



Empirical analysis of performance of CDM projects from registration to CER issuance

Discussion paper CDM-3

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Abstract: We analyse the performance of over 200 CDM projects with issued CERs according to a series of parameters. We find that compared to the initial estimate of CERs when a PDD is submitted for registration, the amount of CERs issued reaches 76%. The project type is critical for the degree of down-/upgrade after registration, ranging from 129% for N₂O projects to 28% for animal waste projects. Very large projects (above 540 kt) perform significantly better than medium-sized projects. However, smaller projects do generally better. India performs best with 122% before China with 55% and Brazil with 90%. This is strongly related to the share and performance of the HFC-23/N₂O- and waste projects in these countries. Performance of some large projects has improved for the Chinese projects since the study's cut-off date in mid-2007. Projects developed inhouse (99%) perform better than those of many large consultancies (Ernst & Young 87%, Econergy 63% and AgCert 18%). Governments and companies interested in using CERs for their compliance should do a careful due diligence of CDM project ideas to avoid unpleasant surprises.

Contents

- Contents 2
- List of acronyms and abbreviations 3
- 1. Introduction..... 4
- 2. The database, sample and methodology 5
- 3. The CDM project pipeline by June 2007 5
- 4. Analysis of the ratio between CERs generated and forecast in PDDs..... 7
- 5. Analysis of the variance of project performance 9
 - 5.1 Project category and project type 9
 - 5.2 Size and scale 10
 - 5.4 Consultants 12
 - 5.3 Validators 13
 - 5.5 Host Country 15
- 6. Conclusion: How to explain project performance or what is the ideal project?..... 17
- 7. References..... 19

List of acronyms and abbreviations

AENOR	Spanish Association for Standardisation and Certification
BVQI	Bureau Veritas Quality International
CDM	Clean Development Mechanism
CER	Certified Emission Reduction
DNA	Designated National Authority
DNV	Det Norske Veritas
DOE	Designated Operational Entity
EB	Executive Board
ETS	Emissions Trading System
EU	European Union
EVI	Emergent Ventures India
HFC-23	Hydrofluorocarbon-23
JACO	JACO CDM., Ltd.
JI	Joint Implementation
JQA	Japan Quality Assurance Organization
KPMG	KPMG Sustainability B.V.
N ₂ O	Nitrous oxide
PDD	Project Design Document
PwC	PricewaterhouseCoopers - South Africa
RWTÜV	TÜV NORD CERT GmbH
SGS	SGS United Kingdom Ltd.
TÜV Rheinland	TÜV Rheinland Japan Ltd.
TÜV Süd	Technischer Überwachungsverein Süd
UNEP	United Nations Environmental Programme
UNFCCC	United Nations Framework Convention on Climate Change

1. Introduction

The Clean Development Mechanism (CDM) is widely recognised as an instrument which benefits both industrialised and developing countries. Industrialised countries with emission reduction commitments under the Kyoto Protocol benefit by acquiring emissions credits from emission reduction projects in developing countries, which are less costly than in their own countries. Developing countries benefit through capital investments with the concurrent development and technology transfer benefits that would not have occurred in the business-as-usual case. Thus, the CDM has the dual target of achieving cost-efficient greenhouse gas reduction and sustainable development in the host countries.

The CDM has generated a huge level of activity. Several thousand projects are under preparation and several hundred have completed all steps of the regulatory cycle. Despite a broad agreement on the dual target of the CDM, there are several challenges to implementation of CDM projects.

Regarding cost-efficient emission reductions, there is an obstacle in the so-called “supplementarity” principle. The Kyoto Protocol states that the market mechanisms Joint Implementation and International Emissions Trading are “supplemental to domestic actions for the purposes of meeting commitments under Article 3.” While supplementarity is not mentioned in the Kyoto Protocol with regard to the CDM and no quantitative limit has been set for the use of emissions credits from the Kyoto Mechanisms, the European Commission has capped the use of CDM in the national allocation plans of its member states for the second phase of the EU Emissions Trading System (ETS), 2008-2012. However, the caps are not binding as they sum up to over 1.4 billion t CO₂ equivalent, whereas the expected shortfall of companies covered by the EU ETS is only 1 billion t.

An issue raised only recently is whether CDM projects really do produce the Certified Emission Reduction (CER) volumes projected at the stage of project development and registration. 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 impacts of monitoring requirements as well as delays in implementation of projects. Therefore, one can expect a lower volume of CERs issued than projected when the project was first developed.

To assess the role that CDM can play in the fulfilment of Kyoto targets of European Union (EU) countries, this research project has two objectives. We analyse the ratio between CERs forecasted at registration request and actual CERs issued. Then, we analyse and explain the difference between the CERs forecast and issued by looking at several variables. For this purpose, we take a risk approach, as we understand project performance as the amount of risk that a project entails in delivery of its CERs projected. The explanatory variables analysed are either project-related, such as project type/category or project size, actor-related, such as validator and consultant, or take the institutional context such as factors related to the host country into account. For the analysis we use CDM project data available at the UNFCCC website and to a minor extent the UNEP Risoe CDM/JI Pipeline (UNEP Risoe 2007), both with a cut-off date of end of June 2007.

We will first elaborate on the database, sample and methodology used for this analysis (Section 2) and then provide a brief introduction to the current CDM project pipeline (Section 3), which should serve as a basis for our analysis of the ratio between CERs generated and

forecast in PDD in Section 4. In Section 5 we analyse how project performance differs according to the explanatory variables identified. Before concluding, we synthesise the results in Section 6.

2. The database, sample and methodology

The CDM project cycle is one of the most transparent international policy procedures. It has three distinct steps where CER levels are published. The first step is when a Project Design Document (PDD) is submitted to the UNFCCC Secretariat for the start of the public comment period process. The second step is when a PDD has been validated by a Designated Operational Entity (DOE) and is submitted for registration. The third step is the issuance of CERs once the project has started operation. Issuance requires monitoring by the project developers and verification by a DOE.

In this study we define project performance as the relation between CERs forecast in the PDD and CERs issued.¹ For this reason, the sample of projects to be analysed becomes the sum of projects which have requested issuance of CERs from their project activity at UNFCCC and already received a certain amount of CERs issued as of end of June 2007. As the end date of issuance of each project varies according to the stage of monitoring and verification process (as determined by the project owner), each individual project's issuance time period is aligned to the average annual emission projections as indicated in the PDDs until the year 2007. This means if a verification period lasted 1 month, the issued CERs will be multiplied by 12 to serve as a comparison to the average annual CER estimate of the PDD.

In total, we have identified 203 projects which have already gone through the UNFCCC issuance process. Although this number is still small, we consider it sufficient to draw first tentative conclusions on the performance of these projects. The quantitative and qualitative data on the projects was collected from the UNFCCC website.²

This data is supplemented by information provided by the UNEP Risoe CDM Pipeline (UNEP Risoe 2007). The Pipeline contains all CDM projects that have been submitted for public comments on the UNFCCC website. It also contains the baseline and monitoring methodologies as well as a list of DOE's and various other data. The pipeline is based on the data provided at the UNFCCC website.

3. The CDM project pipeline by June 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. N₂O and landfill gas projects are also significant but

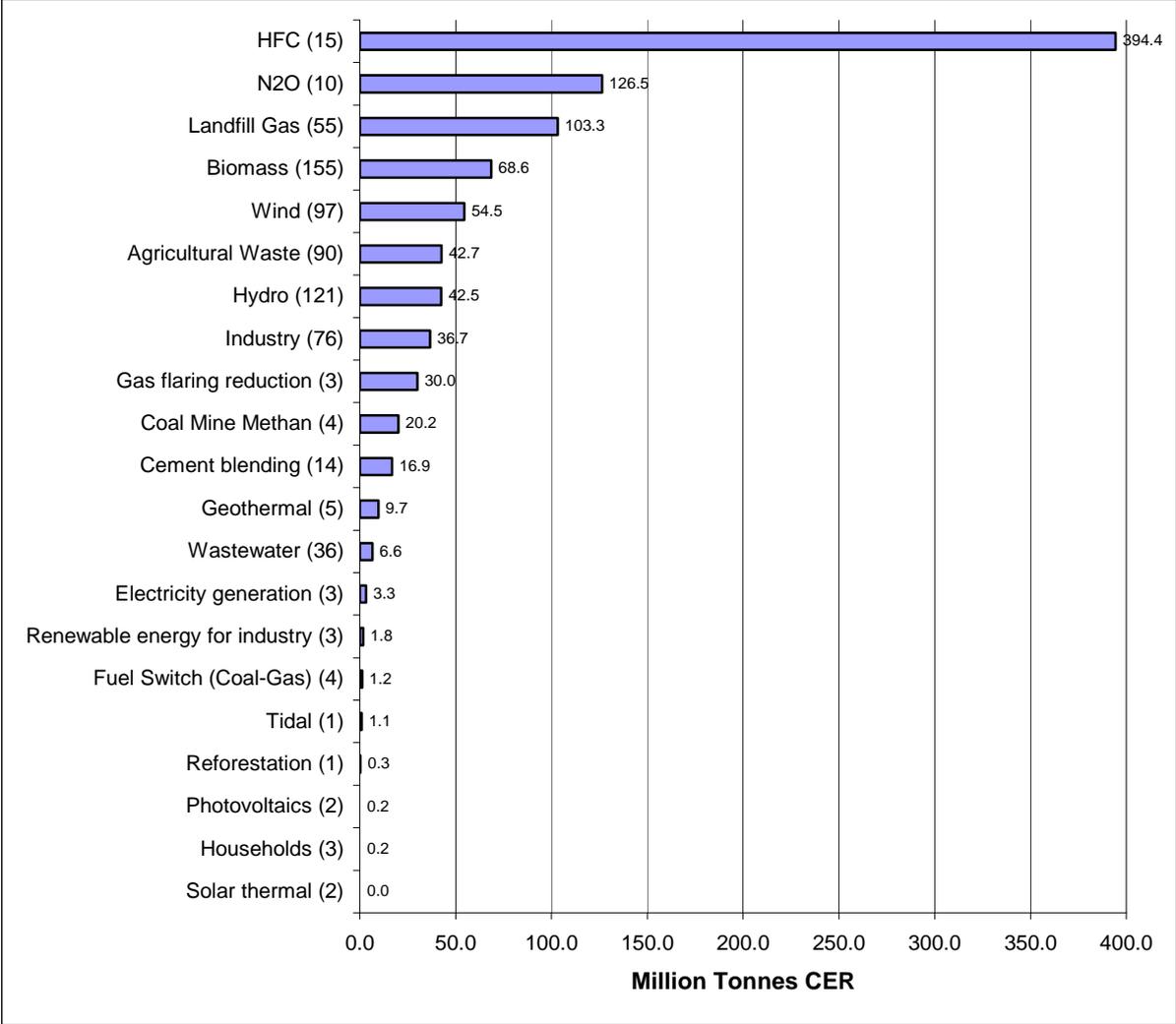
¹ Please note that this is a conservative estimate of project performance, as projects that have been submitted for public comments might never get validated, or their registration might be rejected by the CDM Executive Board. For a discussion of these issues see Michaelowa (2007b).

² <http://cdm.unfccc.int>

have a smaller share of the total amount. In brackets we provide the number of projects of each type.

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.

As the tables below reveal, there is still a steady inflow of new projects at the moment, 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. Therefore, we turn to the analysis of the project performance.

4. Analysis of the ratio between CERs generated and forecast in PDDs

An analysis of CDM project performance, defined as the relation between CERs forecast in PDDs submitted for public comments and finally issued, has to distinguish between the stage of validation and registration.

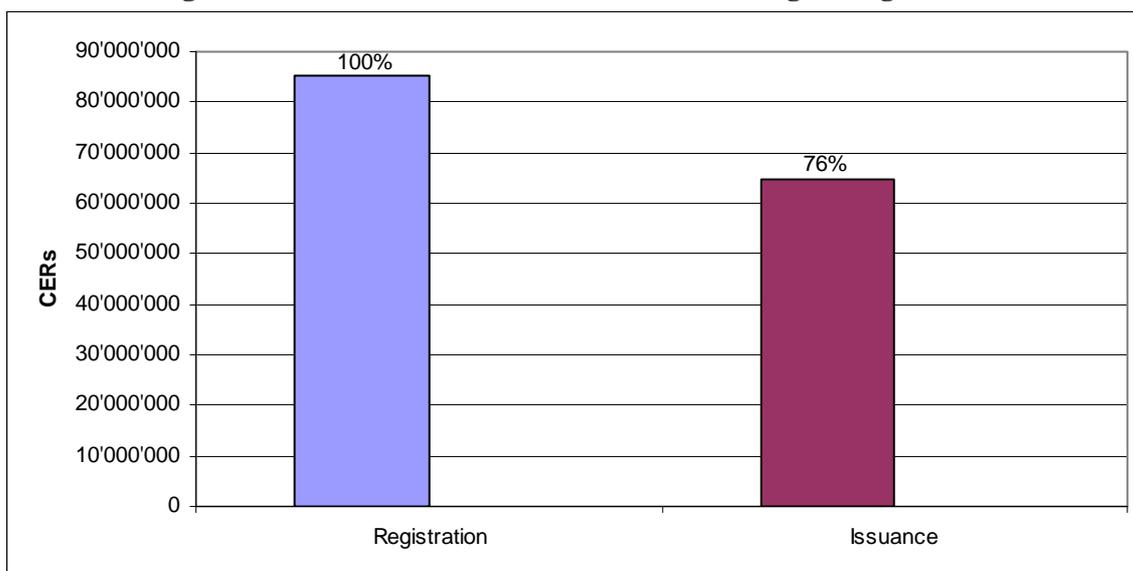
Validation is a process which involves an independent evaluation of the PDD by an external auditor (DOE), which is chosen by the project participants. At this stage, the external auditor reviews the PDD in order to decide whether the project meets CDM requirements. In a lengthy process, the project developer revises his PDD on the basis of “Corrective Action Requests” of the validator. CER projections can be changed substantially due to this process. Only if the validator agrees that all his Corrective Action Requests have been taken into account, he issues a validation report.

On the basis of the validation report and the revised PDD, project developers request registration. Once a registered project is operational, it can hire a DOE to verify the emission reductions achieved within a certain period. The verification is done on the basis of a monitoring report that has to follow the monitoring plan defined in the PDD. Differences between CERs projected in the request for registration stage and the CERs actually issued could have several reasons:

- Delay in the actual start of the project
- Lower load factor of the plant than expected, due to problems with the technology, insufficient inputs, insufficient demand for the product
- Changes in emissions factors used for calculation of the baseline
- Lack of or failure of monitoring equipment.

Figure 2 below shows estimations of the CER volumes of all 203 projects that have issued CERs. Estimations at stage of registration and issued CERs are standardised to a one-year period, so that the different periods become comparable.

Figure 2: Annual CERs issued and forecasts at stage of registration



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

The performance between the stages, as shown in Figure 2, reveals a great difference: Issued CERs amount to only 76% of the CERs predicted at stage of registration. With 85.2 million CERs per year, the forecasted amount of *annual* CERs expected to be issued exceeds the aggregated amount of CERs *actually issued* of all 203 projects, namely 64.8 million tonnes per year. The Figure strongly confirms the hypothesis regarding the overestimation of CERs that takes place in pre-registration phase of the project cycle. The average issuance period per project has been 899 days.

It is important to note that we use *annual comparisons* in this study. To our mind, only standardised figures allow meaningful conclusions. For example, if the issuance period lasts from the factual crediting period start date in December 2005 to April 2006, we accumulate the CERs issued for those five months, divide by the issuance period and extrapolate to one year. The same is done for the CER estimations in the PDD for the same or equivalent period of time. Equivalent periods of time are chosen if the start date of the crediting period in the PDD differs from the factual start date of the crediting period (e.g. if the crediting period has been changed ex-post).

An alternative to this proceeding would have been to centre the analysis around the issued projects and to align the CER estimations and corresponding duration of each project at stage of registration to the issuance period. In our example above, the CERs estimated in the PDD would also be aligned to the issuance period but we would not extrapolate to one year. From our point of view, such a proceeding would be problematic as it does allow comparisons on the individual project level but distorts comparisons when several aggregated projects are compared according to certain characteristics (e.g. host country, project types, etc.).

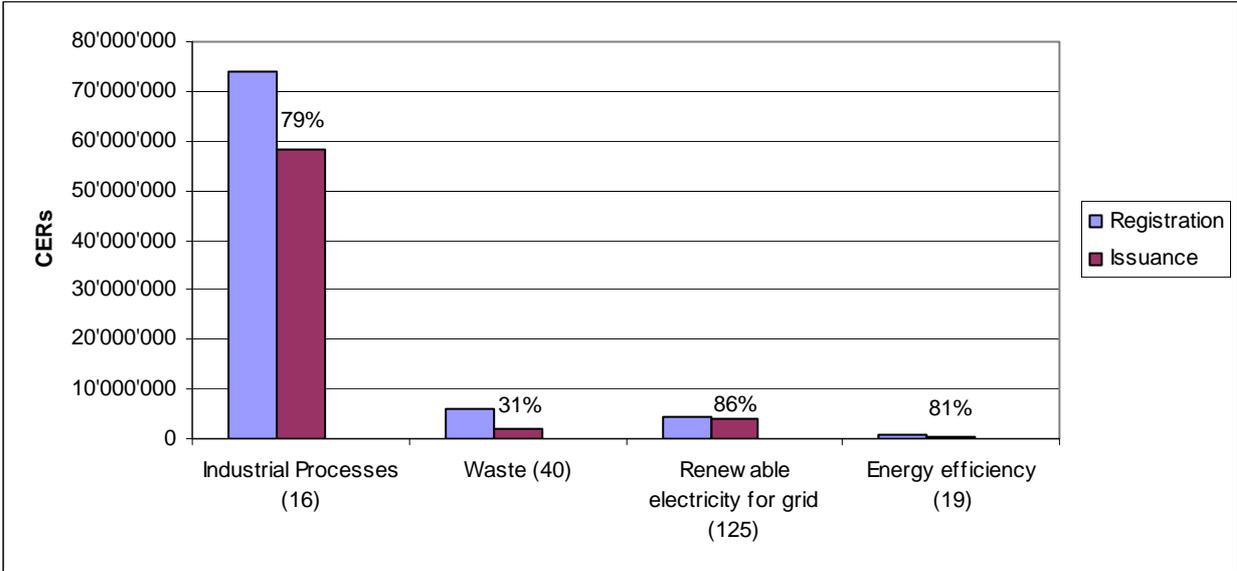
5. Analysis of the variance of project performance

Project performance can vary according to a multitude of factors. In the following we want to concentrate on those which we consider as most critical and on which data is available. These are type and category of project, project size, validator and consultant involved, and the host country of project activity.

5.1 Project category and project type

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 time of project draw 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 are difficult and any statement should be treated with caution. Results are rather tentative and on early stage. Moreover, as Figure 3 shows, projects which aim at producing renewable electricity for the grid might be numerous but do not necessarily produce equal amounts of CERs.

Figure 3: Forecast and issuance of annual CERs, by project category



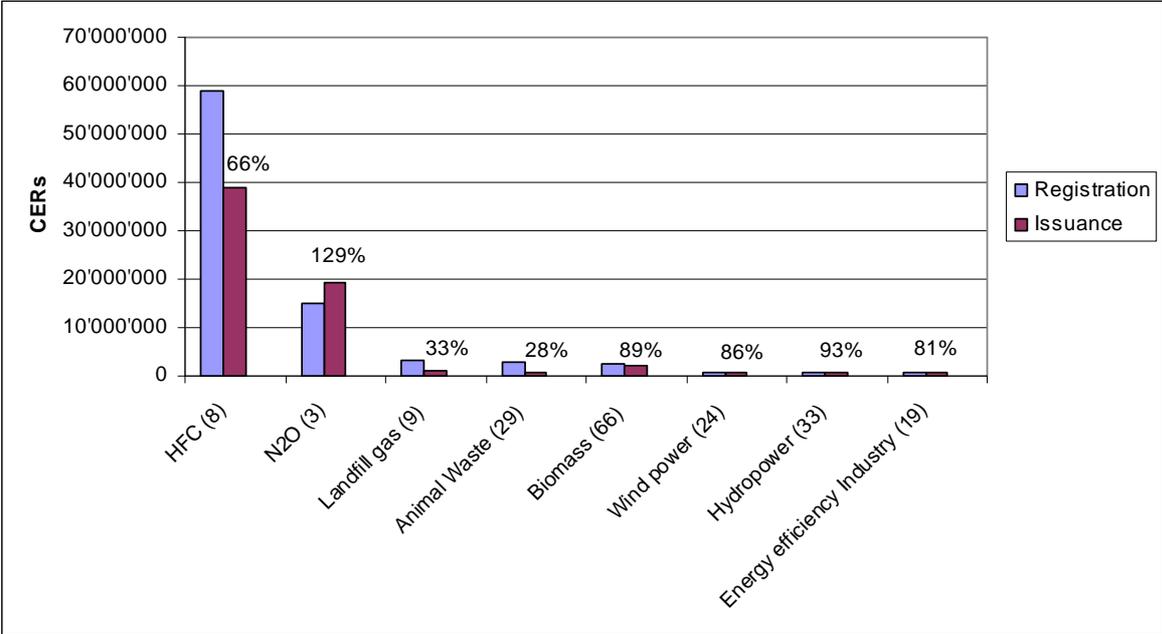
Source: Own calculation on basis of UNFCCC website and UNEP Risoe (2007).

Waste projects, which contain 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 (with non-consideration of 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 4 illustrates, N₂O projects are currently most successful with regard to CERs issued. N₂O is the only project type which issued more CERs than expected. Until June 2007 around 29% more CERs 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, one with Jiangsu Meilan Chemical CO. Ltd and one with Shandong Dongyue Chemical Ltd. Only 66% of the initially predicted CERs were issued. Yet, performance since project draw in mid-2007 has become

better. 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 CERs initially forecasted in the PDD, it is the worst project type that has been implemented in the recent years.

Figure 4: Forecast and issuance of CERs, by project category



Source: Own calculation on basis of UNFCCC website and UNEP Risoe (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). With regard to biomass projects, agricultural plant waste projects performed better (95%) than wood waste projects (76%). Hydropower projects using running rivers for electricity generation 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).

Project types and sectors can clearly influence project performance but they are not the only factors. Project performance may also depend on the project size.

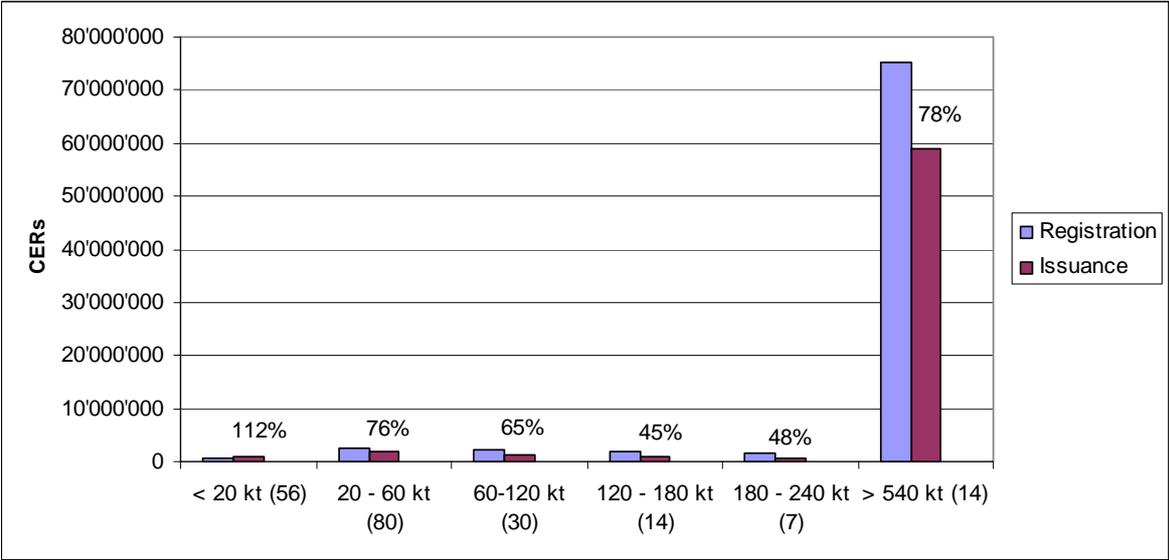
5.2 Size and scale

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. As Figure 5 reveals, this is confirmed, with the exception of projects with a size above 540 thousand tonnes CO₂ equivalent emission reductions.³ 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

³ We have used a 60 thousand 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 5.

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 thousand CO₂ equivalent emission reductions outperform all other projects. This might be due to a high level of conservativeness inherent in such projects and less complexity involved.

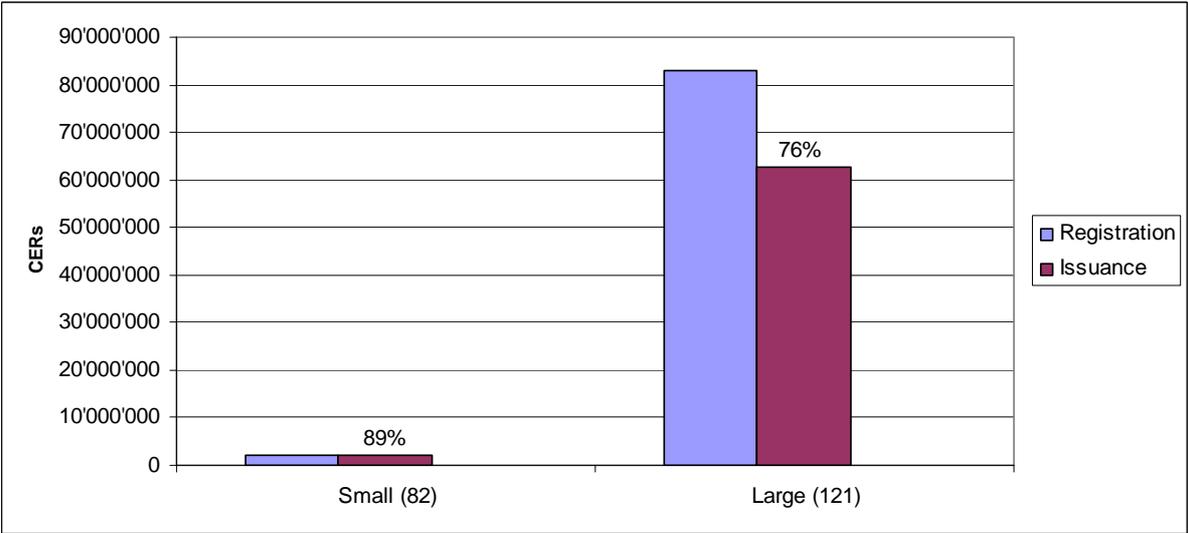
Figure 5: Forecast and issuance of CERs, by project size (grouped according to estimations in PDD at stage of registration)



Source: Own calculation on basis of UNFCCC website and UNEP Risoe (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 big anymore (cf. Figure 6).

Figure 6: Forecast of CERs at stage of registration and CERs issued, by project scale



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

Nevertheless, it confirms the evidence of Figure 5 above. According to UNFCCC's guidelines for completing the simplified project design document, limits to qualify for small-scale are either expressed as a maximum of 15 MW capacity of the project activity (Type I), 60 GWh annual energy savings (Type II) or 60 thousand tonnes CO₂ emission reductions in any year of the crediting period (Type III). 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 6. The good performance of large scale projects is mainly due to the heavy weight of well performing N₂O projects with over 540 thousand 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. Besides project-related factors, intermediary institutions such as consultancies or validators often claim their importance for the success in carbon business and project performance.

5.4 Consultants

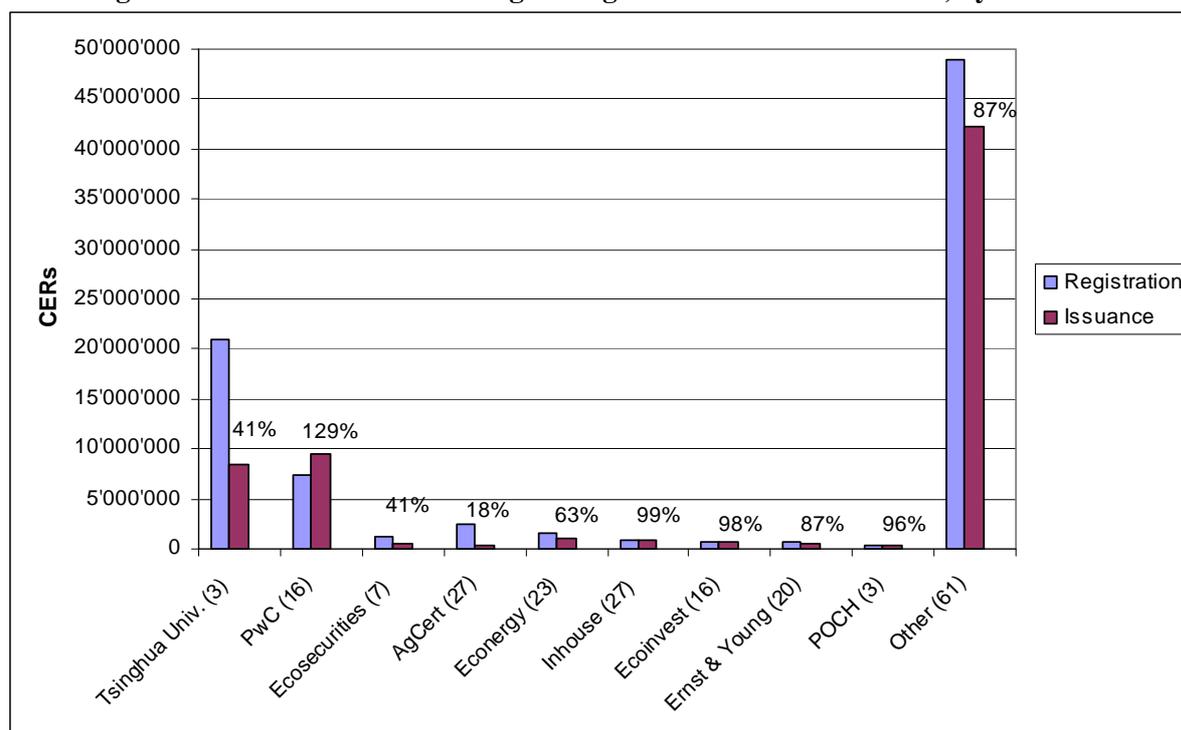
The process until registration and issuance of potential CDM projects is quite complex. The number and specifications of methodologies and UNFCCC regulations have steadily grown over the last years so that the whole registration procedure is becoming more and more inscrutable. As a consequence, the intermediary role of consultants has become 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.

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 China⁴, 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 7 shows the performance of projects in the sample differentiated according to consultant. A comparison between stage of validation and registration is not possible as the data indicates that project owners change their consultants sometimes during this process.

As Figure 7 shows, there are large differences in the performance of CDM projects developed by different consultancies. From all consultancies with three or more projects under issuance, Price Waterhouse Coopers (PwC) has been the consultancy that estimated the emissions reduction potential of the projects most precisely. Its projects took place exclusively in India. Not surprisingly, AgCert performs worst. AgCert does exclusively manure management projects, which have seen a dismal performance rate. On the other hand, there are other well-performing consultancies like Senergy (not in the figure as volumes are too small), which focused on wind projects, with three projects already receiving issued CERs with a performance rate of 119%. Maybe the most interesting insight, in-house development of project design documents shows better results in project performance than most consultancies do. Project proponents seem to know their project best, which questions 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 and that average performance of all projects is 76%.

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

Figure 7: Forecast of CERs at stage of registration and CERs issued, by consultant



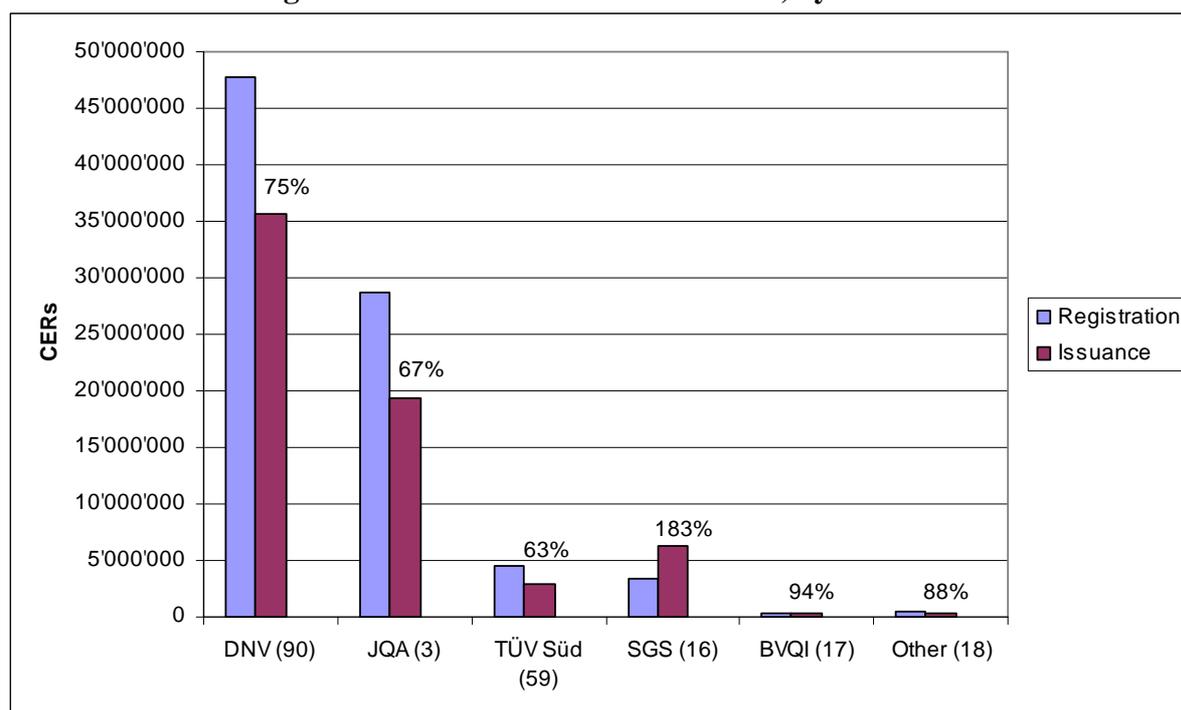
Source: Own calculation on basis of UNFCCC website and UNEP Risoe (2007)

The difference between forecast and actual CERs generated can thus differ tremendously according to consultant involved. Besides consultants also validators may have an influence on project performance. We look at this effect in the next section.

5.3 Validators

The validation process and the role of the validators are crucial for explaining overestimation before registration takes place. Validators have an interest to collude with the audited project developers as they are hired by the project developers (see Michaelowa 2007a). 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 8 shows the difference in CERs between PDDs submitted for registration and final CERs issued according to a selection of validators involved in the process. 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 8: Forecast and Issuance of CERs, by validator



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

As the figure reveals, Det Norske Veritas (DNV), which is the market leader, shows a solid performance around market average. The very good performance of Société Générale de Surveillance (SGS) is almost exclusively influenced by a very well performing HFC-23 project. If this project is taken out of the sample, projects validated by SGS show deductions of 15% in average after registration. The deductions 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. For example, in general the Technischer Überwachungsverein Süd (TÜV Süd) enjoys a reputation for its conservativeness with regard to the assessment of project additionality. However, a high share of TÜV Süd's projects is methane capture from pig wastes, which has a particularly low performance and leads to corresponding deductions. In contrast, RW TÜV (96%) and TÜV Rheinland (87%) perform well, although number and volumes of projects are still very small.

The correlation between project type and performance is confirmed by the table below, which shows the number of projects that the major validators of this sample are involved in. According to the table, DNV's relatively good performance may be explained by its dominant share in "high"-performing project types like renewable electricity or N₂O, despite the exclusive validation of landfill gas projects.

Table 3: Selected validators and project types

	SGS (16)	DNV (90)	BVQI (17)	RW TÜV (6)	TÜV Rheinland (7)	TÜV Süd (59)
Renewable Electricity	8	29	10	3	0	6
Landfill gas (9)	0	9	0	0	0	0
Animal Waste (29)	0	3	0	0	0	26
Biomass (agricultural plant waste) (61)	1	26	4	2	4	22
Biomass (wood waste) (5)	0	3	0	0	0	2
Waste Water (2)	0	1	0	0	0	1
HFC-23 & N ₂ O (11)	1	6	0	0	0	1
Other	6	13	3	1	3	1
SUM	16	90	17	6	7	59

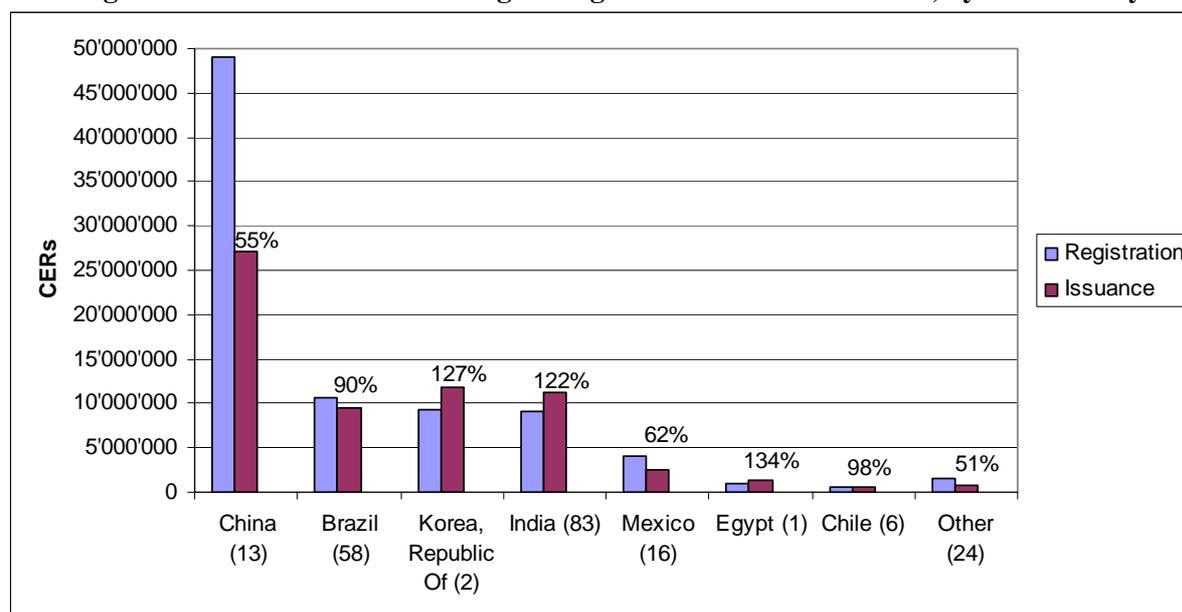
Source: Based on data from UNFCCC website and UNEP Risoe (2007).

5.5 Host Country

Instead of focusing on project-related factors or the role of intermediary players for explaining project performance, some analysts of the carbon market highlight the importance of contextual factors, such as the investment environment of the host country. In the past, most of the carbon capital flow focused on three countries, namely China, India and Brazil. At the beginning India clearly dominated the market in terms of volumes of issued CERs as well as in terms of number of registered projects. China is now at the forefront in terms of volumes, followed by India and – already a bit 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 also more successful in these countries. To be sure, the total number of projects with CERs issued is still not sufficient to allow final conclusions on the performance of these countries, but Figure 9 may provide an indicative assessment.

Figure 9: Forecast of CERs at stage of registration and CERs issued, by host country



Source: Own calculation on basis of UNFCCC website and UNEP Risoe (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 deductions of up to 10% and 45%, respectively, projects in India show a positive performance of 22%. This is significantly above the average deduction of 24%.

The reason for the outperformance of India is mainly based on two well-performing HFC-23 projects which make up 74% of all registered CERs and 81% of all issued CERs in India and achieve 32% more CERs at stage of issuance than predicted (see Tables 4 and 5).

Table 4: Share of N₂O, HFC-23 and waste projects of total volume of CERs in Brazil, India and China at stage of registration and issuance

		China	India	Brazil
N₂O	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 Risoe (2007).

Table 5: Performance of N₂O / HFC-23 and waste projects in Brazil, India and China

	China	India	Brazil
N₂O	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 Risoe (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 project draw in mid-2007. Brazil's performance is based to a lower extent on HFC-23 and N₂O projects. In our sample there are even no HFC-23 projects taking place in Brazil at all and 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 certainly beats down 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 9 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.

Although the type of project already provides a relatively plausible explanation for the performance of a country in CDM projects, an alternative explanation may be the lead time until registration takes place. The longer a registration process lasts, the less emission reductions a project can generate. Lead times, however, may serve as an explanation only if retrospective CER issuance (i.e. for credits before registration takes place) is ruled out. Since this is only the case since the EB decision in 2006, project lead times can not serve as a possible explanation for our project sample.

6. Conclusion: How to explain project performance or what is the ideal project?

The Kyoto Protocol's flexible mechanisms allow the generation of emission reductions abroad. The Clean Development Mechanism (CDM), as a part of them, allows a cost-effective reduction of emissions in developing countries and technology and capital transfer from industrialised countries 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 compliance buyers in industrialised countries bet on the CDM to fill their compliance gap.

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 a reduction of the expected CER volume or even to a rejection of a project.

By mid-2007, more than 200 projects had gotten CERs issued. Thus, there is a sufficient quantitative basis to assess performance of CDM projects according to different variables. We analyse the ratio between actual CERs issued and those estimated in the request for registration. We also try to explain the ratio between the CERs forecast and issued through possible explanatory variables such as project type/category, project size, consultant, validator and host country, using data from the UNFCCC website.

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. Project performance after registration shows a pattern, in which landfill gas, animal waste and geothermal projects, targeting at agricultural plant waste, perform worst.

One of the major insights gained from this study is that the type of the project is critical for project performance. N₂O projects are large-sized, promise good delivery of CERs and make up a large part of the CER supply. This is also true for HFC-23 projects in India but not in China. As these types of project are also mainly implemented in these countries they do not only cause a strong correlation with the variable ‘size’ but also partly with ‘host country.’ In contrast, animal waste, landfill gas, geothermal and cement blending projects have been disappointing so far and showed reductions between 40 and 70% between the CER forecasts at stage of registration and actual CER issuance.

Generally, the smaller the project the better the performance. This may be due to reduced complexity of such projects. Yet, the correlation only holds true until a project size of roughly 240 thousand CERs. Very large projects, above 540 thousand tonnes, which include N₂O/HFC-23 projects, perform almost as good as very small projects.

With regard to consultancies, the analysis showed that in-house consultancy promises to be one of the best approaches to improve the forecast/issuance ratio. This is due to the fact that project owners mostly know their project best, which has a direct influence on the estimation.

7. References

Michaelowa, Axel (2007a): Untergräbt der Clean Development Mechanism den internationalen Klimaschutz?, in: Die Volkswirtschaft, 80, 9, p. 20-23.

www.dievolkswirtschaft.ch/de/editions/200709/Michaelowa.html

(accessed November 1, 2007).

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

UNEP Risoe (2007): CDM pipeline, version June 26th 2007, www.cdmpipeline.org, (accessed July 10, 2007).

World Bank 2007: State and Trends of the Carbon Market 2007, Washington

http://carbonfinance.org/docs/Carbon_Trends_2007- FINAL - May 2.pdf

(accessed November 1, 2007).