Francisco Ascui &
Pedro Moura Costa
EcoSecurities

A PROJECT DEVELOPER'S PERSPECTIVE

CER Pricing and Risk

As other contributors to this volume have discussed, CERs are typically sold through ERPAs. Parties often enter into ERPAs at an early stage in a project's development, when it remains exposed to a wide variety of risks. Alternatively, a CDM project can be developed without an ERPA deal in place. In these cases the CERs can be sold on the spot market once they are actually issued. The vast difference in risk between these two options results in a wide range of prices for CERs sold under different contractual arrangements and at different stages of the CDM project cycle.

The impact that various risks have on the forward price is illustrated in fig. 1. The risk-free price represents the value of an issued CER once it has actually been received in a buyer's registry account. In order to arrive at a fair CER price at an earlier stage in the project cycle, an impact assessment must be made of all applicable risks.

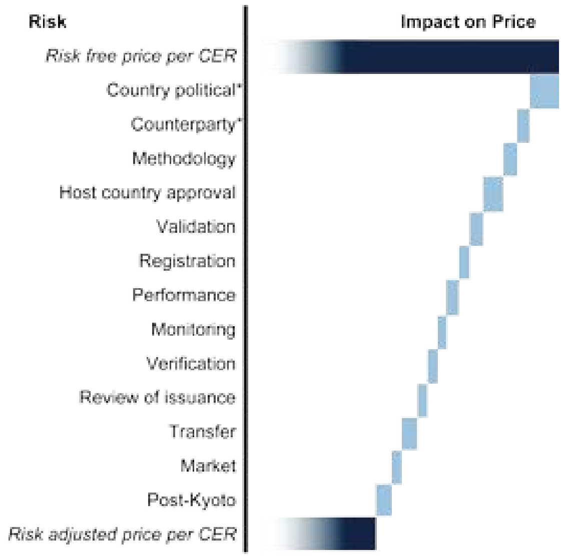
A major challenge for both developers and buyers is evaluating a project's unique risk profile—particularly as different projects may need to be evaluated at different stages of the project cycle. In the following, we discuss key CDM-specific project risks and provide suggestions for how some of the regulatory risk inherent in the CDM could be mitigated. We also discuss risk assessment tools, and how they can be used for project screening and strategic analysis, including the estimation of CER yields from an entire portfolio of CDM projects.

Distinguishing CDM from General Project Risk

Some of the risks identified in Fig. 1 (e.g., country/political and counterparty risks) are not specific to CDM projects. It is, however, worth remembering that CDM projects *generally* tend to

Fig. 1

Reflection of risk in the CER price



* Denotes non-CDM-specific risk

be high risk—even before CDM-specific risks are taken into account. There are three main reasons for this:

1. *Location*. CDM projects are by definition undertaken in developing countries, where country risk factors are higher.
2. *Technology risk*. The majority of CDM projects under development to date (59%)[1] have been renewable energy projects, which typically have a high capital cost to operating cost ratio. This means that the impact of any operational performance risk is magnified. Some renewable energy technologies (such as hydro) are mature and generally reliable, whereas others may have higher performance uncertainty. Mitigating this risk may also be a problem, as providers of new renewable energy technologies may not be able to issue reliable performance guarantees.
3. *Additionality* requirements mean that there must exist a barrier to a project's going ahead without the CDM. Often the bar-

Box 1

Suspension of approved methodologies

In May 2006, the EB suspended two methodologies for animal waste manure management systems, in order to undertake work on monitoring flares and to re-work default calculations regarding methane production in alternative baseline scenarios. The two methodologies remained on hold for over four months, before a new consolidated methodology was approved (ACM0010). During this period, projects relying on these methodologies were also effectively on hold. Great uncertainty was created for developers planning to replicate similar projects, as the draft revision was much more conservative than the existing methodology. Projects planned by AgCert, whose business model was largely based on rapid financing and deployment of such CDM projects, were effectively frozen while these revisions were being considered.

1 UNEP Risoe Centre, "UNEP Risoe CDM/JI Pipeline Analysis and Database, January 2007.

rier is that the CDM project has a poorer expected financial return in comparison with other viable alternatives, but it may also be regulatory or technical in nature. Any such barriers effectively increase the project's risk profile. This means, in practice, that CDM-specific risk factors are critical to the project's overall viability.[2]

In the following sections we discuss the key CDM-specific risks, starting with methodology risk.

Methodology risk

Developing a new methodology is costly, time consuming, and risky; therefore, if an existing approved methodology can be used, this will considerably reduce a project's overall risk profile. Nevertheless even developers using only approved methodologies need to bear in mind the risk that the CDM EB may withdraw, or put on hold, a previously approved methodology, or make amendments to a methodology that can have a material impact (see Box 1).

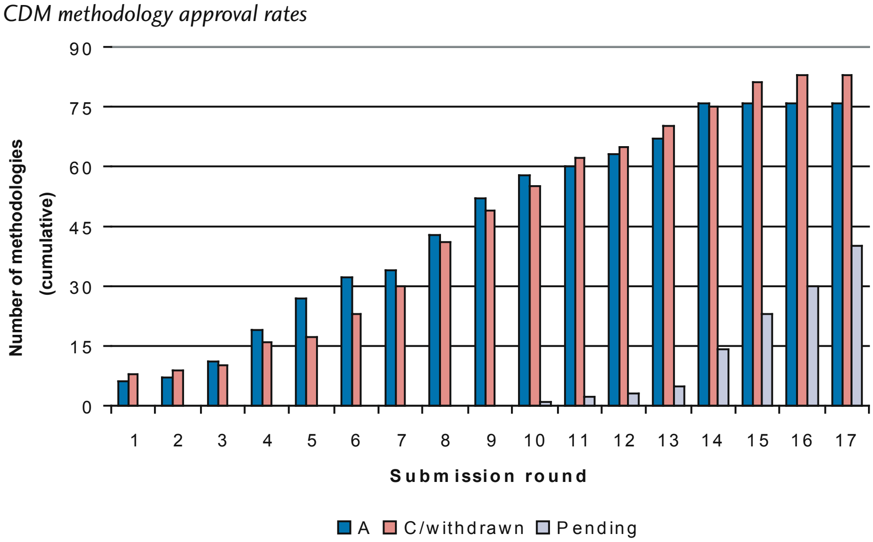
As of January 2007, 199 large-scale methodologies had been submitted. Of these, 76 have been approved (38%), 83 rejected or withdrawn (42%), and 40 still awaiting a final decision (20%), as shown in Fig 2. The risk of methodology rejection is currently over 50% of known outcomes.

It generally takes three to six months to develop from scratch an entirely new large-scale CDM methodology. The cost of doing so—whether measured in terms of internal resources or fees for external consultants—typically ranges from $60,000–100,000, although it may be less for a relatively simple methodology, or one that borrows heavily from an existing methodology. It may also be considerably more, for a more complex methodology.

2 If not, then the decision whether or not to go ahead with the project would be the same with or without the CDM, and hence the project would not be additional.

Fig. 2

CDM methodology approval rates



Source: UNEP Risoe JI/CDM Pipeline Analysis and Database, January 2007

The EB takes around ten months, on average, to approve a new methodology. Time is money in the CDM market—as anywhere else—but the situation is particularly vital considering the uncertainty beyond 2012. Imagine, for example, that a project sponsor was to start work in January 2007 on a new methodology that could unlock the emission reduction potential of an entire sector, process, or technology. It is likely that the first project using that methodology could only be submitted for validation in February 2008. Taking into account further steps in the CDM project cycle, at least two years of emission reductions— representing around a third of the potential carbon revenue until 2012—could be lost.

CDM projects generally tend to be high risk – even before CDM-specific risks are taken into account.

Host country approval risk

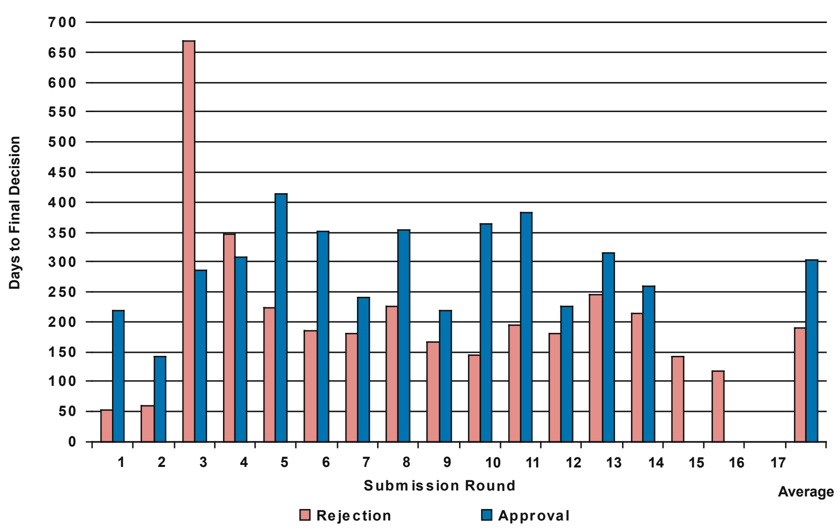
A CDM project must receive approval from the host country DNA in order to be registered. In addition, any project participants must also be authorized by a Kyoto Party. There are three kinds of risk associated with obtaining DNA approval: (1) approval risk, which is binary, (i.e. either the project is approved or it is not); (2) a time lag, which is a variable risk; and (3) market interference risk, which is also variable.

In general, the latter two risks have a higher incidence. It is rare for DNAs to reject a project outright, although project sponsors may give up after excessive delays or interference. The average time between publication of a PDD for comments and issuance of the required LoA is currently 4.5 months.[3] This timeframe varies, however, by up to

3 This figure only applies to the 80% of projects that do not receive the LoA prior to publication for comments. UNEP Risoe CDM/JI Pipeline Analysis and Database, January 2007

Fig. 3

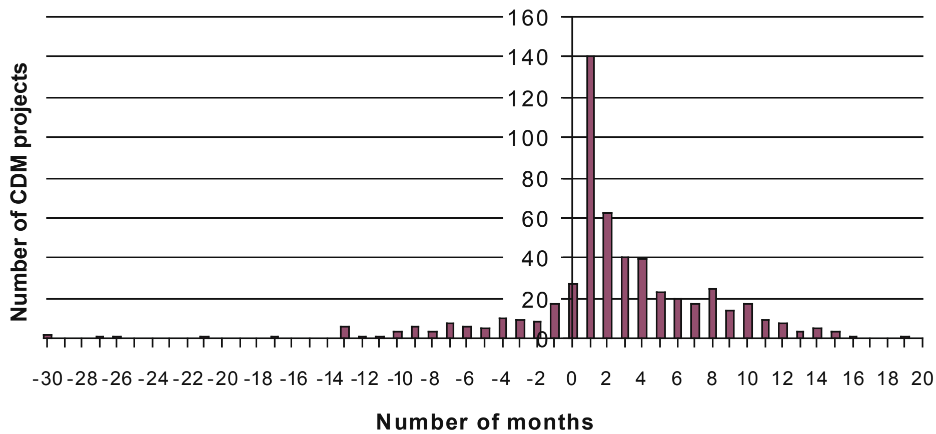
Average time to final decision from date of initial methodology submission



Source: UNEP Risoe JI/CDM Pipeline Analysis and Database, January 2007

Fig. 4

Time lag between publication for comments and LoA



Source: UNEP Risoe JI/CDM Pipeline Analysis and Database, January 2007

a year or more in some instances, as shown in Fig. 4. General political risk factors can stall issuance of LOAs, as in the case of Thailand, where the unexpected coup in 2006 caused projects awaiting approval to be put on hold for months.

Some DNAs have also decided that their role includes fixing prices. In Jordan, for example, the DNA interprets the *economic* component of sustainable development to mean that CERs should only be sold for the best possible price. In China, the DNA requires (informally) that all ERPAs set a minimum CER price level of around €8.

In our opinion, CDM host countries will obtain the best prices for CERs as a natural consequence of the operation of a thriving, transparent, and competitive market. Interference by DNAs in pricing creates uncertainty, and is highly unlikely to achieve the optimum price level for any given project or ERPA. The result will ultimately be economically detrimental to the country, as investors will, *ceteris paribus*, look elsewhere for credits.

Host country approval risk is best mitigated by ensuring that DNAs have transparent approval procedures, with clear sustainable development criteria against which projects can be measured. This saves time for both developers and DNAs, and helps to ensure a high success rate for submitted projects. Risk can also be reduced by following a two-stage process, whereby the DNA first makes a preliminary assessment and issues a nonbinding LOE, followed by a more detailed assessment and issuance of a LoA. Finally, it is up to the project sponsor to initiate the DNA approval process as early as possible, in order to minimize the risk of time lag.

Validation risk

Validation by an accredited, third party DOE plays an essential role in ensuring the quality and integrity of the CDM as an instrument of international climate change mitigation. While DOEs do not exist to assist with project development, the validation process provides a useful quality assurance role and helps to maximize the chances of successful registration. Experienced project developers understand this, and work very closely and effectively with DOEs to ensure that the process runs smoothly.

Nevertheless, the validation stage adds the risk of delays. Although validation of most projects can be done within two months, it typically takes at least three months, due to the high demand for DOE services, combined with limited DOE capacity. As a result, there is a massive backlog of projects at the validation stage, relative to the number of projects which have been registered, as shown in Fig. 5. This is partly a reflection of the rapid increase of new CDM projects over time, but it also illustrates the fact that validation can be a bottle-neck in the process.

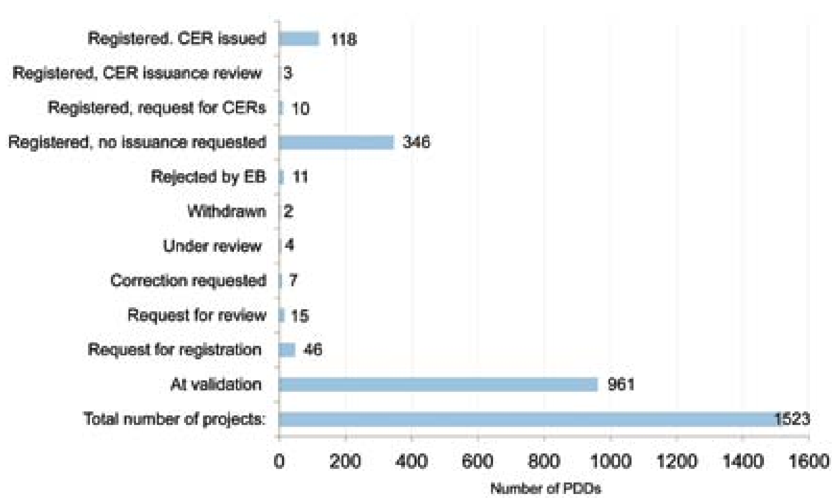
Registration risk

A project submitted for registration has already been through a rigorous process of host country approval and third party validation. Nevertheless, there remains a risk of non-registration or further delay while a project is reviewed. Registration risk thus represents the risk of a validated project not being duly registered. It has two components: (1) outright rejection, and (2) various delays associated with the registration process.

Technically, a project should be registered eight weeks after receipt by the EB of the request for registration (four weeks for a small-scale project). Because a project developer cannot interact directly with the EB, the request for registration must be submitted by a DOE. The risk of delay arises if the DOE delays processing the submission request or associated fee payment, or if the EB secretariat does not officially recognize receipt of the submission on time (by uploading it to the UNFCCC website).

Out of the first 139 projects submitted for registration, only nine requests for review were received—a risk factor of 6.5%. However, in

Fig. 5
Status of projects in the CDM pipeline



Source: UNEP Risoe JI/CDM Pipeline Analysis and Database, January 2007

Box 2
CDM: A catch-22?
Delays can occur at validation that are beyond the control of the DOE. In Brazil, for example, the DNA asks to see the validation report before they issue an LoA. The DOE must, however, see the LoA before they can formally validate a project. A compromise has been reached, whereby the DNA will accept a validation report that is complete in all aspects, apart from the issue of host nation approval (which could take several months). The problem arises that after the approval has been received, the period of validity of a methodology may have expired, new PDD requirements may have been published, or any number of other regulatory variations may have occurred. There is, therefore, a real risk that the validation report is no longer complete, and hence, will need to be updated and resubmitted to the DNA.

2006, a new step in the CDM project cycle was introduced: All registration requests are now appraised by the Registration and Issuance Team (RIT) during the registration appraisal period. This has resulted in an increase in the rate of requests for review to an average of 20% (for projects submitted in 2006).

Fossil fuel switch and HFC destruction projects have experienced the highest rates of requests for review (36% and 41%, respectively). No HFC projects have ultimately been rejected, following a request for review, whereas 7.1% of fuel switch projects have been rejected. Energy efficiency (EE) and cement sector projects also have experienced a high rate of final rejection (8.8% and 7.1%, respectively).

A request for review is triggered if one of the Parties to the project, or at least three members of the EB, request it. Even though all Parties to the project will already have given their approval (as a required prior step in the process), some countries (e.g., Brazil) have been known to trigger formal requests for review of their own approved projects (usually because of minor textual differences between the version of the PDD approved by the DNA and the version submitted for registration).

In theory, if a request for review is based only on *minor* issues, then these issues should be resolved between the secretariat (in consultation with the Chair of the EB), the project participant, and the DOE. No formal time limit is stipulated for this process, during which the registration of the project is postponed.

If a request for review is not based on minor issues, the EB is supposed to take a decision at its next meeting, either to carry out a formal review

Box 3
When does the eight week appraisal period begin?
EcoSecurities has had the unfortunate experience of the EB secretariat delaying the uploading of a validated PDD to the UNFCCC website by one month after it was duly submitted by a DOE, along with payment of the associated fee. In this case, the one-month delay effectively cost the project sponsor 200,000 CERs, or around €3 million at current market prices. Improved procedures and greater clarity about when the 8-week appraisal period begins could mitigate this risk factor.

Table 1

Requests for review before and after introduction of the RIT

	To Dec 05	Jan 06	Feb 06	Mar 06	Apr 06	May 06	Jun 06	Jul 06	Aug 06	Sep 06
Requests for registration	**139**	**16**	**18**	**37**	**63**	**12**	**10**	**49**	**51**	**77**
Requests for review	9	1	3	9	21	3	2	10	13	5
Formal Reviews	7	1	3	7	18	1	1	7	9	3
Correction Request	*2*	-	*3*	*3*	*12*	-	-	*4*	*4*	*3*
Rejected	*2*	*1*	-	*2*	*1*	*1*	*1*	*2*	*2*	-

Source: Derived from EB reports

Table 2

Review and rejection rates for different technologies (October 2004 to October 2006)

Project type	Review rate	Rejection rate
Agriculture	7.5%	-
Biogas	21.5%	-
Biomass energy	13.8%	0.2%
Cement	11.9%	7.1%
EE total	20.7%	8.8%
Fossil fuel switch	35.7%	7.1%
HFCs	40.5%	-
Hydro	10.2%	1.7%
Landfill gas	14.8%	-
Solar	33.3%	-
Wind	17.2%	4.7%

Source: Derived from EB reports

or to register the project. In practice it is, however, not uncommon for items on the EB agenda to be pushed to subsequent meetings, thus taking up to three months to arrive at a decision.

At the time of writing, around 75% of requests have resulted in formal reviews. A formal review is supposed to be completed by the second EB meeting after the request is received (up to 4 months later). At that meeting, the EB can decide to register the project, to request corrections before proceeding with registration, or to reject a project. So far, around 21% of projects undergoing formal reviews have been rejected.

Unfortunately, there is no universal definition of what constitutes a minor issue. An EcoSecurities project was rejected after a formal review, even though the original error (i.e., the DOE inadvertently uploading an incorrect version of the PDD) had been corrected in a re-submission. Other requests for review have been triggered by spelling mistakes in the PDD.

Any issue of insufficient trust in the DOEs should be addressed by the DOE Accreditation Panel. Our view is that the need for yet another check in the system should be re-evaluated, as it creates more uncertainty and risk, and hence lowers the price that buyers are willing to pay for forward CERs. This ultimately reduces overall investment levels in the CDM and the amount of money flowing to developing countries through this mechanism.

Performance risk

CDM project sponsors have been significantly overestimating the performance of their projects. As of February 2007, around 54% of the CERs as projected in registered PDDs were actually issued. If HFC and N_2O projects are excluded, this figure drops to 31%.[4] There are several reasons for this:

4 EcoSecurities analysis and UNEP Risoe CDM/JI Pipeline Analysis and Database, January 2007.

Time lag

One issue impacting the discrepancy between projected and issued CERs is the continuing time lag in the construction and commissioning of projects. Many CDM projects involve technologies or practices that are unfamiliar in the host countries. Appropriate monitoring equipment can also be difficult to obtain locally, and importing such equipment to certain countries can be a logistical nightmare.

Technology transfer

While technology transfer lies at the heart of the CDM, it is not always as easy as it sounds. A piece of equipment manufactured in a European country, for example, may be designed to integrate with certain standard pipe and flange sizes, which may not be standard in the CDM host country. This can be more than just a nuisance, as a manufacturer's warranty may be conditional on the equipment's being installed to specifications based on European conditions. This can lead to installation delays, and additional costs for re-engineering.

Projecting output

Project stakeholders still have relatively little experience with projecting the *output* of a CDM project (i.e., emission reductions). The risks are higher for some technologies and sectors than others. For example, the emission reductions predicted for landfill gas capture projects are based on models developed in Annex I countries, which can be wildly inaccurate when applied to developing country landfills, due to different management practices.

Operating conditions

Operating conditions can also have a significant effect on performance, in ways that may be difficult to predict. In one project case, a modified industrial process with significant potential to reduce energy consumption actually *increased* energy consumption after installation, due to the operator's unfamiliarity with the new process and lack of optimization experience.

Monitoring risk

There is a tendency to assume that once a project is registered, it will automatically produce CERs—yet this is only the case if monitoring is carried out adequately and correctly. If the emission reductions are not being monitored exactly according to the procedures set out in the monitoring plan in the PDD, or if the monitoring data is not being recorded sufficiently accurately (or quality controlled to a sufficient level), then it does not matter if a CDM project is performing as expected. This is emerging as a key risk factor, and one that a CER buyer has little control over, given that monitoring is the responsibility of the project operator.

Risk factors in monitoring are mainly human in origin. It is rare for monitoring equipment itself to fail, but relatively common for equipment to work incorrectly due to operator error (e.g., a flow meter could be inserted in the incorrect location). Improper calibration of metering equipment can invalidate months of data, thereby preventing the issuance of significant quantities of CERs.

Human error can invalidate the date produced by monitoring equipment in a variety of ways. If metered outputs or other factors are recorded manually, there may be transcription errors, or more systemic errors, such as data being recorded with insufficient accuracy. Electronic and hard copy records do not always correspond, thereby undermining both sets of data. Data or calibration records can go missing: Our experience includes *(a)* at least one office move that resulted in hard copy data records being discarded, *(b)* one fire that destroyed records, and *(c)* various instances of electronic storage device corruption. Quality control is thus of paramount importance. Data can be invalidated if, for example, the person who inputs the data also signs off on the crosschecking. To mitigate this risk with respect to our own projects, EcoSecurities invests heavily in quality assurance training and capacity building in host countries. Perhaps a transfer of quality management skills and standards is an unforeseen side benefit of the CDM.

Verification risk

Verification is a highly skilled activity, requiring a combination of process engineering, quality assurance, and financial auditing skills. Not surprisingly, skilled verifiers are hard to find, leading to a shortage of DOEs available to undertake verifications. The CDM rules which require that the verification and validation of large-scale projects be done by different DOEs further exacerbates the human capacity constraint. As a result, verification is often subject to time delays.

Review of Issuance risk

Once a DOE has verified and certified the emission reductions for a given period, it submits a request for issuance to the EB. The secretariat is supposed to upload this immediately to the UNFCCC website, whereupon a fifteen-day period commences, and during which time a request for review may once again be triggered.[5] To date, roughly 20% of requests for issuance have resulted in requests for review, and of those, about 70% have gone on to formal reviews.[6] Of the formal reviews that have been completed, 20% have resulted in rejection. In total, the possible delay resulting from a request for review can be up to four months.

Transfer risk

After verified CERs have been issued by the EB (nearly 28 million had been issued by the end of 2006), some hurdles remain before they can actually be used by a buyer.

Forwarding instructions

Project participants must agree into whose account(s) the issued CERs should be forwarded. A single focal point may be responsible for all forwarding instructions; however, if no such focal point is designated, then any forwarding would, by default, require the approval of all the participants. For projects with many participants, this is both an administrative nuisance and a real risk. If one of the participants were, for example, to fall out with the others—or go into receivership—the issued CERs could be stranded without properly authorized forwarding instructions in a pending account in the CDM registry forever (although the share of proceeds to cover administration expenses, and the 2% levy for the adaptation fund, would still be deducted).

ITL delays

There are risks associated with creating any complex information technology project. A delay beyond 30 April 2008 could impact some compliance buyers, because CERs have to be transferred before this date in order to be usable for the first phase of the EU ETS.

5 The request for issuance is appraised by the Registration and Issuance Team during this fifteen-day period. As with requests for review at the registration stage, a review may be triggered by a Party to the project or by at least three EB members. If triggered, consideration of a review is included in the agenda of the next EB meeting (which means that actual consideration may be pushed back to a subsequent meeting). If a decision is made to undertake a formal review, it must be carried out within thirty days.

6 It should be noted that these figures are based on a fairly small sample size of sixty-six requests for issuance.

Registration

Any Annex I entity wishing to have CERs transferred to its own account in a national registry (or indeed, wishing to be a nominated CDM project participant) must be authorized by the DNA of the Annex I country. Obtaining such a LoA takes time, and the associated requirements differ by each nation.[7]

Eligibility conditions

Finally, there are a number of eligibility conditions that an Annex I country must fulfill before they are able to use, or transfer, CERs. Some conditions are basic, such as requiring ratification of the Kyoto Protocol. But there are also stricter conditions, such as ensuring *(a)* that effective systems are in place to monitor GHG emissions and removals within the country, *(b)* that a national registry connected to the ITL exists, and, most importantly, *(c)* that the country's assigned amount has been adequately calculated and approved. Most Annex I countries (including all EU member states, with the exception of Romania and Bulgaria) submitted assigned amount calculations to the UNFCCC in December 2006, and these must now be reviewed. Any disputes are to be handled by the enforcement branch of the compliance committee within a sixteen-month period. Consequently, a country's eligibility status may not be fully resolved until the end of April 2008.

Market risk

CER worth is determined by market supply and demand at any particular moment. At present, the largest market is the EU ETS. Demand in the EU ETS market is determined by the aggregate decisions of twenty-seven sovereign nations, each pursuing their own national interest as they set the level of free allocation of allowances in advance of each phase of the scheme. While well-informed guesses may be made about the outcomes of these decisions, there remains an irreducible element of unpredictability to this market. Different allocation decisions in the two phases of the scheme (2005–2007 and 2008–2012) have already led to price differences, as shown in Fig. 1 in Bishops' contribution.

Interference by DNAs in pricing creates uncertainty, and is highly unlikely to achieve the optimum price level for any given project or ERPA. The result will ultimately be economically detrimental to the country,

Many governments are also purchasing CERs for compliance purposes. As well, there is a nascent market, primarily in the private sector but also from government agencies, NGOs, and even individuals, to voluntarily purchase CERs for carbon offset. While committed funds and stated policies provide a good indication of the volume of government demand, the wild card of 'hot air' from Russia and Ukraine (in particular) creates price uncertainty in the Kyoto compliance market. Voluntary market demand will depend on whether consumers and governments require high-standard offsets (such as CERs) or accept lower-standard alternatives, which may be substantially cheaper.

At the same time, the supply curve for the CDM market is still poorly understood. CER supply is growing extremely rapidly, which makes future projections difficult. This combination of demand and supply uncertainty means that predicting

7 For example, the UK DNA requires all project participants to sign a declaration stating that all local laws have been complied with, which may constitute a criminal offence if made fraudulently - thus requiring extensive due diligence.

future prices is also very difficult. If the record of the EU ETS over 2005–2006 is anything to go by, the market will continue to be characterized by extreme volatility.

Post-Kyoto risk

The fate of the CER markets post-2012 is uncertain. While it is clear that the emission reductions required under Kyoto are insufficient to "prevent dangerous human interference with the global climate" (the stated objective of the UNFCCC and Kyoto Protocol), it remains to be seen whether the international community will be capable of translating this need into further action.

It is looking increasingly likely that there will be a multiplicity of schemes–perhaps based on voluntary agreements in Japan, self-imposed efficiency targets in the largest developing countries, mandatory caps in Europe and certain US states and/or sectors, plus a range of voluntary schemes serving the private sector, individuals, and communities. This could create differing regulatory requirements, informational barriers and, ultimately, price signals that would reduce the size and liquidity of the overall market.

From a developer's perspective, this uncertainty implies a rapidly approaching point beyond which it will be virtually impossible to raise finance for new CDM projects. Project development takes (at best) at least six months, and often up to three years or longer; therefore, the window of opportunity for a project to recover its costs before December 2012 is rapidly narrowing. In practice, this cut-off point will be reached at different times for different project types, depending on their rate of return. It may already have been reached for some project types.

Very few buyers are prepared to commit to purchase CERs beyond 2012, and then only at low prices. Likewise, most parties require a high rate of return before they will finance a project that will not recover its costs before 2012. Either way, the post-2012 market for CERs will be highly constrained until there is greater certainty (which is unlikely to develop before 2010, at the earliest). These constraints are already having an impact on some projects.

In summary, a CDM project is exposed to a range of specific and generic risks. These risks are cumulative and higher for projects at earlier stages of the project cycle. Risks specific to CDM generally involve delays, but may also result in project failure. A full assessment of these risks is required to arrive at a fair risk-adjusted price for the forward purchase of CERs.

Risk reduction

There are many ways to partially mitigate some of the above risks— typically by apportioning the risk to the party who is best able to deal with it, *via* an ERPA or other contract between project stakeholders. These mechanisms are dealt with elsewhere in this publication, so we will not go into them here.

In addition, there are a number of ways in which CDM-specific regulatory risk can be reduced at the international level. It is important to remember, that every measure designed to improve the quality assurance process has the potential to unintentionally degrade the overall quality of the CDM as a tool for inexpensively and effectively reducing GHG emissions in developing countries. For example, any increase in methodological and procedural complexity will inevitably discourage smaller-scale projects and smaller-scale developers from entering the market.

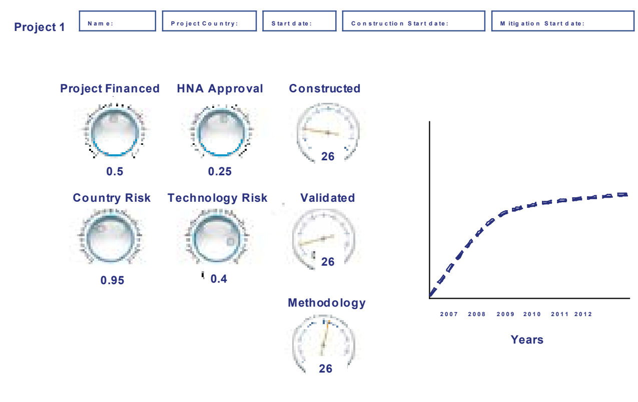
The CDM is already showing itself to be highly geographically biased (two-thirds of all projects in the pipeline at the end of 2006 were either in China or India, with very few in Africa) and technology biased (42% of projected CERs are from HFC, PFC, or N_2O reduction projects).[8] To a certain extent, such biases are inevitable in a market based on the principle of achieving emission reductions at the lowest cost. They are nevertheless exacerbated by the high level of CDM procedural risk, which alters the risk/return profile for all projects, thereby ensuring that some low-return/low-risk projects become insupportable.

We have the following suggestions for improvement:

1. Make the CDM rules more consistent and their interpretation more transparent. There is a need for a "case law" approach: A decision made on one project should take into account decisions made in similar situations for similar projects. Divergent approaches should be avoided wherever possible. A better system for organizing information on CDM decisions is required to make this practical, and all relevant decision makers will need access and training on this information.
2. Place greater reliance on the original CDM institutions. The key elements of any quality assurance process are third party validation, verification, and certification. Rather than adding additional checks and balances, DOEs should be trusted to carry out these activities, and if there are any doubts about the quality of their work, the Accreditation Panel should investigate and swiftly rectify any shortcomings.
3. Improve transparency and communication. Some simple improvements in this area would significantly decrease perceived risks at various stages. For example, allowing direct communication between project participants and the EB or other sub-panels (e.g. RIT) would greatly improve efficiency.[9]
4. Develop a more flexible, results-oriented approach to decision making. The CDM's ultimate objective is to reduce emissions as rapidly as possible, and with maximum long-term benefit to developing countries. There will always be imperfections in any PDD, methodology, or system, and the EB should not allow small imperfections to stand in the way of achieving the longer-term goals.
5. Enhance capacity. Capacity building in developing countries is essential, and much more needs to be done, at both DNA and project host level.

Fig. 7

Print screen of the front end of CARE



8 UNEP Risoe CDM/JI Pipeline Analysis and Database, January 2007.

10 Currently, all such communication must go through a DOE.

Risk Assessment Tools

As noted, issued CERs to date have been only around half of the level estimated in PDDs. This translates into a significant risk for anyone (buyer or seller) counting on the output of a portfolio of CDM projects. Ultimately, there is no substitute for undertaking a detailed risk assessment of each of the above factors, as well as any others that may be applicable to a project, by someone with a detailed understanding of both the project and the CDM market. There are, however, times when a broader overview is required.

Various risk assessment tools can be used for a variety of purposes, such as: to obtain an initial assessment of the overall risk profile of a portfolio of CDM projects, to screen individual projects at an early stage for further possible development, or to help formulate a global strategy for the acquisition of CERs. One such tool is EcoSecurities' Carbon Asset Risk Evaluation (CARE) model. CARE is an in-house developed tool that combines publicly available data with EcoSecurities' experience of developing CDM projects and managing a project portfolio.[10] The model is Excel based and uses Monte Carlo simulation.

'CARE considers three 'layers' of risk: binary risk, continuous risk and delay risk. Binary risk involves an either-or possibility; for example, a project either successfully raises the necessary finance and proceeds to construction, or does not raise the finance and is stalled. Likewise, host country approval is either achieved or not.

A country's risk rating, and the risk rating of the technology used in a specific CDM project are considered examples of continuous risk—their appearance alters as time progresses. In one year, the development of a CDM project in a country might carry little risk, but in another year the situation might be completely different. In assessing the country risk, CARE uses country risk assessment information from ONDD (the Belgian export credit agency), which looks at three risks: war risk, risk of expropriation and government action, and transfer risk. These risk factors have been put in a matrix applying percentages to the minimum, maximum, and 2012 ranges. For each country the three risks are compounded to yield a single risk factor.

As the CDM market matures, so do technologies; therefore, the technology rating is considered a continuous risk. CARE distinguishes between thirty-three different CDM project categories or technologies (e.g., hydro, biogas, cement, coal mine methane, fuel switch, transportation, and landfill gas). EcoSecurities has applied its own experience to the rating of these technologies and has scored them from 0.50 (indicating medium to high risk) to 0.90 (indicating low risk). For instance, CARE considers a fossil fuel switch—oil to gas technology—a low risk and scores it a 0.90.

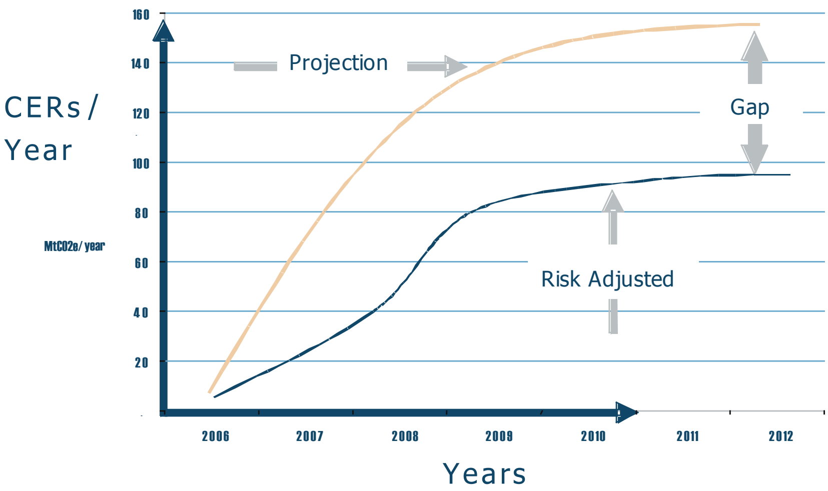
Contrary to the two former risks that mainly influence the delivery volume of CERs, the third layer in the CARE risk model, delay risk, influences the time of issuance of CERs. Delays can occur at many different stages, and the impact on the start date of issuance of CERs is cumulative.

A critical determinant of the time taken to register a project is whether or not an applicable approved methodology already exists. If not, then CARE factors in a delay for the development of a new methodology. The distribution of further delays is based on a corrected dataset of the vali-

10 EcoSecurities' portfolio in February 2007 included 374 projects worldwide using eighteen different technologies. Public data includes the UNEP Risoe CDM/JI Pipeline Analysis and Database, 2007.

Fig. 9

Example CARE output graph depicting the risk adjusted CER flow for a sample portfolio



dation time (time between start of public comments and request for registration). At the final registration stage, CARE applies a discount factor based on historic rejection levels, per technology.

Probability Distribution

In order to capture adequately the interactions between different risk factors across the CDM project cycle and to derive an overall risk factor for an entire portfolio, CARE uses Monte Carlo simulation. Each risk factor is assigned a probability distribution and the model is run several thousand times, with randomly chosen points in each probability distribution. The end result is a statistically robust average project duration and success factor, which can then be translated into a risk-adjusted CER delivery profile for an entire portfolio of projects, to a desired confidence interval. The outputs include tables and graphs showing the relationship between gross (estimated) CERs and the risk-adjusted CER flow for the entire portfolio, year by year, as illustrated in figure 9.

Conclusions

We hope that these insights will help CDM project sponsors understand why forward CER prices at an early stage in the project cycle differ from the theoretical value, today, of an issued CER. We also hope that sharing the experience of some of the many pitfalls in CDM project development may help other developers to negotiate the process more easily. Finally, we hope that the international community and UNFCCC secretariat will better understand the risk impact of checks and balances in the project cycle, their consequences in terms of reduced carbon capital flows, and their adverse impact on project development in higher-risk sectors and countries, in particular.

Checks and balances are there for a good reason—to assure the desired environmental outcome. Nonetheless, a market mechanism has been chosen to deliver this outcome, and markets function much more effectively when the rules are clearly defined, and the outcomes are not subject to arbitrary interpretation.