Empirical analysis of performance of CDM projects: case study Brazil

Discussion paper CDM-8

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Abstract: A sample of 5% of the Brazilian CDM projects registered until end of June 2007 (five projects) and 10% of the projects that had been submitted for public comments before June 2006, but not been submitted for registration by June 2007 (four projects) are evaluated in terms of the barriers they face, lead times and expected CER generation, additionality argumentation, stakeholder participation and sustainability benefits. Access to long-term financing is a general barrier for CDM projects in Brazil, and may be even more so for unilateral and small-scale projects. The amount of CERs forecasted diminishes in most projects (animal waste, biomass, wind) as they progress from validation to registration and issuance, due to changes in monitoring methodology, changes in the operating margin carbon emissions factor, lower output than expected and delays in the start of the crediting period. While the Interministerial Committee on Climate Change (Brazilian DNA) has improved its CDM approval process, the validation of CDM projects causes delays. The additionality argumentation of the assessed projects is credible, but in some cases weakened by changing prevailing practice. In four of the projects the quality of the argumentation is not good enough and received observations from the validation team or the UNFCCC Executive Board. The Brazilian DNA has a standard procedure for inviting stakeholders to issue comments to CDM projects. However, only 5% of Brazilian CDM projects receive any comment, and most of the comments received are not informing project design. Four of analysed projects thus organised consultation meetings or interviews additional to the standard procedure, and a third of them took other measures to ensure stakeholder participation. The Brazilian standard stakeholder consultation procedure by itself does not seem sufficient for gathering concerns and demands from the local population. Although all projects fulfil the Brazilian requisite for ensuring sustainability benefits, the benefits they expect to achieve are not really informed by the views of local stakeholders.

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Contents

List of acronyms and abbreviations

BNDES	Brazilian National Development Bank
BR1 – BR9	Codes given to the analysed projects
CDM	Clean Development Mechanism
CER	Certified Emission Reduction
CIMGC	*Comissão Interministerial de Mudança Global do Clima*, Interministerial Committee on Climate Change (Brazilian DNA)
CO_2 eq.	Equivalent to carbon dioxide emissions (in terms of global warming potential)
DNA	Designated National Authority
DOE	Designated Operational Entity
EB	The CDM Executive Board
EIA	Environmental impact assessment
ETS	Emissions Trading System
EU	European Union
IRR	Internal rate of return
N/A	Not applicable
NGO	Non governmental organisation
NPV	Net present value
ONS	*Operador Nacional do Sistema Elétrico,* National Electricity Grid Operator
PDD	Project Design Document
PROINFA	*Programa de Incentivos às Fontes Alternativas de Energia,* Financial Support Program for Investments in Alternative Sources of Electric Energy
UNFCCC	United Nations Framework Convention on Climate Change
WACC	Weighted average cost of capital

1. Introduction

Under the Kyoto Protocol, the Clean Development Mechanism (CDM) is one of the flexibility instruments aimed at helping industrialised countries, so called Annex I 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 development and facilitating technology transfer.

Certified Emission Reductions (CERs) coming from CDM projects 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.

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 CO_2 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 2012 targets (Michaelowa, 2007). Moreover, there are also doubts about the environmental and social integrity of several CDM projects, which could reduce their attractiveness for potential buyers (Lohmann, 2006; Boyd et al., 2007; Ghosh, 2007).

India, China and Brazil are the developing countries where most CDM projects are being developed. As of end of December 2007, the three countries together account for 63% of all CDM projects registered at the CDM Executive Board and 73% of the projects submitted for validation. Therefore, it is interesting to analyse the performance of projects in these countries in order to try to find answers to the above-mentioned doubts. Brazil hosts 13% of the projects registered up to December 2007 and 6% of the projects submitted for validation up to the same date, being third after China and India in both cases.

This paper analyses a sample of CDM projects in Brazil in terms of the barriers they are facing and their impact on lead times and CER generation. It also evaluates three key aspects of project design: additionality argumentation, stakeholder participation and expected sustainability benefits. In Section 2 we present the project sample used for this analysis; Section 3 elaborates on the barriers faced by CDM projects in Brazil, their possible causes and their effect on project performance; in Section 4 we assess the quality of additionality argumentation in the sample; and in Section 5 we look into the stakeholder consultation process and the expected sustainability benefits of these CDM projects. Section 6, finally, synthesises the findings and draws conclusions.

2. Project sample

Five Brazilian CDM projects registered until end of June 2007 and four CDM projects submitted for public comments before June 2006 without having been submitted for registration by June 2007 are evaluated through the analysis of their Project Design Documents (PDDs) submitted for validation and for registration, their validation, monitoring and verification reports, and through interviews with project developers and local experts. The interviews took place between September and December 2007. In the following sections, all data and calculations will be based on data for the Chinese CDM pipeline as of end of June 2007.

The sample has been chosen so as to include different project types, sizes and developers representative of the Brazilian CDM market, as shown in Table 1:

Table 1: Characteristics of projects selected for the sample

Project characteristics		Number of projects
Project status	Registered (as of June 2007)	5
	In validation	4
Character	Unilateral	3
	Bilateral	6
Project type	Renewable electricity for grid – biomass	2
	Thermal energy for the user – biomass	2
	Animal waste management	2
	Renewable electricity for grid - hydro	1
	Renewable electricity for grid – wind	1
	Landfill gas capture and power	1
Project size	Small	5
	Large	4
Developer	Ecosecurities	2
	Econergy Brazil	1
	Ecoinvest	1
	PTZ BioEnergy	1
	AgCert	1
	PricewaterhouseCoopers	1
	Ecologia Assessoria	1
	APSIS Consultoria	1

3. Barriers faced by CDM projects in Brazil

CDM project development faces several barriers, depending on the project type, character, size and the host country's specific situation. For example, there is a general perception that especially small CDM projects and unilateral ones – this is, projects developed without intervention or investment 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.

In the Brazilian case, it is generally very expensive to borrow money for projects, and therefore 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, even if financing can be found investors are cautious and risk averse.

In 2002, following the massive power blackouts during 2001, the Brazilian Government launched PROINFA, a governmental programme for supporting the establishment of new renewable energy. The goal is to foster 3,300 MW of new renewable energy generation capacity from wind, biomass and small hydroelectric plants. 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 Electrobras, 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). This can be partly explained by the different guaranteed feed-in tariffs for wind and biomass offered to the power producers. For example, the PROINFA tariff for biomass was too low to convince sugar cane mills to invest in using bagasse for cogeneration of process steam and electricity. When electricity prices rose above the guaranteed PROINFA tariff, the situation changed and many sugar cane mills decided to invest in bagasse cogeneration, making these investments within the framework of CDM (La Rovere, 2008).

Brazil 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 CDM projects. 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 is causing some CDM developers to fear a backlash against all forms of carbon trading and climate projects. Some voluntary credit or offset schemes underway using tree plantations in Brazil seem to be based on questionable practices, denying third party verifiers the access to data or proof of activities.

In order to analyse these and other barriers faced by CDM projects in Brazil, as well as their causes and consequences, project developers were asked whether they had faced any additional barriers due to the unilateral or small character of their projects. Changes in the forecasted amount of CER generation and the expected start of the crediting period as projects moved along the CDM project pipeline are also analysed, looking especially for the reasons behind these changes, which may point out to other barriers. Finally, the barrier analysis in the additionality argumentation of the projects is also assessed, but these results are presented in Section 4 further below.

Barriers due to character or size of CDM projects

A third of the projects in the sample are unilateral. Only one project developer mentions 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 proponents 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 Electrobras and BNDES without success. Had it had a bilateral character, this project could have had easier access to financing from foreign sources. The other unilateral projects are owned by large firms, which have less difficulty in achieving the financial closure for their projects.

Half of the projects in the sample are small-scale. 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. This is the same project as the one mentioned above. 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 projects state that they face financial or investment barriers, and over half of them face technological ones.

Barriers affecting CER amount and start of crediting period

Many CDM projects have, at their design stage, very optimistic expectations in terms of the amount of emission reductions they will achieve and the date by which they will start to operate and generate CERs (Castro and Michaelowa, 2007). In the first case, project developers might want to show high amounts of CERs in order to be able to access financing or find buyers more easily, they might not use conservative enough parameters in their calculations, or they might not foresee possible implementation difficulties. In the second case, the CDM project cycle, the in-country required permits and licenses, the financial closure or the construction phase might take longer than expected, thus delaying the start of the crediting period.

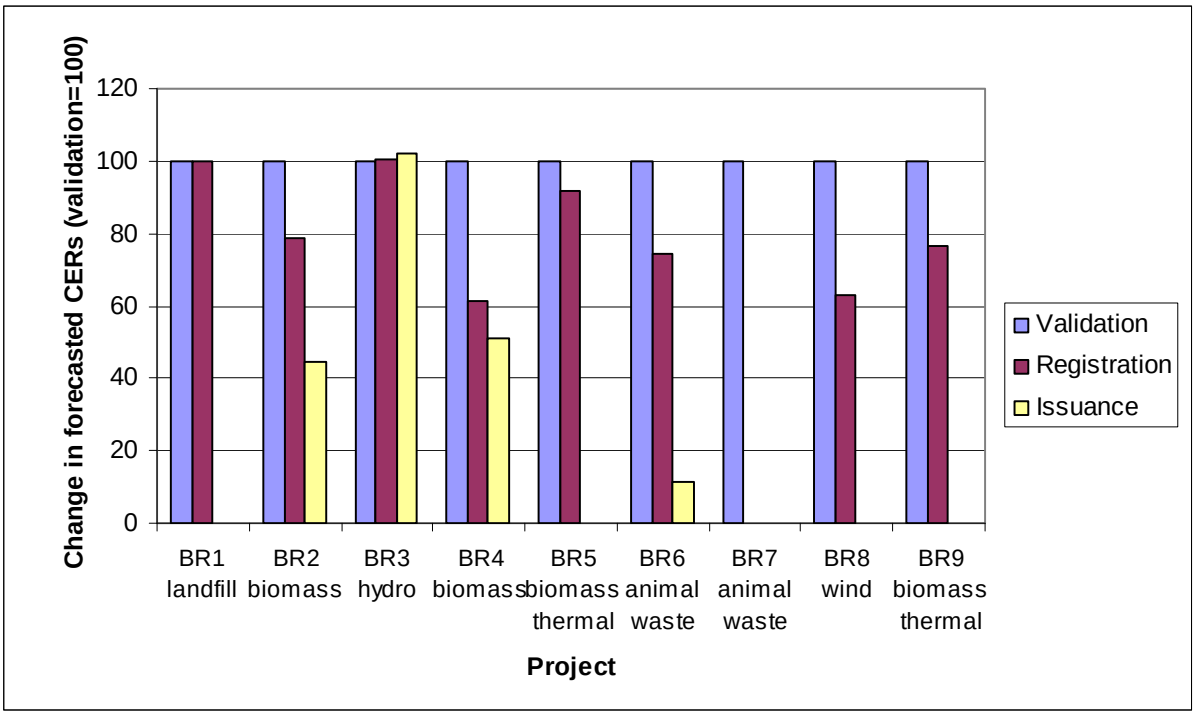
Thus, a different approach to assess the barriers faced by CDM projects and their effect on project performance is used in the following paragraphs: we try to find out how much and why the estimated volume of CERs and the expected start of crediting period changes as the projects move along the project cycle, from validation, through registration to CER issuance. For this purpose, the information provided in the PDDs published during validation and registration is compared. Additionally, where available, the amount of CERs already issued is extrapolated to reach an estimation of the total emission reductions expected once the project is operating. As both the Kyoto Protocol's first commitment period and the EU ETS second phase finish in 2012, only emission reductions foreseen up to that year are considered in the analysis.

Figure 1 shows the per cent change in forecasted CER generation for each project in the sample. It is clear that most projects have very high expectations of CER generation during the first stages of project development, but during registration and issuance the forecasted reductions decrease considerably. Only the hydro project performs slightly better than expected, achieving during issuance around 102% of the CERs forecasted during the validation stage. On the contrary, two biomass projects generate just half of the originally expected CERs, and an animal waste project generates only 12% of them.

Ag Cert International, the animal waste methane reduction company reported losses of 28.5 million Euros in the first half of 2007. 6.8 million Euros of these losses have been accounted by writing off 19% of all sites where projects were to be implemented. The company reduced

its staff from 318 to 192 and is trying to negotiate a deal with a trader to cover sales contracts worth 4.2 million CERs that are difficult to fulfil due to the continuing shortfall in CER issuances. It is now also diversifying into other project types and CER acquisition in order to make up for the shortfalls in its own projects (Reuters, 2007).

Figure 1: Changes in forecasted amount of CERs along the CDM project cycle



Sources: Own calculations based on data from PDDs and verification reports.
Notes: Project BR1 has not requested issuance of CERs yet. Projects BR5, BR7, BR8, BR9 not registered yet as of June 2007, and thus CERs are not yet being monitored or verified. BR8's forecasted CERs at registration taken form registration request form available at Brazilian DNA.

Similarly, BR1, the landfill gas project, was suggested by the validator that landfill gas predictions should be discounted by 50% as recommended by US EPA and not by the 25% that the project is using. The project also seems optimistic that the gas collection efficiency should be as high as 85%, while similar projects use 75% or 80% efficiency, and here again the validator suggested to use a more conservative value. There was also a public comment suggesting a more conservative approach for the baseline calculation. As no request for issuance has been made yet, no ex-post figures are available on the success rate of the project, but given the poor performance of several other landfill gas projects in Brazil it can be assumed that the success rate will be lower than 100%.

Table 2 shows the delays in the expected start of the crediting period of the analysed projects as they move forward along the CDM project cycle. It should be noted that BR2 to BR4 are "early-start" projects: this means, they are already operating by the time they apply to the CDM and are registered, and are allowed to claim credits from a date previous to the registration. In these cases, delays in the crediting period happen only in exceptional circumstances.

The results show that projects may delay the beginning of operations for over a year, and consequently yield less CERs than expected.

Table 2: Delays in expected start of crediting period along the CDM project cycle

Project	Delay validation-registration (days)	Delay validation-issuance (days)
BR1 – landfill	0	N/A
BR2 – biomass (early-start project)	0	0
BR3 – hydro (early-start project)	0	0
BR4 – biomass (early-start project)	91	91
BR5 – biomass thermal	181	N/A
BR6 – animal waste	0	0
BR7 – animal waste	N/A	N/A
BR8 – wind	90	N/A
BR9 – biomass thermal	456	N/A

Sources: Own calculations based on data from PDDs, and verification reports.
N/A: Not applicable because no monitoring and verification reports are available yet.

The reasons behind

Why does the amount of expected CERs vary so much as the projects move forward in the pipeline? The only project experiencing gains in CER generation, a hydro project, benefited from slightly higher water flows during one year. This factor is outside the control of the project and could also affect project performance negatively in future years if droughts occurred. In the other projects, the reductions in expected CER generation were caused by different factors:

- A biomass project burned less biological material as expected, achieving lower avoided emissions in the first years.
- Another biomass project suffered a delay in the start of the crediting period, and also experienced a reduced baseline emission level and higher project emissions than expected.
- An animal waste project suffered great reductions in CERs due to a change of methodology introduced by the CDM EB, which meant that the lesser of actual metered levels and the purely mathematical calculations had to be used. This significantly reduced the yield from this and many other similar projects in the country.
- A wind energy project has been affected by the changes in the operating margin carbon emissions factor for the Brazilian electricity grid. For the PDD submitted to validation the average operating margin carbon emissions factor was 0.338 kg CO_2eq/kWh. For the PDD submitted for registration the average was 0.198 kg CO_2eq/kWh. If the new project offsets less fossil electricity, it earns less CERs.

What are the reasons behind the delays in the start of the crediting period of the analysed projects? 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 having difficulties to cope with the workload. Indeed, two projects in the analysed sample experienced delays 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 implementing them. A third project experienced delays in project implementation.

4. 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 this section of the paper we assess whether the analysed Brazilian CDM projects fulfil the criteria of the Tool for the demonstration and assessment of additionality, as well as the general quality of the argumentation brought forward.

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.

Seven projects identify alternative scenarios to the proposed CDM project, taking into account the legal and regulatory requirements for each of them. The two projects not identifying alternative scenarios are small-scale, and thus allowed to use simplified procedures for additionality argumentation.

Five of the nine the projects perform just a barrier analysis, while one third make both barrier and investment analyses, and only one project performs only an investment analysis. All nine projects argue having investment or financial barriers for project implementation, however, 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 of the project, but also related to difficulties in accessing financing.

Three of the projects performing a complete investment analysis chose the NPV (net present value) as indicator, while the remaining one uses the IRR. One of these projects does not 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 projects performing just a barrier analysis also include financial indicators to substantiate the investment barrier, but without the full calculations: One uses the IRR without a benchmark figure; another one uses the IRR comparing it with the company's WACC (weighted average cost of capital); a third project presents a comparison of the investment costs per kW and the generation costs per MWh with other types of electricity plants; and a fourth one presents very high generation costs per MWh.

Additionally, almost all of the 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.

Five of the 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 are institutional ones, mainly due to the regulatory instability in the electricity sector in Brazil, 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-deep 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).

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.

Finally, not all the 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 CDM registration on the project, 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.

Important for substantiating the additionality argumentation, especially in the cases where no complete investment analysis is performed, is the reference to third-party, independent evidence and information sources. Five of the assessed projects consistently cite independent evidence, while two cite few, insufficient references, and another two do not cite any independent source of information at all.

A large outstanding question is: 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 built[1]. 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 weakening[2]. 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'.

In a different case, it might be questionable to consider additional a project to replace a burner that is already 25 years old. However, the validator states that the old boiler could have been used at least for 35 years, and thus deems the project appropriate.

Summarising this section, the additionality argumentation of all analysed projects is credible. In two of them, nonetheless, the arguments 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, in some of the projects the quality of the argumentation is weak, lacking independent references or detailed, transparent calculations, and thus in three of the cases the validation team required additional information or substantiation to complete the

1 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.

2 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).

additionality argumentation, and in a fourth one the EB requested a review requiring, among other observations, further demonstration of additionality.

5. Stakeholder participation and sustainability impacts

Promoting sustainable development in the host countries is one of the main objectives of CDM projects. Therefore, 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 issue 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 for example voluntary certification schemes such as the CDM Gold Standard[3]. In line with national sovereignty considerations, it is up to each host country to establish their own requirements for stakeholder consultation. Some countries may even not establish specific requirements, leaving it up to the project developer to decide in which manner they invite stakeholders to participate. In the Brazilian case, 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.

Similarly, 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 Parreno, 2007). 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).

3 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).

Brazilian requirements for CDM projects' contribution to sustainable development, as set by the Resolution Nº 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.

The first step to make a consultation possible is to identify the 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 projects identify and contacted the stakeholders as established by the DNA. The other two projects 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.

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.

With respect to the communication media used for stakeholder consultation, two stages are differentiated for the analysis: the communication media used for inviting stakeholders to make comments, and the media used during the consultation process itself. One third of the analysed projects used only letters (closed communication media) for inviting stakeholders for submitting comments, in accordance to the Brazilian procedures. These projects did not announce the stakeholder consultation process publicly (e.g. in the local newspaper, radio or notice board), and therefore limited the range of stakeholders allowed to participate. 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 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.

Four of the projects state having received positive comments from stakeholders. Two projects received some questions or requests for further action form stakeholders, but only one of these projects describes these questions in the PDD. None of the projects states having received any negative comments.

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, which can be seen in Table 3. 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.

Table 3: Sustainability benefits expected by stakeholders

Type of sustainability benefit	Number of projects
Climate change mitigation potential	2
Replicability of project	2
Generation of legal jobs for scavengers	1
Improved waste management	1
Production of renewable energy	1
Very low environmental impacts of energy generation	1
Development of local infrastructure (roads, communications)	1
Reinforcement of the local electricity grid	1
Decreased need of water for energy use, allowing extra water supply in a region suffering from droughts	1

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.

As a comparison to the reported stakeholder expectations, the sustainability benefits that project developers expect to achieve with these projects, as stated in their PDDs, are summarised in Table 4. It can be noted that the 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.

Table 4: Expected sustainability benefits according to PDDs

Type of sustainability benefit	Number of projects
Improvement of local environment (air, water, soil, etc.)	8
Contribution to local economy through generation of local employment and/or demand for local services	7
Contribution to reducing GHG accumulation in the atmosphere	6
Increase of clean energy supply / diversification of electricity sources	4
Contribution to displacing fossil energy	3
Demonstration of clean, efficient technologies and resource conservation	3
Contribution to technological and capacity development	2
Contribution to regional development since electricity expenditure will stay local, and savings can be devoted to other development uses, and also from royalties paid to local municipalities	1
Enhancement of local investment environment	1
Avoidance of potential hazards	1
Development of local infrastructure (roads, communications)	1

6. Conclusions

Unilateral and small-scale projects in Brazil may, but not necessarily face further barriers due to their unilateral character, especially in terms of access to financing. However, accessing long-term financing with reasonable interest rates is a general difficulty among CDM projects in Brazil.

The amount of CERs forecasted diminishes in most types of projects as they progress in the pipeline from the design and validation phase to registration and issuance of CERs: only one of the examined projects experienced a limited increase compared to forecasted reductions, but biomass, animal waste and wind projects have all decreases in them. Reasons for these reductions are changes in monitoring methodology, changes in the operating margin carbon emissions factor, lower output than expected and delays in the start of the crediting period. These delays are due to longer than expected validation processes or delays in project implementation. In the Brazilian case, the national approval procedure is thorough and sometimes bureaucratic but not a significant source of delay.

With regards to additionality argumentation, all analysed projects state having investment or financial barriers for implementation, but only four perform a complete investment analysis in the PDD to substantiate this claim. The investment barriers are related not only to low

expected returns on investment, but also to difficulties in accessing financing. Other barriers found are technological, institutional, legal and prevailing practice ones.

The additionality argumentation of all assessed projects is credible. In two of them, the arguments 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, in some of the projects the quality of the argumentation is not good enough, lacking 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.

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 of a general character and 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. One third of the projects took other additional measures to ensure stakeholder participation, such as joint development work with local communities, a survey to assess project's acceptability, a permanent email address and phone number for questions or clarifications, and an open letter for public comments. 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.

In order to demonstrate a project's contribution to sustainable development, the Brazilian DNA requires a description of its contribution to local environmental sustainability; the development of working conditions and employment generation; income distribution; capacity building and technology development; and regional integration and articulation with other sectors. Although all projects fulfil this requisite, the development benefits they expect to achieve are not really informed by local stakeholders.

References

Boyd E., Hultman N.E., Roberts J.T., Corbera E., Ebeling J., et al. (2007). *The future of the clean development mechanism: an assessment of current practice and approaches for policy*. Tyndall Centre for Climate Change Research Working Paper 114. 55 pp.

Castro P., Michaelowa A. (2007). *Opinions of project developers regarding performance of CDM projects*. Discussion paper CDM-5. London: Climate Strategies.

CIMGC (2007). *Current status of the project activities under the Clean Development Mechanism (CDM) in Brazil and the world.* Brasilia: Comissão Interministerial de Mudança Global do Clima - Interministerial Commission on Climate Change, Ministry of Science and Technology. November 13, 2007. 12 pp. Available at www.mct.gov.br/clima.

Ellis J,. Kamel S. (2007). *Overcoming barriers to clean development mechanism projects*. COM/ENV/EPOC/IEA/SLT(2007)3. Paris: OECD and UNEP Risø Centre. 51 pp.

Ghosh S. (2007). *Aid, the Clean Development Mechanism and some open questions.* Oslo: Development Today. 3 May 2007.

Hild S. (2007). *The application of barrier tests in renewable energy CDM projects: the case of Brazil*. Master Thesis for the Programme "Interdisziplinäres Fernstudium der Umweltwissenschaften". Oberhausen and Hagen: Fraunhofer-Institut für Umwelt-, Sicherheits- und Energietechnik UMSICHT and Fernuniversität in Hagen. 136 pp.

La Rovere E. (2008). Prof. Emilio Lèbre La Rovere, Executive Coordinator Centro Clima, Professor at Programa de Planejamento Energético – PPE, Instituto de Pós-Graduação e Pesquisa de Engenharia – COPPE, Universidade Federal do Rio de Janeiro – UFRJ. Personal communication with author. Rio de Janeiro, January 16, 2008.

Lohmann L. (2006). *Carbon trading – A critical conversation on climate change, privatisation and power*. Development Dialogue No. 48. Uppsala, Dag Hammarskjöld Foundation. 360 pp.

Michaelowa A. (2007). *How many CERs will the CDM produce by 2012?* Discussion paper CDM-2. London: Climate Strategies.

Michaelowa A; Michaelowa K. (2007). Climate or development: is ODA diverted from its original purpose? *Climatic Change* 84: 5-21.

Miguez J. (2007). Executive Secretary, Interministerial Committee on Climate Change, Ministry of Science and Technology (Brazilian DNA). Personal communication with author, Rio de Janeiro, November 11, 2007.

Olsen K.H. (2007). The Clean Development Mechanism's contribution to sustainable development: a review of the literature. *Climatic Change* 84: 59-73.

Reuters (2007). *Shares in carbon firm AgCert crash on failed deal.* URL: http://www.reuters.com/articlePrint?articleId=USL035393520071203. Accessed December 3, 2007.

Sirohi S. (2007). CDM: Is it a ‘win–win’ strategy for rural poverty alleviation in India? *Climatic Change* 84: 91-110.

Sutter C., Parreno J.C. (2007). Does the current Clean Development Mechanism (CDM) deliver its sustainable development claim? An analysis of officially registered CDM projects. *Climatic Change* 84: 75-90.

UNFCCC. (2001). *The Marrakech Accords*.

PDDs, validation reports, monitoring, verification and certification reports of the following CDM projects:

- AWMS GHG Mitigation Project BR05-B-16, Bahia, Goiás, Mato Grosso, Minas Gerais, Rio de Janeiro and São Paulo, Brazil
- Burning of solid biomass for process steam generation for beer manufacture in place of the BPF 3 fuel oil at the Águas Claras do Sul Branch
- CAMIL Itaqui Biomass Electricity Generation Project
- Nobrecel fuel switch in black liquor boiler project
- NovaGerar landfill gas to energy project
- Pesqueiro Energia Small Hydroelectric Project
- Rosa dos Ventos wind energy project
- Sadia owned farms– GHG capture and combustion from swine manure management systems in Brazil
- Santa Elisa Bagasse Cogeneration Project (SEBCP)