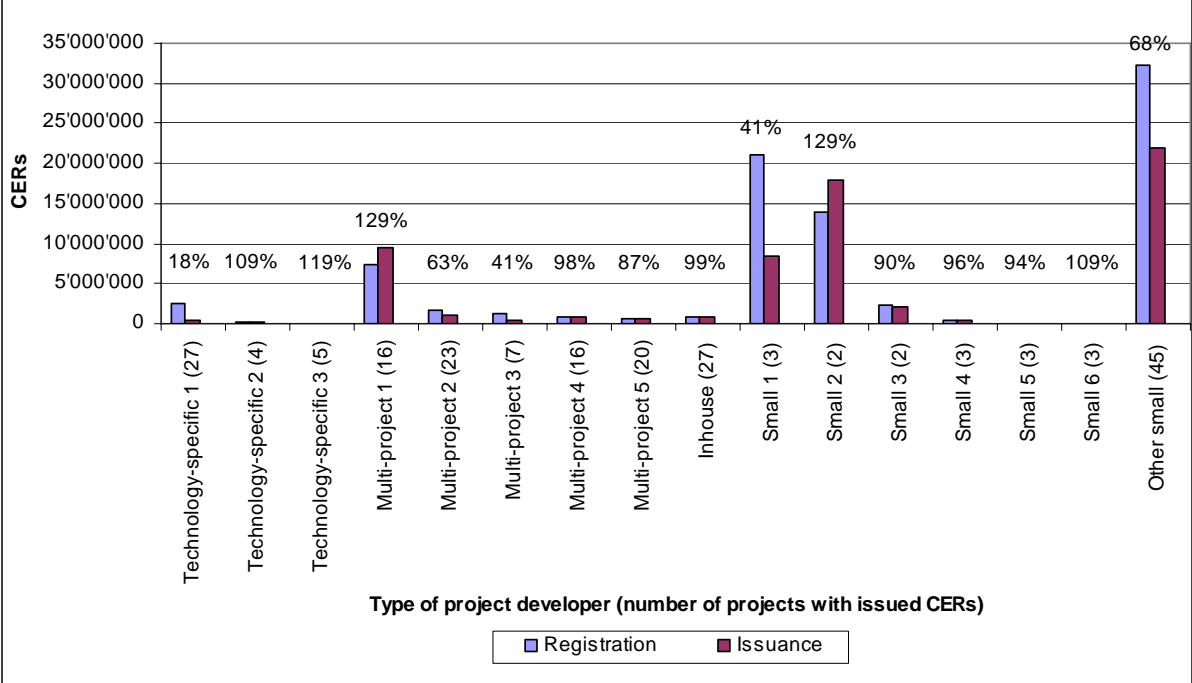
With regard to project performance the consultant's role is critical as he is the main responsible for the estimation of the project potential in the PDD. If the consultant is paid a success fee as is common now in most large CDM host countries with the exception of China¹⁰, he has a particular interest in achieving as many CERs from the project as possible. As a consequence, he tries to bring as many CERs through the process as possible. Figure 9 shows the performance of CDM projects in terms of CER issuance rate differentiated according to type of project developer. We classify project developers as “technology-specific”, when they specialise in one or two specific types of project; “multi-project”, when they develop several different types of projects; “in-house”, when it is the project owner itself who develops the PDD; and “small”, when the number of projects registered and with credits issued is too small in order to differentiate a consultancy between technology-specific or multi-project. Many of the small consultancies are also local firms in the host country, in contrast to the international consultancies with the largest project portfolios.

As Figure 9 shows, a great differentiation between the consultancies and project performance exists. We can see that even within each type of project developer, performance varies substantially. Technology-specific consultancies perform on average worse (25%) than multi-project ones (106%) and small ones (73%). Nonetheless, these results are affected by the especially low performance of one technology-specific consultant with a large portfolio of animal waste management projects and the very good performance of one multi-project consultant with a large portfolio of projects in India. Without taking these outsiders into account, technology-specific consultancies would perform better than multi-project ones. Maybe the most interesting insight, in-house development of project design documents shows better results on project performance than most consultancies do. This could indicate that project proponents seem to know their project best, which would question the “facilitating” role of external consultancies to some extent. It is important to underline again that the number of projects is partly still too small to draw final conclusions. The high variance

¹⁰ The Chinese DNA has prohibited consultants to take a success fee.

shows, in addition, that other project characteristics – project type and host country, for example – are probably affecting performance more decisively than type of developer.

Figure 9: Forecast of CERs at stage of registration and CERs issued, by type of project developer



Source: Own calculation on basis of UNFCCC website and UNEP Risø (2007).

Effect on validation success and rejection/withdrawal prevalence

85% of all rejected and 75% of all withdrawn projects were developed by a multi-project developer, this is, a consultancy firm working with different types of CDM projects. The remaining 15% of rejected projects and 25% of withdrawn projects were developed in-house by the project proponents themselves. In comparison, out of a sample of the registered projects, only 57% were developed by multi-project consultants, while 26% were developed by technology-specific consultants and 17% by the project proponents. It seems therefore that technology-specific consultants have more success than multi-project ones in getting their CDM projects registered.

Conclusions for this section

Consultants are the main responsible for the estimation of the project potential in the PDD. They have an incentive to achieve as many CERs as possible, as it is common among them to charge a success fee from CDM projects. Performance in terms of CER issuance rate varies greatly among and within all types of project developers, and the sample analysed is too small to draw definitive conclusions. The performance of consultants might be related to the project types they focus on, or to the countries they operate in. Interestingly, in-house developed projects perform much better than most consultancies in terms of CER issuance, which would question the facilitating role of external consultancies to some extent.

Analysing the rejected projects, it seems that technology-specific consultants are more successful at getting their projects registered by the EB. However, as the sample is still too small, this conclusion needs to be taken with care.

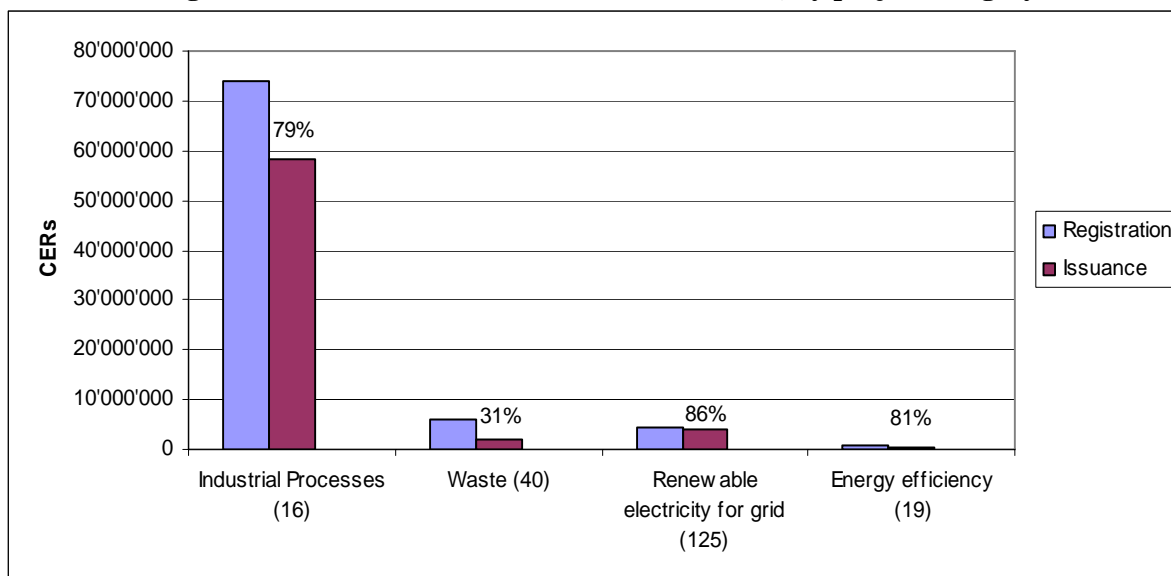
6.4. Project type and category

As already hinted above, project type is one of the variables most likely to affect CDM project success. Renewable energy projects, such as hydro and wind power plants require high levels of funding, much above the CER revenues, and thus have a longer planning stage and could face longer delays than other types of projects. Projects involving new, unknown technologies might face more implementation and monitoring difficulties. Some types of projects, finally, depend on natural resources that are difficult to quantify (water and wind resources), while others are based on industrial by-products or wastes with known historic flows (waste gas, N₂O, HFC-23, etc.). These characteristics are thus likely to be reflected in CER issuance rates (the likelihood that CER generation was estimated precisely in advance), lead times (unforeseen implementation or registration difficulties), and also validation and registration success (as in some countries it is difficult to demonstrate that certain types of projects are additional). In the following paragraphs we assess these issues empirically.

Effect on CER issuance rate

CERs have been issued for five different project categories, i.e. industrial processes, waste, renewable electricity for the grid, energy efficiency and fuel switch. While for some categories already a high number of projects is found, some are still under-represented. For example, at the cut-off time in mid-2007 there were 125 renewable electricity projects but only three fuel switch projects. For this reason, conclusions with regard to correlations between project category and project performance in terms of CER issuance are difficult and any statement should be treated with caution.

Figure 10: Forecast and Issuance of annual CERs, by project category

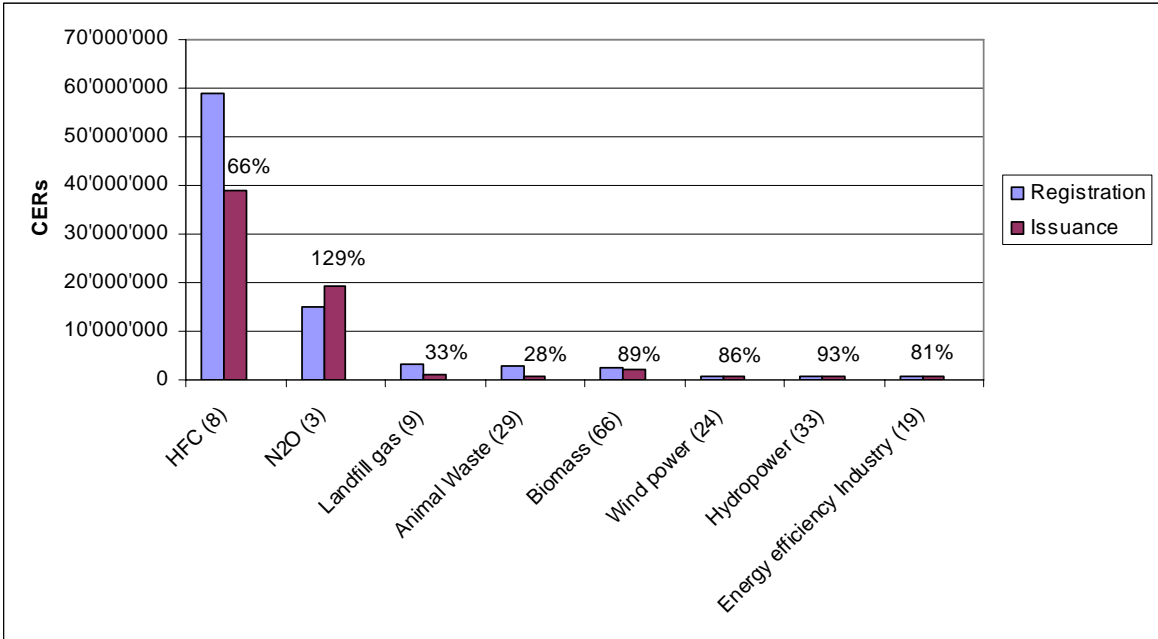


Source: Own calculation on basis of UNFCCC website and UNEP Risø Centre (2007).

Figure 10 shows the performance of CDM projects in terms of CER issuance rate by general project category. Waste projects, which comprise landfill gas, animal waste gas and waste water projects, perform worst. Overall deduction is 69% compared to the CERs forecasted at stage of registration. All other project categories (without considering fuel switch due to the low number of projects) show deductions between 15% and 20%.

An analysis of the 13 different project types confirms this picture. As Figure 11 illustrates, N₂O projects are currently most successful with regard to CERs issued. N₂O is the only project type that generated more CERs than expected. Until June 2007 around 29% more CERs than predicted were issued. In contrast, the eight HFC-23 projects considered in this sample disappointed so far, which is mainly due to two low performing projects in China. Only 66% of the initially predicted CERs were issued. Yet, performance of these projects since the cut-off date in mid-2007 has improved. Landfill gas projects (particularly those, which aim at producing electricity) and animal waste projects show even lower performance rates than HFC projects. With deductions of up to 70% of initially forecasted CERs in the PDD these are the worst project types that have been implemented.

Figure 11: Forecast and Issuance of CERs, by project category



Source: Own calculation on basis of UNFCCC website and UNEP Risø Centre (2007).

As the World Bank points out in its recent 'State and Trends of the Carbon Market' report, “overestimation of the potential generation of gas at the modelling stage, inadequate design of gas capture systems, suboptimal operation of the landfills, or other external factors“ might be potential reasons for the low performance of landfill gas projects (World Bank, 2007: 28).

Project developers interviewed for this study confirm this position: In their opinion, landfill projects are underperforming mainly because the model used is too optimistic. Also in waste incineration projects the models for estimating waste growth are too simple and result in overestimations. But this is a specific situation, related to the model, and possibly also to the very high expectations of developers who tend to use non-conservative values in the model in order to get more CERs and make the project look more attractive. Landfill projects are very often not based on real field data and not often tested in terms of methane production. And even when they are tested, biogas production is a biological process, and many environmental factors affect it. The management of the site can also affect the results of the project: Developing countries are not used to controlled landfills, and they may not know how to use the gas pipes, how to maintain or take care of the gas collection systems. For example, big trucks circulating in the landfill can destroy the pipes.

Moreover, for swine manure and landfill projects there has been a debate on monitoring, and the methodology has changed to include new parameters. For landfill projects there is now a compulsory tool for monitoring the composition of flared gas continuously. Although this new tool is not applicable to projects that are already registered, it applies to those in the pipeline, and can affect their registration time, or their viability at all.

In addition, according to one interviewee, monitoring requirements are getting much more stringent than 2 years ago, and are very complex for certain types of projects. For example, a composting project may have to monitor 30-40 parameters every year, which is complicated and requires lots of equipment, care, trained personnel, etc. In contrast, a hydro project just needs one parameter to be measured. Also energy efficiency projects, such as waste heat recovery projects in industrial facilities, are rather simple: they use a simple technology, the expected levels of industrial production and energy consumption are known. Thus, the prediction is quite close to what is being produced.

With regard to biomass projects, agricultural plant waste projects performed better (95%) than wood waste projects (76%). Run-of-river hydropower projects perform slightly better (94%) than projects based on reservoirs. The very few geothermal and cement blending projects, which have seen some CERs issued until mid-2007, disappointed so far (47% and 45%, respectively).

As we noted earlier, project performance may improve as project staff learns to apply the monitoring methodology. This effect cannot be assessed in the overall results shown here, since most projects have undergone just one or few monitoring and verification reports. In the in-depth Indian case study, however, analysing non-verified monitoring reports for four CDM projects, we found that in three of these cases the performance improves if these new monitoring reports are included for the calculation of expected CERs at issuance: a HFC-23 project improves from 53.5% to 107.5% performance, when the 2nd and 3rd monitoring reports are also used; an hydro project improves from 76.4% to 86.7% when the 2nd monitoring report is included in the calculations; a wind project improves from 58.6% to 79.1%. However, another hydro project shows a worse performance if the second monitoring report is included in the calculations (it falls from 74% to 66.5%). Thus, not all projects improve their performance over time. Small hydro projects are especially sensitive to changes in the hydrological and rainfall patterns.

These results could be explained through the little importance that monitoring is being given to in CDM projects. Many CDM consultants offer a full CDM management service, from design to issuance, in order to gain clients that otherwise might be scared of the complex CDM registration process. While overcoming institutional barriers, this system may also lead project owners to believe that the consultant will take care of the whole CDM business, and that they just have to wait for the CER revenues to arrive. The problems arise when the project is registered, the consultant is no longer there, and the project owner is in charge of monitoring the emission reductions on his own.

Not only low performance levels are observed, but also some projects (one third of the projects that already have requested CERs to be issued in the Indian case study) are facing requests for reviews or corrections for their verification reports. This means that the Executive Board has found deficiencies or mistakes in the reports, even after the verification by the DOE, and that some of the CERs might not be issued after the corrections are made.

Effect on validation success and rejection/withdrawal prevalence

As can be seen in Table 5, there is no apparent correlation between project categories and share of projects remaining long times in validation, as for each category the share of projects lagging in validation is similar to the share of all submitted projects. The same is observed when analysing project types. Thus, validation success would appear to be similar for all project categories and types.

Table 5: Share of projects lagging in validation and all submitted projects by category

Project category	Share of projects lagging in validation (%)	Share of all projects submitted till June 2006 (%)
Renewable energy	51.1	53.8
Waste	22.4	24.0
Energy efficiency	10.3	11.8
Fuel switch	6.9	3.4
Fugitive emissions	6.3	1.9
Industrial processes	1.7	4.7
Transport	0.6	0.1
Forestry	0.6	0.2

Source: Own calculation on basis of UNFCCC website and UNEP Risø Centre (2007).

The picture changes when we analyse the rejections. The majority (65%) of rejected projects belongs to the “energy efficiency” category, while this category only holds 17% of submitted and 14% of registered projects till June 2007. This could be an indication of correlation between project category and rejection. Looking into the specific project type, we find that 30% of rejected projects are cement blending ones, which represent only 1% of submitted and 2% of registered projects.

It is interesting to note that these cement blending projects were all rejected due to insufficient demonstration of additionality, and that four of them took place in India. However, out of the 14 cement blending projects already registered at the EB, 13 (93%) are taking place in India, too. It remains unclear why additionality argumentation in these 13 projects was found more convincing than in the four rejected ones. Probably the EB scrutinized the arguments more strongly in the case of the later submissions.

Within the energy efficiency category, there are also 5 rejected industry projects (25% of all rejected), which are overrepresented as compared to the submitted (14%) and the registered (11%) industry projects. Likewise, 10% of rejected projects are in electricity generation, which compares to only 2% of submitted projects and 0% of registered ones. This is also a hint that industry and electricity generation are project types more likely to being rejected than others.

Other project types are not so significantly represented among the rejected projects. “Renewable electricity for the grid” is the general category with second highest share: 25% of rejected projects belong to it. However, 50% of submitted and 50% of registered projects belong to this category, hinting that it is reasonable to have so many rejected projects in that category.

With respect to the withdrawn projects, all of them belong to the renewable electricity for grid category, and the biomass sub-type. Out of them, three (75%) involve using bagasse for

electricity production, and one involves using biomass waste from the palm oil industry. However, as three of these projects were requested a review but the reasons given for it are different in each case, it can be assumed that these projects were withdrawn due to different causes, despite this similarity in project type.

Conclusions for this section

Project type and general project category have an important influence on CER issuance rates, lead times, and validation and registration success.

Waste projects (landfill gas, animal waste, waste water) perform worst in terms of CER issuance, with only 31% of CERs forecasted being issued. Overestimations in the waste growth or gas generation models, management and operation problems, and monitoring difficulties are the factors leading to these results.

Projects involving industrial processes (HFC, N₂O, cement) have a better performance (79%), slightly higher than the overall average. Among them, N₂O projects consistently generate more CERs than expected, and HFC projects have a varied performance, rather low still, but improving since project draw. Renewable energy and energy efficiency projects have a decent performance, above average in both cases. Among them, hydro power plants have the best CER issuance rate (93%). These projects benefit from the fact that their monitoring methodologies are not as complex as those for waste projects.

Project performance in terms of CER issuance may improve in time, as shown by the analysis of monitoring reports of four Indian CDM projects. In three of the cases the performance improves when new monitoring reports are included in the calculations, while in one (a small hydro project) it worsens. To further improve project performance, monitoring quality should be paid special attention by project consultants and owners. Good training of the operative staff and presence of the developer also after registration are important.

Validation success appears to be similar in all project categories and types. However, rejections are related to project category and type: most rejected projects are energy efficiency ones, and mainly of the cement blending type. All these rejections were due to insufficient demonstration of additionality.

Withdrawn projects until June 2007 were all biomass energy projects. Three of them were requested a review, but for different reasons in each case. Thus, it can be assumed that these projects were withdrawn due to different causes, despite the similarity in project type.

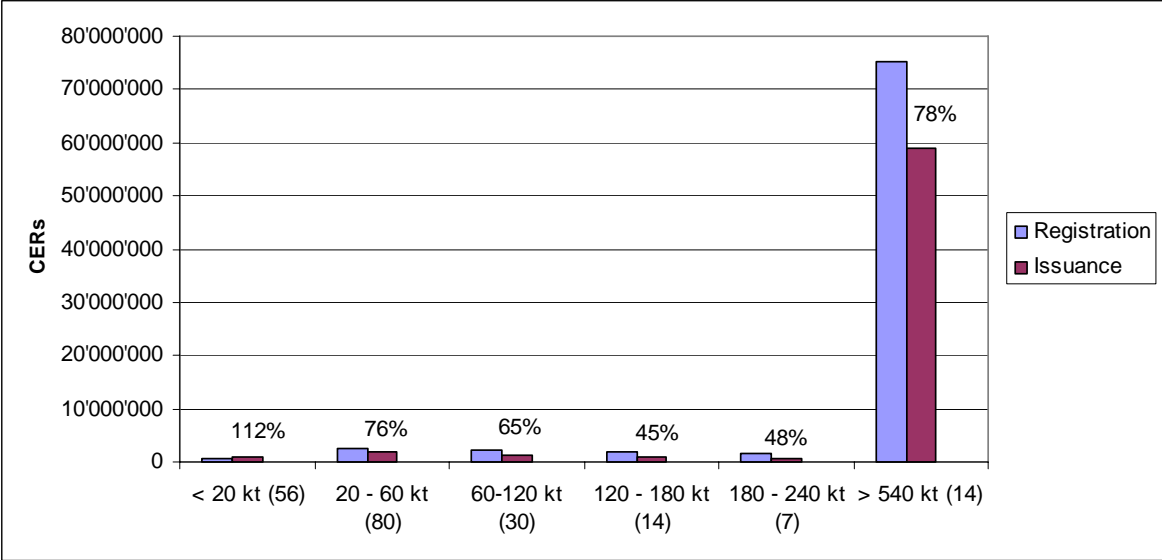
6.5. Project size

Effect on CER issuance rate

It seems obvious that the size of projects matters for estimation and generation of emission reductions. As complexity is reduced, emission reductions of small projects seem to be easier to assess than those of large projects. Consequently, the larger the projects the higher the overestimation by the project proponents should be. Figure 12 confirms this hypothesis, with the exception of projects with a size above 540,000 tonnes CO₂ equivalent emission

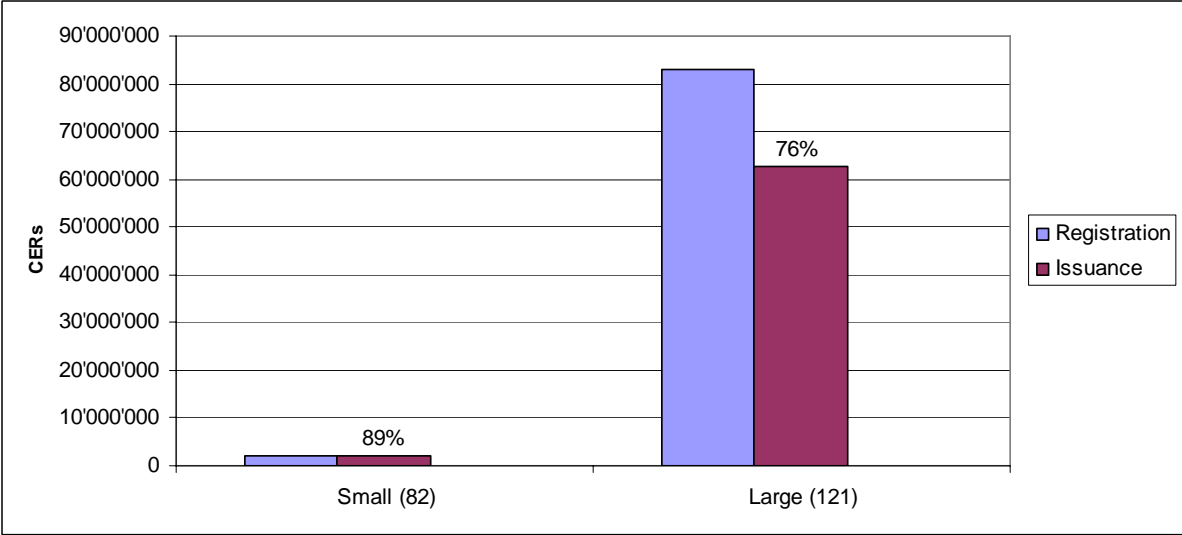
reductions per year.¹¹ These project sizes contain N₂O projects, which – as mentioned above – perform very well in terms of CERs predicted and finally issued. Even the relatively low performance of HFC-23 projects does not drag the performance very much downwards (78%). With 12% more CERs issued than predicted, very small projects below 20,000 CO₂ equivalent emission reductions per year outperform all other projects. This might be due to a high level of conservativeness inherent in such projects and less complexity involved.

Figure 12: Forecast and Issuance of CERs, by project size (grouped according to estimations in PDD at stage of registration)



Source: Own calculation on basis of UNFCCC website and UNEP Risø (2007), differentiation by baseline methodology type.

Figure 13: Forecast of CERs at stage of registration and CERs issued, by project scale



Source: Own calculation on basis of UNFCCC website and UNEP Risø (2007), differentiation by baseline methodology type.

These observations are only partly reflected if project scale is operationalised by the methodology chosen. If project sizes are lumped together on a dichotomous variable, the difference is not so large anymore (cf. Figure 13). Nevertheless, it confirms the evidence of

¹¹ We have used a 60,000 tonnes interval here. As there are only two projects in our sample of a size between 240 and 540 thousand tons of CERs predicted, we disregarded them in Figure 10.

Figure 12 above. According to UNFCCC's Guidelines for completing the simplified PDD, limits to qualify for small-scale are either expressed as a maximum of 15 MW capacity of the project activity, 60 GWh annual energy savings or 60 thousand tonnes CO₂ emission reductions in any year of the crediting period. Thus, if we assume for small-scale projects a size of up to 60 thousand tonnes emission reductions per year, our analysis points to a performance of 84% for such kind of projects. This is close to the 89% in Figure 12. The good performance of large-scale projects is mainly due to the heavy weight of well performing N₂O projects with above 540,000 CERs per year.

In sum, project size matters. However, to some extent project type and project size are closely linked. "Project scale" serves as an indicator for project size.

Effect on validation success and rejection/withdrawal prevalence

Small-scale projects appear to have some more problems at validation than large ones: while 53% of CDM projects with long validation times are small, only 48% of all projects submitted by the same date (June 2006) are small.

Experts interviewed for this study contest this finding: in their opinion, the bigger the project, the longer it takes to validate it and the more complex it becomes. Similarly, large projects appear to face more rejections at registration than small ones: 60% of rejected projects are large-scale, which is a proportion slightly larger than the one existing for submitted projects (56%) and for registered ones (53%). Among the withdrawn projects, however, only one (25%) is large-scale. Therefore, no conclusion can be drawn whether the scale of a project has any impact on its failure.

Related barriers

The country case studies did not provide much evidence about barriers related to the size of projects. In the Brazil case study, half of the projects in the sample were small-scale (5 projects). However, only one of them states having faced financial barriers due to the scale of the project, related to the difficulties existing for obtaining loans for renewable energy projects in Brazil. These barriers might however not be exclusive for small projects. As described above, the investment environment in Brazil is complex. Also, in the additionality argumentation section of their PDDs, all of the analysed Brazilian projects state that they face financial or investment barriers. In the Chinese case, only one of the projects in the sample was small-scale, and it did find technological and financial barriers for implementation that were enhanced by its size, as stated in its PDD. On the one side, small hydro projects have a higher risk of low availability of water resources, which may cause considerable variance in the amount of reduced emissions. In addition, the limited capacity of a small project proponent can increase the implementation and maintenance risks, as well as the financial risks. The latter is especially the case for small private companies which face difficulties in securing loans from local banks, which often do not take the expected CERs revenue as a security because they are not familiar with the CDM and do not have trust in its revenues. Approximately 11% of all registered and 22% of all submitted Chinese projects are small-scale. Although the analysed sample is too small to allow generalisations, other small CDM projects in China could be facing similar barriers to the ones described above. Again here, these barriers might however not be exclusively true for small projects. As described in the additionality argumentation section of their PDDs, all of the analysed Chinese projects face financial or investment barriers, and four (67%) face technological ones.

Conclusions for this section

Project size is relevant for CER issuance rate. In general, the smaller the project the better its performance in terms of CERs issued as compared to those forecasted. Projects generating less than 20,000 CERs. per year outperform all other project sizes. This may be due to the less complexity and the higher conservativeness involved in small projects. This trend is no longer valid for very large projects, above 540,000 CERs per year. This category includes mainly the N₂O and HFC projects. As seen above, N₂O projects have the best performance among all project types.

According to the analysis of projects lagging in validation since June 2006 or before, small-scale projects appear to have more problems at validation than large ones. However, experts interviewed for this study hold the view that the larger the project, the longer it takes to validate it and the more complex it becomes.

In line with this opinion, large projects appear to have more rejections at registration than small ones. As most withdrawn projects are small-scale, however, no conclusion can be drawn whether project scale has any impact on its registration failure.

The country case studies did not provide much evidence about barriers related to the size of projects.

6.6. Quality of additionality argumentation

Additionality is the key parameter that ensures that CDM projects result in real reduced greenhouse gas emissions and are not “business as usual” projects. It implies demonstrating that the project would have not been viable without the positive impact from the CDM registration and CERs sale. This demonstration is usually performed through a standard tool, the “Tool for the demonstration and assessment of additionality”, which includes specific steps that need to be followed in order to substantiate why the project can only happen thanks to the help of the CDM component. Although this tool is required in most consolidated methodologies and is nowadays common practice, it is not formally mandatory. Especially small-scale projects are allowed to follow simplified procedures to demonstrate additionality, and some methodologies for large-scale projects have specific requirements in terms of additionality demonstration.

The tool consists of the following steps:

- Step 0: Preliminary screening based on the starting date of the project activity – Only for projects beginning between 1 January 2000 and 18 November 2004, which wish to claim credits for the operation time before their registration under the CDM. This step was removed from the tool in February 2007.
- Step 1: Identification of alternatives to the project activity consistent with current laws and regulations.
- Step 2: Investment analysis.
- Step 3: Barrier analysis (only one of steps 2 and 3 needs to be done).
- Step 4: Common practice analysis.
- Step 5: Impact of CDM registration.

In the following paragraphs we compare how the analysed samples of CDM projects in the China, India and Brazil case studies fulfil the criteria of the Tool for the demonstration and assessment of additionality, as well as the quality of the argumentation brought forward.

Findings from the country case studies

All Chinese projects evaluated in the study follow the steps given by the Tool for the demonstration and assessment of additionality, even the small-scale one. Eleven of the projects in the Indian sample are small-scale, thus considering the UNFCCC regulations, we try to differentiate the analysis between small and large projects. Also for HFC-23 projects (one in the Indian sample) there are simplified additionality demonstration criteria¹². In the Brazilian case study, five projects out of nine analysed are small-scale, and here we also try to differentiate the analysis according to scale.

None of the analysed Chinese projects pass Step 0, as all of them begun their activities after November 2004. 57% of the analysed Indian projects (13 projects) do not go through Step 0. In five of these cases it is not necessary, as these projects are not claiming carbon credits retroactively. In nine of the cases, the project is small-scale, which means that it follows a simplified procedure to demonstrate additionality and thus can skip Step 0. Only one of the large projects claiming credits retroactively fails to include Step 0 in the PDD. This project was submitted for public comments in September 2006 and is still in validation, so this might be one of the deficiencies causing this delay in validation. In Brazil, four out of nine analysed projects pass Step 0, since they begun activities before November 2004. Half of them present the evidence of considering CDM early on in the project cycle just to the validation team, without describing it in the PDD.

All Chinese projects identify alternative scenarios to the proposed CDM project, taking into account their legal and regulatory requirements. 61% of Indian projects identify alternative scenarios. Most of the projects not doing it (8 out of 9) are small-scale, thus following simplified procedures. The only large-scale project not identifying alternatives is the HFC-23 destruction project, which is per se an additional project, since this is not a mandatory measure in India. In Brazil, similarly, seven projects identify alternative scenarios to the proposed CDM project, and the two not doing so are small-scale.

In the Chinese case study, half of the projects substantiate additionality through the investment analysis, two through the barrier analysis and one using both tests. In the Indian case, 18 out of the 23 analysed projects perform a barrier analysis to demonstrate additionality, three projects perform a full investment analysis and only one project performs both. The HFC-23 project shortly describes the regulatory and financial reasons why the project would not have been undertaken without the CDM incentive. None of the small-scale projects perform an investment analysis. Five of the nine Brazilian projects perform just a barrier analysis (four of them are small-scale), while one third make both barrier and investment analyses (one of them small-scale), and only one project performs only an investment analysis.

¹² The HFC destruction facility entails significant capital and operating costs and no benefits (apart from CER revenues), so the host entity has no direct economic incentive to incur these costs. Therefore, the proponent needs to provide proof that the quantity of HFC-23 destroyed is greater than the quantity required to be destroyed according to the host country's regulations. In India, there are no regulations requiring HFC-23 to be incinerated.

All Chinese projects argue having investment barriers for project implementation, but only half of them (three projects) perform a complete investment analysis, which helps to substantiate this barrier. In all three cases, the validator requested further clarification, documentation or data to substantiate the IRR calculation and/or benchmark, and as a result two of them included an annex with the detailed cash flow. All three projects perform a sensitivity analysis, although one of them limits this analysis only to changes in the operating hours of the facility.

Two of the Chinese projects performing barrier analysis also use the IRR to substantiate the investment barrier, but without providing a detailed account of their calculations or a benchmark figure. The third one just presents a qualitative description of the barrier, without any quantitative indicators.

In India, 16 projects argue having investment barrier for implementation, although only four of them make a full investment analysis. One of these projects choosing the investment analysis received a public comment criticising that the IRR calculation does not include the tax breaks available for the project, which could amount to most of the equity required for its financing, and that the IRR computation should be done for the whole life of the project (30 years), and not only for ten years. In this project, the project owner is one of the leading exporters in the renewable energy sector in the country, known to financial institutions, so that financial barriers should not really constitute a major inhibition to the project. The validator, however, accepted their investment barrier argumentation.

Another Indian project choosing the investment analysis option received also a public comment criticising that the IRR calculation is not transparent. Indeed, it does not include the full financial calculations in the PDD, and the sensitivity analysis is not very complete, since it considers just one factor.

The arguments brought forward by Indian projects to substantiate the investment barriers in absence of a full investment analysis refer to the different risks borne by the projects (resource reliability, changes in energy or related policies, climatic risks, delays in payments for power, lack of experience in the power sector), to difficulties in achieving the financial closure, to the higher costs of the CDM project compared to the alternative scenarios or to the low expected returns.

However, although access to finance can be a challenge due to the Indian banks' conservative risk approach, known companies usually do not find severe borrowing constraints, which is the case of several of the analysed projects. Also, local financial institutions are increasingly developing schemes that include CER revenues as collateral for loans (see e.g. Kumar, 2007; Babakina, 2006). Finally, some of the projects arguing low returns on investment use the IRR to defend their case, but without showing the detailed calculations or sources of information. For these reasons, in some cases the investment barriers described in the Indian PDDs are not convincing.

All nine Brazilian projects argue having investment or financial barriers for project implementation, but only four of them perform a complete investment analysis. The investment barriers are not only related to low expected returns on investment in the absence of the CDM component, but also related to difficulties in accessing financing. Three of the projects performing a complete investment analysis perform a sensitivity analysis, and another one says it does, but without including it in the PDD. Only in one of these projects the validator requested additional details of the investment analysis as well as the benchmark IRR

for the sector in Brazil, so that it could review the calculations made. This project is the only one that performed just an investment analysis, without description of other barriers.

The Brazilian projects performing just a barrier analysis also include financial indicators to substantiate the investment barrier, but without the full calculations, which can be regarded as a way to avoid showing the whole cash-flow calculations. Additionally, almost all of the Brazilian projects report finding difficulties accessing financing. A third of them perceive that Brazil lacks a long-term debt market, as the only supplier of long-term loans is BNDES, the Brazilian National Development Bank; two PDDs mention the excessively high interest rates existing in the country; and five argue that the new, unproven technologies used in the projects make investors, lenders or buyers (of electricity) wary, thus increasing the project's financial risks.

Other barriers found in the Chinese projects are technological (two thirds of the projects), unsuitable infrastructure, organisational and prevailing practice ones.

14 Indian projects (61%) also mention technological barriers for implementation, and 11 claim having faced prevailing practice barriers. Other types of barriers mentioned are related to the location of projects and the derived geographical and resource risks, and to institutional, regulatory, managerial and market constraints.

Five of the Brazilian projects also describe technological barriers for implementation. These include lack of technology suppliers for wind turbines; technical limitations imposed to the electric grid by a fluctuating feed such as wind energy; a prevailing trade-off between efficient technologies and economic efficiency at bagasse cogeneration plants; very advanced swine manure management technology with high operation, maintenance and monitoring requirements and increasing costs for smaller livestock populations; unknown reliability of the use of biomass boilers in the beverage sector.

Other types of barriers mentioned in Brazil are institutional ones, mainly due to the regulatory instability in the electricity sector in the country, but also due to prejudices against new sources of electricity from the buyers' side, lack of secure buyers for excess electricity produced, fragmentation and conservativeness of the industry leading to lack of motivation to invest in efficient cogeneration facilities, and inadequate commercial contractual agreements with energy buyers. There are also legal barriers, since advanced swine manure management systems are not required by law in the country, and barriers related to the low reliability of raw material supply for a biomass energy project.

In an in-depth analysis of the barrier argumentation of registered CDM projects in Brazil, Hild (2007) discusses that some of the above-mentioned barriers are not valid for substantiating additionality. Concerning the institutional barrier, for example, he points out that project developers do not explain in the PDDs how the CDM registration would contribute to remove it, and thus, even if this situation is really complicating or preventing project implementation, this barrier does not comply with the requirement that "if the CDM does not alleviate the identified barriers that prevent the proposed project activity from occurring, then the project activity is not additional" (version 3 of the additionality tool, p.7).

All analysed Chinese projects go through step 4 of the additionality tool, this is, the common practice analysis. However, in two of the PDDs this analysis does not seem detailed enough, as it does not really present other similar projects happening in the region or country. One of these projects, a large hydro power plant, received a public comment during the publication of

the PDD in the UNFCCC's webpage, expressing doubts about the quality of the PDD, including the common practice analysis in the additionality section: "In common practice analysis, I see there were already 500 MW small hydropower projects developed without CDM. It's not "very few". In addition, hydro electricity is more than 60% of all electricity generation capacity in Hubei"¹³.

21 out of the 23 analysed Indian projects include a common practice analysis. However, in seven of the PDDs this analysis does not seem detailed enough again. In Brazil, seven out of the nine analysed projects include a common or prevailing practice analysis. From the two projects not passing this step, one is small-scale and one is large. Also, in one of the PDDs this analysis does not seem detailed enough, since it does not provide any quantitative data of what proportion of the industry uses the technology.

With respect to the common practice analysis in CDM projects, in Brazil there is a critical question: when does the prevalence of CDM projects change the baseline? This applies, for example, to the use of bagasse cogeneration projects in the sugar cane industry as well as to improved swine manure management. Neither the DNA nor the project developers know how to deal with this question, at least not in a future second crediting period when the projects are up for renewal. No CDM project in the world has been approved for renewal yet, so the rules for this step are not yet clear.

The use of high-efficiency cogeneration for bagasse burning is starting to become standard practice, at least for all new ethanol mills being built¹⁴. This process is being driven both by the incentive of the CDM but also by higher electricity prices; and with the ongoing consolidation of the ethanol industry the arguments about a fragmented and conservative, unmotivated industry and about difficulties in marketing this kind of electricity are gradually weakening¹⁵. Similar situation faces a project related to fuel switch in a paper mill, where all the technologies involved are available in the market and have been used effectively in Brazil. It has been argued that there are other barriers (financial challenges, lack of support from the government) and that this mill is the smallest of all the Brazilian mills using the technology, but this might not be a strong enough point to classify this project as 'not common practice'.

Finally, all six projects in China describe the way in which they expect the CDM will help to overcome the described barriers (impact of CDM registration). Three of them provide a quantitative account of the effect of the CDM on their expected revenues, and the other three give a qualitative description of these effects.

Only 12 Indian PDDs (around half of the sample) describe the way in which they expect the CDM will help to overcome the described barriers in detail, other three do it very briefly, and another two just show it in terms of IRR improvement. Six of the PDDs do not describe the expected impact of CDM registration at all.

Also not all the Brazilian projects describe the way in which they expect the CDM will help to overcome the described barriers. A third of them give a detailed account of the impact of

¹³ Comment by Long Yan, Huaneng Environmental Consulting, available at http://www.dnv.com/focus/climate_change/projects/projectdetails.asp?ProjectId=514.

¹⁴ Retrofitting old, low-efficiency cogeneration facilities is still quite expensive and thus would face more barriers than installing new, high-efficiency cogeneration plants from scratch.

¹⁵ Here again, Hild (2007) explains that this cultural barrier, presented frequently by bagasse cogeneration projects, is based on a 1999 study, which is already old and which refers to the general sector, but "does not consider the individual project at all" (p. 74).

CDM registration, though one of these does it only qualitatively. Further two just show the impact of CDM in terms of IRR improvement. And four of the PDDs (two large and two small projects) do not describe the expected impact of CDM registration at all – of course, in some of these cases it can be deduced that the impact will make the project economically viable.

One third of the Chinese projects lack, in the additionality section of their PDDs, independent sources of information, sufficiently objective barrier analysis and detailed common practice analysis. These projects have been in validation for over a year, without having been submitted for registration yet, and this lack of quality of the additionality argumentation might be one of the reasons why. All the Chinese projects already registered were requested additional information, documentation or clarification to substantiate the additionality argumentation by the validators, and thus show an improvement in the quality of additionality argumentation between the PDD submitted for validation and the one used for registration.

In the Indian PDDs, in other aspects the quality of the argumentation is also generally poor: Only five out of the 23 analysed projects consistently cite independent evidence to substantiate the additionality argumentation, while seven cite few, insufficient references and another eleven do not cite any. Six of the projects in the Indian sample received public comments during validation criticising their additionality argumentation. In four of these cases, the projects are still in the validation phase, and thus the answer to the public comments is not yet available. One comment was not considered valid, because the person submitting it is “not an accredited observer organisation to the” UNFCCC COP (cited from the validation report). The other comments received answers from the project proponents that were considered acceptable by the validating DOE.

Also six Indian projects received requests for clarifications or corrections from the DOE during validation. This relates only to the 11 already registered projects, since for the other 12 there is no validation report yet. Considering the long time these projects are spending for validation, they very likely have had many corrections to the PDD.

Five of the assessed Brazilian projects consistently cite independent evidence (including three small projects), while two cite few, insufficient references, and another two do not cite any independent source of information at all. In general, in some of the Brazilian projects the quality of the argumentation is weak, too, lacking independent references or detailed, transparent calculations. Thus, in three of the cases the validation team required additional information or substantiation to complete the additionality argumentation, and in a fourth one the EB requested a review requiring, among other observations, further demonstration of additionality.

Additionality in rejected and withdrawn projects

We also use the steps of the Additionality Tool to assess the substantiation of additionality in all rejected and withdrawn projects till June 2007.

70% of rejected and 75% of withdrawn projects identified alternatives to the project activity. This step of the tool does not appear to be influential for project failure.

There is a clear predominance of barrier analysis (instead of investment analysis) in rejected and withdrawn projects: 95% of rejected and 100% of withdrawn projects performed a barrier analysis, while in only 20% of rejected and 50% of withdrawn projects an investment analysis

was carried out.

The type of barrier most commonly mentioned is technological or technical (75% for rejected and 75% for withdrawn projects), followed by investment or financial barriers (55% and 100%, respectively), prevailing practice (50% in both rejected and withdrawn projects) and market barriers (40% of rejected projects). Other barriers mentioned were regulatory risks, climatic uncertainty or resource availability, managerial, and logistics and infrastructure. These barriers do not differ significantly in type from the ones in the samples of registered projects analysed above. Only among the rejected projects are technological barriers more frequent than investment ones, so opposite than in the case studies.

Although many projects indicate the presence of financial or investment barriers, most of them do not present a proper investment analysis, few present a comparison of the IRR without detailing the input data, and many present just a qualitative description of the financial barrier.

An important characteristic of the barrier analysis in all of these projects is that not enough third-party evidences or references are used to demonstrate the barriers presented: 10 projects (half of all rejected ones) provide no independent sources of information at all in the additionality argumentation in the PDDs; 35% of rejected projects provide few independent sources of information, most of them not enough to substantiate the barriers; and only 15% of rejected projects make a real effort to substantiate their additionality argumentation with independent evidence.

Another problem found in the barrier analysis of rejected projects is the actual nature of the barriers being discussed. In some cases, the barriers do not apply to the CDM project itself, but to the industry sector where it has been applied. In others, the issues presented as barriers are normal characteristics of all investment projects, even without CDM – e.g. going to a tender and bid process to win an electricity concession, or having to invest in new equipment (without explaining why it is especially difficult to find the financing for the investment, or why the returns for the investment are not sufficient to make it financially feasible). The EB members observed in 2 projects that there was lacking information on cost savings due to the CDM project, and thus that the investment barriers could not be accepted. They also required an investment analysis for 3 other projects, due to similar considerations.

In many cases also, it is not clearly shown how the CDM will help to overcome these barriers: 6 projects (30% of all rejected ones) did not explain in the PDD how the CDM will help to overcome the barriers; 8 (40%) explained it in some detail, but just qualitatively; only the remaining 30% give a quantitative account of how CDM revenues will be used. Withdrawn projects perform better in this sense: 50% of them gave a quantitative explanation of impact of CDM registration, 25% gave a qualitative explanation and 25% gave no explanation.

It is remarkable that 65% of the rejections were caused – at least in part – by problems in the additionality demonstration. The specific reasons given by the Executive Board for rejecting these projects were:

- Barrier analysis not sufficiently convincing or demonstrated (13 out of 13 projects)
- Lack of financial analysis (3 projects)
- Common practice analysis not sufficiently demonstrated (2 projects)
- Serious consideration of CDM from the beginning of project planning not sufficiently demonstrated (2 projects).

As can be seen, all of the projects rejected due to additionality have problems with the barrier analysis, and some have other additional deficiencies. On the contrary, none of the projects where an investment analysis was carried out was rejected due to additionality.

Further analysis shows that 69% of projects rejected due to additionality took place in India, and 15% each in Brazil and Mexico. Also, as said before, 46% of them belong to the cement blending type, 23% to industry type, and 15% each to wind and hydro generation. There are also differences between large and small projects: while 75% of large projects were rejected due to additionality (all those which did not perform an investment analysis), only 50% of small ones were, even though only 12.5% of small projects performed an investment analysis.

With respect to the withdrawn projects, only one of them had observations with respect to additionality demonstration from the EB members, project that had performed only a barrier analysis.

From this analysis we can infer that projects with PDDs with only a barrier analysis for additionality demonstration could have a higher risk of being rejected than projects with a full investment analysis, especially in the case of large projects.

Opinions from experts

One expert interviewed for this study stressed that his company performs a due diligence of all projects regarding additionality, but it does not have all the information to assess it properly. He had serious doubts about the additionality of some projects, especially very large ones, because as they involve very high levels of investment, it is not easy to believe that they are not financially attractive. Experts consider it easy to turn around numbers, choose the indicators and benchmarks that suit you best.

From the buyers' view, additionality is regarded as an "Executive Board problem": it is not about additionality itself, but about getting the project registered.

Another interviewee suggested that the ideal project, in order not to have problems with additionality, is when the project owner approaches the consultant at an early stage, when they are still making an investment decision.

Yet another interviewee argued that argumentation regarding additionality is certainly a challenge for each project. The most important steps are "identification of alternatives" and "common practice analysis". Certainly in most of the cases, it has been found that the investors did have a clear idea on available alternatives, but they lacked detailed investigation beyond a certain stage and the option implemented had been decided based on the marketing skills of the equipment suppliers. He stressed that the EB was now opposed to wind projects from India and hydro projects from China. He complained about the Registration and Issuance Team¹⁶ starting to challenge the state electricity regulatory commissions in India, which are independent entities, regarding plant load factors and tariffs for wind power projects. He stressed the reasons why wind projects are additional in India, despite the doubts from the EB and the RIT team.

¹⁶ The CDM Registration and Issuance Team (RIT) assists the CDM EB in the evaluation of requests for registration of CDM projects and requests for issuance of CERs. It was created in 2006.

Conclusions for this section

From the analysis in the three case studies we conclude that additionality demonstration is still a problem in all three countries, whereas all of them have both good and bad examples of additionality demonstration. In a first assessment of 19 Indian projects registered up to May 2006, we found only two very good examples of additionality demonstration, and 5 projects for which the doubtful arguments should have triggered a rejection. Worse still, in a recent assessment of additionality in all CDM projects registered by mid-2007, Schneider (2007) estimates that additionality is unlikely or questionable in about 40% of them. Our analysis shows moreover that there are problems in all the most important steps of the additionality tool (barrier analysis, investment analysis, common practice analysis, demonstration of the impacts of CDM registration) and that independent evidence to support the argumentation is missing in a large proportion of the PDDs.

While in China half of the analysed projects centre the additionality argumentation in an investment analysis, in India most projects perform a barrier analysis and in Brazil several projects do both.

Investment barriers are the most commonly argued in the three countries: In China and Brazil all projects argue having them, and in India 70% of projects say so, too. The arguments brought forward to substantiate the investment barriers in absence of a full investment analysis refer, in India, to the different risks borne by the projects, to difficulties in achieving the financial closure, to the higher costs of the CDM project compared to the alternative scenarios or to the low expected returns. However, although access to finance can be a challenge due to the banks' conservative risk approach, reputed companies usually do not find severe borrowing constraints. Indian banks are also increasingly accepting CERs as collateral for loans. Some of the projects arguing low returns on investment use the IRR to defend their case, but without showing the detailed calculations or sources of information. Thus, in some cases the investment barriers described in the PDD are not convincing. In the Brazilian case, the investment barriers are related not only to low expected returns on investment, but also to difficulties in accessing financing, high interest rates or high financial risks.

Technological barriers are also frequently mentioned in all three countries, for different project types. In India and Brazil, institutional and regulatory barriers are also frequently mentioned. In both countries, the energy sector has indeed suffered frequent regulatory changes. Concerning this institutional barrier, however, we may argue, as Hild (2007) does for the Brazilian case, that there is no evidence on how the CDM would contribute to alleviate this barrier, and thus it is not valid for additionality argumentation.

Although most projects in the three countries perform the common practice analysis required by the Additionality tool, in several cases this analysis does not seem detailed enough.

The contribution of CDM registration for alleviating the mentioned barriers is described in all Chinese projects, but not in all Indian or Brazilian ones. Some PDDs substantiate the contribution of the CDM for project success just in terms of IRR improvement, while others prefer a qualitative, descriptive approach.

One third of the Chinese projects lack independent sources of information, sufficiently objective barrier analysis and detailed common practice analysis. These projects have been in validation for over a year, without having been submitted for registration yet, and this lack of quality of the additionality argumentation might be one of the reasons why. All the Chinese

projects already registered were requested additional information, documentation or clarification to substantiate the additionality argumentation by the validators, and thus show an improvement in the quality of additionality argumentation between the PDD submitted for validation and the one used for registration.

Only five out of the 23 Indian projects consistently cite independent evidence to substantiate the additionality argumentation. Six of the Indian projects in the sample received public comments during validation criticising their additionality argumentation, and also six projects (out of the eleven already registered) received requests for clarifications or corrections from the DOE during validation.

In two of the Brazilian projects the arguments given for substantiating additionality are weakened somewhat, because the technology is rapidly spreading in the country, and in another one because of the age of the equipment being replaced. Furthermore, also some Brazilian projects lack independent references or detailed, transparent calculations, and thus in three of the cases the validation team required additional information or substantiation to complete the additionality argumentation, and in a fourth one the EB requested a review requiring, among other observations, further demonstration of additionality.

We also analysed the quality of additionality argumentation in the rejected and withdrawn projects. In these, there is a clear predominance of barrier analysis (instead of investment analysis). The types of barriers brought forward in these projects do not differ significantly from the ones in the samples of registered projects. Only 15% of rejected projects make a real effort to substantiate their additionality argumentation with independent evidence, which is below the proportion in registered projects.

It is remarkable that 65% of the rejections were caused – at least in part – by problems in the additionality demonstration. In all of them, the barrier analysis was found not sufficiently convincing or demonstrated. Additionality demonstration seems to be a more critical issue for large projects than for small: while 75% of large projects were rejected due to additionality, only 50% of small ones were.

PDDs with only a barrier analysis for additionality demonstration could have a higher risk of being rejected than those with a full investment analysis, especially in the case of large projects.

6.7. Quality of stakeholder consultation

Promoting sustainable development in the host countries is one of the main objectives of CDM projects. To this end, CDM projects have to receive a national approval from their Designated National Authority (DNA), which is based on the sustainability benefits that the project will achieve in the host country. Moreover, the Project Design Documents have to explicitly detail what are the expected sustainability benefits to be achieved by the projects, they have to present the documentation related to the environmental impact assessment of the project, and they have to describe how the relevant local stakeholders were allowed to participate and make comments on the project. By engaging in consultation with the relevant stakeholders, projects can demonstrate that they respond to the development demands of the local population, while ensuring social and environmental sustainability.

However, there are no specific internationally recognised requirements for ensuring good-quality stakeholder consultation processes in CDM projects, apart from voluntary certification schemes such as the CDM Gold Standard¹⁷. In line with national sovereignty considerations, it is up to each host country to establish its own requirements for stakeholder consultation. Some countries may even not do so at all, leaving it up to the project developer to decide in which manner they invite stakeholders to participate. Therefore, the stakeholder consultation process varies from project to project and its analysis can provide an idea of how seriously a project developer, vis-à-vis the in-country regulations, considers participation and social engagement.

According to Boyd et al. (2007), it can be misleading to evaluate project performance in terms of sustainable development benefits only through project documentation, since local conflicts might not be visible due to biases in selecting participants for stakeholder consultation meetings (Cole, 2006; Corbera and Brown, 2007). Nonetheless, in this and the following section we will assess both stakeholder participation and sustainable development benefits on the basis of the statements made in the projects' PDDs, again for the case studies in China, India and Brazil.

Findings from the country case studies

With respect to the stakeholder consultation, the Chinese government has a centralised CDM approval procedure and the DNA has not established any explicit procedure to fulfil this CDM requirement. Chinese provincial or local government bodies have no mandate to clear or approve CDM projects independently.

In the Indian case there are also no specific requirements for the CDM stakeholder consultation process. Thus, CDM project developers frequently use the consultation requirements of other instances – EIA approval process, Panchayat¹⁸ letter of no objection – as demonstration of the project's stakeholder consultation process. Assessing the means used for inviting stakeholders to issue comments and participate in project design can provide an idea of how seriously a project developer considers participation and social engagement.

In Brazil, despite an ambitious procedure for inviting stakeholders to issue comments, including a standard list of relevant stakeholders, defined by the DNA, projects receive very few comments. According to Mr. José Miguez, the head of the Brazilian DNA, less than 5% of Brazilian CDM projects receive any comment from stakeholders, and most of the comments received are of a general character and not really commenting on project design (e.g., the local major welcoming the project).

This situation can be partly explained by a lack of capacity: most Brazilian NGOs do not have the technical knowledge or the time to comment on hundreds of proposed projects. Or they prioritise other issues above the CDM (Miguez, 2007). This is a common problem with consultation; even if there is an opportunity for civil society to comment, it is not always clear that the information reaches the local community or that there is an interest or capacity to engage. Although a rather elaborate stakeholder consultation process is mandated in Brazil, some project developers do include extra consultation processes, such as hosting local public meetings, which allow for a communication to a wider community than the one considered in the standard procedure.

¹⁷ Currently, only four registered CDM projects are officially acknowledged as Gold Standard. Information is not complete as to how many projects are requesting registration as Gold Standard, but at least there are twelve in this process (<http://www.cdmgoldstandard.org/projects.php>).

¹⁸ The Panchayat is the elected representative body of the local population, and its permission is needed for any project being set up in the village's jurisdiction.

The first step to make a consultation possible is to identify the relevant stakeholders. All six Chinese projects and 21 out of 23 Indian projects analysed identify their stakeholders, however, the number of organisations or rather “categories” of stakeholders vary greatly, between just one category of stakeholders (local land owners) and ten categories.

All Chinese projects identify local residents or landowners as relevant stakeholders, and almost all of them mention also the government officials, among other local actors. In the Indian case, the village Panchayat, the representative body of the local population, is the stakeholder most frequently mentioned, and the communities themselves follow. Interestingly, some PDDs identify the Panchayat and the community as two separate groups. The state government agencies providing several clearances and permits to projects – Pollution Control Board and Electricity Board, for example – are also frequently recognised as stakeholders, as well as the project’s consultants, equipment and raw material (biomass, fly ash) suppliers. Only four projects consider NGOs as relevant stakeholders.

The Brazilian procedure establishes that the following stakeholders have to be engaged in consultation:

- Local municipal administration
- Local municipal legislation chamber
- Municipal and state environmental agencies
- Brazilian NGO Forum
- Local community associations
- District attorney.

Seven of the Brazilian projects identify and contacted the stakeholders as established by the DNA. The other two consultations took place before this procedure was published (11th September 2003), so they identify their stakeholders in an ad-hoc manner. One of them identifies five interest groups (public sector agencies, NGOs, related private sector enterprises, international climate change organisation, scavengers). The other one considers the stakeholder consultation made with local municipalities for obtaining the environmental licenses for the project as also sufficient for the CDM.

On the other side, the number of people actually responding to the project developer’s invitation to participate in a public consultation process also varies significantly from project to project. In the Chinese case, two projects had a response from over 50 people, one project had between 20 and 50 people attending its meeting, another project had below 20 respondents and two do not specify in their PDDs how many people gave feedback.

In the Indian case, although PDDs usually identify many different stakeholders as relevant to the projects, only four of the PDDs provide information on the actual number of people attending their consultation meetings. Most PDDs just provide a description of the instances through which they have needed to pass in order to get the project approved and running. They mention thus the state Pollution Control Board, which is responsible for the environmental clearances for the projects, or the Electricity Board, with which the Power Purchase Agreement is signed, and the Panchayat, which gives the permission for setting up of the project under the jurisdiction of the village. They frequently also mention the consultants that helped to design the project, and the suppliers of technology and raw materials. Thus, although project developers prove in this way that they have approached several governmental and private instances in order to execute the project, they do not prove

that they have undertaken a specific consultation process for the CDM component of the project.

In Brazil, the number of real responses to the invitation varies from zero answers (four projects, all of which just followed the standard procedure) to four answers (one project). The remaining four of the analysed projects do not state in their PDDs how many people answered their invitations. These are all projects that followed a different or additional consultation process as the one required by the national regulation, and thus did approach several stakeholders in public or private meetings. One of the project sponsors stated that representatives from around 14 organisations (public, private, academic and non for profit sectors) were present at the public meetings held by them.

It is also interesting to analyse what kind of communication media project developers use to engage stakeholders, invite them to participate and receive their comments. Using open, mass communication media (such as radio, TV or public notices in community centres) shows that “everybody is invited”, which is a sign of openness and transparency in the consultation process. Using, on the other hand, only “closed” communication channels, directed to specific people or organisations (letters, emails, telephone calls), can limit the ability of the general public to express their concerns. We should note here that the results from this analysis may also reflect rather the local institutional setting than project developer’s degree of openness.

In this analysis, two stages are differentiated: the communication media used for inviting stakeholders to make comments, and the media used during the consultation process itself.

In the China case study, half of the analysed projects do not describe in their PDDs what the communication media used for inviting stakeholders is. The other half uses written media¹⁹, directed to specific stakeholders, possibly limiting the range of stakeholders allowed to participate. Half of the Chinese projects used a written survey or questionnaire as the tool for gathering comments, one of them in a process linked to the Environmental Impact Assessment (EIA) for the project, one additional to the EIA consultation, and one in cooperation with the local government. While allowing the participation of a large number of different people, written surveys gather comments that might not be sufficiently informed (a survey normally includes a brief written description of the project and its expected benefits, but does not allow for detailed explanations and answers to questions and doubts, as consultation meetings do). They also normally have concrete questions and provide limited space for additional comments. In one of these cases, the validator additionally organised a public discussion with some local families. One third of the projects in China organised public meetings and had additional discussions with authorities. One project, finally, does not state in its PDD what kind of consultation process it organised, but states that it had been linked to the EIA process and the acquisition of permits and governmental licenses.

In India, the preferred consultation method appears to be the meeting, although this procedure is frequently mixed with the process of getting the necessary governmental licenses. Ten of the projects do not detail in their PDDs the means of communication used for inviting stakeholders to submit comments. Seven used closed communication media, this is, letters, emails, or other forms of direct communication with specific stakeholders, which limited the range of stakeholders allowed to participate. Only six projects used open communication media to announce the stakeholder consultation process publicly (e.g. advertisements in local

¹⁹ Written surveys or questionnaires directed to a specific number of people. Depending on the method used for selecting the sample of people to include in the survey, which is not described in any of the cases, the sample could or could not be representative of all the projects’ stakeholders.

newspapers, public notices in villages). Almost half of the Indian projects refer to the process of getting the necessary permits and clearances, including the Panchayat's "no objection certificate", as the way to engage in public consultation. At the same time, 70% of the project PDDs mention having had some kind of meeting with local population, stakeholders or Panchayat members, in which they presented the project and invited comments and questions. One of these projects organises a regular meeting with the identified stakeholders every six months. In several cases it is however not very clear, whether these meetings were organised because the general national environmental or municipal regulations require them, or because of the CDM stakeholder consultation itself. Few PDDs mention different consultation processes, such as outreach and information activities to customers (cement blending project), newspaper invitations to issue comments, or a direct approach to stakeholders. One PDD does not really describe the consultation process, but the stakeholders, their importance, the necessity to involve them in the project and the benefits provided to them. Four other PDDs do not describe the consultation process very clearly.

In one Indian project, there was a public comment during validation that criticised the consultation process because most of the attendants were the company's employees, and only three or four were villagers and another three to four were government representatives. It thus demanded a newspaper advertisement to be published to invite stakeholders. The project proponent answered that in reality four consultation meetings had been organised: one with key stakeholders, one with local stakeholders, one with the Panchayat and one with the district collector. The DOE accepted this explanation.

One third of the analysed Brazilian projects used only letters (closed communication media) for inviting stakeholders for submitting comments, in accordance to the country's procedures. Another third of the sample used newspaper adverts and letters to publicise the consultation process. One project states having used emails, personal communications and apparently other, possibly open media, to invite stakeholders. Another one does not describe the communication media used, but states having followed the procedure, so it can be assumed that it also used letters to communicate with stakeholders. The remaining one does not describe clearly which media it used, but refers to a 'public' meeting. Five of the Brazilian projects expected just written comments to be sent to them, and only one of them received comments. The remaining four projects organised stakeholder consultation meetings. Out of them, one project held these meetings as part of the environmental licensing process required by the national regulations, and another one organised additional interviews with specific interest groups. Some of the project developers organised some additional measures to ensure stakeholder participation. A small hydro project, for example, is working with local communities on environmental education projects, reforestation of degraded areas, regular water quality assessment, support for environmental parks, hiring of local manpower, erosion control, and support for community agriculture. Another project organised a survey among the people attending the public meeting in order to assess the acceptability of the project; the results of this survey are however not available in the PDD. It also made public a permanent email address and phone number to answer questions or clarifications regarding the CDM project. Another PDD mentions that additionally to the letters sent to specific stakeholders, a copy of the letter will be open for public comments in English and Portuguese versions.

One of the conclusions that could be drawn from this analysis is that the Brazilian standard stakeholder consultation procedure in its present format is not able by itself to successfully reach out to local stakeholders. From the projects analysed, only one summarises in its PDD the questions and concerns expressed by the stakeholders, and this is possible because it organised public meetings, where discussion was possible. Only this project and other three

could provide an idea of the sustainability impacts felt by stakeholders. This results also in a lack of information about the local development expectations of the nearby residents, which therefore cannot be incorporated into project design.

Stakeholder consultation in rejected and withdrawn projects

The description of the stakeholder consultation processes in rejected and withdrawn CDM projects does not differ significantly from the ones in registered projects. As in the country case studies described above, PDDs in most rejected and withdrawn projects (95% and 75%, respectively) identify the relevant stakeholders. However, stakeholder identification was again not uniform in the projects: some of them identified just “categories” of stakeholders, others identified specific organisations, and others identified persons within organisations. Also, also in the failed projects the amount of stakeholders identified and invited to participate differed greatly: of all failed projects, the majority (71%) identified between 5 and 9 categories of stakeholders, but some identified less than 5 categories, some more than 10 and some did not identify the stakeholders. Similarly, the number of stakeholders answering the invitation – either attending a stakeholder meeting, writing letters, or posting comments on the projects’ webpages – varied significantly or was not given at all: 67% of failed projects did not mention in the PDDs how many stakeholders had answered the invitation, 8% had below 20 answers, 17% had between 20 and 50 answers and 8% had over 50.

The communication media used for inviting stakeholders were again very varied: letters, newspaper advertisements, invitations on the notice board of the local village, invitations in the projects’ web pages, public broadcasts. 54% of the projects used communication media that were directed to specific stakeholders, such as letters or emails, 25% used both invitations to specific stakeholders and open media, 8% used just open media and 13% of projects did not describe in the PDD the communication media they used. An important share of the failed projects used various communication media at the same time (33%). Most of the projects organised meetings for presenting themselves and asking for comments (50%), many expected written comments (29%), others expected comments to be posted on their webpages (17%), and others used other media (questionnaires, forums, seminars, workshops, consultation integrated in the EIA process, interviews). An important share of the failed projects used various forms of consultation at the same time (25%). 50% of failed projects received positive comments from the stakeholders, 21% did not receive positive comments and 29% did not report about receiving or not receiving positive comments. 37.5% of failed projects received negative comments or questions from stakeholders, and they were all answered in the PDDs.

It is interesting to note that one of the rejected projects included social and environmental indicators in the CDM monitoring plan, thus indicating a commitment with sustainable development that went further than was required for CDM registration.

As these failed CDM projects come from different countries, in some cases these results reflect the national regulations regarding stakeholder consultation processes. We have not been able to draw any links between quality of the stakeholder consultation processes described in the PDDs and the rejection or withdrawal of projects.

Opinion from experts

Accordingly, stakeholder participation was not seen by the experts interviewed as a problem, except for wind and large-scale hydro projects where either the contractors or the investor do not involve local stakeholders.

Conclusions for this section

There are no specific internationally recognised requirements for ensuring good-quality stakeholder consultation processes in CDM projects, apart from for example voluntary certification schemes such as the CDM Gold Standard. It is up to each host country to establish its own requirements for stakeholder consultation, and some countries do not do it at all.

Neither in China nor in India are there specific procedures for carrying out stakeholder consultations in CDM projects. On the contrary, Brazil has established a standard procedure. In China, the consultation method mostly used is the written survey or questionnaire, followed by the public meeting. While allowing the participation of a large number of different people, questionnaires gather answers that might not be sufficiently informed and provide limited space for additional comments. Several of the Chinese PDDs do not provide sufficient information on the consultation methods, the people participating or the communication channels they used. This could reflect just the current institutional situation in China or also a lack of transparency in the description of the consultation process. In India there are several procedures that investment projects in general need to follow in order to be allowed to operate, including the approval from the village representative body, the Panchayat. The description of the stakeholder consultation process seems to follow a standard model in Indian projects, although there is no regulation about it. So, for example, it is common practice thus to identify the Panchayat as a relevant stakeholder, as well as the state government agencies providing permits or licenses to projects. Consultants and suppliers are also frequently identified as stakeholders in Indian projects. Almost half of the projects refer to the process of getting the necessary permits and clearances as the way to engage in public consultation. 70% of the PDDs mention having had some kind of consultation meeting. However, several PDDs do not describe the consultation process clearly, and many do not prove that they have undertaken a specific consultation process for the CDM. The Brazilian DNA has established a mandatory, standard procedure for inviting stakeholders to issue comments to CDM projects, which consists of a written consultation to a defined group of stakeholders. However, less than 5% of Brazilian CDM projects receive any comment from stakeholders, and most of the comments received are not really informing project design. In the sample, only one of the projects that followed this procedure received comments from stakeholders. Other projects organised additional consultation meetings and/or interviews, and all of these received comments or questions about the project. The Brazilian standard stakeholder consultation procedure, with a one-way communication that offers respondents a chance to send written comments themselves, does not seem to be sufficient for gathering potential concerns, expectations or questions from local stakeholders.

We have not been able to draw any links between quality of the stakeholder consultation processes described in the PDDs and the rejection or withdrawal of projects. As the failed CDM projects come from different countries, in some cases these results reflect the national regulations regarding stakeholder consultation processes.

6.8. Quality of sustainability benefits

Similarly as for the stakeholder consultation, the Marrakech Accords established that it is the host country's prerogative to define whether a CDM project contributes to sustainable development (UNFCCC, 2001). Thus, international sustainable development standards are absent (Sutter and Parreño, 2007), except again for the CDM Gold Standard, which is voluntary and not yet widely used. Several studies show that CDM projects are failing to achieve real synergy between emission reductions and sustainable development in the host country (Lohmann, 2006; Boyd et al., 2007; Michaelowa and Michaelowa, 2007; Olsen, 2007; Sirohi, 2007).

In the following paragraphs we compare the findings about sustainability benefits of CDM projects found in the three country case studies in China, India and Brazil.

Findings from the country case studies

The Chinese government considers sustainable development to be a national strategy and China's approval procedures and requirements stress that CDM projects must make a contribution to sustainable development. So far, however, the CDM approval procedures do not include quantifiable indicators to measure project's contribution to sustainable development. Projects are rather evaluated on the basis of their impact within a clearly defined priority area than by a quantified measurement of sustainable development (IGES and CREIA, 2005).

China has identified the following priority areas for CDM project implementation: energy efficiency improvement, development and utilisation of new and renewable energy sources, and methane recovery and utilization. These priority areas comprise projects reducing carbon dioxide and methane, because reducing emissions of these two GHGs is closely related to energy conservation and renewable energy development, and it often involves much higher emission reduction costs per unit. The emissions of the other four GHGs are mainly generated by chemical industries, and reducing them generally involves end-of-pipe treatment and other simple technologies. It also offers limited social, environmental or economic benefits other than GHG abatement or CER revenues. These emission reductions are thus charged with high levies by the Chinese government (IGES and CREIA, 2005).

India's Designated National Authority (DNA) assesses CDM project's sustainability contribution under the light of the national priorities set by the Indian five year planning process and according to the general understanding of sustainable development. For the last half century, India's development guiding principles have been sustained economic growth; poverty alleviation; food, health, education, and shelter for all; containing population growth; generating employment; self-reliance; and public participation in planning, programme implementation, and infrastructure development (IGES, 2005). Its last Five-Year Plan (2002-2007) reinforces India's commitment to the UN Millennium Development Goals and poverty alleviation.

Accordingly, the Indian National CDM Authority specifically emphasises that "CDM projects should be oriented towards improving the quality of life of the poor from the environmental standpoint"²⁰. The criteria it utilises for assessing project's contribution to sustainable development relate to social, economic, environmental and technological well-being. Nonetheless, it does not have any specific indicators for making the assessment. It can, if

²⁰ http://cdmindia.nic.in/host_approval_criteria.htm (accessed 25/01/2008).

needed, recommend additional requirements to ensure that project proposals meet the national sustainable development priorities, comply with the legal framework, are compatible with the local priorities and stakeholders are duly consulted. The Authority also “ensures that in the event of project proposals competing for the same source of investment, projects with higher sustainable development benefits and which are likely to succeed are accorded higher priority”. It finally supervises that project proposals do not involve diversion of official development aid²¹.

Brazilian requirements for CDM projects’ contribution to sustainable development, as set by the Resolution N° 1 of the Interministerial Commission on Global Climate Change (Brazilian DNA) of 11th September 2003, demand that project participants describe the project’s contribution to: local environmental sustainability, the development of working conditions and employment generation, income distribution, capacity building and technology development, and to regional integration and articulation with other sectors.

Table 6: Main concerns, demands and sustainability expectations raised by stakeholders

Type of concern, demand or expectation	Number of projects China	Number of projects India	Number of projects Brazil
Requests or expectations related to creation of local employment	5	5	1
Concerns about possible negative environmental impacts of project / Request for compliance with environmental regulations and management plans	5	4	-
Expectations of possible positive environmental impacts (improved waste management, reduced polluting emissions, etc.)	2	2	2
Requests to ease the local power shortage situation / Expectation for improved energy use, improved local electricity grid	2	-	1
Concerns about possible land expropriations, or displacement of population	2	2	-
Concerns about the invasion of local people’s rights	-	1	-
Requests for compensation to land owners if project affects their lands	1	-	-
Requests for further communication to communities about the project	1	-	-
Interest in replicability of project	1	-	2
Development or improvement of local infrastructure (roads, communications)	-	2	1
Request for right of way into the project’s roads after its implementation	-	1	-
Contribution to improvement of rural economy	-	1	-
Reduced GHG emissions, climate change mitigation	-	1	2
Production of renewable energy	-	-	1
Decreased need of water for energy use, allowing extra supply in a drought-prone region	-	-	1
Resource conservation (e.g. furnace oil, coal, etc.)	-	1	-
Request to be provided the ash generated by the project for use as fertilizer	-	1	-
Enhanced company’s profitability	-	1	-
Suggestion about further expansion of the plant’s capacity	-	1	-
Questioning of the use of wind power, since not the core business of the enterprise	-	1	-

Note: These results derive from the analysis of 6 Chinese, 23 Indian and 9 Brazilian PDDs.

The main concerns, demands or expectations raised by Chinese, Indian and Brazilian stakeholders in the stakeholder consultation processes are summarised in Table 6. The majority of stakeholders in China and India expect that local employment will be generated by the project. Some stakeholders also expect possible contributions to the development or improvement of local infrastructure, such as roads, communications and electricity provision

²¹ http://cdmindia.nic.in/cdm_india.htm (accessed 25/01/2008).

itself. In Brazil this differs, as local people scarcely express their opinions due to the institutionalised stakeholder consultation procedure. So in only one Brazilian project stakeholders expressed the expectation for local jobs. The most frequent concern expressed in China and India refers to possible negative environmental impacts brought by the project. In contrast, Brazilian stakeholders rather praise the positive environmental implications of the CDM projects analysed. Some Chinese and Indian actors also expect the projects to have positive environmental impacts.

In China, some of the concerns are related to the general negative perception of large hydro power plants, whose construction may entail negative environmental impacts and population displacement. In the last several years, news about local protests against hydro projects in China has spread (Chen, 2004; Cheng, 2005; Liu, 2007; Yardley, 2007; Everding, 2008). Although apparently none of these protests have involved projects within the CDM, this is a sensitive issue for large hydro power projects. In all the projects in the sample with these kinds of concerns, the developers have assured that none of the feared impacts will take place.

Table 7: Expected sustainability benefits according to PDDs

Type of sustainability benefit	Number of projects China	Number of projects India	Number of projects Brazil
Contribution to local economy through generation of employment and/or demand for local services	5	19	7
Reduced GHG emissions	-	20	6
Energy and/or resource conservation (coal, fossil fuels, minerals)	-	16	3
Increase of clean energy supply / diversification of electricity sources	4	8	4
Demonstration of a new, clean technology	2	12	3
Enhanced reliability of local energy supply	-	13	-
Reduced pollutant emissions	-	16	-
Improvement of local environment (air, water, etc.)	2	6	8
Improved waste management / reduced waste generation	-	9	-
Development of local infrastructure	-	8	1
Contribution to capacity development	-	5	2
Contribution to local development through investment in the area	-	5	1
Provision of capital investment to project developers / enhancement of local investment environment	3	-	1
Additional contribution to local development (provision of local health, education, civil society facilities, environmentally friendly activities, social development schemes)	-	4	-
Encouragement of replication projects	-	3	-
Use and propagation of indigenous technology	-	1	-
Development of new technologies	-	1	-
Possible contribution to further reduction of ozone depleting substances	-	1	-
Improved salaries for employees	-	1	-
Awareness raising among employees	-	1	-
Project location in poor rural area with high percentage of ethnic minorities ²²	1	-	-
Avoidance of potential hazards	-	-	1
No sustainability benefits detailed in PDD	1	-	-

Note: These results derive from the analysis of 6 Chinese, 23 Indian and 9 Brazilian PDDs.

²² This characteristic of the project is regarded by the Chinese authorities as a positive contribution to sustainable development, as the project is expected to contribute to poverty alleviation.

The demands and concerns raised by the stakeholders during the consultation processes can be compared to the sustainability benefits that the projects expect to achieve, as stated in the first part of their PDDs (see Table 7). In many of the cases, especially when referring to employment generation opportunities and positive environmental impacts, the concerns and demands of the population are in accordance with the sustainability benefits that the project developers expect to attain.

In the Chinese case, none of the PDDs gives a detailed, quantitative account of the expected benefits to be reached. Moreover, as can be seen in Table 7, all of the expected sustainability benefits derive directly from the project activities themselves or from the country's environmental regulations and requirements. In none of the cases any voluntary, additional contribution to local development (e.g. community support activities, corporate responsibility programmes) is mentioned.

In the case of India, it can be noted that the project developers' expectations regarding the sustainability benefits of projects largely exceed the expectations from the stakeholders whose opinions were gathered in the PDDs. All in all, stakeholders in India appear to express few expectations for direct local benefits from CDM projects, apart from job creation. This might be not because the stakeholders do not have expectations of concerns regarding the projects, but because not all relevant stakeholders participated in the consultation process or because the consultation process is not described with sufficient detail in the analysed PDDs. It also gives the impression that stakeholders are not really informed about the economic benefits (CER revenues) that project developers expect to achieve when registering their projects as CDM. They just see the general benefits brought to the area (more local investment, more local jobs, improved environment), but not the money that the developer will earn and the benefits that could "trickle down" to them from these revenues.

The quality of stakeholder consultation processes for CDM projects in India has already been questioned, as well as their compliance with environmental regulations and the effectiveness of the process to ensure sustainability benefits, for example by the online newspaper *Down To Earth*, issued by the Indian Centre for Science and Environment. In an in-depth investigation of two Indian industrial gas CDM projects, they found out that the questions and answers reported for the consultation process in the PDDs for both projects were exactly the same, even with the same spelling mistakes. "Even if the consultations were held, their record in the documents does not seem credible". Similarly disappointing results were found after enquiries about the expected sustainability benefits of the projects: not only the villagers around the projects had an history of complaints about the negative environmental impacts caused by the plants (before the CDM projects were started), but also none of the promised benefits to be achieved by the CDM projects were evident in the area around the projects or when asking company officials about them. A copy of one of the project's EIA (environmental impact assessment) could not be produced even after repeated requests, despite the fact that the validation report states having verified the existence of the study (Down To Earth, 2005a).

Similar outcomes were found during the investigation of several biomass power projects: the biomass fuel was not being sourced from sustainable sources, and was therefore leading to deforestation and affecting poor people that use biomass as cooking fuel. Projects were also causing pollution problems and deepening the groundwater level, and the promised jobs were given to outsiders and not to local people. In these cases, the stakeholder consultation section of the PDD was also apparently copied from one another (Down To Earth, 2005b). The lack

of monitoring guidelines or measurable sustainability indicators contributes to these outcomes.

It is interesting to highlight also the case of the HFC-23 reduction project, which mentions as sustainability benefits the transfer of technology, the CER-related revenues, the reduction of GHG emissions and a possible voluntary contribution to reduce CFCs and other halocarbons not yet covered by the Montreal Protocol in India. HFC-23 projects have generally been criticised for not contributing to sustainable development in the host country, for generating very large windfall profits for project developers and for providing perverse incentives that could undermine the goals of the Montreal Protocol on Substances that Deplete the Ozone Layer. A more detailed discussion of the debate around these projects can be found in Box 1.

Box 1: The debate around HFC projects

HFC-23 (trifluoromethane, CHF₃), a greenhouse gas with a global warming potential of 11,700, is generated as a by-product during the manufacture of HCFC-22 (chlorodifluoromethane, CHClF₂). The quantity of HFC-23 produced depends in part on how the process is operated and the degree of process optimisation that has been performed. At plants not fully optimised, the upper bound for HFC-23 emissions is 3 to 4 % of HCFC-22 production. However, many plants have implemented process changes in recent years to reduce HFC-23 generation because the generation of more HFC-23 means less valuable product (HCFC-22) is produced. At these plants, the likely range of emissions is about 1.5 to 3% of production with 2% being a reasonable average estimate (IPCC 2000). The IPCC default value of 4% thus may overestimate HFC-23 production considerably.

There exist four different proven continuous process technologies for the decomposition of HFCs. The investment costs of the Solvay process are 3 million € to destroy 200 metric tonnes of HFC-23 per year plus 0.2 million € annual operating costs. On this basis, Harnisch and Hendricks (2000) report abatement costs of 0.2 €/t CO₂ eq.. The gaseous/fume oxidation process used for the Ulsan CDM project in South Korea (see below) quotes destruction costs of 2.5-4 €/kg HFC which would mean abatement costs of 0.2 – 0.4 €/t. Costs of the PLASCON process reach 2.5 – 3.5 €/kg HFC, and for the Ohei process 1.5 – 2.5 €/kg HFC (UNEP TEAP 2002). The cost range of 0.2 – 0.5 €/ t CO₂ eq. is thus robust and also confirmed by Jimenez (2005). Lead times for installation of these technologies amount to 12 months; the lead time from planning a CDM project to get CERs is likely to be 18 to 24 months.

The first approved baseline methodology of the entire CDM process relates to HFC destruction. It was submitted by the Ulsan project developers and approved in July 2003 under the formal title AM0001 “Incineration of HFC-23 Waste Streams”. For about one year nobody found a problem with HFC-23 reduction and the Ulsan project developers set up their destruction plant which was inaugurated in May 2004. Suddenly experts on ozone depleting substances raised alarm (see Schwank 2004) and triggered an unprecedented process of baseline revision. This was due to the fact that the Chinese government had organised a workshop on HFC-23 reduction in February 2004 that for the first time drew attention of a wider audience to the huge CER potential from that technology.

The main reason for alarm was that HCFC-22 is a first-order replacement for the “ozone killers” CFC but remains an ozone-depleting substance. Thus it has been phased out in industrialised countries but developing countries are allowed to increase production until 2015 and continue production at the 2015 level until 2040. Schwank (2004) argues that CER sales allow HCFC-22 producers to expand production indefinitely as the CER revenues alone

make HCFC-22 production profitable even if the HCFC-22 is given away for free (or vented). This problem could be solved by requesting a proof that the HCFC-22 is actually sold and used (Perspectives 2004). Moreover, arguments were made that show a misunderstanding of the function of markets. The indirect pressure on other competing companies worldwide under pressure to come forward with similar CDM project proposals as soon as possible is seen as negative while it is an ideal way of the market promoting an incentive for emission reduction.

In parallel, HCFC-22 producer DuPont made a non-public submission to the CDM Executive Board (EB) arguing that the baseline default HFC-23 production rate should not be set at 4% of HCFC-22 production but at just the 1.37% achieved at DuPont's Louisville Works (DuPont 2004). The reason for DuPont arguing for such a strict baseline emission factor was that DuPont feared that its competitive position would deteriorate due to the fact that DuPont could not implement any HFC-23 reduction CDM projects while its competitors could. Jacob (2005) argues that DuPont feared that HFC-23 reduction could be made ineligible, that it was helpful in avoiding such an outcome and that a large programme of projects in China could still lead to such a decision.

In July 2004, the Swiss EB member launched a review request for AM0001 which was put on hold without further notice. This decision without prior consultation raised a lot of protest and thus the EB belatedly launched a public consultation in September 2004. 22 submissions were made, many of which complained about the process. In December 2004, the EB decided that AM0001 should apply only to HCFC-22 production facilities with at least three years of operating history by the end of the year 2004 and that baseline HCFC-production would be capped at the maximum (annual) production during the last three years. The HFC-23/HCFC-22 rate would be capped at 3%. If no direct measurement of HFC-23 release or mass balance exists for these three years, the default rate would be set at 1.5, i.e. almost the rate proposed by DuPont. Additionality testing is simple as there is no relevant market for HFC-23 and the HFC-23 destruction entails costs that would not be incurred otherwise. Monitoring is relatively complex but manageable for operators of the plant.

By May 2005, the Ulsan and another project in India had formally been registered by the CDM, estimating 39.8 million CERs until 2012. In late 2005, China decided to tax CER revenues from HFC-23 projects at a rate of 65%. Nevertheless, submission of projects went on smoothly and they quickly became the largest category both in terms of estimated and issued CERs. Nowadays, HFC-23 reduction projects have over 50% of all issued CERs, and are expected to yield about 20% of total CERs accumulated till 2012, according to UNEP Riso Centre's CDM Pipeline (version 01 February 2008) shows. However, in terms of number of projects they account for less than 3% of all projects in the pipeline.

The debate around these projects continues. They have been criticised for not contributing to sustainable development in the host countries, as they do not provide local environmental benefits, generate no significant additional employment and do not promote a long-term transition towards improved energy efficiency and increased renewable energies. In most countries, these projects also generate considerable windfall profits for the plant operators (Schneider, 2007). Around 3 billion € cumulated profits could be generated up to 2012 with CER prices of 5 € according to Cames et al. (2007). Only in China the government has imposed a 65% levy on CERs from HFC and N₂O projects, and the revenue is planned to be used for a fund that could finance climate mitigation and adaptation or other sustainable development projects.

On the other hand, these quality deficiencies need not be generalised. Two PDDs in the Indian sample describe the expected sustainability benefits in detail, providing quantitative indicators of the improvements to be generated, which gives the impression that these project proponents take the sustainability impacts of their projects more seriously. Three other PDDs provide at least some quantitative indicators about the expected benefits. And four projects describe local sustainability contributions that exceed the normal outcomes of the project activities, such as the construction of local health and education facilities, of a meeting hall for local representatives, the development of environmentally friendly activities or the provision of scholarships for employees' children. It remains to be seen whether these promises are held.

One of the conclusions that could be drawn from the analysis in this and the previous section is that the Brazilian standard stakeholder consultation procedure in its present format is not able by itself to successfully reach out to local stakeholders. From the projects analysed, only one summarises in its PDD the questions and concerns expressed by the stakeholders, and this is possible because it organised public meetings, where discussion was possible. Only this project and other three could provide an idea of the sustainability impacts felt by stakeholders, which can be seen in Table 6. This results also in a lack of information about the local development expectations of the nearby residents, which therefore cannot be incorporated into project design.

Within the analysed sample, some of the projects are inherently benign and have limited local impacts (landfill gas, animal waste management, wind electricity), so for these projects it may be argued that civil society does not see the necessity to engage. However, among the biomass projects, at least one will use external biomass residues, which could displace other users of this raw material. The hydro project, although it is run-of-river and small-scale, could still raise fears of local villagers about changes in water availability or impacts on land. Even without any negative impacts, if communities were well informed of the nature of CDM projects and the CER revenues accruing from them, they would probably like to have a share of these revenues or at least see some benefits "trickling down" to them, such as job or income opportunities. Local people are usually more accessible through meetings and open discussion, because they might not understand a technical document, or not care to read it. Thus, there is a point for arguing that local meetings might gather more inputs from local stakeholders than the written submission of project documentation.

When looking at Table 7, it can be noted that the Brazilian project developers' expectations far exceed the expectations from the stakeholders whose opinions they managed to gather. Again, this might be not because the stakeholders do not have expectations or concerns regarding the project, but because not all relevant stakeholders participated in the consultation process.

Buyer preferences: Opinions from project developers

Buyers do prefer projects that also give them good reputation, so some of them even do some due diligence on the ground on environmental impacts, sustainability effects, community development benefits and other co-benefits. However, buyers do not have a strong position, because there are less projects (less CERs in the market) offered than demanded. So it's difficult to look for good projects, especially if one does not want to pay more for them. But there are buyers that still do look at project quality, look for Gold Standard CDM projects, and pay a premium for them. This is especially true for the primary market, which is at the moment bigger than the secondary market.

Sustainable development benefits and additionality

One subject that has been raised recently is the apparent trade-off between CDM project additionality – this is, its environmental integrity in terms of the GHG reduction goal – and its sustainable development benefits. Indeed, in the analysis of additionality for 19 Indian projects (paper CDM-1), we found that additionality was especially critical for projects where the main revenues come from the sale of a product, such as electricity. These are mainly renewable energy projects, which, on the other side, offer very high benefits in terms of the transition of the energy system to a more sustainable mix. A similar trade-off can be observed for energy efficiency projects: as investments are easily recovered through the savings in energy consumption, these projects have more difficulties in demonstrating additionality. However, their benefits in terms of improving the energy intensity of the economy in developing countries are indubitable.

Although one could argue that additionality could be relaxed in order to incentivise these projects, it should not be forgotten that CDM projects are used to offset emissions in Annex B countries, and thus that any non-additional reduction from CDM projects entails an increase in global GHG emissions. These issues are also true for the voluntary market of emission offsets, and even more critical. There are no figures yet as to how many failed CDM projects have gone to the voluntary market, but the amount might be significant. And studies about the performance of providers of voluntary carbon offsets suggest that additionality is even more of an issue in these projects, whereas, for example, some “providers often do not offer any information to suggest that the reductions they are selling would pass any credible additionality test or broader quality review” (Clear Air-Cool Planet, 2006: p. 5).

Conclusions for this section

Host countries are the ones defining how CDM projects shall contribute to sustainable development.

China’s approval procedures and requirements stress that CDM projects must make a contribution to sustainable development. So far, however, the CDM approval procedures do not include quantifiable indicators to measure project’s contribution to sustainable development. Nonetheless, one way in which the Chinese government differentiates preferred projects from others is by establishing levies on CER revenues coming from reduction of gases other than CO₂ or methane.

India’s DNA assesses CDM project’s sustainability contribution under the light of the national priorities set by its five year planning process, emphasising its contribution towards improving the quality of life of the poor from the environmental standpoint. The sustainability criteria considered for the assessment are social, economic, environmental and technological well-being. However, here again there are no measurable indicators for making the assessment.

Brazil’s DNA demands that project participants describe the project’s contribution to local environmental sustainability, the development of working conditions and employment generation, income distribution, capacity building and technology development, and to regional integration and articulation with other sectors.

The majority of stakeholders in China and India expect that local employment will be generated by the project. Some stakeholders also expect possible contributions to the development or improvement of local infrastructure. In Brazil this differs, as local people scarcely express their opinions due to the institutionalised stakeholder consultation procedure. So in only one Brazilian project stakeholders expressed the expectation for local jobs.

The most frequent concern expressed in China and India refers to possible negative environmental impacts brought by the project. In contrast, Brazilian stakeholders rather praise the positive environmental implications of the CDM projects analysed.

In many of the cases, especially when referring to employment generation opportunities and positive environmental impacts, the concerns and demands of the population are in accordance with the sustainability benefits that the project developers expect to attain. However, in all three cases, but especially in India and Brazil, the project developers' expectations regarding contributions to sustainable development far exceed the expectations from the stakeholders whose opinions they managed to gather. This gives the impression that stakeholders are not really informed about the economic benefits brought by CER sales and the benefits that could "trickle down" to them from these revenues.

While in India most PDDs express having discussed the project in meetings with the stakeholders (and so it is not understandable why stakeholders have so few demands), in Brazil the official written consultation method seems not to be working properly. Thus, although all Brazilian projects fulfil the requisite of the DNA for approval, the development benefits they expect to achieve are not really informed by local stakeholders.

However, not all projects have these deficiencies. At least few projects in India and Brazil mention some voluntary, additional contribution to local development (e.g. community support activities, corporate responsibility programmes) among their expected sustainability benefits. Similarly, some PDDs in India and Brazil make the effort to provide quantitative indicators of their expected impacts on sustainable development.

The performance of CDM projects in terms of their contribution towards sustainable development does not have any evident impact on their success in terms of CER issuance, lead times, validation or registration success. Buyers do prefer good projects, with added value such as sustainability benefits, but they do not have a strong position since demand for CERs is larger than the offer. However, this aspect needs not to be disregarded, if the double aim of the CDM is to be achieved. More detailed monitoring guidelines or measurable sustainability indicators may contribute to improve the sustainability performance of CDM projects.

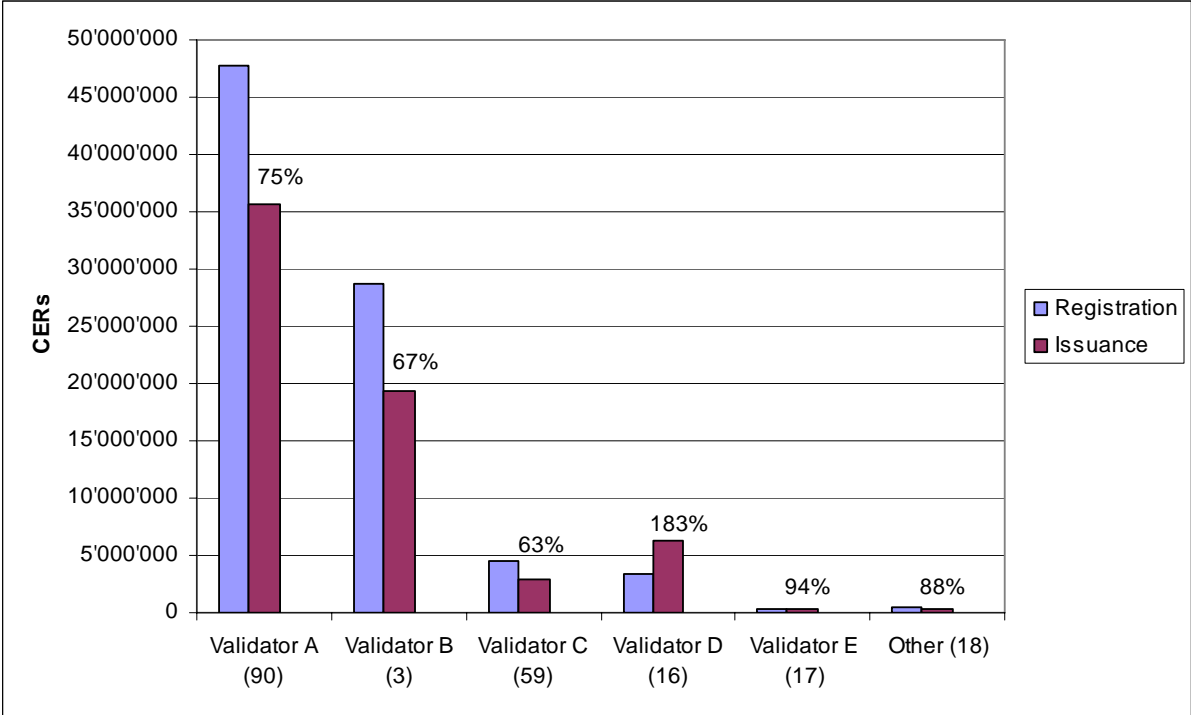
6.9. Other factors

Validators: Effect on CER issuance rate

The validation process and the role of the validators are crucial for explaining overestimation before registration takes place. Validators – or Designated Operational Entities, DOEs, as they are officially named – have an interest to collude with the audited project developers as they are hired by the project developers (see Michaelowa, 2007b). As many project developers are developing more than one project, validators have an incentive to let the

projects pass to get future assignments from that developer. This is exacerbated by a fierce competition between validators; prices for validation services have fallen over time. The question is now whether all validators accept the forecasts made in the PDD or whether some apply stricter validation procedures than others. Figure 14 shows the difference in CERs between PDDs submitted for registration according to a selection of validators involved in the process and final CERs issued. Unfortunately, an assessment of the validator’s conservativeness during validation process (measured by the validator’s deductions for each project) as a standard of comparison is not possible due to a lack of data.

Figure 14: Forecast and Issuance of CERs, by validators



Source: Own calculation based on data from UNFCCC website and UNEP Risø Centre (2007).

As the figure reveals, the market leader (Validator A) shows a solid performance around market average. The performance of Validator D, best among all others, is almost exclusively influenced by a very well performing HFC-23 project. If this project is taken out of the sample, projects validated by this DOE show deductions of 15% in average after registration.

The performance of the projects according to validator may be explained again by the focus of some validators on project types that are likely to have a good generic operational performance such as energy efficiency improvement in heavy industry, whereas others have focused on project types with a low performance, such as landfill gas. This correlation between project type and performance is confirmed by Table 8 below, which shows the number of projects that the major validators of this sample are involved in. According to the table, the good performance of Validator A may be explained by its dominant share in “high”-performing project types like renewable electricity or N₂O, despite its being the only validator for landfill gas projects. Validator C, which enjoys a reputation for its conservativeness with regard to the assessment of the project additionality, has a high share of projects in methane capture from pig wastes, which has a particularly low performance and leads to the corresponding deductions.

Table 8: Selected validators, performance and number of projects by type

	Validator D (16)	Validator F (6)	Validator E (17)	Validator G (7)	Validator A (90)	Validator C (59)
Average performance (%)	183%	96%	94%	87%	75%	63%
Renewable Electricity	8	3	10	0	29	6
Landfill gas (9)	0	0	0	0	9	0
Animal Waste (29)	0	0	0	0	3	26
Biomass (agricultural plant waste) (61)	1	2	4	4	26	22
Biomass (wood waste) (5)	0	0	0	0	3	2
Waste Water (2)	0	0	0	0	1	1
HFC-23 & N ₂ O (11)	1	0	0	0	6	1
Other	6	1	3	3	13	1
SUM	16	6	17	7	90	59

Source: Based on data from UNFCCC website and UNEP Risø Centre (2007).

Validators: Opinions from project developers

Validation was not seen as major bottleneck causing project delays by the interviewed project developers, except for China. Nonetheless, in the opinion of one interviewee, there are differences between validators. Some are more problematic than others, and they can be arbitrary in setting additional requirements that can take a long time to comply with. A validator comes with his experience, not only from the company, but from his own personal experience. Thus, validators vary a lot. And sometimes they can over-impose risk mitigation measures, they will make one do a million things. Theoretically, validation should take 1-2 months, but it can take 1.5 years.

Project owners: Opinions from project developers

The experts interviewed also explained that many project owners see CDM as an additional source of income, and do not realise that they have to go through a long, complex process where they have to be involved. They see the consultant as providing additional return, but do not make any effort from their side. There is a big difference between private and public sector projects. The latter have problems due to political instability, lack of capacity for project formulation and development, too many conflicting interests. A company with long experience in project design, evaluation, monitoring and implementation, will be faster than a new company with little experience, which is more prone to find difficulties along the way.

Monitoring: Opinions from project developers

Monitoring is a problematic area mentioned by all interviewees. Sometimes the quality of monitoring reports has been insufficient for issuing the CERs. The main problem is that often these quality problems are only discovered after a whole year of monitoring, and then one risks losing all (or a high percentage of) CERs for that year. Somehow during the registration the consultant is really present, checking, helping. But once the project is registered, the people on the ground are left alone. There are some procedures, but mistakes are easy to make, and it can take up to a few months until someone realises these mistakes in the monitoring procedure. Then you lose a lot of CERs. Thus, training of the project owner and the people working for him is very important. And even though they do a training, the project owner may lack skilled people, or the workers may change, so it is not sufficient to ensure a good monitoring. These problems arise mainly in the first year, afterwards many project

owners learn how to do monitoring. Monitoring problems may also be due to poor information flows in the organisational chart. Technical problems relate to calibration procedures not being applied properly.

Conclusions for this section

The analysis of CER issuance rate by validator shows that the performance of DOEs is related to the types of projects dominating in their portfolios, rather than to a perceived conservativeness of particular validators.

An expert interviewed during the study holds the view, however, that the experience of a validator, and also the personal experience of the team in charge has an influence on the requirements set by the DOEs. In his opinion, validators can be arbitrary in setting additional requirements that can take a long time to comply with. Our data are not sufficient to test this claim.

An additional factor affecting project performance, in the view of the experts interviewed, is the role of the project owners, both during project planning and during implementation. A company with longer experience will be faster than a new company; a public sector project may have problems due to political instability, lack of capacity, too many interest groups, which are less likely with private projects. Lack of sufficient training of the local staff may lead to errors in monitoring, which will have an effect on CER issuance.

7. Conclusions

The Clean Development Mechanism (CDM) aims at a cost-effective reduction of GHG emissions and technology and capital transfer from industrialised to developing countries. The CDM has seen a true gold rush period, with thousands of projects being developed in a few years. More and more governments and companies bet on the CDM to fill their compliance gaps.

Many CDM project developers and buyers of CER forwards underestimate the risks related to generation of Certified Emissions Reductions (CERs) from CDM projects. The CDM is governed by an internationally unprecedented set of rules and regulatory institutions administering these rules. The CDM project cycle has a number of serious pitfalls, which can lead to longer than expected lead times, to reductions in the expected CER volume or even to a rejection of a project.

To analyse the likelihood that the registered CDM projects and those currently in the validation pipeline will produce the CER volumes necessary to close the European gaps with regard to the Kyoto Protocol commitments and the EU ETS, to identify the key parameters that influence CDM project success, to inform CER procurement strategies and the discussions about CDM reform, we undertook an empirical analysis of CDM projects, including samples of those registered, in the pipeline, rejected and withdrawn. This was underpinned with in-depth case studies in China, India and Brazil, and the analysis was complemented with expert interviews and secondary information.

We analyse the ratio between actual CERs issued and estimated in the request for registration (CER issuance rate); the time from project submission to validation and project registration

(lead time); the likelihood that a project fails in validation (assuming that projects staying over one year in the validation stage are failing); the prevalence of rejections or withdrawals. We try to explain these parameters of project success through possible explanatory variables such as project type/category, project size, consultant, validator and host country, unilateral or bilateral character. We use data from the UNFCCC website and from the UNEP Risø Centre CDM Pipeline, with cut-off date of late June 2007.

We find that many CDM projects have a serious CER underperformance. Consultants and validators tend to strongly overestimate the emission reduction potential of the projects. Each step of the CDM project cycle leads to a downward adjustment of CER levels. CERs forecast at the request for registration stage reached 85.2 million CERs per year. However, only 64.8 million CERs (76% of initial forecast) were actually issued.

The countries where most CDM projects are being developed (China, India and Brazil) are not necessarily the ones with best performance in terms of CER issuance rate. While India has been issued more CERs than expected so far, Brazil has less than expected but still above the world average, and China is below the average. Other countries performing very well are Korea, Egypt, Peru, Malaysia and Chile.

In terms of CER issuance rate, we have not found evidence of a direct effect of host country on project success. However, changes in the countries' emissions factors affect mainly renewable energy projects. This effect has been observed for projects in China and Brazil, but is likely to be present in other countries.

Project lead times up to registration may also affect project success in terms of CER generation, if we do not consider early-start projects. Most projects experience delays in the start of the crediting period. Host country-specific factors, such as overwhelmed DNAs and DOEs, or delays in getting governmental licenses can contribute to longer CDM project lead times, but may not be the only or main causes of project delay.

The host country does not appear to be a relevant factor leading to failure in validation. In contrast, the host country, especially in interaction with certain types of projects, appears to be a relevant factor leading to rejection. India and Brazil host most rejected projects, and in both cases a high share of them are cement blending projects, which were all rejected due to problems with additionality.

Other host-country related barriers found along the study are: governmental interference with CER prices; governmental interference in the decision about who buys the CERs; non-approval of projects by DNA; and investment and regulatory risks.

Bilateral projects are more successful than unilateral ones in terms of CER issuance rate (77% versus 67%). Out of the bilateral projects, those with European participants perform best with 121% success. Possible reasons for the better performance of bilateral projects might be improved access to technology, technical support, quality control and upfront financing.

Unilateral projects have on average shorter lead times (275 days) than bilateral ones (325 days). However, there are many more unilateral than bilateral projects lagging for over a year in the validation stage. Unilateral projects are more likely to be rejected, but considering also the withdrawn projects they are not necessarily more likely to fail at registration. In the country case studies in China, India and Brazil we did not find enough evidence to support or discard the theory that unilateral projects face more barriers than bilateral ones.

Consultants are the main responsible for the estimation of the project potential in the PDD and have an incentive to achieve as many CERs as possible. Performance in terms of CER issuance rate varies greatly among and within types of project developers, and the sample analysed is too small to draw definitive conclusions. The performance of consultants might be related to the project types they focus on, or to the countries they operate in. Interestingly, in-house developed projects perform much better than most consultancies in terms of CER issuance, which would question the facilitating role of external consultancies to some extent.

Project type and general project category have an important influence on CER issuance rates, lead times, and validation and registration success. Waste projects perform worst in terms of CER issuance, with only 31% of CERs forecasted being issued. Overestimations in the waste growth or gas generation models, management and operation problems, and monitoring difficulties are the factors leading to these results. Projects involving industrial processes have a better performance (79%), slightly higher than the overall average. Among them, N₂O projects consistently generate more CERs than expected, and HFC projects have a varied performance. Renewable energy and energy efficiency projects have a decent performance, above average in both cases. Among them, hydro power plants have the best CER issuance rate (93%). These projects benefit from the fact that their monitoring methodologies are not as complex as those for waste projects.

Project performance in terms of CER issuance may improve in time, as shown by the analysis of monitoring reports of four Indian CDM projects. To further improve project performance, monitoring quality should be paid special attention by project consultants and owners. Good training of the operative staff and presence of the developer also after registration are important.

Validation success appears to be similar in all project categories and types. However, rejections are related to project category and type: most rejected projects are energy efficiency ones, and mainly of the cement blending type. All these projects were located in India and Brazil, and were rejected due to insufficient demonstration of additionality. Although all withdrawn projects are biomass energy projects, withdrawal does not seem to be related to project type.

Project size is relevant for CER issuance rate. In general, the smaller the project the better its performance in terms of CERs issued as compared to those forecasted. Projects generating below 20,000 CERs per year outperform all other project sizes. This may be due to the less complexity and the higher conservativeness involved in small projects. This trend is no longer valid for very large projects, above 540,000 CERs per year. This category includes mainly the N₂O and HFC projects. As seen above, N₂O projects have the best performance among all project types.

Small-scale projects appear to have more problems at validation than large ones. However, experts interviewed for this study hold the view that the bigger the project, the longer it takes to validate it and the more complex it becomes. In line with this opinion, large projects appear to have more problems at registration than small ones. As most withdrawn projects are small-scale, however, no conclusion can be drawn whether project scale has any impact on its registration failure.

The analysis of CER issuance rate by validator shows that the performance of DOEs is related to the types of projects dominating in their portfolios, rather than to a perceived

conservativeness of particular validators. An expert interviewed during the study holds the view, however, that the experience of a validator, and also the personal experience of the team in charge has an influence on the requirements set by the DOEs. In his opinion, validators can be arbitrary in setting additional requirements that can take a long time to comply with. Our data are not sufficient to test this claim.

An additional factor affecting project performance, in the view of the experts interviewed, is the role of the project owners, both during project planning and during implementation. Companies with longer experience and from the private sector may perform better. Lack of sufficient training of the local staff may lead to errors in monitoring, which will have an effect on CER issuance.

From the analysis in the three case studies in China, India and Brazil, we conclude that additionality demonstration is still a problem in all three countries, whereas all of them have both good and bad examples of additionality demonstration. Public comments, corrections and clarifications during validation and requests for review are frequently related to issues pertaining project additionality. A good knowledge of the in-country economic and policy context is needed to assess project additionality.

Additionality is the main cause of project rejection. 65% of the rejections were caused – at least in part – by problems in the additionality demonstration. In all of them, the barrier analysis was found not sufficiently convincing or demonstrated. Additionality demonstration seems to be a more critical issue for large projects than for small: while 75% of large projects were rejected due to additionality, only 50% of small ones were. PDDs with only a barrier analysis for additionality demonstration could have a higher risk of being rejected than those with a full investment analysis, especially in the case of large projects.

There are no specific internationally recognised requirements for ensuring good-quality stakeholder consultation processes in CDM projects, apart from for example voluntary certification schemes such as the CDM Gold Standard. It is up to each host country to establish its own requirements for stakeholder consultation. Neither in China nor in India are there specific procedures for carrying out stakeholder consultations in CDM projects. On the contrary, Brazil has established a standard procedure.

In China, the consultation method mostly used is the written survey or questionnaire, followed by the public meeting. While allowing the participation of a large number of different people, questionnaires gather answers that might not be sufficiently informed and provide limited space for additional comments. Several of the Chinese PDDs do not provide sufficient information on the consultation methods, the people participating or the communication channels they used. This could reflect just the current institutionality in China or also a lack of transparency in the description of the consultation process.

In India there are several procedures that investment projects in general need to follow in order to be allowed to operate, including the approval from the village representative body, the Panchayat. The description of the stakeholder consultation process seems to follow a standard model in Indian projects, although there is no regulation about it. 70% of the PDDs mention having had some kind of consultation meeting. However, several PDDs do not describe the consultation process clearly, and many do not prove that they have undertaken a specific consultation process for the CDM.

The Brazilian DNA has established a mandatory, standard procedure for inviting stakeholders to issue comments to CDM projects, which consists of a written consultation to a defined group of stakeholders. However, less than 5% of Brazilian CDM projects receive any comment from stakeholders, and most of the comments received are not really informing project design. The Brazilian standard stakeholder consultation procedure, with a one-way communication that offers respondents a chance to send written comments themselves, does not seem to be sufficient for gathering potential concerns, expectations or questions from local stakeholders.

We have not been able to draw any links between quality of the stakeholder consultation processes described in the PDDs and the rejection or withdrawal of projects. As the failed CDM projects come from different countries, in some cases these results reflect the national regulations regarding stakeholder consultation processes.

Host countries are the ones defining how CDM projects shall contribute to sustainable development. Although the Chinese, Indian and Brazilian DNA have a definition of the contribution to sustainable development CDM projects should achieve, they fail to include quantifiable indicators to measure it. Nonetheless, the Chinese government differentiates preferred projects from others by establishing levies on CER revenues coming from reduction of gases other than CO₂ or methane.

In many of the cases, especially when referring to employment generation opportunities and positive environmental impacts, the concerns and demands of the population are in accordance with the sustainability benefits that the project developers expect to attain. However, in all three cases, but especially in India and Brazil, the project developers' expectations regarding contributions to sustainable development far exceed the expectations from the stakeholders whose opinions they managed to gather. This gives the impression that stakeholders are not really informed about the economic benefits brought by CER sales and the benefits that could "trickle down" to them from these revenues.

At least some projects in India and Brazil mention some voluntary, additional contribution to local development among their expected sustainability benefits, or make the effort to provide quantitative indicators of their expected impacts on sustainable development.

The performance of CDM projects in terms of their contribution towards sustainable development does not have any evident impact on their success in terms of CER issuance, lead times, validation or registration success. Buyers do prefer good projects, with sustainability benefits, but they do not have a strong position since demand for CERs is larger than the offer. However, this aspect needs not to be disregarded, if the double aim of the CDM is to be achieved. More detailed monitoring guidelines or measurable sustainability indicators may contribute to improve the sustainability performance of CDM projects.

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