PERSPECTIVES SERIES 2007

CD4CDM
CAPACITY DEVELOPMENT FOR THE CLEAN DEVELOPMENT MECHANISM

Equal Exchange:
Determining a Fair Price for Carbon

UNEP

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Equal Exchange:

Determining a Fair Price for Carbon

Glenn Hodes and Sami Kamel,
Editors

UNEP

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EDITORS' INTRODUCTION

Equal Exchange: *Determining a Fair Price for Carbon*

One of the foremost concerns of Clean Development Mechanism (CDM) project participants when entering into any given emission reductions purchase or sale agreement is whether they are getting a 'fair deal'. This question cannot be easily answered in the context of a specific transaction, on its own, but nor is one that can be appreciated in a purely theoretical way, either.

A general understanding of the global carbon market—its underlying structure, dynamics, and likely evolution—is required, as well as a sense of how various market forces shape demand and supply, and hence influence prices. At the same time, one also needs to understand a bit about the various motivations of individual actors in the CDM market and the factors influencing their negotiation power in relation to each other.

Unfortunately, this broader knowledge of the market is generally quite asymmetrical between carbon buyers and investors in the North and CER sellers from middle-income countries, and is often almost completely lacking on the part of actors from least developed countries. Lack of perfect price information in the CDM market has resulted in few guideposts by which CDM developers and project sponsors can negotiate specific deals. Moreover, the process of determining an equitable exchange for CERs is confounded by a number of factors, such as the sheer dynamism and volatility of the carbon market, on the one hand, and its complexity and disjointedness, on the other hand. As Charlotte Streck remarks in her contribution to this volume, the rapid pace of the carbon market's development has rendered it difficult for knowledge to keep pace with the

availability of funds, and particularly challenging for sellers to keep abreast of innovations in structuring and contracting CDM transactions.

At the other end of the spectrum, concerns from a variety of quarters point to the need for more transparency in the pricing practices or policies of major carbon buyers. Equitable CER transactions should embody not only fair prices that are consistent with real supply and demand balances at the time of sale, but also exchanges that bridge the specific (and time-sensitive) needs of buyers with the desire of developing country sellers to improve their country's sustainable development. In light of growing demand for using CERs in the voluntary and retail carbon markets, CDM transactions must also increasingly address consumer concerns for exchanges that are non-exploitative, have a high degree of environmental integrity, and foster genuinely empowering partnerships.

To address the situation outlined above, and as part of its capacity development objectives, the Dutch-funded Capacity Development for the CDM Project (CD4CDM) has produced this first issue of its new *Perspectives Series*. The CD4CDM *Perspectives Series* will comprise an annual special feature showcasing the views and experiences of *visionaries and leading actors* in the carbon market on a topic of pivotal importance to developing countries in the global carbon market. This year's feature focuses on the issue of determining fair transactions under CDM.

In total, sixteen authors in eleven different contributions make up this volume. The authors' perspectives are their own, yet they also represent a wide spectrum of the various market actors that are interacting in order to realize both successful and equitable carbon transactions. The essays touch upon one or more of the following thematic topics:

- **Global carbon price dynamics.** Key drivers and factors (economic, environmental, and political) affecting long-run trends in global prices for carbon, such as supply and demand balances of different types of emissions reduction commodities (especially EUAs and CERs).

- **CDM project risk profiles and/or premiums.** Key risk factors between primary and secondary CER transactions, how they are evaluated and managed by carbon buyers, and their correlation to either a price premium or deduction compared to the market standard.

- **The importance of time factors and delivery guarantees.** Key temporal factors underlying the determination of prices and contracting arrangements between CDM project proponents, lenders, and carbon investors.

- **The impact of regulatory drivers and post-Kyoto outlook.** Guidance on political and social forces that project proponents need to consider when negotiating with buyers, and how to contract for the purchase or sale of post-2012 emission reductions.

- **Region-specific outlooks.** How, and the degree to which, views on fair CER pricing and actual ERPA negotiations are affected differently by regional outlooks, positions, and regulatory environments, for example, in Latin America, China, and Sub-Saharan Africa.

- **Strategies, contracting models, and approaches** toward transacting CERs.

Point Carbon's *Jørund Buen, Elisabeth Lokshall, and Marte Nordeseth* lay down the foundations for understanding the dynamics of the global carbon market and how these market fundamentals affect CER prices. They provide a broad, yet concise inventory of the regulatory and other drivers shaping the underlying price determinations in different segments of the carbon market, and underline the key differences between primary and secondary CERs, and "guaranteed" and unsecured CERs. This is complemented by *Veronique Bishop* of the World Bank Group, who elaborates on these key differences in the various market segments, while providing specific helpful recommendations to CDM project proponents on how to maximize the potential value they could realize from the emission reductions they seek to sell. She emphasizes the need to balance various price offers with the need to minimize project risks and financing gaps, and provides some examples of financial structuring tools that can be used to enhance 'total project value' in CDM deals.

Martijn Wilder and Monique Willis of Baker & McKenzie review the key regulatory, project-specific, and transactional legal issues that directly influence the pricing of primary CERs. They share new insights into the impact of various *domestic* laws and regulations in some countries on CER prices, and speak to the impact of uncertainty surrounding future restrictions on the importation of CERs to other domestic and regional emission trading schemes, such as the EU ETS.

A number of other contributions also directly aim at assisting sellers to maximize the benefits from potential CDM deals. For example, *Karen Degouve*, from the NatIXIS/European Carbon Fund, describes the ingredients needed for a successful and equitable CDM deal and presents a number of case studies based on ECF's experience on how to maximize both efficiency and value in carbon transactions. *Charlotte Streck,* of Climate Focus, complements this with an overview of the key contractual clauses that underpin any carbon transaction. She provides a useful strategic checklist for CDM project proponents to use in order to reach a sales or purchase agreement that best trades off their risks for a maximized reward. She emphasizes that the price is not the only, or even the most important factor to consider.

The contribution by *Francisco Ascui and Pedro Moura Costa* of EcoSecurities presents a detailed breakdown of the various risks associated with developing a CDM project and a tool that they have developed for systematically evaluating these risks and their impact on primary CER generation. The chapter includes risk data based on EcoSecurities' own transactional database that has never been previously published. This information is indispensable to project sponsors, project developers, and carbon funds, particularly in shedding light on the optimal timing of transactions and suggesting areas that need closer scrutiny in the due diligence process.

Mark Meyrick, of EDF Trading, presents an overview of the dynamics between CER and EUA pricing and how the two commodities are becoming increasingly correlated. This is very instrumental for a developing country project proponent to understand prior to engaging in market transactions. He also ponders on the key criteria that make for an equitable market, and to what degree the CDM is meeting those criteria.

Readers from the carbon buyers' side will be particularly interested in regional views on fair CER pricing and experiences with CDM transactions. For example, the contribution from *Gao Guangsheng and Li Liyan* – translated from an original text in Chinese – from China's Designated National Authority (DNA), examines the theoretical and ideological basis for how China regards the CDM and CER pricing, why it sets a minimum or floor CER price, and how China is managing its vast GHG emission reductions potential. They also share data on the price evolution of ERPA transactions in China from recent years.

Martha Castillo of the Andean Development Corporation/Latin American Carbon Program shares a perspective from the Latin America region, offering insights on trends in prices there over the past years. She raises interesting points about how the market has reacted to recent volatility and speaks to the nature of "substitutes" to CERs and their impact on CER price trends.

Alfred Ofosu-Ahenkorah of the Energy Commission of Ghana outlines the unique challenges and opportunities facing the CDM in sub-Saharan Africa, and offers some recommendations on how to enhance African participation and benefits from CDM, including higher prices. These include by improving the CDM regulatory framework and by considering Unilateral and Programmatic CDM options.

Finally, *John Palmisano* of the International Environmental Trading Group provides a unique viewpoint on the market through aid of his own model of the factors affecting carbon prices. Looking at recent CDM transactions and public price data, he tests this model against two fundamental theories of decision-making - expected utility theory and prospect theory - and then makes intriguing conclusions on carbon price determination based on his interpretation of how well these predict the

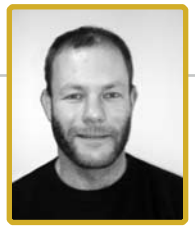
behaviour of the individual actors that make up the global carbon market.

We believe that this type of publication is both unique and overdue. While we expect it to be of broad general interest to a variety of actors in the market, our core audience is CDM project proponents in developing countries, given that our key objective is to enhance the knowledge among CDM stakeholders. In facilitating a more open exchange of knowledge and experience, we hope that this publication can help level the playing field between buyers and sellers so as to secure the goal of more equitable transactions in the current marketplace.

It is important to note that since the majority of contributions were drafted in late 2006 or early 2007, and since the carbon market is characterized by rapid change, the reader should take greater stock of the general trends, concepts, and arguments presented, rather than the specific price information or transaction data provided as such. It was never the editors' intention to publish a definitive market study or forecast of carbon prices in each segment, as such periodic studies are already undertaken and updated by other well-known market actors. We would also like to note that the editors do not endorse any particular contributor's opinion as expressed in this publication.

Finally, we would like to express sincere appreciation to our colleague *Nicoline Haslev-Hansen*, UNEP Risoe Centre, for her excellent support to the editorial process for this publication.

Marte Nordseth, Jørund Buen, and Elisabeth Lokshall
Point Carbon


A MARKET ANALYST'S PERSPECTIVE

CER Market Dynamics

In this essay we discuss the price for Certified Emission Reductions (CERs) under the Kyoto Protocol's Clean Development Mechanism (CDM), and its main long-term and short-term drivers. We further outline certain factors that can shift the price in Emission Reduction Purchase Agreements (ERPAs).

CER prices fluctuate widely and are not closely correlated with traditional macro-economic factors. While market demand for CERs is stimulated by increased output of conventional energy sources that emit greenhouse gases (GHGs), the main macro level determinants of CER prices are the political and administrative processes that shape the implementation procedures for global climate change treaties.

At the micro level, prices are very sensitive to risk allocation terms between the buying and selling parties. CERs are a non-standardized product; suppliers can influence prices by agreeing to assume project and CDM-specific policy risks. Markets have shown risk premiums of up to 75% for projects where the buyer assumes all the risks.

Commoditization of the CER market is likely to evolve in the future as more tradable CERs are issued and become available for spot trading[1], and as secondary markets become more liquid. The primary segment of the market is, however, likely to remain non-standardized with individualized terms and prices.

Developers assessing the price potential of their CERs should, therefore, pay keen attention to global climate change policy decisions made at multiple levels, and work closely on the optimization of contract terms and cash flow requirements for their specific projects.

1 These are for immediate settlement (usually within one or two days of the trading date).

Setting the stage

In brief, the carbon market can be explained as a result of buying and selling GHG emission allowances and emission reduction credits in order to enable countries and companies to meet their GHG emission commitments.

The CDM allows countries listed in Annex B of the Kyoto Protocol to receive CERs for GHG emission reductions achieved through projects implemented in non-Annex B countries (i.e., countries, primarily developing nations, that have not taken on emission reduction commitments) initiated since 2000. A CDM project can have either a seven year crediting period, which can be renewed twice to make a total of twenty-one years, or a one-off ten year period. Most current CDM projects, however, only contract CERs until 2012 due to the lack of international reduction commitments after that date.

Even with already large trading volumes, there is still room for considerable growth. Still, although the market is maturing, it continues to be characterized by a low degree of both liquidity and transparency.

Joint Implementation (JI), the sister mechanism of CDM, allows for GHG emission reduction projects to be carried out between two or more developed Annex I countries, wherein one acts as the investor/buyer and the other as host/seller.[2] These projects result in Emission Reduction Units (ERUs), which can be used for compliance by countries or companies. One country acts as host, issuing the certificates that are then deducted from the other's emissions. Unlike CDM, which generates additional reductions, in JI the transfer is only from one country to another; thus, the total authorized emission level remains the same after the implementation of the offset project.

To comply with Kyoto, governments in most of the EU countries and Japan have CER/ERU purchase programs. According to current Point Carbon estimates, the total governmental procurement plans for the first Kyoto phase are 707 million tons. CERs and ERUs can also be used by installations (entities with emission quotas) involved in some trading schemes which place a GHG emission limitation on a number of installations within specific sectors. For example, the EU Emission Trading Scheme (EU ETS) allows emission reduction commitments to be met through trading emission allowances (EUAs) as well as CERs and ERUs.

The CDM project market has grown at a considerable rate the over the past few years. According to Point Carbon's transaction database, in 2004 an estimated 50.8 million tons of CERs were purchased at an average price of €4.7 per ton, while 397 million tons of CERs were purchased in 2005 at an average price of €6.7 per ton. Nearly 522 million tons were purchased in the primary market in 2006, and another 40 millions tons in the secondary market. Assuming payment on delivery and a 7% discount rate, together these transactions are valued at €3.9 billion.

The carbon market is now, to all extents and purposes, a fully operational commodity market. Even with already large trading volumes, there is still room for considerable growth. Still, although the market is maturing, it continues to be char-

2 Industrialized countries having emission limitation and reduction targets under the Kyoto Protocol are listed in Annex B of the Kyoto Protocol and Annex I of the UNFCCC. These countries are, therefore, often referred to as "Annex B" or "Annex I" countries.

acterized by a low degree of both liquidity and transparency.

Macro-drivers of CER prices

Carbon prices in the long- and short-term will be driven by the interplay of Annex I governmental purchasing programmes and trading schemes, overall GHG quota allocations, non-market policies such as voluntary GHG mitigation, as well as the global supply of CDM and JI projects.

Firstly, all Kyoto Annex B countries will be issued emission quotas also known as Assigned Amount Units (AAUs). Such AAUs can then be directly traded on a bilateral basis under International Emissions Trading (IET), one of the three flexible mechanisms of the Protocol. Countries or companies who have fallen short of compliance can buy surplus AAUs. In order to sell surplus AAUs, however, a country must first become eligible for IET by fulfilling several criteria, such as having in place a national registry and a GHG inventory.

Governments, several of whom are already purchasing CERs and ERUs, may begin buying AAUs in 2008 when the Kyoto Protocol's first commitment period starts. The main supply of AAUs is expected to come from economies in transition (EITs) such as countries in Eastern Europe, Russia, and Ukraine, whose actual emissions are below their Kyoto commitments (their assigned amounts). The supply of AAUs from EITs could potentially be sufficiently abundant for all Annex B countries to achieve their Kyoto targets. Governmental demand for AAUs, and the volume of AAU surplus that comes to market, can influence the long-term demand for CERs. Since the EU ETS does not allow installations to use AAUs for compliance, private sector demand for them could be very limited, confined to Japan and possibly Canada.

There are some issues surrounding public acceptance of trading AAUs, however, as a large share of potential surplus allowances are the result of declining industrial production rather than policies and measures purposefully undertaken to reduce GHG emissions. The concept of a Green Investment Scheme (GIS) has been proposed as an instrument for securing environmental benefits from AAU trading. Under a GIS, revenues from the sale of AAUs would be earmarked for projects in the selling countries intended to reduce GHG emissions. Although the current preference of European governments is to purchase project-based carbon credits, not AAUs, AAU trades will quite likely be transacted through large-scale, bilateral political deals in order to avoid Kyoto non-compliance. These transactions are expected to take place within a GIS framework—provided that such a framework is established in time and gains acceptance from both buying and selling governments.

Since the EU ETS does not allow installations to use AAUs for compliance, private sector demand for them could be very limited, confined to Japan and possibly Canada.

Secondly, governments with demand for allowances under Kyoto can also forward parts of their compliance obligation to installations through emission trading schemes or other measures. At the time of writing, the only operational regional trading scheme is the EU ETS, which is occurring in its first phase from 2005 to 2007. The EU ETS works by placing GHG emission limitations on a number of installations within specific sectors, and allowing their emission reduction commitments to be met through trading EUAs; thus, if the price of carbon is higher than the internal

abatement cost, companies will - at least in theory - reduce internally to meet their commitments and sell any unused allowances in the market.

The National Allocation Plans (NAPs), developed by each EU member state and approved by the European Commission (EC), set the overall structure of the EU ETS. NAPs outline the level of allowances to be issued (the caps) and how these are allocated to sectors and individual installations within each state. Although CERs and ERUs can be used in the EU ETS (i.e., as carbon credit offsets from sources not covered by the ETS itself) the allocation plans for the EU ETS phase two (2008–2012) will specify limits on their use for compliance. The proposed limits as stated in the NAPs and ruled upon by the Commission vary greatly from country to country: from as high as 20% in Germany to 7% in Slovakia. Some NAPs also put in place limitations, or reserve amounts, on the number of allowances that can be sold under JI (see Table 2). The caps set for each country, as well as the overall limits in phase two, will influence CER demand and hence prices.

The risk that the CERs may not be available, due to possible delays in implementing the ITL, has contributed to suppressing the price of CERs.

Thirdly, the EUA price has already become a benchmark for the prevailing carbon price. The strong price link between CDM/JI and EU ETS means that the spot market price for CERs in 2008 will be linked to the price of EUAs. The two markets will thus have many of the same short-term drivers, and the CER/ERU price will be influenced by EU allocation issues. Other factors, such as fuel prices (notably the coal-gas price differential) and even European weather influence the EUA price and will, therefore, also affect CER/ERU prices (see Table 1).

Fourthly, the CER price is influenced by factors such as the various decisions taken by the Conference of the Parties/Meeting of the Parties (COP/MOP). This annual meeting of all the signatory countries to the climate change treaties provides both positive and negative signals to the CDM market.

Table 1

Difference between EUAs and CERs

	EUA	**CER**
Type	Allowance	Offset/Credit
Time of delivery	Immediate settlement and forward	Forward settlement to date, immediate settlement possible in the future
Counterparty risk	None or very limited	Yes
Project risk	No	Yes
Limit on use in EU ETS	None	5–25% of allocations
Banking between EU ETS phases	Not allowed in ETS phase 1, Allowed from ETS phase 2	Allowed

Table 2

Overview of EU ETS Import Limitations on CERs and ERUs

Country	Emission Cap under EU ETS 2008-12 (Mt)	Limitation on CER/ ERUs, %	Limitation on importation of CER/ ERUs 2008-12 (Volume of credits, Mt)	Level of limit	JI reserve 2008-12 (Volume of credits, Mt)
Austria	154	10	15	Installation level	0
Belgium	293	Flanders: 24 (energy), 7 (industry); Wallonia: 4; Brussels: 8	25	Installation level	0
Bulgaria*	220	12.6	28	Installation level	23.5
Czech Rep.	430	10	43	National level**	0
Cyprus	28	10	3	N/A	0
Denmark*	119	19	23	Electricity production sector: 32.5%; Other sectors: 7%.	0
Estonia	64	0	0	N/A	10.5
Finland	188	10	19	Installation level over 5 yrs.	0
France	664	13.5	90	Installation level	0
Germany	2266	20	453	Installation level	0
Greece	346	9	31	Installation level	0
Hungary	135	10	13	N/A	2.5
Ireland	112	10	11	Installation level over 5 yrs.	0
Italy	979	15	147	Installation level over 5 yrs.	0
Latvia	17	10	2	installation level	0
Lithuania	44	20	9	N/A	2.5
Luxembourg	14	10	1	Installation level	0
Malta	11	0	0	N/A	0
Netherlands	429	10	43	Installation level	0
Norway*	65	38.2	25	N/A	0
Poland	1044	10	104	Installation level	9.0
Portugal	177	10 (general), 50 (combined cycle plants)	18	Installation level	0
Romania*	345	10	45	Installation level	5.5
Slovakia	155	7	11	National level**	0
Slovenia	42	15.8	7	National level**	0
Spain	762	20	152	Installation level	0
Sweden	114	10	11	National level	0
United Kingdom	1231	8	98	Installation level. Limit set per year, but banking between years allowed.	0
Total	10443		1416		53.5

* Point Carbon estimates, given no EC ruling at time of writing

** First come, first served for installations

Decisions taken by the CDM Executive Board (EB) will also influence market development, as their decisions determine whether a specific project will qualify for CDM or not. The total supply of CERs will, therefore, depend on the project volume approved by the EB.

CERs purchased by private buyers cannot be delivered into the buyer's national registry account and then surrendered for compliance at a later date until the overarching UN registry is operational. This registry, the International Transaction Log (ITL), is expected to be functional by the end of 2007, but for now CERs that have been issued exist only in the United Nations Framework Convention on Climate Change (UNFCCC) CDM registry. CERs from a project are transferred into the project developer's account, wherefrom they can be transferred only once to other project participants' holding accounts. The primary buyer has to become a project participant and receive a Letter of Approval (LoA) from the investor government to receive the CERs. The risk that the CERs may not be available, due to possible

Box 2
Categorization of CER Transactions from Point Carbon's Pricing Analysis

Category 1:
The seller does their utmost to deliver a flexible or non-firm volume, while the buyer commits to buy if the seller delivers. The buyer assumes all regulatory risk; in many cases the seller must ensure that some underlying conditions, such as project commencement, are met. This means in practice that payment is made to the project regardless if the project generates CERs. If the emission reductions are not eligible for CDM the buyer will buy them as verified emission reductions (VERs).

Category 2:
The seller assumes regulatory risk and commits to do their utmost to deliver a flexible or non-firm volume. The buyer commits to buy the emission reductions generated, as long as they are issued as CERs.

Category 3:
The seller commits to deliver a firm volume of CERs, and the buyer commits to buy if the seller delivers. The contract is, however, only valid with a set of preconditions. For example, a precondition could be that the ITL is operational. If the underlying project(s) fail(s) to deliver as planned, the seller commits to replacing the agreed volume of CERs or another form of compensation.

Category 4:
There are no preconditions; rather, the seller guarantees to deliver a firm volume and the buyer guarantees to buy if the seller delivers. The seller must give compensation or replace the CERs if the buyer does not receive the agreed amount.

delays in implementing the ITL, has contributed to suppressing the price of CERs.

Micro-drivers influencing CER prices

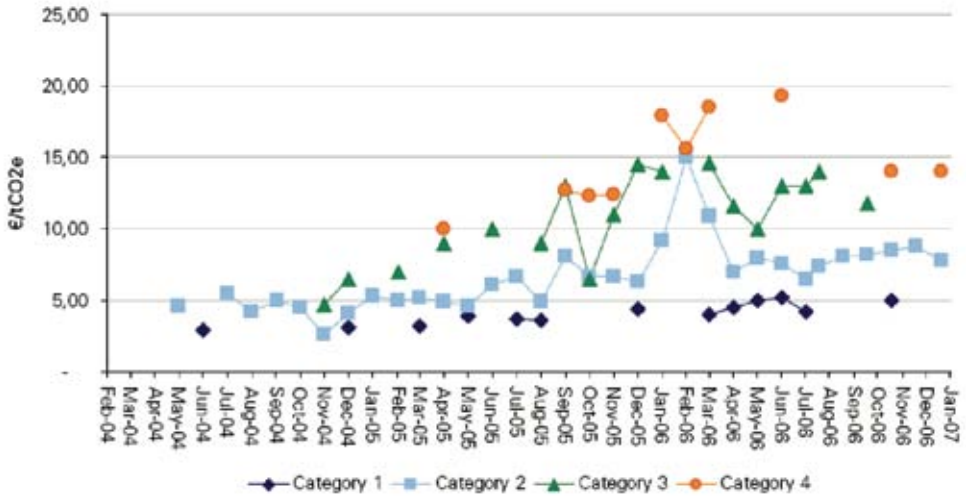
As in other markets with non-standardized commodities, each CER transaction will be associated with an individual set of terms that distribute risk between buyer and seller. The terms and conditions agreed upon in CDM/JI contracts such as ERPAs, are, therefore, viewed as highly relevant for the price.

Though the products are not standardized, broad categorizations of the most typical deal types are possible. Point Carbon has developed four CER/ERU price categories based on the risk distribution between buyer and seller in ERPAs. They are broad, and prices vary within each category according to specific price determinants linked to volume risk, regulatory risk, and contractual arrangements. The main questions when determining the risk distribution are: Who stands to lose if the project does not deliver? Will the seller or the buyer take on the lion's share of the loss? According to Point Carbon's categories, the buyer assumes maximum risk in category one, and the seller assumes maximum risk in category four (see Box 2).

Point Carbon's database of actual transactions shows that the market has developed an increasing understanding of the risk premiums associated with these transaction categories. As shown in figure 1, the market has matured significantly during the last couple of years and now puts a substantial risk premium on deals in categories one and two. There has been a clear tendency towards an increased price differentiation between categories one and four (n.b., figures are based on ERPAs).

Forward CER prices as reported in 2006 varied between €3.50 and €20, and were influenced by variations in EUA prices. The average CER price

Fig. 1
Illustration of CER price trends by Point Carbon category



for standard contracts with non-guaranteed delivery (category two) started off at around €7, rose to above €10, then fell back again to around €7. The range was from a low of €3.50 to a high of €15. Prices for CERs whose delivery is guaranteed but with preconditions (category three) had a similar trajectory, ranging from €8 to €18. In the last quarter of 2006, however, little activity was recorded in both category three and four; average prices in the latter category started off at €17-18, but fell to around €13.

Primary CER market

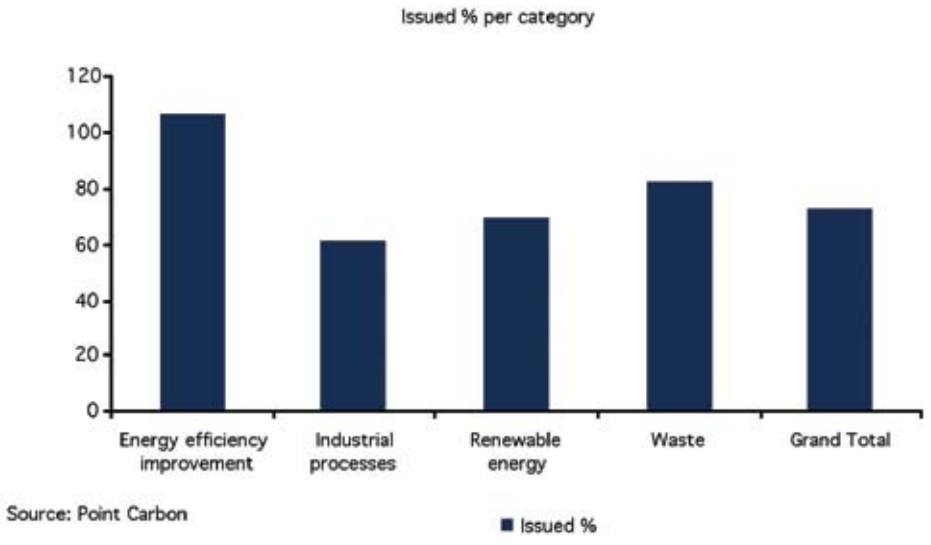
Prices vary within each of the categories, depending on contract-specific risks in the ERPA and a particular project's underlying performance risk. They may also be affected by project type and technology used, as these factors can either enhance or reduce the likelihood of timely delivery of the contracted amount.

The CDM market is still in a nascent phase. As of early 2007, less than a 100 projects had been issued with CERs. It is therefore too early to draw conclusions on the success rate for various project types; however, for illustration purposes, it is possible to compare the total planned reductions (as noted in the latest available project design documents [PDDs]) with the volume of issued CERs to date. As illustrated in figure 2, the issuance percentage of different project types has varied from 107% in the energy efficiency category to 61% in the industrial processes category. As more and more projects issue CERs, the figures could change significantly.

Furthermore, the price tends to increase as the project advances in the CDM project cycle. For example, a seller of forward CERs from a project that has been registered, and perhaps even issued its first batch of CERs, can often expect a much higher price than the seller of CERs from a project that does not yet have an approved baseline and monitoring methodology. Issued CERs have, on average, traded at a price of €15–16. Registered projects

Fig. 2

Percentage of issued CERs per category compared to CERs planned in the PDD as of the latest issuance report date



have traded at a price of €12, while projects that have not yet been validated have tended to yield a much lower price, sometimes as low as €5-6.

Sometimes a seller can attract a higher price if the volume is large and the buyer can purchase the entire project volume. There are also some factors that relate to the CDM project host country, as well as the counterparty in the transaction, which could influence the price:

1) If clear and transparent project approval procedures are in place and in use by the host country's Designated National Authority (DNA) for CDM, this can decrease perceived delivery risk and increase the price.
2) High creditworthiness of the counterparties may yield a price premium; indeed, a high credit rating may be a precondition for some buyers (and sellers), especially those operating in category three.
3) If a project or project portfolio has several buyers, the one with senior rights would, in general, have to pay more than the subordinate buyers, due to lower volume risk. Some sellers do not operate with priority of rights, but distribute CERs to the buyers according to agreed upon arrangements.
4) If a buyer is granted to be a formal project participant and/or to act as the focal point for communication with the EB, it would have more control over CER issuance, and hence, the project would carry a lower risk premium.

In some cases the buyer is involved in securing the underlying project finance. This can be accomplished through equity investments in the project, or different debt structures. In other instances the buyer may take part in identifying the project, arranging the development of the PDD, or providing other forms of assistance. Depending on the type of involvement, the price could be discounted. The transaction costs might also be covered by the first batch of CERs.

The price can be indexed to EUA prices, and future CER spot prices, in various forms. A fixed price will reduce any risk connected to price volatility for both buyer and seller. Whether indexing will increase or decrease the overall CER price, however, will depend on the type of indexing as well the market price developments. New contract structures are emerging, with more complex price structures. Moreover, strong collateral in the form of cash, a letter of credit (LOC), bank guarantees, or surety bonds reduce the buyer's perceived risk and can yield a higher price.

Box 2
Example: Category 2 ERPA Deal
Sugarcane Ltd, a South American sugarcane enterprise, enters into a contract to sell 100,000 of the CERs they generate from their bagasse cogeneration project to Power and Money Ltd, a European power company.

- As the project has not yet been validated, and Power and Money Ltd assumes most of the project risks, they agree upon a price of €6 per CER.
- Due to project delay, only 80,000 CERs are generated and thus Sugarcane Ltd cannot deliver 100,000 CERs to Power and Money Ltd's account.
- The end result is that Power and Money Ltd buys the 80,000 CERs at the agreed upon price and is not entitled to compensation for the remaining 20,000 CERs.

There are several questions that are part of the negotiating process and that can affect the price, such as: Who will pay the share of proceeds when CERs are issued? Who will pay if there are any costs for tax provisions? How does the contract define the event of default and events of contract determination? What kind of compensation should be given in case of non-delivery?

Secondary CER market

When the primary buyer transfers CERs to a second buyer, this is considered a secondary contract. In many secondary contracts, the delivery of CERs is divorced from the project that generated them. These contracts are therefore much less risky, because they exclude project performance risk, political risk of the host country, and regulatory risk associated with gaining project approval from the CDM EB. Prices in secondary deals often depend on the creditworthiness of the buyer and seller. Even though buyers are reluctant to take on the credit risk of unrated or poorly capitalized sellers, they may be assuaged if the seller utilizes bank guarantees or LOCs.

The secondary market is mostly, but not always, based on guaranteed delivery. This creates some entry barriers for non-Annex I market participants.

The terms of delivery agreed upon between buyer and seller are another element in CER pricing in the secondary market. Such terms may include the condition that if the ITL is not operational by the delivery date, then: (a) delivery will occur soon after it is operational with the price adjusted for the cost of carry; (b) EUAs will be delivered instead of CERs; (c) the contract may be deemed void with no liabilities to either party; or (d) the seller guarantees compensation or financial damages. The rule of thumb is that better product definition means better pricing, because less flexibility in the contract reduces risk.

Most deals in the secondary market are pegged against the 2008 EUA price. The price range in the first half of 2007 has been about 65-85% of the EUA price. This reflects that a secondary CER transaction agreed today for delivery on 1 December 2008 is 80% of the price for delivery of EUAs on the same date. However, in some cases a rolling price average is used, as the market could be volatile over the course of the delivery day, perhaps varying by €0.50 or more.

Box 3
Example: Secondary Market, Category 3 Deal

Power and Money Ltd, a European power company, enters into a contract to forward sell 100,000 CERs that they plan to purchase from a South American bagasse project to JapCom, a Japanese utility. Power and Money Ltd guarantees delivery, provided that the ITL is up and running by delivery date.

- Due to project delays, only 80,000 CERs are delivered to JapCom.
- Power and Money Ltd has to deliver 100,000 CERs to JapCom's account and thus Power and Money Ltd transfers 80,000 CERs and pays mark to market damages* for the remaining 20,000.

*) The amount equivalent to the assigned value the commodity would fetch in the open market at the current or contracted time.

Looking forward

Because the CDM market is highly politicized, CER sellers looking to enter the market should keep an eye on global climate negotiations. Furthermore, the risk distribution between the buyer and seller is of vital importance for the final CER price, so a CDM project developer should develop a clear strategy before entering the market.

Looking forward, there are several trends and unresolved questions that will impact pricing in the carbon credit market:

- Interest in buying post-2012 CERs is on the rise, especially since both the (COP11/MOP1) in Montreal and the COP12/MOP2 in Nairobi made it clear that CERs will have a value after 2012
- If the CER becomes the global currency of the carbon world, it could have significant implications for the long-term development of the CDM
- In the United States, several emerging state and regional emissions trading systems are considering allowing CER/ERU purchase. The Regional Greenhouse Gas Initiative (RGGI, or "Reggie") proposed by seven northeastern states, is an example. California is also considering a cap and trade system that would allow CERs and ERUs as offsets.
- In Australia, the proposed National Emission Trading Scheme (NETS) has suggested allowing the use of externally generated offsets for compliance. Such offsets could include CERs.

An outcome of these developments could be that CERs act to interconnect the carbon market, ensuring an indirect price link between the different trading systems. As the CERs would flow between the different players in the global carbon market, they would theoretically go to the trading system with the highest price, thereby creating a truly global carbon market.

Box 4
Who trades in the secondary or guaranteed market segment?

Companies with installations covered by the EU ETS, or financials institutions hoarding credits in order to sell into EU ETS, have been the main buyers of guaranteed CERs. These players often have very strict internal risk management procedures, and one of the key elements of these procedures is credit risk.

The secondary market is mostly, but not always, based on guaranteed delivery. This creates some entry barriers for non-Annex I market participants. Firstly, CER deliveries from the original project developers are rarely detached from project risks. Secondly, many non-Annex I sellers are not able to put a solid balance sheet on the table in order to provide a guaranteed delivery of CERs that will satisfy the risk-averse buyer. Even those sellers who can demonstrate a solid balance sheet often still face a rigid process on the buy side since they rarely have previously established credit lines with the buyers.

One potential solution for market participants from non-Annex I countries could be to ally themselves with a bank in order to secure a guaranteed deal. The bank could assume the risk in return for a percentage of the revenue and/or CERs.

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A LAWYER'S PERSPECTIVE

CER Pricing: *Legal Influences*

International rules establish the CDM and emissions trading, and enable the participation of public and private sector institutions and companies in the Kyoto Protocol framework, under the authority of state parties to Kyoto.[1]

CERs can be used by countries to meet their Kyoto targets and by liable industry in those countries under domestic and regional emissions schemes. They are a commodity created by law and given value through legal systems that establish market demand. Where market demand exists, the pricing of CERs is, however, affected by a wide range of factors, many of which are linked to the risk profile of the specific projects.

In this essay, we analyze the regulatory, project-specific, and transactional *legal* issues that impact CER pricing. We focus on the primary market for CERs rather than the spot sale of CERs already issued by the CDM EB, or the resale of CERs on the broader carbon market (often referred to as the secondary market).

In the primary CDM market, there is no doubt that key determinants of CER price include the nature of the project, the seller's creditworthiness and technical ability to generate CERs, and the commercial terms under which a transaction is contracted. In many cases these factors may, however, be less important than other considerations, such as:

- the impact of local regulation of CDM projects
- the nature of the CER purchaser
- the desire for certain CERs from projects with high environmental integrity (over and above the regulatory requirements)
- the payment structure for the CERs
- the way in which they are brought to market.

1 See Articles 12 and 17 of the Kyoto Protocol and subsequent supportive decisions by the COP/MOP, and guidance from the CDM EB.

In the months prior to the time of writing, market commentators and participants have witnessed a great increase in demand for CERs, contributing to more competition among carbon purchasers, and a corresponding upwards pressure on prices. Although demand is driven by commercial and political issues, legal considerations can both shape the market and assist buyers and sellers in ranking CDM projects for primary transactions.

Although demand is driven by commercial and political issues, legal considerations can both shape the market and assist buyers and sellers in ranking CDM projects for primary transactions.

The Regulatory Framework

A legal construct

The CDM is a unique framework created by the Kyoto Protocol under international law and overseen by organizations established by that treaty. The International Rules allow for public and private sector participation in the CDM. They provide a framework for independent audit of a proposed project, a set of national and international approvals—which must be obtained before a CDM project is eligible to create CERs—and the measurement and verification of emission reductions to be credited as CERs. At the domestic level, national laws have been, or are being implemented that further regulate CDM projects and also directly influence pricing.

The incentive to create CERs, and the demand to acquire them, is driven by obligation to meet emission reduction targets under Kyoto and domestic regulations such as the EU ETS. CER purchasing has been driven mainly by meeting obligations imposed under the first commitment period of Kyoto and phase two of the EU ETS (although it is also possible to utilize CERs to evidence a voluntary desire to reduce or offset emissions).

Demand from governments and private participants in the market currently far exceeds supply, with buyers entering into long-term contracts (i.e., under which CERs are to be supplied through 2012 and beyond). The legal rules relating to the creation, trading, and utilization of CERs directly affect, and impose some restraints on, CER prices.

Kyoto Protocol and EU ETS Rules

Under the Kyoto Protocol and EU ETS rules, CERs are eligible for use by participants to meet their compliance targets under these schemes. CERs are an attractive commodity for Kyoto Parties and EU ETS participants, because they can be purchased at a lower price than other eligible units (such as EUAs or, in the case of the Kyoto Protocol, AAUs). The price of other units, therefore, tends to be related to, and establish a ceiling for, the price of CERs. As discussed elsewhere, the price of CERs in primary CDM transactions has, however, tended to be discrete from the price of allowances, given the need to factor in certain project risks and regulatory constraints.

Under the rules establishing emissions trading frameworks at the international and EU level, targets must be primarily met through the surrender of allowance units issued to countries or companies at the beginning of the relevant

compliance period. CERs, as credits representing project-based offsets occurring outside the borders of the countries where the targets are imposed, can be used to supplement these allowances. Emissions trading schemes are, however, primarily designed to lower domestic emissions, so the rules establish explicit or implied limits on the number of CERs that can be used to meet targets (i.e., *supplementarity limits or caps*).

Outside of CERs generated by forestry projects, the Kyoto Protocol does not expressly limit the number of CERs that can be used for compliance purposes under that treaty. It does, however, require that the use of project-based credits (CERs and ERUs) be supplemental to domestic efforts to reduce emissions.[2] The supplementarity requirement is generally considered to require Kyoto Protocol parties to meet at least 50% of their projected compliance gap through domestic measures (i.e., limiting imports of CERs and ERUs to a maximum of 50% of the projected emissions gap). It is however at the discretion of each Annex I country to set its own limits, within this general concept.

The exact supplementary limits for EU member states are still in a state of flux at the time of writing. The EU ETS requires each participating member state to establish limits on the number of CERs that participants may use to meet their targets. The EC has indicated that, as a general rule, installations should only be allowed to use CERs or ERUs to supplement their allowance allocation by up to 10%.[3]

2 See, for example, Article 17 of the Kyoto Protocol.

3 Communication from the Commission to the Council and to the European Parliament on the assessment of NAPs for the allocation of GHG emission allowances in the second period of the EU ETS, 29 November 2006. http://ec.europa.eu/environment/climat/pdf/nap2006/20061128_communication_en.pdf

Stringent supplementarity limits will necessarily affect the demand for and pricing of CERs. In our view, market actors have an insufficient appreciation of the importance of supplementarity limits in terms of long-term CER pricing.

In addition to supplementarity limits, the penalty for noncompliance within an emissions trading scheme can also affect the pricing of eligible units under that scheme. The EU ETS establishes a substantial penalty of €100 per tonne of excess GHG emissions, requiring the culpable installation to repair ("make-good") its noncompliance by the subsequent deadline. This structure was designed to ensure that emissions limitations are actually achieved, as there is no option for installations to avoid compliance by paying the penalty.

In other emissions schemes with no make-good requirements, such as the New South Wales Greenhouse Gas Abatement Scheme, the penalty was designed to roughly reflect the expected abatement cost, and therefore is an indicator of market price. In such schemes, participants have the option of undertaking abatement (or purchasing offsets), *or* paying the penalty.

Emissions trading infrastructure

The ability to trade, transfer, and deliver CERs also relies upon the operation of the ITL. To utilize CERs, they first need to be delivered into a national registry account: Only then can they truly be considered fungible to EUAs, and sensibly priced. If delivery occurs (and the seller receives payment) prior to the operation of the ITL, then the purchaser runs the risk of paying for CERs that could be stranded in the CDM EB registry while the implementation of the ITL is continually delayed.

Many purchasers may, therefore, be wary of paying higher prices for CERs that are EUA index-linked and issued prior to the operation of the ITL. Any delays in ITL implementation will directly affect the CERs pricing in ERPAs where delivery may occur into a temporary CDM registry account.

At the time of writing, CERs are trading at a discount to phase two EUAs. Theoretically, there is no reason that issued CERs should be worth less than EUAs, since they can be used for the same purposes. Unlike EUAs, CERs can be banked between commitment periods, which means that they may ultimately have more worth. However, at the time of writing, it is not technically possible to arrange for immediate delivery of CERs, since the ITL—the key piece of infrastructure which links the CDM EB registry to the national registries—has not yet been established. Because CERs cannot currently be received into national registries, and used for compliance purposes in the EU ETS, even CERs that have already been issued are generally still trading at a discount to phase two EUAs.

...[M]arket actors have an insufficient appreciation of the importance of supplementarity limits in terms of long-term CER pricing.

Domestic legal systems

Participation in the CDM, and the implementation of CDM projects, depends entirely on those Annex I countries authorizing participation and, in particular, the domestic law and policy of host countries. Project participants are not limited by the International Rules in this respect, although domestic law and policy will of course regulate or limit the conduct of a particular participant and the implementation of a project under local country law.

CDM projects and emissions trading will generally be subject to the same domestic legal frameworks as other projects and other types of trading. These include taxation regulations, environmental laws, foreign investment restrictions, transfer pricing arrangements and derivatives regulation. More specifically, many host countries have implemented laws and policies regulating the development of CDM projects, largely to ensure that maximum sustainable development is achieved and that CER revenues are shared equitably. Some host countries only regulate specific issues concerning CDM, including:

- what type of entities may undertake CDM projects (i.e., whether a CDM project developer may be a non-national or foreign-owned company)
- whether or not it is necessary to have a contract in place with an Annex I credit buyer before the host country issues a LoA
- what, if any, terms must be included in such a contract (e.g., with respect to CER pricing)
- what types of environmental or foreign investment approvals must be sought for CDM projects.

Undoubtedly, such regulations influence the cost or risk of implementing a CDM project, or purchasing CERs, in a particular country and, hence, affect the CER price.

Host countries have taken different approaches to domestic regulation of the CDM. India, for example, has tended to minimize CDM-specific regulation, providing project developers with

flexibility when structuring their projects and transacting CERs. Some Indian electricity authorities have, however, successfully sought through regional administrative proceedings to ensure that developers account for a portion of expected CER revenues from renewable energy projects in the negotiation of power purchase agreements with the government.[4]

China, currently the largest CDM jurisdiction, has imposed stringent regulations on many aspects of the CDM. In China, requirements contained in specific CDM regulations add further complexity to carbon pricing issues. The *Measures for Operation and Management of Clean Development Mechanism Projects in China*[5] (hereafter referred to as the "Measures"), implemented on 12 October 2006, provide that Chinese government authorities must review and approve the terms under which CERs are sold as well as the contents of the CER sales agreement. This review includes approval of the specific buyer and the specific price at which CERs are sold under the ERPA or other sales agreement. The Chinese DNA has also made several key policy interpretations of the Measures.[6] China regulates:

Project developers. The identity and share ownership of CDM projects are limited for foreign developers. A foreign developer's involvement in a CDM project cannot exceed a 49% stake in an equity joint venture. This also requires a local Chinese partner who is prepared to invest capital, thereby limiting the manner through which revenues can be repatriated.

CER pricing. The Chinese DNA must approve the pricing of each CER sold in China. If a CER sale and purchase agreement has been entered, and a Chinese LoA is sought prior to registration, then the DNA must approve the price paid per CER in that agreement. Although Chinese CDM regulations do not specify a particular minimum price, the Chinese Government has, through the Measures, effectively set a minimum floor price for the sale of CERs in China, which was—at the time of writing—nearly €8, or $10 (where CERs are to be purchased in US dollars).[7] Moreover, since the DNA generally takes the ERPA's or CER sales agreement's unit price as the minimum, the Government may not approve agreements containing provisions for lowering the unit price.

Host countries have taken different approaches to domestic regulation of the CDM.

While these considerations appear to limit the ability of CDM project participants to determine prices, in practice the Chinese Government has allowed some flexibility, where justified by the particular contractual arrangements. For example, where the buyer's contribution to the CDM project is comprised of both payments for CERs and technology or consulting services, the Government may approve a price that is lower than the established floor price. If an ERPA has not been entered into at the time of Chinese DNA approval, then all CERs generated by that project must be held in the Chinese Government's registry account until a purchaser is found.[8]

4 For example, see the (Indian) Electricity Act, 2003 read with Order dated 29 September 2006 passed by the Honorable Rajasthan Electricity Regulatory Commission.

5 Source: NCCCC, www.ccchina.gov.cn

6 See Article 24 of the Measures.

7 The Chinese Government has stated that in conducting its mandatory review of agreements, it will not approve CDM projects with prices lower than these amounts.

8 Important Announcement on Regulating Consulting Services for and Assessments of CDM Projects in China, made by National Coordination Committee on Climate Change 5 February 2006. www.ccchina.gov.cn

CER revenue sharing. Chinese CDM regulations also provide that revenues received from the sale of CERs must be shared between the CDM project developer and the Chinese Government. The national government taxes revenues from CERs according to the project type and the extent to which that type contributes to sustainable development. Renewable energy projects, for example, are taxed at 2% and are considered as priority projects, whereas HFC23 abatement projects are taxed at 65%.

Consultancy fees. In the early days of the market, it was common for a consultant to prepare the documentation and to facilitate a project's advancement through the CDM project cycle on behalf of a company, in return for a share of the CERs. The Chinese DNA has released a guidance paper indicating that this will no longer be allowed, and that consultancy fees for must not be linked to the value or volume of CERs arising from a CDM project.

In jurisdictions such as China, where CDM projects and CER transactions are heavily regulated, the floor price established by the government tends to become an unpublished market price for transactions. The Chinese CER floor price is higher than the prevailing market price in some other jurisdictions (e.g., India or South America), which tends to limit the profit that can be made by speculative carbon buyers seeking to buy CERs from China at a low price and resell them at a higher price on the European market. This does not, however, seem to have dampened enthusiasm for the development of Chinese CDM projects.

Political risk

As with other investments, political risk in a particular CDM host country or region is an important consideration. Many private sector CER buyers are reluctant to tie up their funds in host countries perceived to present high political risks, including civil disruption or project nationalization.

For this reason, investment in CDM projects has tended to concentrate in jurisdictions considered more politically stable, such as the burgeoning economies in Asia and South America. Other jurisdictions (primarily Africa) have largely been ignored. Some of the multilateral carbon funds (such as the World Bank's family of carbon funds) initially procured CERs from projects in countries perceived as more risky, but the overwhelming trend has been to focus on the safer jurisdictions.

The international community recognizes the low or lack of CDM investment in regions such as Africa and the Pacific Islands as a problem. It is likely, however, that governments and multilateral institutions will lead the way in such jurisdictions presenting high political risk. In situations where the buyer is comfortable with a particular counterparty and project, it may of course factor political risk into the CER offer price; however, in our experience, purchasers have tended to simply bypass politically risky countries altogether rather than adjust CER prices accordingly.

Specific project influences

For use in Kyoto and the EU ETS, one CER is generally fully fungible with another. A CER from a small-scale wind project in Papua New Guinea is, for compliance purposes, identical to one from a large-scale HFC23 reduction project in China. An entity wishing to use CERs under ETS should

be prepared to pay the same price for *existing* CERs (e.g., through spot trades) from any type of project in any host country. Having said this, we must emphasize that each CDM project and ERPA is different. It will have a different risk profile, and thus a different price, depending on factors such as: host country CDM and non-CDM requirements (as discussed previously), political risk, and the likelihood that the project will generate and deliver CERs (taking into account the availability of project inputs, legal impediments, counterparty creditworthiness, and legal entitlement to the CERs).

In order to accurately determine the risk level inherent in a specific project, comprehensive legal and financial due diligence is required. Many purchasers will, however, simply weigh the potentially high cost of due diligence against the overall risk presented by the transaction. If a buyer only intends to pay for CERs once received into their account, then they may be content to limit the scope of their due diligence. If a substantial advance payment is negotiated, then this would necessitate more comprehensive due diligence to account for the increased risk.

Project Type

Any project can create CERs, regardless of type, as long as it meets the eligibility requirements of the CDM. While many buyers are comfortable purchasing CERs from any type of project, the EU ETS has excluded CERs from forestry projects (both temporary CERs and long-term CERs) and has limited use of certain CERs from large-scale

hydro projects.[9] This therefore lowers the marketability of and demand for such CERs. Conversely, some projects have a more positive, immediate local sustainable development impact (such as those complying with the WWF CDM Gold Standard), and some purchasers add a premium to CERs arising from such projects.

Project status

As a project moves through the CDM project cycle, the risk that the project will not deliver CERs is reduced. A buyer, who purchases CERs from a project that is still an abstract concept, and that has not yet received any approvals, takes a substantially larger risk than a buyer purchasing verified CERs from a registered CDM project. Unless this additional risk is dealt with contractually (such as through conditions precedent or make-good provisions), this additional risk will be factored into a reduced CER price.

Although Unilateral CDM projects are allowed under international rules (and, indeed, such projects are prevalent in India and South America), several countries insist upon the involvement of an Annex I project participant at the time of host country approval.

Technology Risk

Technology risk is also likely to be factored into CER pricing. It can be difficult to predict (and therefore guarantee) CER volumes from certain types of technology. For example, wind projects may generate more or less electricity depending on prevailing weather conditions. For projects with high technology risk, the seller may be unwilling to contractually guarantee delivery of the volume of CERs as anticipated in the PDD. Accordingly, this generally means that they must settle for a lower price.

Unilateral or multilateral project structures

When the CDM was first conceived, it was expected that an Annex I party (or a company from such a party) would be involved in, or provide finance to, a CDM project throughout its development, collaborating on implementation with a host country government or company. A project using this structure is referred to in this essay as "Multilateral."

As projects began to develop, however, it became apparent that many CER purchasers were not prepared to provide underlying finance (often due to the expense or inability of obtaining security). Many developers were able to fund themselves or to obtain funding from their existing financiers. If the project was locally funded, it was not necessary for the developer to forward sell CERs. Such CDM projects are considered to be "Unilateral."[10]

In a Unilateral CDM project, the owner/developer may retain CERs until they are issued and then sell them on the spot market. Buyers will pay more for spot CERs than for those issued under long-term forward sale and purchase arrangements. Therefore, the Unilateral CDM model potentially enables a seller to get a higher price for CERs.

9 Under the EU ETS, CERs from large-scale hydro projects are only eligible where implemented in compliance with guidance from the World Commission on Dams.

10 Initially, there was debate over whether Unilateral projects were allowed under the CDM rules. The CDM EB subsequently clarified that there is nothing in the rules that necessitates the involvement of an Annex I country or company at the time of CDM registration. See paragraph sixty-seven of the report of the EB's eighteenth meeting.

Although Unilateral CDM projects are allowed under international rules (and, indeed, such projects are prevalent in India and South America), several countries insist upon the involvement of an Annex I project participant at the time of host country approval. Malaysia, for example, has issued guidance specifying that a project will not be approved unless an Annex I CER purchaser is involved at the time of submission. Although such policies are designed to ensure that the original CDM goals of technology transfer and foreign investment are pursued, prohibiting Unilateral CDM projects means that local developers in Malaysia must sell their CERs through long-term forward arrangements rather than on the spot market, even in cases where the project developer has the capacity to fund the project themselves.

In India, on the other hand, where Unilateral CDM projects are supported by the government and commonly implemented, many developers began their projects at a stage when the EUA price was around €30—its peak in recent years. Several Indian CER portfolios, which we have seen go to tender in recent months, have indicated that the pricing expectations of the sellers are still relatively close to these peak prices, and were unsuccessful in attracting serious bidders. Problems can arise when a developer has relied on an overly high CER price to obtain financing or board approval for the implementation of a CDM project. Such firms will be in a difficult position if potential buyers do not match their price expectations once CERs are issued and ready for sale.

Carbon Transactions

Although international rules allow for public and private sector participation in the CDM, they do not regulate the underlying commercial arrangements between participants in a project, the pricing of CERs, or a project structure. There are, therefore, countless ways to structure and implement a CDM project, and to value and transact the resultant CERs.

The way in which project risks are contractually managed (particularly regarding whether or not CER delivery is guaranteed) will further affect pricing. Theoretically, any Certified Emission Reductions Sale and Purchase Agreement (CERSPA) between the primary project developer and the initial CER purchaser should contain a negotiated price, taking into account the purchaser's risk assumption. In this sense, a CERSPA is similar to any other long-term supply agreement (such as a power purchase agreement).

Type of Transaction: Spot or Forward

The market has seen a price differential between forward and spot CERs. In the latter case, the CER purchaser does not bear any of the project-specific risks, such as technological, force majeure, or political risks, which could prevent the generation of a forward stream of CERs. This reduced risk profile is likely to be factored into the price.

The Seller's Approach

As mentioned previously, many of the earliest project developers forward sold CERs to buyers at a relatively low price by today's standards. When it was uncertain whether or not the Kyoto Protocol would ever come into force, demand for CERs was more limited and prices were understandably lower. As the CDM market has evolved, however, many sellers have developed sophisticated CER pricing and marketing strategies that provide them greater leverage and control over pricing and risk. In jurisdictions where Unilat-

eral CDM is possible, many sellers have chosen to market issued CERs in a formal tender process, thereby encouraging competition among buyers, and, hopefully, maximizing the price.

As many CERs are purchased by special purpose vehicles with no credit rating, many sellers are beginning to insist that buyers provide letters of credit or provide funds channeled through escrow arrangements.

The buyer's approach

The CER price is also impacted by the purchaser, their level of sophistication, and the extent to which they provide an underlying debt or equity investment. For example, the buyer could reasonably discount the offered CER unit price to account for the cash value of any advance payment provided. Since the CDM market is increasingly a seller's one, it is also possible that a seller may demand a higher price based on the buyer's perceived creditworthiness or lack of political advantage. As many CERs are purchased by special purpose vehicles with no credit rating, many sellers are beginning to insist that buyers provide letters of credit or provide funds channeled through escrow arrangements.

Buyers with a long operating history in a country and the trust of the government, such as multilateral institutions, tend to be more successful in obtaining lower CER prices than newer, private sector carbon funds. Buyers having greater security over CER delivery, and those that provide underlying project finance, are also able to negotiate a lower price.

Some of the early buyers, such as the World Bank and pioneering CDM project development companies, entered the market when CDM investment was undoubtedly a highly risky venture. They were able to secure very low CER prices through forward contracts signed as early as 2001. As the sellers in these projects begin to generate CERs and re-evaluate the carbon price, which can currently be as much as five times greater than that negotiated in early contracts, it will be interesting to see whether disputes arise over such contracts.

While some buyers seek to tailor the CER price when negotiating each CERSPA, others simply establish a single minimum purchase price and only contract projects that meet the risk parameters upon which such a benchmark price is based. These are generally established through careful due diligence during the early stages of negotiating a CERSPA. Sometimes buyers whose CER price has been approved and pre-established by their board or stated in their governing documents, find themselves priced out of the market as the CER price increases.[11] When buyers require CERs for compliance purposes, or to supply minimum volumes to binding resale commitments, it is crucial that they retain sufficient flexibility to adjust their CER pricing as the market develops.

Buyers have a range of ways to insure sufficient flexibility in CER pricing, including:

- Fixing the price for each contract based on prevailing market conditions at the time of entry into the agreement
- Establishing a set price at which all purchases will be executed, while retaining flexibility to adjust the price in future

11 This occurred with some of the earliest public sector buyers, such as the CERUPT and ERUPT funds run by the Dutch Government.

transactions upon certain trigger events (e.g., a market adjustment of over 25%), thereby ensuring that the seller shares in the price upside or downside

- Pegging the price to the EUA market index price, which is related (albeit unreliably so) to the CER price, with or without a floor price. Once a published market CER price is established, something unlikely to occur until the ITL is finally established, any CERSPA will likely refer to this price (which includes the non-EU Annex I countries such as Japan, Canada, and New Zealand) rather than the EUA price.
- Entering into call option arrangements, where delivery at a certain price is at the option of the buyer.

Many buyers, particularly speculators, will also enter into hedging arrangements to ensure that they are not unduly exposed to market price fluctuations.

Despite the increasing sophistication of the CDM market, in recent years we have observed some buyers and sellers, often those newer to the market, utilizing current EUA phase two prices as the sole indicator of the CER price. They seek to lock in long-term fixed CER prices in forward contracts for unregistered CDM projects as close to the EUA price as possible. As witnessed in 2006, the EUA price is not guaranteed to always increase. In recent months, many sellers have found that they have needed to readjust their expectations for forward CER prices. Those buyers who entered into fixed-price forward purchase contracts near the peak of the EUA market price now risk suffering a significant and ongoing financial loss over the next five years.

Carbon pooling

In transactions where the supply of CERs is highly dependent on project performance, and the seller does not have direct access to replacement CERs, the buyer must factor in project-specific risks into to its overall risk assessment (and, potentially, the CER price). An event of force majeure, for example, will immediately stem the flow of CERs to the buyer, who may find itself in breach of any subsequent resale agreements.

When the seller has access to a pool of CERs (i.e., through a number of bundled projects, or through combining resources with other project developers), the risk of an unexpected circumstance impacting the flow of CERs is reduced. With such security features, buyers may be prepared to pay a higher price.

Allocating contractual risk

Buyers may pay more for CERs purchased under forward contracts if their delivery is contractually guaranteed, or otherwise if the seller must make-good in cash (i.e., pay the difference between the market price and the agreed unit price). On the other hand, several major buyers currently have standard contractual terms whereby the buyer will only seek damages in the event of gross negligence or willful default on the part of the seller. In other words, the buyer simply receives whatever the seller is able to produce, and so inherits all the project risk, technology risk, and political/regulatory risk. Such buyers would not be able to enter into binding International Swaps & Derivatives Association (ISDA) - style arrangements (with cash make-good obligations for non delivery) unless they themselves had access to a pool of CERs from a range of projects, and were comfortable that sufficient CERs would be delivered from the pool to meet any agreed resale ar-

rangements. In addition, the buyer could not rely on a guaranteed stream of CERs (or cash equivalent) from one specific project for compliance purposes. This would presumably be factored into the CER pricing.

Finally, CER pricing is likely to be impacted by a range of terms in the contract, and the perception that the parties consider the contract to be legally robust and enforceable. Early CER procurement contracts were often relatively informal documents, without significant consideration of how to deal with the various contingencies that may arise over the long-term performance of those contracts. On the basis of lessons learned from early experience, CERSPAs have continued to evolve, and now a range of sophisticated contracts are utilized by both buyers and sellers in the market.

In our experience, most buyers and sellers in primary forward CER agreements prefer to tailor their own contractual documentation to their specific risk appetite, rather than utilize industry standards. Though most contracts contain subtle but important distinctions, general market practice is beginning to be consolidated in many areas. In the absence of access to an extensive CER pool, the robustness of a primary CERSPA is crucial in determining a buyer's ability to resell CERs on the secondary market. A buyer is, therefore, more likely to commit to a higher CER price when sure that a contract is robust and can be legally enforced in the relevant jurisdiction.

Conclusion

The past several years have provided many lessons for buyers and sellers in terms of the legal and commercial considerations in pricing CERs. Buyers and sellers have developed a range of strategies to price CERs, and to assess the legal and commercial risk profiles of particular CDM projects.

As the market continues to develop, demand for CERs will naturally affect supply. In the absence of any clear commitments beyond 2012, many CERSPAs only provide for fixed purchase obligations through ETS phase two.

Market actors anticipate that some form of international consensus will be reached on a post-Kyoto framework, that the EU ETS will continue, and that other markets for CERs or similar emission reductions (including the voluntary carbon market) will continue to grow in size. In particular, they hope that major Kyoto non parties, such as the United States, will begin to exhibit a political appetite for involvement in the global carbon market.

Those buyers who entered into fixed-price forward purchase contracts near the peak of the EUA market price now risk suffering a significant and ongoing financial loss over the next five years.

If these developments come to pass, it is likely that the market for CERs will not only continue to expand, but that CER supply will become an immediate challenge. Potential CER buyers and sellers should stay abreast of legal and political developments, and make sure that they understand the management of CER legal risk, thereby providing that their pricing strategy is flexible and robust enough to withstand the current uncertainty regarding the future of the market.

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A FINANCIER'S PERSPECTIVE

Improving Price Equity in CDM Projects: Strategies for Maximizing Carbon Value

How can CDM project sponsors maximize the value of their carbon credits? They can start by seeking the highest possible price for their CERs, but they also need to consider other objectives in planning when and how to sell carbon credits—notably their financing needs and their appetite for risk. This paper examines the key drivers of carbon prices and illustrates some of the project enhancement and financial structuring tools that sponsors can use to maximize the risk-adjusted price they receive for CERs, thereby enhancing the total project value.

Key drivers of carbon prices

Carbon prices vary widely across market segments—allowances, compliance credits, and voluntary credits—and over time. Three key factors account for these price variances and volatility:

- Demand and supply within each market segment
- The risks and other attributes of a particular project
- The distribution of risks among the parties to a carbon contract

The price that project sponsors can obtain depends on the market segment in which they can compete, the attributes of the credits they are selling, and the risks they are prepared to assume in the sale. Raising the compliance quality and lowering the delivery risk increases the price. The trick for the sponsor is to maximize the *quality* of their CERs without assuming unreasonable levels of *risk*.

Market fundamentals

As in all markets, the key overall determinant of carbon prices is the interaction of demand and supply. Assessing these market fundamentals is difficult in the carbon market because of the multiple variables involved, many of which hinge upon future policy decisions. As a result, spot prices are highly volatile, and forward[1] prices are extremely difficult to predict.

Demand for CERs and ERUs

Demand for CERs and ERUs is driven primarily by three factors: the commitments undertaken by countries under Annex B of the Kyoto Protocol to cap their emissions (and their willingness to adhere to these commitments); the limits these countries set on admitting Kyoto credits into their compliance regimes; and the requirements imposed on firms under the EU NAPs.

The trick for the sponsor is to maximize the quality of their CERs without assuming unreasonable levels of risk.

Kyoto commitments. The World Bank projects that the Parties to the Kyoto Protocol (excluding Canada) will have a shortfall of 1.7 to 2.2 billion tCO2e, of which 0.9 billion tCO2e has already been contracted through the purchase of CERs and ERUs, leaving a residual demand of some 0.8 to 1.3 billion tCO2e.[2] Actual demand will be affected by a number of factors including economic growth, weather patterns, fuel prices, availability of low-emissions electricity (notably nuclear and natural gas) and, importantly, the extent to which the Annex B countries can implement "additional policies and measures," such as energy efficiency improvements.[3]

How much will EU countries limit the use of carbon credits? Certain EU governments announced that they will impose limits on the use of Kyoto credits in meeting reduction targets in phase two of the EU ETS (2008–12). Current draft limits for CERs range from 7% to 20% of quotas, with the final ranges (and mechanisms for imposing them) yet to be decided. The volume of CERs to be presented for sale is not likely to exceed the expected import ceilings, but this is not assured. As for AAUs, some countries, including Austria, Germany, Japan and the Netherlands, have decided only to buy them if they are "greened" by using the proceeds to generate environmental benefits. If countries find themselves with large shortfalls as 2012 approaches, however, they may ultimately ease restrictions or caps on the use of CERs and/or AAUs.

How tight will the phase two NAPs be? EUA prices have been extremely sensitive to the level of NAPs. In April 2006, EUA spot prices plummeted by 60% in one week (from €30 to €12) on rumors that actual 2005 emissions exceeded the annual allowance allocation. Since then, it has become increasingly evident that the market in phase one

1 In a forward contract, a seller agrees to deliver a certain volume of a commodity to a buyer at a specific time in the future. Forward contracts are usually privately negotiated, not traded through an exchange, so the two parties must bear each other's credit risk. The contracts are not standardized and are not exchange-traded; they are, therefore, relatively illiquid. Forward contracts for *carbon* are usually multiyear and for emission credits that have not yet been generated.

2 Of this amount, Europe comprises about 80% and Japan, about 20%. Canada has an estimated shortfall 1.3 billion tCO2e but has indicated that it cannot fulfill its commitment. Source: Karan Capoor and Philippe Ambrosi, 2007. *State and Trends of the Carbon Market 2007.* The World Bank: Washington, D.C., p. 40. http://carbonfinance.org/docs/Carbon_Trends_2007-_FINAL_-_May_2.pdf

3 Interruptions in low-carbon fuel sources, such as nuclear and natural gas, would require power generators to resort to higher-carbon coal or oil, resulting in higher emissions.

will be long (i.e., the available EUAs will comfortably exceed the levels required under the NAPs), and as a result, spot EUAs are nearly worthless, trading at only a few cents per tonne. As figure 1 shows, however, higher prices for the December 2008 contract[4] indicate the expectation that the market will be short in phase two. We can expect continued high volatility in the EUA markets, particularly in the periods leading up to the announcement of the NAPs and of the annual actual emission results, and the reconciliatory or "true-up" periods at the end of each phase.

The net amount of demand will become clearer as these policy decisions are made—but even then, major policy shifts could disrupt the market, as Canada's withdrawal has shown.

4 This is commonly quoted as the benchmark contract for EU ETS phase two.

Supply of credits

Supply of credits is also driven by bureaucratic and policy questions, as well as the availability of credits from large, low-cost sources.

Will Russia and Ukraine sell AAUs, if Europe will buy them? JI eligible countries have an estimated surplus of 6.5 billion tonnes of AAUs—several times the anticipated need of Annex B countries—beyond their cumulative Kyoto requirements. Yet in order to sell their AAUs, JI countries must meet exacting eligibility standards.[5] Russia and Ukraine, which together account for about 75% of the total surplus, face an uphill battle to fulfill the requirements before the 2008 deadline.

5 Eligibility requirements for trading AAUs under International Emissions Trading (Kyoto Protocol Article 17) include establishing a national registry, submitting annual inventories, and maintaining reserves. For details see the UNFCCC Web site, http://unfccc.int/files/meetings/cop_11/application/pdf/cmp1_16_modalities_rules_and_guidelines_art17.pdf. For JI details go to http://ji.unfccc.int/Eligibility.

Fig. 1
EUA prices

Source: European Climate Exchange (www.europeanclimateexchange.com)

Even if they succeed, they must then decide how much surplus to put on the market as AAUs, how much to convert to ERUs under JI Track 1, and how much to "bank," i.e., retain for future compliance periods. The bottom line is that only a small volume of unadorned AAUs are likely to be put on the market—assuming countries with shortfalls are willing to buy them.

Green investment schemes and JI Track 1. A number of schemes are under development for "greening" AAUs, i.e., using their sale proceeds to fund actual projects to reduce future emissions. For example, central European countries such as Bulgaria and Romania are opting for "greening" or retaining their AAUs, rather than selling them outright. While Annex B buyers have a greater appetite for such "greened" AAUs, these credits and Track 1 ERUs are also subject to strict eligibility requirements. As a result, it is unclear whether substantial volumes will reach the market.

The scarcity of information about these key demand and supply drivers results in extreme price volatility, and renders price forecasts nearly meaningless.

Bureaucratic hurdles. Kyoto credits cannot be transferred until the International Transaction Log is in place and the participating countries have functioning registries. Until these prerequisites have been met, CERs will continue to trade at a discount to same-vintage EUAs because of the risk of compliance and eligibility.

Complexity of procedures. The complexity and slow approval process for CERs hampers their delivery and dissuades potential project sponsors from pursuing CDM status. Sponsors risk either never receiving credits, or generating them too late to gain much revenue before 2012.

Large projects coming on line. Announcements of expected deliveries from large projects have the ability to move the market. To illustrate, demand for phase two EUAs was dampened in June 2006 by the World Bank's announcement that two Chinese HFC23 deals arranged under its Umbrella Carbon Fund would deliver up to 20 million tonnes of CO_2 per annum, and the recognition that China has additional hydrochlorofluorocarbon (HCFC) plants which will sell carbon credits in future.

The scarcity of information about these key demand and supply drivers results in extreme price volatility, and renders price forecasts nearly meaningless. But based on early experience with EUA trading, the market is likely to tighten—and prices will spike again—in 2012 as buyers scramble to hedge *potential* short positions.[6] At that point, it will be too late to mobilize a substantial new supply of CERs/ERUs because of their long gestation period. Thus, project sponsors with CERs issued, but not under contract, in 2012 may find themselves in a position to sell at favorable prices, taking advantage of the premium for guaranteed delivery (See the section on Structured Finance Solutions below).

Beyond 2012

What will the carbon market look like after 2012? There is little clarity about what type of regime will emerge. As a result, there are few buyers and current market prices for post-2012 vintages are low. It is becoming increasingly clear, however,

6 Companies regulated under the EU ETS over hedged in early 2006, and after determining that their allowances exceeded actual emissions, they (and speculators) dumped EUAs.

that there *will* be a market after 2012. The political will to promote the carbon market is growing as awareness of the dangers of climate change increases. The United Kingdom in particular has taken a leading role in promoting a global successor to Kyoto.

Even in the United States, despite its rejection of Kyoto, a number of regional, state, and municipal governments have made commitments to reduce greenhouse gases, and the Democratic Congress has made the passage of climate change legislation a priority. Broad-based political support is emerging in the United States, not only from the environmental community, but also from diverse groups such as religious[7] and even industrial[8] associations seeking regulatory clarity in order to make informed investment decisions. Given mounting concern about climate change, many observers predict that the United States will implement a cap-and-trade system by 2013, modeled on California's.

Should CDM sponsors consider selling post-2012 vintages forward, or should they wait until there is more clarity? There are a few issues to consider. Current forward prices are low. Monetizing post-2012 ERPAs cannot yield substantial debt financing, due to both low prices and the high discount rates applied by lenders, especially to greenfield projects.

There is likely to be a compliance regime in place after 2012 that will be at least as tight as Kyoto, given the expected participation of the United States and Canada. On the supply side, projects that mitigate gases with high global warming potential (such as methane, nitrous oxide, and hydrofluorocarbons) are quickly being locked up. This means that by 2012, most new CERs will necessarily come from CO_2 reductions (such as fuel switching, energy efficiency, and renewables), which have higher capital costs per ton of carbon.

In light of these factors, the net value of forward selling CERs today is small relative to the likely value of *issued* CERs in the post-2012 market. Certain multilateral institutions are developing facilities that will purchase post-2012 credits, however, including a joint program by the European Investment Bank and KfW. Project sponsors are, therefore, well advised to either *(a)* hold on to post-2012 credits until there is improved clarity—and higher prices—or *(b)* invite equity investors seeking the potential upside of the post-2012 market who are comfortable with emerging market risk.

The project: Risk and other attributes

Although volatile, EUA prices *for a given contract maturity at a given time* are quite uniform. This is because the underlying asset is homogeneous.[9] In contrast, contracts for CERs and ERUs are highly *heterogeneous,* and therefore trade in a much wider price range. Whereas the prices of CER contracts have, in general, tracked EUA prices, the price of credits from a particular CDM project depends on the market's perception of that project's risks. These risks and other attributes include:

7 See Web site for The National Religious Partnership for the Environment, http://www.nrpe.org/index.html; World Council on Churches, "WCC statement to the high-level segment of the UN Climate Change conference," 9 December 2005, http://www.oikoumene.org/index.php?id=2606.

8 See Web site for the U.S. Climate Action Partnership, http://www.us-cap.org/

9 For example, all December 2008 EUAs are equally compliant because they represent the right to emit one ton of CO_2e emissions and are essentially free of delivery risk.

- *Project risk*, or whether and when the project is likely to be built and generate carbon credits
- *Compliance risk*, or whether the emission reductions become eligible under Kyoto, EU ETS and/or other regimes
- *Project attributes* as well as features for which a buyer is willing to pay a premium.

Forward CERs are difficult to compare precisely because these risks and attributes vary dramatically across projects. Therefore, while CERs can (under certain conditions) substitute for EUAs, the rights are not identical. The reasons for this are outlined below.

Project risk

CDM projects whose CERs have not yet been issued pose an array of risks. These include:

- *Construction risk*, i.e., whether the project will be built and begin operating on schedule and within budget
- *Performance risk*, i.e., will the project perform as expected and will it be fully operational during the contract period[10]
- *Financial, business, and regulatory risk*, e.g., the competitive and regulatory environment governing the project; whether project cash flows are sufficient to fund capital investments, operations and maintenance, and debt service; and whether a reasonable return is likely to be achievable
- *Contract and counterparty risk*, i.e., whether the key project contracts are adequate and enforceable, which in turn relates to the counterparties' creditworthiness and performance
- *Country risk*, which includes political factors, such as expropriation and foreign exchange convertibility

10 Critical elements of performance risk for renewable energy projects, for example, include technology risks and resource risks.

Compliance risks

CDM and JI projects also face risks related to whether the credits generated will be eligible for trading under Kyoto and/or other regimes.

Kyoto risk

Kyoto risk refers to the eligibility of a project's emission reductions under the Kyoto Protocol (and its successors). This risk is based on, among other things: whether there is an applicable approved methodology in place; whether the project meets additionality criteria; how easily or quickly the CERs could ultimately be registered by the CDM EB; whether the baseline used in the project design document is robust, and whether emission reductions generated after 2012 will be eligible for trading. Today, few carbon buyers are willing to bet on a compliance regime to succeed Kyoto; they therefore heavily discount the price of emission reductions expected to be generated beyond 2012.

EU ETS compliance risk

Credits from CDM projects likely to be eligible under the EU ETS Linking Directive command a premium over those that do not. Agriculture, forestry, and other land use (AFOLU) projects, and hydropower projects over 20 MW that cannot demonstrate their compliance to World Commission on Dams criteria, are currently ineligible under the EU ETS; hence, CERs from such projects are discounted accordingly.

Carbon-related country risks

These risks include host country nonperformance risks, such as compliance, transfer, and registration (for a more in-depth discussion of these risks, see Charlotte Streck's contribution in this volume).

Project attributes

Other project attributes also affect pricing. CERs from renewable energy projects, particularly those in low-risk Latin American countries and small projects providing community development benefits, are highly sought after. Some buyers are willing to pay a premium for these credits, to provide upfront financing on attractive terms, or to offer additional support, such as grants for project preparation.

The contract: Distribution of risks

Beyond market fundamentals and project risks and attributes, a third feature has a strong bearing on price: the *distribution* of risks within the carbon contract. In carbon finance, as in project finance, *allocating risks among the parties best equipped to bear them* maximizes the value of the transaction. This means, in general, that carbon contracts are structured so that the project sponsors and financiers bear the bulk of the generic *project* risk and the carbon buyers bear the *price or market* risk. The other risks are then shared, put onto third parties, and/or mitigated in some other way.

Sponsors are well positioned to bear project risks because they are best equipped to address them. For example, they can bring in technical expertise required to build and operate the project. Lenders are well positioned to bear project risk for the sectors and sponsors they understand well; after all, their business is to assume credit risk and to mitigate it by diversifying their investments. In contrast, neither project sponsors nor their in-country lenders are well positioned to assume market risk, because they lack short positions in carbon. To the extent that they invest in CDM projects, they are therefore fully exposed to carbon price risk.

Carbon buyers are generally the mirror image of project investors. Unlike the investors, the buyers often have only a limited understanding of the project risks that are applicable to the sectors and countries they are targeting. Moreover, they typically have large short positions in carbon. Purchasing CERs forward helps them to hedge these short positions.

Nevertheless, forward CERs contracts expose buyers to residual project risk. If the project under-performs or encounters Kyoto or other compliance risk, then it is likely to under-deliver CERs. Buyers try to limit this residual risk by:

- Screening projects upfront and undertaking careful due diligence
- Minimizing upfront payments (for example, covering some project preparation costs but not otherwise paying for CERs in advance), and heavily discounting any upfront payments they do make
- Buying only a portion of the expected CERs (i.e., over-collateralization)
- Requiring seniority (i.e., the buyer is first in line to receive CERs issued in a given year)
- Building retiring provisions into the contract, so that the obligation to purchase CERs is reduced if the project fails to meet certain milestones and/or deliver minimum amounts
- Transferring generic country risk to specialized insurers and export credit agencies
- Seeking early letters of approval from host countries
- Seeking delivery guarantees to cover potential investment losses and/or delivery risk.

Some buyers require sellers to guarantee delivery of CERs. Although providing such guarantees can yield a substantially higher price (as discussed in the following section), CDM developers should carefully weigh the risks of this approach. This may well expose them to a large uncovered liability in the event that the project falters and carbon prices are high at the time when the CERs need to be delivered. An alternative is to transfer the risk to a third party guarantor who provides credit enhancement and can thereby reduce the seller's risk exposure.

Many buyers also manage risk through diversification (purchasing a pool of CERs), hedging, portfolio monitoring, and other portfolio management tools.[11] As CDM project sponsors limit the risks, they can expect buyers to pay a higher price, but this only makes sense if sponsors are able to bear these risks at low cost.

How risk is factored into carbon prices

Given the array of risks described above, it is not surprising that EUAs command a substantial premium over CERs, and that CERs trade in a much wider band than EUAs. EUAs trade at a premium to CERs, because CER contracts:

- Can entail substantial delivery risk, as they are generally forward contracts executed years before the CERs are created
- Are usually *multiyear* contracts (as opposed to EUA contracts for delivery on a specific date)
- Are currently not as liquid (and will continue to be illiquid until the ITL is in place).

As explained above, CER and ERU prices range widely because of the heterogeneity of the underlying projects and contracts. This is illustrated in figure 2, which presents two snapshots of market prices for project-based carbon credits. Both charts show that secondary market CERs trade at a sizeable premium over forward CERs, and that CERs command a premium over both ERUs and voluntary credits.

By disaggregating this data for a representative month (see figure 3), one can see that:

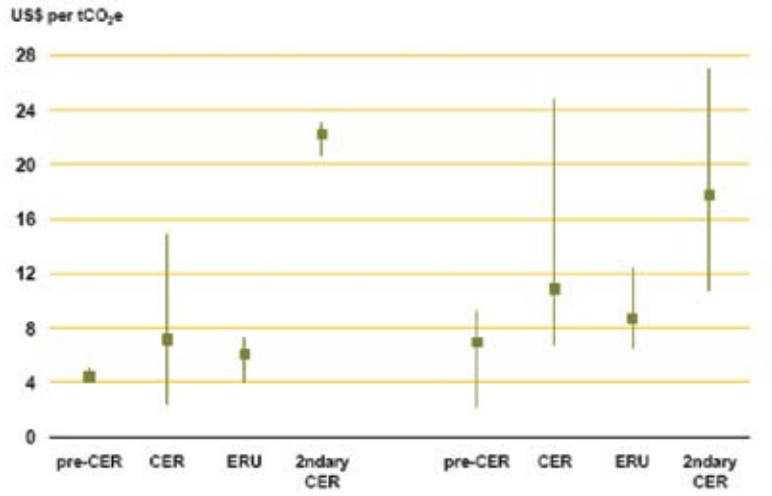
- Spot CERs trade at just a slight price discount to EUAs,[12] since they are virtually free of delivery risk. Once the ITL is in place (expected in 2007), CERs will be freely tradable inside and outside of the EU ETS. Given CERs' fungibility, this discount is likely to disappear, and even invert to a premium.
- Forward contracts are discounted heavily relative to spot contracts (especially for greenfield projects).
- Forward CERs with delivery guarantees trade nearly on par with spot CERs, commanding a 50% premium over non-guaranteed forward CERs.
- ERUs trade at substantially lower prices, due primarily to the lack of clarity about crediting rules.
- To the extent that buyers pay upfront for CERs, they discount their payment to reflect the degree of risk they are assuming. If the buyer received a guarantee or other security, then the discount rate would be commensurately lower.
- A limited number of issued CERs are traded on a forward basis. At the time of writing, these CERs appear to trade at a

11 See for example the web site for Natsource's Greenhouse Gas Credit Aggregation Pool, http://www.natsource.com/markets/index_sub.asp?s=178.

12 Issued CERs now trade against phase two, and not phase one EUAs, as the former are worth more. They are currently priced at a 10% discount to the 2008 EUA ask price (20% discount to the bid price).

Fig. 2

Observed prices for project-based transactions in 2005 and 2006



Source: Capoor, K., and P. Ambrosi. 2007, *idem.*, p. 31.

premium of at least $2 over those forward CERs that have not yet been issued.

- Forward CER contracts generally do not take the evolution of risk into account in their pricing.

Buyers translate this information into their offer price, comparing their bid to other transactions on the market, and adjusting for risk. One approach is to use benchmarks and spreads. First, the buyer identifies a relevant benchmark (e.g., EUAs for delivery on, or after, the expected CER delivery date) and develops a price forecast for that benchmark. The buyer then applies spreads to reflect the risk attributes described above as they relate to a particular project and transaction structure. The spreads can be developed through surveys or by studying other transactions on the market. The buyer may discount the price to reflect the array of project-related and Kyoto-related risks, all of which may reduce the likelihood that they will receive fully compliant CERs in a timely manner. The degree of competition for a project—which in turn relates to its attributes—is also an important determinant of how much buyers are willing to pay.

The offered price resulting from this type of assessment explains why the market pays less for CERs than for EUAs; the market views CERs as riskier than EUAs, despite their greater fungibility across the phases of the EU ETS.

In light of the large premium for guaranteed or issued CERs, a CDM project sponsor may want to consider:

- Delaying forward contracts until the project has issued CERs, if price volatility can be tolerated or hedged.
- Inserting escalation clauses into any forward contracts (if postponement is not an option) that would allow prices to step up

after: the ITL is in operation; the project reaches key milestones in terms of construction and/or CDM project cycle; or the project's first CERs are registered.

- Obtaining a third party guarantee, if the price premium exceeds the cost of the guarantee.

The next section explores how to put this advice into practice.

Strategies for maximizing carbon value

CDM project sponsors can employ a variety of tools to enhance carbon value, including unilateral CDM, advanced project development, project enhancements, and structured finance. These tools can increase total returns while addressing other needs, such as attracting financing. There are, however, pros and cons to each of them.

A higher CER price may not necessarily result in higher overall value, if the sponsor must assume costly risks in the process

A CDM project sponsor should be particularly mindful of the tradeoffs between price and risk. A higher CER price may not necessarily result in higher overall value, if the sponsor must assume costly risks in the process. In considering how to structure the sale of carbon credits, sponsors should therefore focus on overall value, after factoring in their risk exposure.

Unilateral CDM

CERs that have already been issued command a substantial price premium over those from projects that remain to be built—unless they are backed with a guarantee from a creditworthy counterparty. To capture the premium for guaranteed delivery of CERs, sellers can delay sale until after the CERs are issued. This means that the project is developed, executed, and financed without foreign direct investment or other involvement by an Annex B participant. This approach is known as "Unilateral CDM,"[13] under which CERs may be sold either directly through a growing number of national auction and settlement systems or through brokers.[14]

Although Unilateral CDM allows sponsors to retain the delivery premium, the approach has its downsides, including issues related to financing, additionality and price risk, discussed below.

Financing

A sponsor may have difficulty obtaining project financing without a forward contract for the sale of CERs. Infrastructure lenders seek certainty about a project's revenue streams. In the absence of long-term contracts and purchase agreements with creditworthy counterparties, they may refuse to finance a project, require higher debt service coverage, or insist on lower leverage to

13 Unilateral CDM has been defined to include projects that, albeit developed locally, sell CERs under forward contracts. According to the UNFCCC Climate Protection Programme, Unilateral CDM includes "project activity [that:] involves no foreign direct investment, has only the approval of the host country before registration, and sells its CERs through a DPA [Direct Purchase Agreement] after certification and issuance or sells them not at all." UNFCCC, Unilateral CDM–Chances and Pitfalls (Bonn, 2003), p. 5.

14 The Brazilian Mercantile and Futures Exchange, for example, is establishing an auction mechanism and settlement system that will enable project sponsors to tap the market directly.

compensate for the additional risk.[15] One solution is to finance construction at the corporate level, although this is only available to sponsors with strong balance sheets. Another solution is to identify financiers prepared to invest on the basis of future spot sales of CERs. Due to the uncertainties surrounding future CER prices, however, these investors would normally require rates of return similar to those of equity investors, and/or guarantees from the sponsor or a highly creditworthy obligor, such as a bank.

Additionality

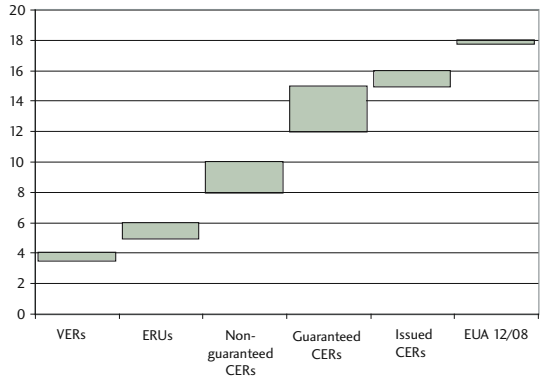
Under CDM rules, it is more difficult to substantiate additionality under Unilateral CDM than for a project where a buyer is identified at the outset. Although not formally a requirement (e.g. under the Additionality Tool), sponsors and lenders are typically asked during the validation process to substantiate that CER revenues were an integral factor in the decision to go ahead with the project. If the project has gone forward without a carbon buyer in place, it is more difficult to demonstrate that CER proceeds were in fact integral to project execution.

Price risk

Under Unilateral CDM, the sellers assume the risk that the spot price of CERs at the time of delivery may be lower than the price that they could have obtained on a forward basis. Attempting to time the market can be dangerous, as the April 2006 collapse in EUA prices demonstrated. In deciding whether to execute a CDM project unilaterally, sponsors should assess whether they are prepared to assume price risk—that is, whether they are prepared to trade a firm price for CERs against the possibility of obtaining higher *or lower* prices after delivery.

Fig. 3

Carbon price comparison, August 2006



Sources: European Climate Exchange, Point Carbon, Chicago Climate Exchange, as cited by CarbonPositive at: http://www.carbonpositive.net/viewarticle.aspx?articleID=137

Project sponsors should consider Unilateral CDM if (1) they can obtain financing without a long-term contract in place, and (2) they believe future spot CER prices (on delivery) will exceed forward prices sufficiently to compensate for both volatility and the cost of obtaining financing.

Whereas true Unilateral CDM projects appear to be rare (at least, they are not widely publicized), an increasing share of project sponsors are undertaking CDM projects without Annex B investors, but with forward contracts for the sale of CERs. For example, in India, more than 60% of the projects registered in 2006 were done without Annex B participation, as were about half of the projects registered in Brazil. This approach may reduce preparation costs, if local technology and knowledge of CDM are adequate, and may increase the price that sellers can obtain (as

15 Standard & Poor's considers that the minimum debt service coverage ratio (DSCR) thresholds typical of traditional independent power producer (IPP) project financing are too low for merchant power plants (MPPs). They recommend a minimum level of 1.70 for MPP equity distributions for investment-grade transactions. Peter N. Rigby, 1999. "Merchant Power: Project Finance Criteria," Standard & Poor's: 1999 Infrastructure Finance Criteria and Commentary (October 1999): 24.

project risk is lower than for projects in earlier stages). But it would also diminish the possibility of accessing some types of trust funds and long-term financing offered by Annex B countries.

Advanced project development

If neither Unilateral CDM (higher price but limited access to financing) nor forward sale (lower price but improved access to financing) seems like an attractive option, a CDM project sponsor can choose a middle route: developing a project to the validation stage before marketing its CERs. Using existing, proven methodologies (rather than developing a new, project-specific one) reduces Kyoto risk, as well as the time and cost of preparing a project.

Another way to enhance carbon value is to phase the project to deliver CERs early, i.e., before 2013 (as shown by the Nova Gerar project, see Box 1). For example, in the case of projects that capture methane to generate power, by first commissioning the methane capture and flaring component before building the power generation component, a sponsor can:

- Reduce upfront capital costs
- Accelerate delivery of CERs, enabling the sponsor to obtain spot market prices
- Generate early cash flows that can be used to finance subsequent capital expenditures
- Establish a track record upon which the seller can establish a better price for forward sales of additional CERs
- Appropriately scale the power generation component, based on actual measurements of methane collected.

As in Unilateral CDM, finding sufficient capital for the initial investment may be challenging. Reducing upfront capital costs through phasing (as shown by Nova Gerar) is one solution. Another is to seek funding from other sources, including:

- *Technical assistance* funding is available to project sponsors for a number of consulting services such as methodology preparation, research and development, and in some cases, prefeasibility and feasibility studies[16]
- *Project financing* combined with carbon sale from specialized funds, such as the Japan Carbon Fund[17] or Climate Change Capital[18]
- *Mezzanine finance,* which helps leverage senior debt without diluting the project's equity, from specialized sources such as the Merzbach Group[19].

Highlighting project attributes

Just as carbon credits are not all the same, neither are all carbon buyers. Whereas many buyers simply need cheap, low-risk credits, many others will pay a premium for credits that deliver additional environmental and/or community benefits. Project sponsors can add value to their projects by promoting their positive attributes and identifying buyers who are seeking them out; moreover, some donors will provide grant or concessional financing to support such projects.

16 For example, see Web site for The World Bank Carbon Finance Unit, CF-Assist and Project Development, http://carbonfinance.org/Router.cfm?Page=CFAssistProj&ItemID=24696&zrzs=1&cp=24696.

17 See Web site for the Japanese External Trade Organization (JETRO), Santiago, http://www.jetro.go.jp/chile/pdf/CDM_JCF.pdf#search=%22%20japan%20carbon%20fund%20%20jbic%20dbj%22.

18 Climate Change Capital, "Climate Change Capital Raises US$830m to Create World's Largest Private Sector Carbon Fund on Target to Raise US$1bn," 11 September 2006, Climate Change Capital Press Release, http://www.climatechangecapital.com/pages/pressdetail.asp?id=243&.

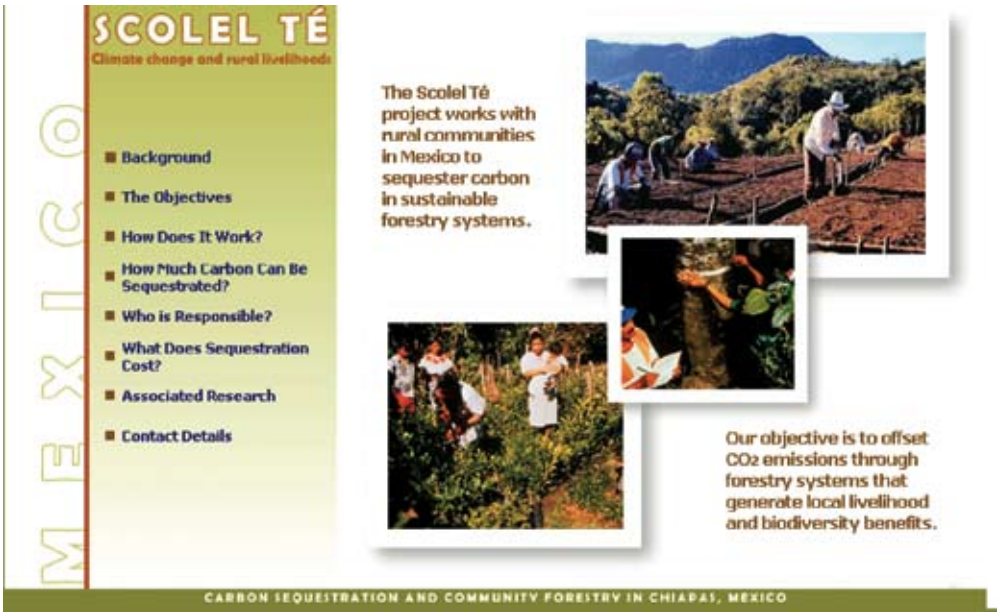
19 For more information see Web site for the Merzbach Group, http://merzbachgroup.tripod.com/.

Box 1

The Nova Gerar Project

The Nova Gerar CDM project is an example of this approach. The project involves the closure and recovery of an existing landfill in the Rio de Janeiro metropolitan area, and the development of a new sanitary landfill nearby. The project generates carbon credits by collecting and combusting landfill gas. A long-term, fixed-price contract was secured for the sale of €8.5 million worth of carbon credits to the Netherlands CDM Facility. Given the high global warming potential of methane, and the relatively low cost of collecting landfill gas (under €1m), the payback period will likely be under three years. If the economics of power generation are attractive (e.g., steady flow of landfill gas that is high in methane content, relatively high power prices, and low grid connection cost), the sponsors can use excess cash flows from the landfill gas component to partially finance an investment in modular spark ignition engines to generate power.

Fig. 4
Web site for Scolel Té



Small-scale projects

Offsetting carbon footprints has become trendy among environmentally conscious companies, travel websites, and sponsors of high-profile events (e.g., the World Economic Forum). Indeed, the New Oxford American Dictionary named "carbon neutral" as Word of the Year for 2006.[20] To meet the demand driven by this environmental trend, carbon brokers are targeting emission reductions from small-scale projects, primarily in renewables, reforestation, and energy efficiency.[21] Many purchase voluntary credits (not eligible under Kyoto or the EU ETS) due to their lower cost. Some are willing to pay a premium, or cofinance project development, or both.[22] To attract buyers in this market segment, successful sponsors promote their project's additional positive features—tell the story, document it, and provide supporting imagery (see figure 4).[23]

Community benefits

In some cases sponsors can also obtain premium prices and/or concessional funding for projects that provide attractive environmental and/or community benefits, for example by improving access to infrastructure services for the poor or by reducing local environmental impacts.

20 "Being carbon neutral involves calculating your total climate-damaging carbon emissions (your carbon footprint), reducing them where possible, and then balancing your remaining emissions, often by purchasing a carbon offset—paying to plant new trees or investing in 'green' technologies." The Oxford University Press Blog, comment from The Green Technology Blog, comment posted 16 November 2006, http://blog.oup.com/oupblog/2006/11/what_do_al_gore.html.

21 For a list of buyers including retail carbon prices, see the Web site for EcoBusinessLinks: Environmental Directory, http://www.ecobusinesslinks.com/carbon_offset_wind_credits_carbon_reduction.htm.

22 Japanese Ministry of Economy, Trade, and Industry, "The Role of JBIC in Support of Overseas Projects Related to Kyoto Mechanisms." See Web site for Japanese Bank for International Cooperation, http://www.meti.go.jp/english/information/downloadfiles/JCIF/jbic.pdf.

23 See additional examples of project write ups at the Web site for the Carbonfund.org Foundation, http://carbonfund.org/site/pages/our_offset_projects/. Also see the Web site for The Carbon Neutral Company, http://www.carbonneutral.com/.

Premium pricing. Buyers such as the Community Development Carbon Fund (CDCF) offer premium prices to CDM projects that deliver community benefits, and in some cases also give upfront financing on concessional terms.[24]

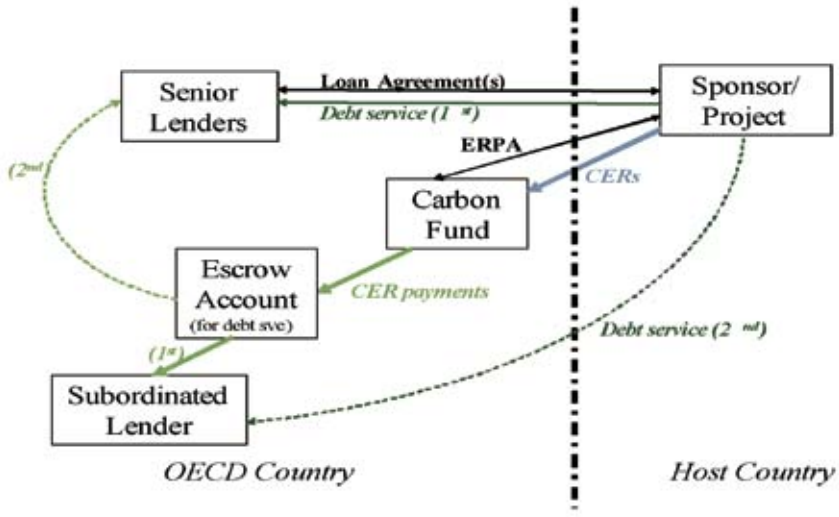
Output-based aid (OBA). OBA is a strategy for using explicit, performance-based subsidies to fund the gap between people's willingness or ability to pay for public services and the cost of providing that service, or to mitigate externalities such as environmental costs. The Global Partnership on Output-Based Aid (gpoba.org), for example, is providing capital subsidies to a project in Nepal that replaces kerosene and other energy sources with biogas digesters used by poor households. The project will sell CERs to the CDCF. These additional revenues can be used to fund other projects or to extend the program to more households.

24 See Web site for the CDCF, http://carbonfinance.org/Router.cfm?Page=CDCF&FID=9709&ItemID=9709.

Concessional financing. A number of bilateral and multilateral agencies have pledged to increase their investment in renewables and energy efficiency, through their own programs as well as through third party investments. These financiers provide a number of advantages, including offering longer-term financing than private sector banks generally do (which helps defray the high upfront costs of these projects), and arranging technical assistance grants (e.g., for CDM and project preparation). Germany's KfW, for example, has several programs promoting renewable energies and energy efficiency, through which it provides long-term loans. It also has a technical assistance facility under its Carbon Fund that supports the preparation of CDM project documents.[25] The European Commission recently

25 "The Special Facility for Renewable Energies and Energy Efficiency" enables KfW Entwicklungsbank, acting on behalf of the German federal government, to provide borrowers with up to €500 million in low-interest loans from 2005 to 2009." See Web site for KfW Bankengruppe:http://www.kfw-entwicklungsbank.de/EN_Home/KfW_Entwicklungsbank/News/KfW_Special_Facility_for_Renewable_Energies_and_Energy_Efficiency.jsp.

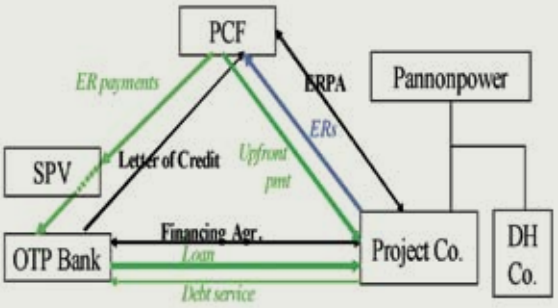
Fig. 5
Limited-recourse financing



Box 2
The Pannonpower biomass project

The Pannonpower biomass project illustrates such a structure. Pannonpower supplies heat and hot water to the city of Pécs—Hungary's second largest district heating network—and electricity to the grid. Pannonpower wanted to convert one of four combined-heat-and-power units to biomass firing to provide electric generation, as well as peaking and reserve heat supply. The company substituted sustainably harvested wood for coal, reducing CO_2 emissions as well as SO_2, NOx and particulate pollution.

Fig. 6
Structure of the Pannonpower biomass project



The company secured senior financing from Hungary's second largest commercial bank, OTP Bank, but additional capital was required. The company did not want to contribute equity; OTP was unwilling to provide additional senior debt.

To fill the financing gap, Pannonpower agreed to sell 1.2 million tonnes of verified GHG emission reductions to the Prototype Carbon Fund (PCF). PCF provided a portion of the purchase price in advance as limited recourse debt, secured by only (1) carbon credits to be generated by the project and (2) a letter of credit from OTP, without recourse to the project's other cash flows (see figure 6). Thus, the financial structuring of the carbon component helped to complete the financing of the facility, which was commissioned in August 2004. With a capacity of 65 MW thermal and 49 MW electric, it is the largest biomass cogeneration facility in Hungary and one of the largest in Europe.

committed €80 million to the Global Energy Efficiency and Renewable Energy Fund (GEEREF), a third party "fund of funds" aimed at stimulating the creation of regional subfunds investing in clean energy.[26] The International Finance Corporation (IFC) has an array of programs that support environmentally friendly technologies with technical assistance and financing,[27] including early-stage venture capital funding, and targeted

26 Europa: Gateway to the European Union, "Commission Proposes €100 Million Global Risk Capital Fund for Developing Countries to Boost Energy Efficiency and Renewables," 6 October 2006, GEEREF Press Release, http://europa.eu/rapid/pressReleasesAction.do?reference=IP/06/1329&format=HTML&aged=0&language=EN&guiLanguage=en.

27 "The Cleaner Technologies Program provides catalytic funding from US$200,000 to US$2,000,000 for innovative business initiatives that produce goods and services with environmental benefits. In addition to providing funding for IFC clients to pursue cleaner production initiatives, [they] provide innovative businesses equity, quasi-equity, debt, and other kinds of flexible funding to finance working capital requirement or capital investment. When financing a project the Program will only take a minority position and seeks to leverage its investment with cofinancing from project sponsors and other sources." See Web site for the IFC, "What we do," http://www.ifc.org/ifcext/enviro.nsf/Content/CleanerTech_WhatWeDo.

lines of credit offered through local financial institutions.

Structured finance solutions

The disconnect between a buyer's desire for guaranteed delivery and a seller's inability to provide such a guarantee creates an opportunity for intermediation using structured finance tools. There are two types of structured finance products available today that can help bridge this gap: transaction-specific financing structures and delivery guarantees.

Transaction-specific financing structures

CDM project sponsors often face shortfalls in equity funding to complete their project, but are reluctant to dilute ownership. Meanwhile, emerging market equity investors are reluctant to invest in unlisted companies unless there is at least one clear, viable exit strategy.

One solution to this apparent impasse is for financiers to add a tranche of limited recourse financing[28] with a senior interest in the CER proceeds and a subordinated interest in the project's other cash flows (see figure 5). Senior creditors can treat these instruments as equity because of their subordination, whereas shareholders can treat them as debt, because they do not permanently dilute the shareholders' ownership interest.

Limited recourse financing can also be structured as a self-liquidating equity investment, whose dividends and capital are reimbursed over time from CER proceeds. If the CER proceeds fall short of the contractual volumes, the investor would share in the project's other cash flows, but would be subordinated to the senior creditors. To help manage currency convertibility risk, payments from the carbon contracts may be paid directly into an escrow account to be used for debt service (see Box 2). Such structures are common in mining projects; dividends are paid out as the mine is depleted, and, once closed, there is no residual value.

Delivery Guarantees

A number of tools are available to guarantee delivery of CERs; some are transaction-specific and some involve pooling projects. As figure 7 shows, their cost is commensurate with the strength of the guarantee they provide.

Transaction-based carbon delivery guarantee

A transaction-based carbon delivery guarantee provides for a guarantor to deliver a fixed volume of CERs (or the equivalent value) to a buyer willing to pay a premium for guaranteed delivery. The guarantor earns a fee related to the risk and hedging cost, typically by purchasing CERs from other projects. Guarantee contracts can be issued at a fixed or indexed price, or a blend of the two. Settlement can either be in CERs, or in cash equal to the difference between the contractually agreed price and a market index.

Pooled arrangements

Pooled arrangements, such as Natsource's Greenhouse Gas Credit Aggregation Pool (GG-CAP),[29] provide delivery protection by offering a priority interest in a collection of projects that are expected to generate CERs. With total capital of €455 million from 26 participants, GG-CAP will

28 For example, subordinated debt or convertible equity.

29 IETA, Natsource closes Greenhouse Gas Credit Aggregation Pool with over €455 million (US$550 million) in commitments, 19 October 2005, *Natsource Press Release*. http://www.ieta.org/ieta/www/pages/download.php?docID=1182.

Box 3
Case study: IFC's Carbon Delivery Guarantee

The IFC has developed a Carbon Delivery Guarantee (CDG) to enable CDM project sponsors to capture part of the premium for "guaranted" CERs.

Under the proposed transaction, the IFC will enter into back-to-back forward contracts to (a) purchase CERs to be generated by new renewable energy facilities, and (b) on-sell them to compliance buyers with an IFC guarantee which will carry its AAA rating, thus eliminating credit risk to the compliance buyers and generating a higher price for the sellers. Prices for both contracts will be pegged to the EUA. The sponsors (a medium-sized Brazilian manufacturer and a local family) will provide guarantees and/or credit support to the IFC for the delivery of the CERs. In the event of under-delivery, the IFC would be liable to pay the buyers an amount of acceptable substitute: CERs, EUAs, or a predetermined penalty in reference to the CER shortfall at the prevailing price. The IFC would then exercise the sponsor guarantees to compensate for any losses.

In addition to increasing the sponsor's CER revenue, the transaction should lower the compliance cost to the buyer, and potentially attract capital to similar clean energy projects.

purchase and manage delivery of a large, diversified pool of CERs and ERUs. Investors can expect to receive a minimum volume of CERs, while the aggregator will contract for excess CERs, which it can later sell on the spot market.

Conclusions

The nascent carbon market is rife with imperfections, including information asymmetries, high transaction costs, and players with substantial market power. The market will thus continue to experience high volatility and uneven pricing until these are resolved. It will also continue to place a substantial premium on guaranteed delivery, liquidity and compliance quality.

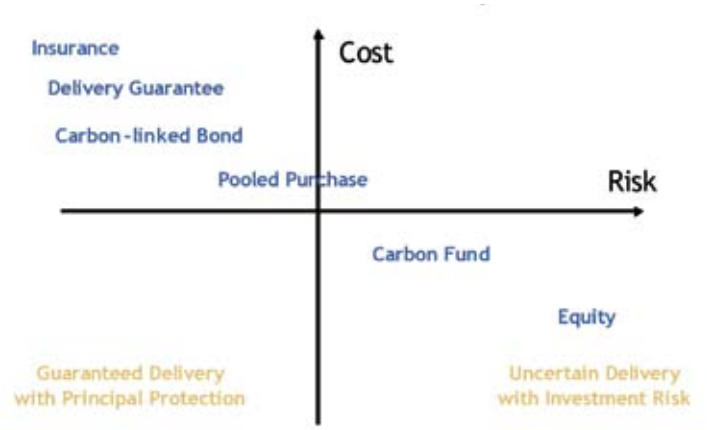
Market volatility has, on the other hand, stimulated the creation of hedging and guarantee tools that sponsors can now use to raise their risk-adjusted returns.

To maximize price while managing risk, sponsors can:

- Sell CERs on the spot market after they have been issued
- Purchase put options to protect against downside price risk
- Use a third party delivery guarantee
- Highlight project attributes, and market to buyers who seek out these attributes
- Ensure eligibility under the EU ETS
- Absorb risks that buyers are loath to assume - if the price premium received for assuming these risks exceeds the cost to the seller.

Fig. 7

Costs and risks of guarantee tools



Sponsors can also structure carbon transactions to help finance their CDM projects, by borrowing against ERPA proceeds or by securing equity from investors willing to be reimbursed in carbon credits.

In today's market, sponsors of greenfield CDM projects who believe that carbon prices will hold firm during the Kyoto commitment period—and who are prepared to accept the risk that they may not—are well advised to postpone the sale of their CERs until they can be delivered spot. This will enable them to capture as much of the delivery premium value as possible, as well as any potential upside. Those without the appetite for risk, and/or those whose creditors are not prepared to assume market risk, can use the tools outlined above to help secure financing and hedge market risk.

John Palmisano
International Environmental Trading Group

A GREEN INVESTOR'S PERSPECTIVE

Risk, Uncertainty, and Individual Decision Making in Emission Markets

Risk, uncertainty, and individual decision-making all materially influence GHG credit and quota pricing, albeit in different ways.[1] I explore these impacts by deconstructing the relative risks and uncertainties of GHG credit versus quota transactions, according to various categories and metrics. I attempt to link micro-, macro- and behavioral issues into a system for understanding and assessing price dynamics.

Why credits are different than quotas

Despite key differences, GHG emission quotas, credits, and other potential climate compliance instruments are constantly traded, and sometimes exchanged for each other. Indeed, the markets for these emission credits and quotas are linked because of the Kyoto Protocol. Yet although they are linked, they differ in significant respects.

While quotas are rights created immediately through law, credits (e.g., CERs and ERUs) are derived from the development of emission reduction projects over time. Under a quota-based system, the regulatory agency allocates a permissible allowance of emissions to each source (whether plant, firm, state, or nation), and is responsible for tracking trades and monitoring compliance. Once the allowances are distributed and a monitoring system is in place, the regulated entities are free to buy and sell quotas as they please.

Alternatively, in a credit-based system, tradable credits exist only when regulated entities exceed their emission control obligation, and when reg-

1 Risk implies that one knows (or thinks one knows) the underlying probability distribution, while uncertainty implies that one does not or cannot know this.

ulators review and approve the granting of such credits. The obligation or incentive to abate emissions takes precedence over the right to pollute. Credits slowly emerge from a five-step process: (1) commercial conceptualization, (2) project design, (3) generation of actual emission reductions, (4) certification by the regulators, and (5) credit registration. Each step in this process has specific risks; additionally, many of the risks associated with buying and selling credits do not exist with quota trading.

Thus, a key distinction between quota and credit systems is that the latter ascribes to an emission reduction legal certificate—in effect a property right—only after actions by both regulated entities and regulators, whereas quotas simply "exist." It takes less time and effort to start a credit-based system than a quota system; however, each subsequent trade takes longer to complete, because it must be reviewed and certified. Conversely, a quota system takes considerable time to construct, but involves fewer subsequent transaction costs than a credit-based system; the regulator tracks, but does not carefully scrutinize, individual trades.

Supply and demand

No assessment of GHG quota and credit prices can avoid an understanding of supply and demand. These are largely (but not exclusively) determined by the regulators, who establish the initial endowment of quotas and the method for their allocation (e.g., auctioning or grandfathering), and who also establish the emission reduction targets, eligibility requirements for credits, and the baseline against which credits are established.

Supply

There are several factors that commonly influence supply in all markets: *(a)* the initial endowment of opportunities; *(b)* the cost of technology, substitutes, and complements; *(c)* the forward curve for technologies, substitutes, and complements; and *(d)* other regulatory factors.

Regarding GHG credit and quota trading, NAP targets are a primary factor affecting supply. For the pilot phase of Kyoto (2005–2007), these targets are lenient. This will likely result in relatively large supply and low demand, meaning lower carbon prices than some observers had hoped to see. The precipitous decline in EUA prices in the spring of 2006 made this relationship clear, following reports from key countries that they would meet their targets more easily than had been anticipated.[2]

In terms of the initial endowment, supply might be affected by how the EITs, such as Russia and Ukraine, manage their abundant and cost-effective GHG control opportunities. As emission targets are set relative to 1990 levels, the economic downturn and corresponding drop in GHG emissions experienced by these countries has left them with significant quota (i.e., AAU) surpluses, or "hot air." Some potential buyers of these surplus AAUs are eschewing them unless they are "greened" through specific, tied investments in cleaner infrastructure or local sustainable development. Other buyers are simply reluctant to purchase them due to what they see as an unfair policy.

In any case, this reservoir must be accounted for in the minds of carbon buyers and sellers. On the one hand, if greened AAUs (which perhaps

2 EUA prices fell by more than 50% within days of the announcement.

should be called "warm air") are available to sell, then there is the potential that these quotas and associated credits could flood the market and depress prices. On the other hand, it could provide an opportunity for sellers to behave as a cartel and manipulate the price of carbon.

Demand

As with supply, NAPs are a central factor in determining levels of demand. If allocations continue to be set too high, there will be little need for trading quotas or credits. But demand is also contingent upon other factors, including fuel prices that to some degree already reflect GHG emission prices, and domestic policies on nuclear energy. If the price of natural gas remains high relative to coal, then switching to coal may be preferable, thereby increasing emissions and the demand for GHG offsets. Likewise, if certain countries phase out nuclear power, then their remaining options—hydro, coal, and gas—are either likely to be insufficient to supply enough power to effectively meet the subsequent energy gap, or else very expensive. This, too, will influence carbon prices.

Other factors influencing demand are technological advances, regulatory policies with respect to Kyoto and post-2012 obligations, and price forecasting measures.

Other key factors influencing price

Figure 1 below illustrates a simple model of factors influencing GHG credit pricing. It provides a graphical illustration of the following discussion.

Risk

Risk is pervasive and cannot be avoided. Large organizations try to manage risk by creating departments that focus on identifying, deconstructing, quantifying, and managing risk, in order to minimize losses and to achieve gains. Risk management departments are now commonplace in financial organizations, such as banks and insurance companies, as well as in almost all power and energy companies, and in all energy and emission trading firms (see box 1).

In assessing GHG credit price risk, risk factors must be identified, measured, and managed. Since managing risk is costly in terms of time and money, many traders and compliance managers prefer to purchase relatively non-risky quotas instead of risky credits. Depending on how one looks at this behavior, either the market is paying a premium for quality or is heavily discounting perceived "inferior" credits.

Buyers

Credit and quota buyers fall into two main classes: (1) those that buy solely to meet compliance targets, and (2) those that buy and hope to sell again at a profit. Environmental compliance managers are extremely risk averse by nature; after all, they are generally hired to keep their companies in compliance with regulations and to establish and maintain good reputations—not to make profits or even to minimize costs. This is reflected in their education and training, job duties, and unique set of individual rewards and incentives. These buyers generally behave, thus, as risk minimizers, not profit maximizers.

Speculators, on the other hand, are obviously in business to make money. Their interest is to buy low and sell high, or to sell short. To be success-

Box 1

Energy risk survey

A recent survey of 150 energy risk management executives published in a leading trade magazine revealed their daily struggles with educating both executives and traders on risk.[1] This poll is especially informative because emission trading is within the purview of these executives.

Their responses revealed the following:

Which risks do you measure?

1. *Market and price risk* *86%*
2. *Trading positions* *85%*
3. *Credit risk* *75%*
4. *Operational risk* *69%*
5. Reputation risk 33%
6. *Catastrophic risk* *30%*

What hinders people from measuring risk?

1. Lack of time, personnel, and expertise
2. Corporate culture
3. *Lack of sufficient information*
4. *The difficulty in quantifying risks*
5. *Lack of models*
6. *Lack of hedging instruments*
7. *Immature markets and lack of data*
8. *Lack of trust in the results*

What are the greatest challenges?

1. *Educating people who need to be engaged*
2. *Volatility in energy markets*
3. *Market complexities*
4. *Getting market data and keeping up with market changes, prices, legislation*
5. Accounting standards
6. *Environmental regulations*
7. *Credit risk*

* Risks that directly relate to GHG trading and price formation are *italicized*.

1 "Top of the Agenda", *Energy Risk* (November 2005): 18–19.

ful, they must scrutinize and manage risks.

Risk factors relate to the quantity and quality of possible GHG credits, their eligibility for compliance, the years they might be used, potential import restrictions, and questions regarding the strength of the property rights associated with them. These factors, and their relative importance to the buyers and sellers, influence the bid and offer prices.

Market information

Several sources of information exist for GHG prices including brokers, intermediaries, and public auctions.

Daily price updates from brokers

Many emission brokers, funds, and other intermediaries provide data on prices, and much of this can be found on the internet. For example, according to one well-known broker, on 15 December 2006, the 2008 EUAs were priced at €17.05, while a batch of CERs from 2008–2012 (payable in December each year) was selling for €12.80 bid, €13.30 asked. One could also swap EUAs for CERs settled in December 2008 by adding €3.30 to each CER.[3]

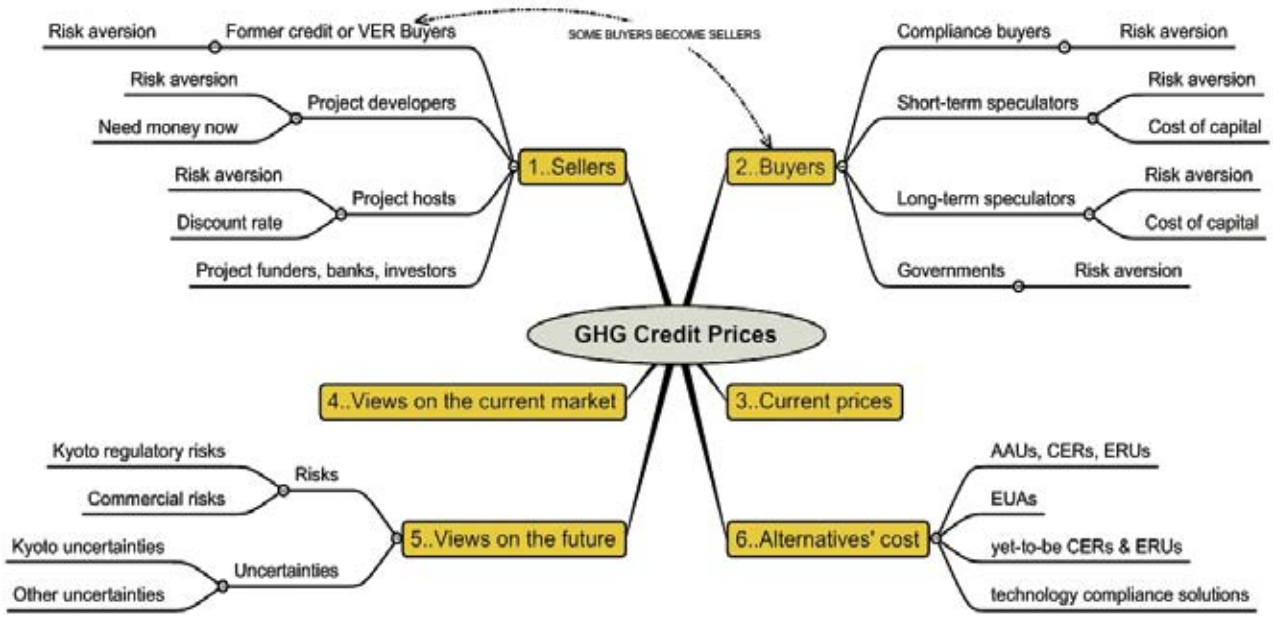
Note that the Kyoto Protocol states that there is equivalency between CERs and ERUs; hence, there should also be a rough equivalency between these credits and EUAs[4]. But in the reality of the commercial world, risk and uncertainty erode the value of preissued CERs and seriously discount *actual* CERs, too. In simple terms, the

3 Prices reflected either over-the-counter (OTC) or those on the various EU exchanges.

4 There is a limit on the number of CERs or ERUs that can be applied to a country's emission control obligation; therefore buying Kyoto credits does have some imbedded risk. But early credits for 2008, 2009, and 2010 are unlikely to be affected by this limit. Still, prices for primary and secondary CERs are discounted against EUA prices.

Figure 1

A Simple Model of Factors Influencing GHG Credit Pricing.



perceived risk of securing and using CERs drives prices downward to 10–30% of comparable vintage EUAs.

Auctions

Private sector CER auctions occur frequently, as well as some public sector EUA auctions. In the course of one such typical auction in December 2006, the Asia Carbon Exchange (ACX) traded CERs from three Indian CDM projects. The auction saw bids ranging from €8.00 to €12.10 per CER. Issued CERs from two renewable energy projects, vintages 2001–2006 and 2005–2006, traded at €11.80 and €12.10, respectively. CERs from one of the projects, this one concerning wind power, captured a large premium (€2.80 per CER) over its previously transacted price on the ACX platform nearly one year earlier, when the project was still in its final stages of validation and had not yet issued its first credits. All other things being equal, this amount—about 30% of the total value—could be viewed as the risk-free premium a buyer might pay for CER quality.

A third project concerning biomass power generation yielded a price of €10.00 per CER (vintage 2007–2008). The seller stipulated an upfront payment condition, which was disclosed to the buyer prior to auction and accepted at the point of transaction. CERs on offer for the same project for the period 2009–2012 did not receive any bids at a floor price of €13.00, and hence were not transacted.[5] Clearly the floor price was seen as too high or, alternatively, the risk associated with the performance of the project over

5 See "CERs transacted at ACX demonstrates maturity in the CDM markets", Press release, The Asia Carbon Group (15 December 2006): http://www.asiacarbon.com/news.htm#

the next six years was seen as too risky. Thanks to the internet, knowledge about GHG credit prices travels fast, and the credit markets, whether instigated through bilateral trades, exchanges, or auctions, are surprisingly efficient.

Thanks to the internet, knowledge about GHG credit prices travels fast, and the credit markets, whether instigated through bilateral trades, exchanges, or auctions, are surprisingly efficient.

Views on the current market

Regulatory drivers influence GHG emission credit prices to a greater degree than fuel, technology, or power prices. This is quite different from the more mature SOx and NOx markets in the United States, where the regulations are well established, property rights are well defined, many transactions have taken place, and substantial litigation has provided buyers and sellers with good information on what they are buying. In addition, market actors already know fairly well the supply/demand relationships and the positions of many participants. In the embryonic GHG market, data and information are scarce; therefore, price projections vary greatly compared to more mature emissions markets. Views on current prices are influenced by access to data on trades as well as by economic models, power models, and fuel price forecasts.

Views on the future

Since GHG markets are highly politically driven, CERs and ERUs are produced over time, and Kyoto compliance obligations stretch out to 2012, carbon buyers and sellers must develop views and draw conclusions on many future regulatory and commercial outcomes in order to predict credit prices. These predictions about future events influence views on the market and current prices. There are both macro-views regarding the number and timing of carbon credits that will come on the market, and micro-views including those focused on project-specific transactions (see Fig. 2).

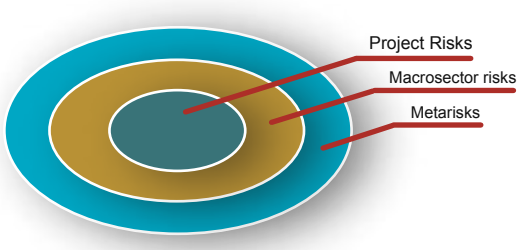
Risks related to JI and CDM projects

Risks can be nested in terms of meta-, macro- and micro-issues. Some risks, like the risk of worldwide inflation or economic depression, are not CER-specific. These are metarisks. All potential actions, including doing nothing, could be influenced by such potential outcomes; therefore, it makes little sense to look into these risks. Before investing in a CDM project, however, many macro-issues should be investigated.

Macro-Issues

Risk assessment for CDM or JI projects requires a focus on macro-country, macrosector, and microproject perspectives.

Fig. 2
A simple view of CDM project risks



How can this model of "nested" risk apply to, and affect CER and ERU prices? Few people have influence over macrorisk factors, though sometimes instruments exist that allow some of these to be hedged. Project risks are, to a certain ex-

tent, most under the control of the project sponsor/developer. Carbon buyers will thus try to push off project risk to those counterparties who can better assess and manage project risks.

Meta- and macro-issues must, however, be dealt with using other means, such as political risk insurance, currency hedging, or credit default instruments.

Kyoto-specific risks

Besides country or sector risk, carbon credit buyers and sellers both face a variety of Kyoto-specific risks at both the macro- and project-level. Risks can be further organized by the regulatory risks associated with creating, registering, transferring, and applying CERs or ERUs toward a GHG control obligation. This is addressed in more detail by other contributors in this volume.

In response to the relative immaturity of the Kyoto markets, Marsh, a leading risk and insurance service firm, in association with Global Energy & Environment Ltd (GEEL), asked experts in 2001 to rank the risks that they believed most influenced GHG emission offset transactions, and hence prices. Participants ranked each risk on qualitative scales measuring perceptions of their relative likelihood and potential impact. The product of both likelihood and impact in turn produced rankings and 'priority' scores (see table 1).[6]

This list boggles the mind. It is essentially incomprehensible and unmanageable to many buyers and sellers, yet it can be taken as a *Gestalt*. These judgments demonstrate how risk assessment is based on visceral determinations that are shaped by one's own perceptions as well as those of others—acting rather like a financial Rorschach inkblot. Few CDM or JI buyers compartmentalize project risks so tightly, though frequent buyers and sellers might want to do so. It is those frequent buyers and sellers that establish GHG trading custom.

Uncertainties

Uncertainty implies the inability to know the distribution of events and potential outcomes, such as the likelihood of oil prices going above a certain ceiling, of a turbine blade failing, or even whether the Kyoto commitment period will be extended beyond 2012. Some uncertainties positively influence prices, while others have a negative influence. Accounting for these uncertainties, and developing hedge strategies, is an important part of both compliance and pricing for regulated organizations.

Alternatives' cost

The cost of compliance alternatives also influences price. If the price of natural gas rises faster than other fuel costs, then GHG credit and quota prices will rise. If steam turbine costs fall and the cost of producing coal-fired power declines, then GHG credit and quota prices should increase. Likewise, if policies favoring renewable energy and energy efficiency gain political traction, then GHG prices will fall. Technological advances also need to be taken into account here. Some data on current and future prices are governed by risks, others by uncertainties.

6 Warren Diogo, "The GHG emissions market risk mapping workshop report," *Marsh Environmental Initiative Programme* (2001), 6-10.

Table 1 Marsh survey of risks facing GHG emission trading

Risk Rank	Impact	Likelihood	Priority	Risk Group
1	3.00	3.06	9.19	Compliance burden
2	2.56	3.00	7.69	Overly complex rules for participation
3	2.69	2.63	7.05	Cross-border fungibility
4	2.75	2.56	7.05	Enforcement/incentive
5	2.63	2.56	6.73	Uncertainty over rules for national/regional trading schemes
6	3.00	2.19	6.56	Non-ratification
7	2.69	2.44	6.55	Inadequate risk management
8	2.75	2.38	6.53	Inability of "green" technology providers to raise capital
9	2.81	2.31	6.50	Unachievable compliance targets
10	2.56	2.50	6.41	Uncertainty over rules for EU ETS
11	2.56	2.50	6.41	Cost of capital
12	2.75	2.31	6.36	Flawed/failed policy
13	2.56	2.44	6.25	Ineffective compliance rules
14	2.31	2.69	6.21	Uncertainty over rules for CDM/JI
15	2.38	2.56	6.09	Volatility risk
16	2.56	2.31	5.93	Credit generation efficacy
17	2.44	2.38	5.79	UK ETS flawed/failed policy
18	2.13	2.69	5.71	Uncertainty over Kyoto rules
19	2.13	2.63	5.58	Uncertainty over domestic regulation
20	2.31	2.38	5.49	Changed regulations/policy
21	2.44	2.25	5.48	Liquidity risks
22	2.50	2.19	5.47	Ineffective verification rules
23	2.38	2.25	5.34	Compliance error and omissions
24	2.50	2.13	5.31	Demand risk
25	2.56	2.06	5.29	Failure to achieve corporate targets
26	2.31	2.25	5.20	Uncertainty over rules for UK ETS
27	2.31	2.25	5.20	Nationalization/expropriation risk
28	2.44	2.13	5.18	Uncertainty over domestic regulatory authority/jurisdiction
29	2.13	2.44	5.18	Lack of US political engagement in climate change
30	2.44	2.13	5.18	Human capital risk
31	2.56	2.00	5.13	Performance risk due to natural hazard
32	2.31	2.19	5.06	Stranded assets
33	2.38	2.13	5.05	Social risk
34	2.56	1.94	4.96	Auction risk
35	2.63	1.88	4.92	Climate change understanding
36	2.31	2.13	4.91	Property rights
37	2.00	2.38	4.75	Currency fungibility
38	2.13	2.19	4.65	Perceived inequity
39	2.31	2.00	4.63	War/terrorism
40	2.19	2.06	4.51	Counterparty risk
41	2.19	2.00	4.38	Market manipulation
42	2.25	1.94	4.36	Infrastructure externalities
43	2.25	1.94	4.36	Technology
44	1.94	1.69	3.27	Ineffective trading platforms and procedures

Impact *Scale of impact to strategic objectives*	**Likelihood** *Probability that a risk event occurs during a stated period of time*
1. low 2. medium 3. high 4. catastrophic	1. unlikely 2. possible 3. probable 4. likely

What do people maximize: profits, revenue, or satisfaction?

In order to understand pricing in any market, it is essential to have an insight into *who* is participating and *what* each individual decision maker tries to maximize (or minimize). If every actor works solely to maximize profit, then the market operates as a zero-sum game, but if participants all have varying objectives, then there can be a solution with multiple winners.

Actors in the carbon market appear to have many motivations. These include risk minimization, compliance maximization, achieving simplicity in decision making, creating a good public image, and maximizing profits. These motivations can also be confounded by exogenous incentives, however, which may induce actors to make certain decisions that are not instinctive. For example, a regulated monopoly, like a power company, might prefer to invest in a capital-intensive technology rather than buy GHG credits or demand-side efficiency measures, because it could possibly pass the costs on to rate payers.[7]

7 This economic phenomenon is referred to as the Averch-Johnson effect.

Building a model to explain the decision making of market actors is pivotal for attempting to predict their behavior. Below, two competing models of economic decision making are used to build a framework for understanding behavior in the carbon market.

Expected Utility Theory

The most widely known intuitive theory of economic decision making, and a pillar of the broader theory of rational choice, is von-Neumann and Morgenstern's Expected Utility Theory (EUT). EUT is based on the idea that human beings are rational and self-interested actors who act only if the anticipated benefits, or total utility, outweigh the costs. All participants are thus utility maximizers.

As an example, imagine you are given two choices. You may either accept a guarantee of $100 ($100 with a probability of 1), or you can take a 50/50 chance of receiving either $200 or $20 ($200 with a probability of .5, and $20 with a probability of .5). According to EUT, any rational actor would size up the wager by multiplying the probability of each possible outcome by its likelihood, adding the two together, and comparing them to the alternative. Our expectation would be ($200 x .5 = $100) + ($20 x .5 = $10) for a total anticipated return of $110. In other words, the anticipated payoff of taking the bet would be $10 more than that of the guaranteed $100.

Yet few people will in fact take the wager described above. In fact, most people will take the guaranteed offer—the proverbial "bird in the hand"—and forego the extra $10 payoff. Because of declining marginal utility, most people will pick the outcome that trades off certainty for lower expected returns. Simply put, they are substantially happier just getting $100 in their

pocket. The potential upside predicted by EUT is not worth the risk.

Furthermore, while many people spend money on statistically irrational bets, such as lotteries, they also derive some good karma or "psychic income" for such wagers. GHG traders and CDM investors are not likely to make such bets, because it is unlikely that they get much psychic income from GHG trades. To the extent that this is not the case (because some buyers are motivated by a good public image), it can be argued that the ordinary declining marginal utility is more substantial for public relations and image making endeavors.[8]

Some data on current and future prices are governed by risks, others by uncertainties.

What does all this mean for the carbon market? It means that project developers, speculators, and credit purchasers are risk averse; they do not favor risky bets on JI or CDM projects over more certain bets (or investments) in alternatives such as quotas, approved CERs, or technology. They may prefer to buy actual CERs instead of potential CERs. The more risk averse they are, the more they will avoid any and all CDM projects that are in the early stages of development (they may demand large price discounts to get involved in such projects).

Prospect Theory

Perhaps the most well-known and accepted challenge to EUT comes from Amos Tversky and Daniel Kahneman's Prospect Theory. Through laboratory experiments, Tversky and Kahneman chipped away at the key assumptions of EUT. Under Prospect Theory, utility is defined not in relation to a final state of wealth, but rather in relation to a reference point, or *status quo*. Preferences depend on the size of the loss or gain. In addition, Prospect Theory predicts diminishing marginal utility for gains and diminishing marginal disutility for losses. People are not just risk averse, they are also, and overly, "loss averse": Thus, *they "feel the pain" of losses more deeply than equivalent gains*. As a result, there can be impediments in markets, because loss-averse participants are less prone to trades. In fact, some such people feel remorse before they even buy or sell! Therefore, trade volumes could be lower than classical economic theory might otherwise suggest.

Prospect theory reinforces the notion that many decision makers, when confronted with a choice between low-risk EUAs and high-risk CERs, or even higher-risk future CERs, will gravitate toward low-risk choices. This is because individual GHG compliance buyers weigh failure in greater terms than the firms that employ them.

Prospect Theory suggests that people are even more risk averse than they would appear in a von Neumann-Morgenstern world. For example, compliance buyers or public officials managing government carbon funds usually do not get bonuses for keeping multiyear compliance costs lower than some arbitrary historical average. They have, therefore, little reason to take chances. Emission brokers and speculators, on the other hand, often have a different perspective, given their more short-term motivations (e.g., securing a high bonus, or closing their "books" at the end of the year).

8 The first CDM project that an investor promotes may receive public recognition, but each successive project will receive less.

Based on my personal experience in emissions brokering and trading, Prospect Theory better predicts the actual behavior of compliance buyers. Anecdotally, small loses are weighed very much and large gains are viewed with diminishing returns, especially by "Environmental Health and Safety" specialists who are the final buyers of many, if not most, credits.

The phenomenon of complexity management and risk aversion was realized in the early SOx trading market and was described by analysts, including Joseph Kruger, formerly an employee of the US EPA and Resources for the Future. Kruger observed:[9]

> Compliance planning in an emissions trading program is both simpler and more complex than under command-and-control regulations. It is simpler in that the compliance determination itself is objective and straightforward—a company simply holds enough allowances to match its emissions. . . .On the other hand, the flexibility and freedom inherent in a ... trading program put added pressure on a company to develop an effective strategy.
>
> A poor strategy could lower shareholder value and erode the competitiveness of a company *vis-à-vis* other firms in the industry. Thus, a variety of factors must be considered...*Reconciling all of these factors may be considerably more challenging than implementing a technology mandate* [emphasis mine]. The wide range of possible [compliance] strategies and options increases the complexity of the analysis that must take place...

Emissions trading places complex information and decision making burdens on regulated entities, and on specific individuals within those entities. If those who develop and implement compliance strategies are not given the proper incentives, they will protect their jobs and avoid profit making or cost minimizing opportunities by settling for risk minimizing options. They do this by over investing in technology, or by paying a premium for gold-plated GHG credits. Risk-averse environmental managers respond even more cautiously when confronted with complex choices, for the reasons noted above.

GHG pricing is affected by the participation of many actors: project developers, project hosts, credit buyers, and those regulated entities to whom credits might finally be sold. These other entities are the last part of this chain and may not appear on the scene for years, as they may forego spending cash on any GHG credits until their emission control obligations are completely certain.

Meanwhile, speculators must get returns above their cost of capital and these profits must be assured, because they too are risk averse. If the cost of capital is 15%, and if the speculator needs an additional profit of 10%, then the total return required per year is 25%. This means that if you can sell a CER for $10.00 in four years, then a prospective buyer will not pay more than $4.10 today. But because of the risks associated with CDM projects, the speculative buyer would actually pay less than $4.10.

Conclusion

It is intuitively obvious that risk, uncertainty, and individual decision making influence GHG credit and quota prices. Firms can meet their commercial objectives by either good luck or rigorous analysis. Each of the factors I have considered is subject to analysis; some, in fact, give rise to practical hedging strategies that allow firms to lock in profits or reduce downside risks. Since luck is difficult to control, carbon market participants might want to further develop models that focus on risk, uncertainty, and the tools that allow them to manage related outcomes.

9 Joseph Kruger, "Companies and Regulators in Emissions Trading Programs," Resources for the Future, discussion paper 05-03, (February 2005): 7–10.

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A CHINESE PERSPECTIVE

Initial Thoughts on Equitable CER Prices: *The View from China*

CDM has progressed rapidly since the Kyoto Protocol came into force. The Chinese perspective on CDM is mixed. As an innovative, win-win market mechanism, CDM boosts clean energy investment, and is therefore of long-term significance to the global efforts against climate change. Carbon credits can reduce project operational and maintenance risks, which can help assure the creation of clean energy projects. At the same time, while CDM has certainly helped developed countries reduce the cost of their compliance to the Kyoto Protocol, it remains debatable whether the CDM has delivered on its promised objective to promote sustainable development in developing countries. However, the relatively low CER prices and lack of technology transfer to date have not been particularly satisfactory from China's perspective.

In order for CDM to preserve its utility as a market-based mechanism and further develop in a healthy way, effective participation of all stakeholders must be maintained, and reasonable and equitable CER prices must be assured. In this piece we compare the characteristics of CERs in relation to other commodities in terms of pricing. We examine current CER prices and their evolution, based on practical experiences with CDM project implementation in China, and then discuss the necessary conditions, principles, and major factors to be considered for equitable CER pricing.

Unique characteristics of CERs vs. other commodities

According to Marxist economic theory, there are two fundamental preconditions for a market's existence: the product must be useful, and it must have value. A product's price is the monetary expression of its value. The price changes depend-

** the essay represents the authors' personal views and not necessarily the position of the Government of China or the National Climate Change Coordination Committee Secretariat,*

ing on factors affecting its perceived value as well as currency fluctuations.

As with other commodities, CER pricing depends on production costs (both material and labor related) and anticipated profits. Some of the major factors influencing these costs include: technology development, availability of natural resources, and management expertise. Specific subcomponents of these factors include: labor productivity, salaries, levels of physical/material consumption, the price of raw materials, fuel prices, fixed costs, as well as the value of fixed assets and depreciation rates.

Unlike other commodities, however, it is the perceived utility of emission reductions that renders CERs of value as a tradable commodity. The atmosphere has no market value, being a public good. Traditional Marxist theory has considered natural resources to be, in some sense, infinite, and therefore unsuitable as a tradable commodity, despite their being indispensable for economic activity and human survival. Such traditional theory no longer holds, however, because of the negative impacts that climate change can have on the economy. This in some sense limits the "space" for GHG emissions, which, in effect, means that the use of this space is not really free, and that emission reductions have value.

At the same time, the market for CERs fundamentally requires international regulation which determines the value of emission reductions. The carbon market exists, in large part, because of the gap in GHG emission mitigation costs between developing and developed countries. Developed countries, or Annex I Parties, are generally more mature economies (owing to nearly 300 years of industrialization) with highly advanced technology and management expertise, as well as higher labor costs. GHG mitigation costs are therefore higher compared to developing countries (i.e., non-Annex I parties). This differential and the gap between targeted and actual domestic emission reductions among Annex I parties is closely linked to CER prices.

Carbon price trends and China's role

Since the EU ETS formally came into operation on 1 January 2005, and the Kyoto Protocol entered into force on 26 February 2005, the trading of both allowances and project-based emission reduction credits (under CDM and JI) has been booming. In 2005, the total value of global carbon market transactions exceeded US$10 billion, of which US$8.2 billion was accounted for by the EU ETS. In 2005, the market price of an EU allowance rocketed from €7 to a peak of €30; however, during the same period, the average price of a CER grew from $5.65 to only $7. In the first quarter of 2006, the average CER price was $11.56 on the primary market and $23.33 on the secondary market.

In late April 2006, EU member states began to report the actual 2005 emissions of entities under the EU ETS. The figures indicated that in six countries, 2005 emissions were lower than expected. As a result, the price of EUAs dove from €30 to €13 in a short period of time. Meanwhile, by the end of 2005, a higher volume of registered CDM projects and issued CERs consolidated new confidence in the CDM market, pushing the price of a CERs to around €10–14. As in any other market, prices continue to fluctuate, but by the end of April 2006, the gap between EUA and CER prices had been nearly eliminated.

As the biggest developing country, China provides a huge potential GHG emission reduction market for the world. Due to this enormous potential, China plays an important role in the international carbon market. According to World

Bank estimates, China will supply half of the global CER market, both in the first Kyoto commitment period and in the long run.[1] Hence, the price of CERs from Chinese CDM projects have great bearing on the global CER price.

Progress with CDM project implementation in China

In November 2004, China approved its first CDM project. Since the entry into force of the Kyoto Protocol, the number of CDM project application submissions has been steadily increasing. The DNA's approval process is explained below.

After preparing a CDM project, the owners and/or third-party developers submit a written application to the NDRC, the Chinese DNA. Upon examining the application, the NDRC (China National Development and Reform Commission) informs the project owners whether the application has been accepted. Once accepted, project review and approval procedures are initiated. The application documents, including the PDDs, are sent to experts and government agencies for review, chiefly the six other members of the National CDM Board. The National CDM Board holds the final review meeting in order to arrive at a collective decision. In the end, the NDRC issues the Letter of approval (LoA) on behalf of the Chinese Government.

The expert review should take no more than twenty days. The National CDM Board decision should take no more than thirty days, excluding the possibility of a ten day extension (only granted if applicants are informed in advance in writing for an extension). It normally takes around two months from project acceptance for the owner to receive the LoA.

From 30 September 2006 to the time of writing, the Chinese National CDM board had held 21 meetings and approved 125 CDM projects. Provided that all of these projects are successfully registered by the EB, China's total estimated CER output will be over 600 million tCO2e. Nearly 90% of these CDM projects are in priority areas encouraged by the Chinese Government, i.e. sectors with high local sustainable development benefits, including wind power, hydropower, landfill gas utilization, industrial energy efficiency, and coalmine methane capture and utilization. Wind power projects are particularly popular, because their risk level is lower, their consistency with Chinese policies for boosting renewable energy development, the methodologies are available and well-developed, and buyers, particularly European ones, prefer wind projects and tend to offer good prices.

Over 70% of emission reductions come, however, from HFC-23 and N_2O destruction projects. Their lower investment cost and large CER output renders these projects popular among carbon buyers. Due to the high level of capital flows involved in such transactions, however, the project risks tend to be higher. Although these type of projects are not in priority areas encouraged by the government, they have passed the DNA approval process due to their substantial contribution to global GHG mitigation, and the fact that there are readily available methodologies and reliable buyers.

Market stability and equity are closely related to the existence of buyers with high credit ratings and strong purchasing power. Currently, the major buyers active in the Chinese carbon market not only include creditworthy, low-risk international institutions and government procurement programs such as the World Bank and the Austrian JI/CDM Programme, but also specialized

1 World Bank, *Clean Development Mechanism in China 2004* (Washington, DC: World Bank, 2004).

private carbon funds such as Climate Change Capital. Moreover, there are also large power utilities and enterprises, including Italy's Enel, Spain's Endesa, and the Central Power Corporation from Japan.

Table 1 indicates the countries that have CDM project implementation partnerships with China and information about their CER purchases.

CER Prices from Chinese CDM Projects

As of 30 September 2006, prices among the 125 approved projects show a general upward tendency (see figure 1). CER prices have increased from $5/tCO$_2$e among the first projects to $11.5/tCO$_2$e in July 2006.[2]

2 Some projects are of float price, calculated on the base prices fixed in the contracts.

The lowest price point in figure 1 occurred at the time of the first purchase agreement with the World Bank. Since this agreement was reached during the very early days of CDM project development, the attendant risks were quite high and, thus, the price was low.

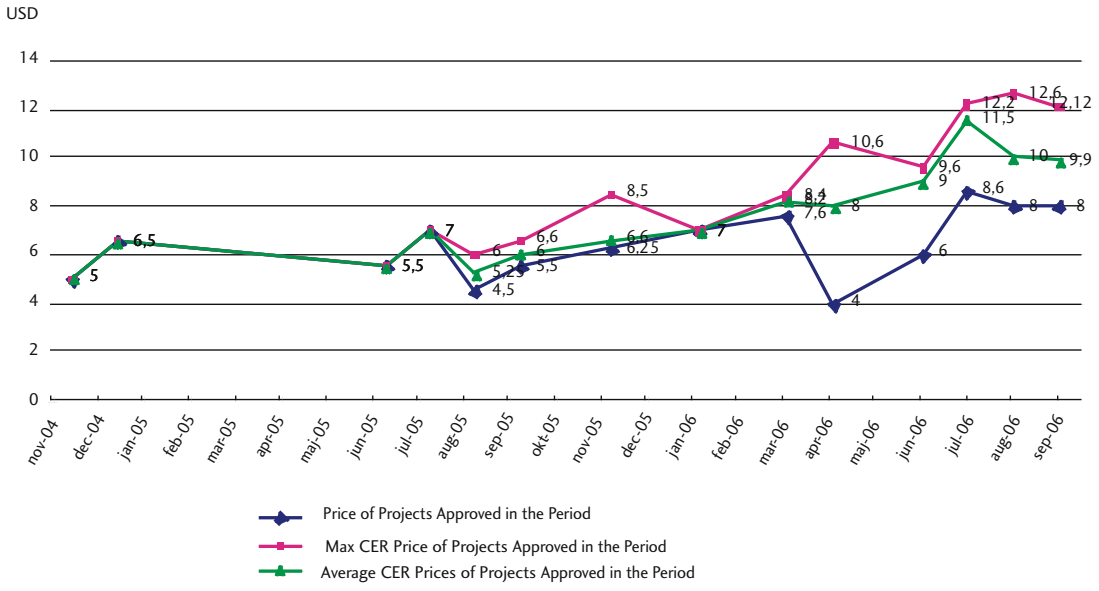
Projects with large emission reductions (e.g., those involving HFC-23 destruction and N_2O destruction, as well as large wind power projects) usually get higher CER prices. Among buyers, international institutions and government funds usually offer the lowest prices as they come with low payment/credit risks. Similarly, private companies, with their higher credit risk, often offer higher prices.

Table 1 Countries cooperating with China and CERs purchased

Country*	Project		Estimated CERs Purchased	
	Number	Percentage	CERs	Percentage
UK	40	30.5%	130,472,155	21.6%
Netherlands	17	13.0%	17,964,220	3.0%
Italy	15	11.5%	78,127,946	13.0%
Spain	11	8.4%	17,107,482	2.8%
Japan	11	8.4%	88,417,734	14.7%
Unilateral	11	8.4%	6,190,630	1.0%
World Bank	8	6.1%	150,790,292	25.0%
Austria	7	5.3%	5,136,289	0.9%
Sweden	6	4.6%	5,639,338	0.9%
Canada	2	1.5%	100,590,000	16.7%
Switzerland	1	0.8%	800,000	0.1%
Luxemburg	1	0.8%	1,200,000	0.2%
France	1	0.8%	538,440	0.1%
Total	**131**		**602,974,526**	

') Some projects have more than one buyer.

Fig. 1 Average CER prices from Chinese projects



Major considerations by Chinese authorities when fixing CER prices

A CER is a special kind of commodity, one whose price formation is different from other ordinary commodities. Market prices not only depend on production costs and profit levels, but also market demand, information transparency, and government policies.

China's experience shows that following the establishment of the European carbon market and a transparent price for carbon allowances, market players raised their expectations about CER prices. Average CER prices have gradually climbed higher, despite the fact that they remain much lower than allowance prices under the EU ETS.

In most cases, CERs from Chinese CDM projects are sold lower than their generation costs; without policy support by the Chinese government, many of them would not be economically viable. For example, among the projects approved by the end of September 2006, 46% are wind power projects. The generation costs of wind power (around $.07 to .09/kWh) are about double the costs of electricity from the coal-fired power plants ($.04 to .05/kWh) that they replace. The CER revenues only cover one-sixth or one-seventh of these incremental costs. Preferential policies by the Chinese Government in the form of higher grid-access tariffs are a precondition for the viability of these projects. Their implementation embodies China's contribution to the mitigation of global climate change.

When fixing a CER sales price, the Chinese Government and enterprises mainly consider the following factors:

1. Prevailing prices on the international carbon market. These establish the deviation of the CER sales price from the global price level, leave some profit margin for the buyers, and aid in avoiding wild price fluctuations.
2. CDM project development and transaction costs (e.g., PDD preparation, monitoring/verification/certification fees, EB registration and adaptation fees/charges) and payment arrangements. Generally, the CER price will be higher if all these costs are undertaken by the seller, and lower if covered by the buyer.
3. The project type and potential replacement risk. For example, aforestation and reforestation projects fetch low CER prices (around $\$4–5/tCO_2e$) as sellers may need to obtain emission reductions from other projects to replace those CERs. The price is approximately half the average contract price of Chinese CERs (about $\$8–10/tCO_2e$).
4. The reliability of the buyer and the contract terms and conditions, including: risk sharing between buyer and seller, payment of CDM development costs, up-front payment, purchase term, and whether the term covers post-2012 period. Some CDM projects having CERs bought by the World Bank were approved despite their low contract prices. This is not only because the CDM project development agreements in question were signed earlier than others, but also because some projects have a CER purchase term until 2017.
5. The steering of Government policies and revenue allocation. China imposes higher levies on CER proceeds from projects associated with low cost, high revenue, and limited sustainable development benefits. A 2% levy is imposed on projects from priority areas such as energy efficiency improvement, renewable energy, and methane recovery and utilization, while HFC and PFC destruction projects are levied at 65%, and N_2O destruction project activities at 30%. A China CDM Foundation was established to pool these levies, and funds will be used to support relevant climate change response activities.

Chinese government measures to support equitable CER prices

The Chinese Government ratified the Kyoto Protocol on 30 August 2002 and has since taken a proactive attitude toward CDM. The implementation of CDM projects contributes to China's pursuit of sustainable development and generates additional revenues for its enterprises. Successful implementation of CDM project activities is promoted by the Government, while trying different approaches in order to maintain as much equity in the market as possible. The Chinese Government's efforts toward equitable CER market transactions are reflected in the following initiatives.

Early establishment of the DNA

Proper supervision and administration by government agencies is indispensable for any market. This is particularly true for the CER market, considering the unique characteristics of the commodity, the uncertainties inherent in climate change issues, and the fact that CDM transactions in this early period involve high risks. Under such circumstances, it is important to have a government agency familiar with national policies, knowledgeable of international negotiation processes and tendencies, and able to mobilize different stakeholders while regulating and ad-

ministering the CER market in China. In accordance with decisions by COP-7, the China National Coordination Committee on Climate Change chose the NDRC as the Chinese DNA for CDM, whose mandate includes both approving and administrating CDM project activities and regulating the Chinese CER market.

The issuance of relevant regulations

The legal basis for the operation, management, and approval of Chinese CDM project activities is outlined in the *Measures for Operation and Management of Clean Development Mechanism Projects in China* ("the Measures") issued jointly by the NDRC, the Ministry of Science and Technology, the Ministry of Foreign Affairs, and the Ministry of Finance in October 2005. The relevant detailed rules regarding enforcement of the Measures were issued by the Chinese DNA[3].

Provisions in the Measures embody the Chinese Government's initial efforts to maintain equity in the CER market. For example, Article Fifteen of the Measures stipulates that the project information subject to the National CDM Board's approval not only include the eligibility of the project proponents, PDDs, proper application of methodologies, CER quantities, terms and conditions for funds and technology transfer, expected crediting period, and monitoring plans, but also

3 The detailed rules and templates for LoA application are provided by the DNA on the website of http://cdm.ccchina.gov.cn.

the CER transaction price. Practical experience so far indicates that this provision effectively guarantees the upward evolution of CER prices on the Chinese market, and provides an important price reference to the international CER market.

Box 1
Prerequisites for Equitable CER Prices

- Fair prices should first of all reflect the average carbon abatement cost differential between CER buyer and seller countries, with measures to keep CER market price deviations within a reasonable range.
- CER prices should amply reflect the incremental costs of the CDM project, including investment and operation/maintenance costs, PDD development, validation, registration, administration, and adaptation levies, among others.
- Profits from CER transactions should be reasonably shared between the buyers and the sellers. The current situation, where major profits from CER transactions go to the intermediaries should be changed.

Establishment of the National CDM Board

Review and approval by the National CDM Board is a key step for receiving a LoA from the Chinese DNA. The National CDM Board is made up of members from the NDRC, the Ministry of Science and Technology, the Ministry of Foreign Affairs, the Ministry of Finance, and three other ministries. The Board carries out a comprehensive review of all aspects of a project, including the CER price, taking into account reviews by independent experts.

In screening applications, the DNA examines the expected CER price in relation to prevailing international market prices, and defers acceptance for those projects whose CER price is too low. The National CDM Board usually considers all aspects of the project in its CER price approval, comparing the expected CER price with international prices, as well as those of other similar, approved projects. Based on this, it could require that project participants whose offered CER prices are too low further negotiate with buyers. Experience demonstrates almost all of the small number of project participants for whom an LoA is deferred for this reason have ultimately managed to secure higher CER contract prices. Naturally, the National CDM Board is very prudent in making such decisions and does its best to combine efficiency and justice in the process.

Prerequisites for Equitable CER Prices

As previously mentioned, a CER is a special commodity with different supply and demand characteristics. To date, this market is not yet well developed. It is therefore difficult to guarantee equity in CER prices. Here we share some views on how to create more reasonable and equitable CER prices (see also Box 1).

Currently, contract prices for CERs are lower than their incremental costs, and the fundamental reason for this is insufficient market demand. The most important prerequisite for equitable pricing is to increase this demand. An important step in this direction could be made if developed countries, especially those with high per capita carbon emissions and economic growth, showed a greater commitment to emission reduction ob-

ligations. Another important element is to guarantee for information symmetry between buyers and sellers. More transparency on mitigation costs, especially in developed countries, is also of consequence.

It is also necessary to intensify capacity building, particularly among developing country parties, so that they can have a better overall understanding of CER pricing and can more effectively protect their interests. Apart from general tendencies in the international market, stable and gradually increasing CER prices in the Chinese CDM market are, to a large extent, a result of capacity building activities on the part of government agencies, project developers, and intermediary organizations. These activities have enormously improved China's CDM knowledge and awareness, and the price negotiation capabilities of national stakeholders. It is also essential, of course, to assure the proper guidance and direction by governments.

Criteria and recommendations for equitable CER Prices

The following criteria should be considered in judging whether or not CER prices are equitable:

(1) Do they promote stable development of CDM projects and enable an apt contribution of the CDM toward global climate change mitigation efforts?
(2) Do they help prevent wide price fluctuations in the carbon market, so as to maintain the enthusiasm of buyers and sellers?
(3) Do they properly reflect the interests of both buyers and sellers, considering their costs, abilities to assume risk, and revenue sharing plans?

Conclusion

CDM was designed to promote sustainable development in developing countries. Yet regardless of the CDM, China has proactive policies and measures in place to combat climate change. Still, the CDM is an important part of the emerging carbon market. CDM should be seen by stakeholders as effective and useful so that it will continue long into the future. China has a uniquely important role to play in updating and developing CDM policy and regulation, in conjunction with the evolution of international rules and domestic good practices.

There is clearly scope for improvement, given the CDM's current modalities and procedures. For example, the majority of CDM projects involve only transacting CERs and do not provide for genuine technology transfer. Even the few projects that do have a technology component concern only equipment purchasing rather than transfer of technology and know-how. Additionally, many small developing counties do not benefit from the CDM. Lack of capacity and poor geographical distribution are still the main topics in international fora.

Strengthening and deepening the emission reduction commitments by developed countries is essential for price equity. In our view, this is, in fact, the most fundamental requirement to ensure sustainability and prosperity in the CER market.

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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.

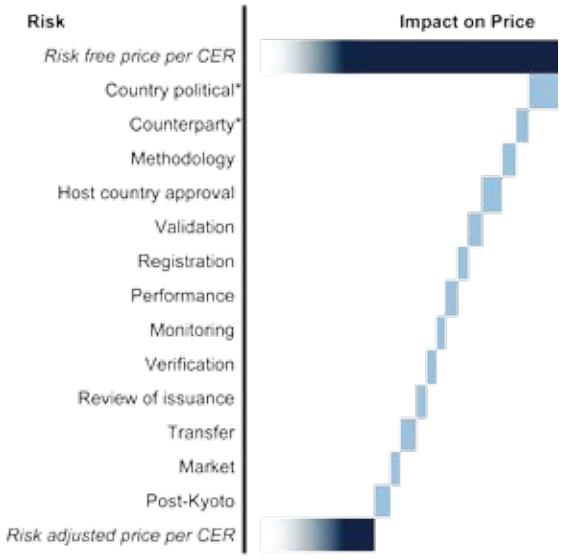
A major challenge for both developers and buyers is evaluating a project's unique risk profile—particularly as different projects may need to be evaluated at different stages of the project cycle. In the following, we discuss key CDM-specific project risks and provide suggestions for how some of the 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-

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

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.

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).

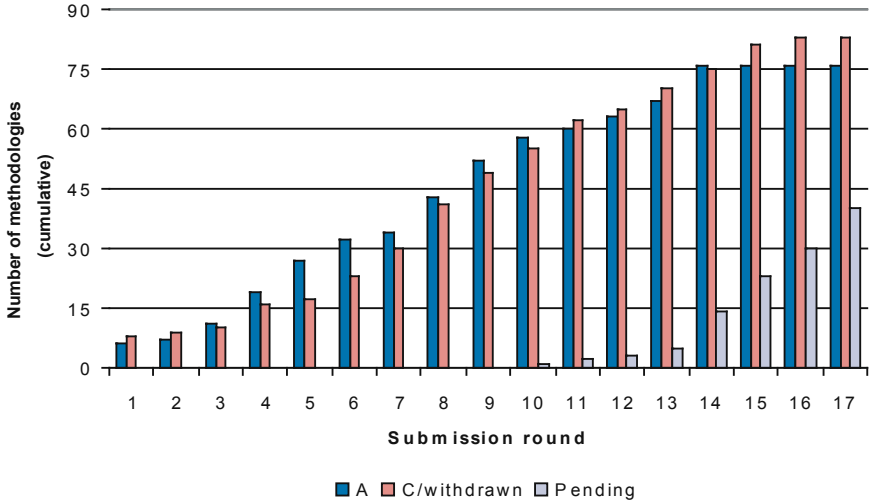
As of January 2007, 199 large-scale methodologies had been submitted. Of these, 76 have been approved (38%), 83 rejected or withdrawn (42%), and 40 still awaiting a final decision (20%), as shown in Fig 2. The risk of methodology rejection is currently over 50% of known outcomes.

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

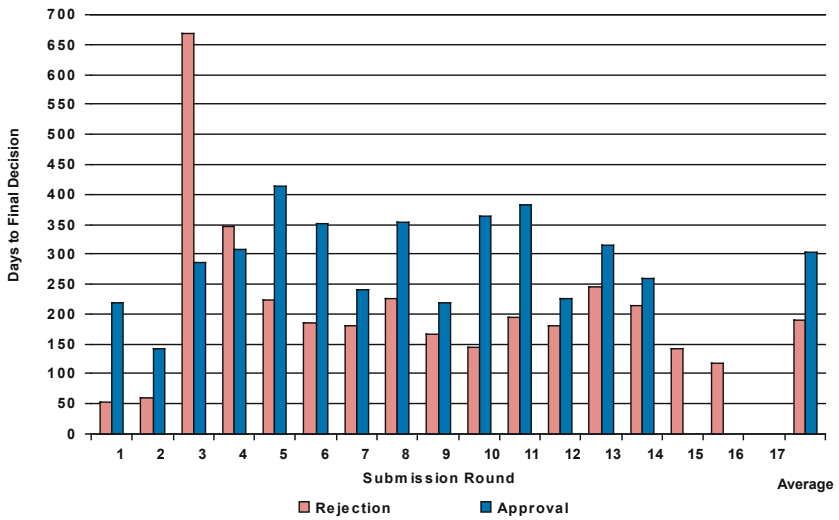
A CDM project must receive approval from the host country DNA in order to be registered. In addition, any project participants must also be authorized by a Kyoto Party. There are three kinds of risk associated with obtaining DNA approval: (1) approval risk, which is binary, (i.e. either the project is 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

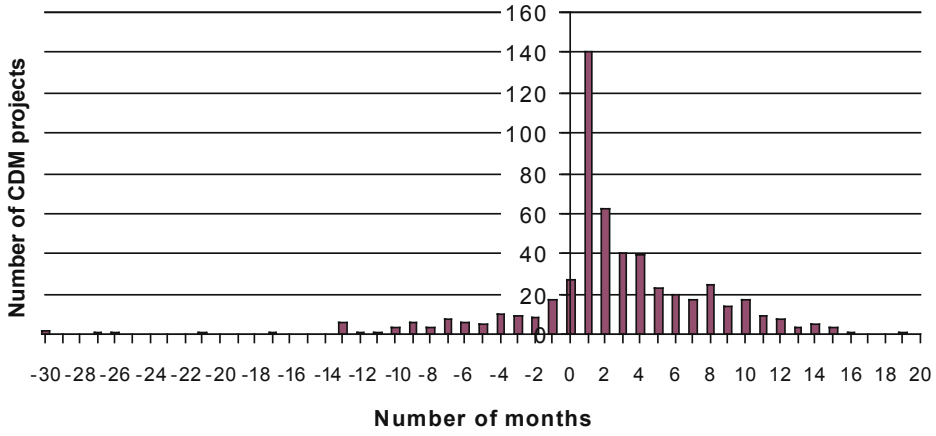
Average time to final decision from date of initial methodology submission



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.

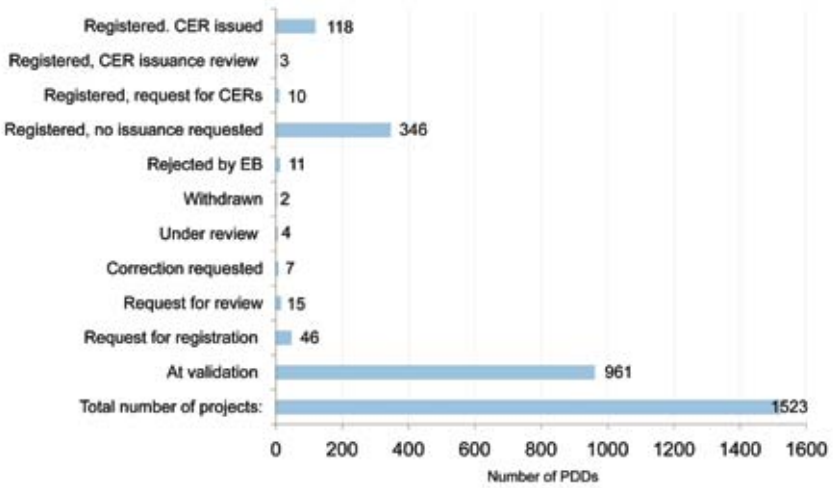
Registration risk

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 dis-

courage smaller-scale projects and smaller-scale developers from entering the market.

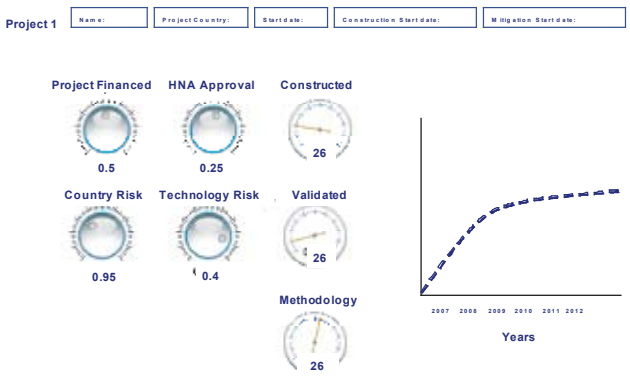
The CDM is already showing itself to be highly geographically biased (two-thirds of all projects in the pipeline at the end of 2006 were either in China or India, with very few in Africa) and technology biased (42% of projected CERs are from HFC, PFC, or N_2O reduction projects).[8] To a certain extent, 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.

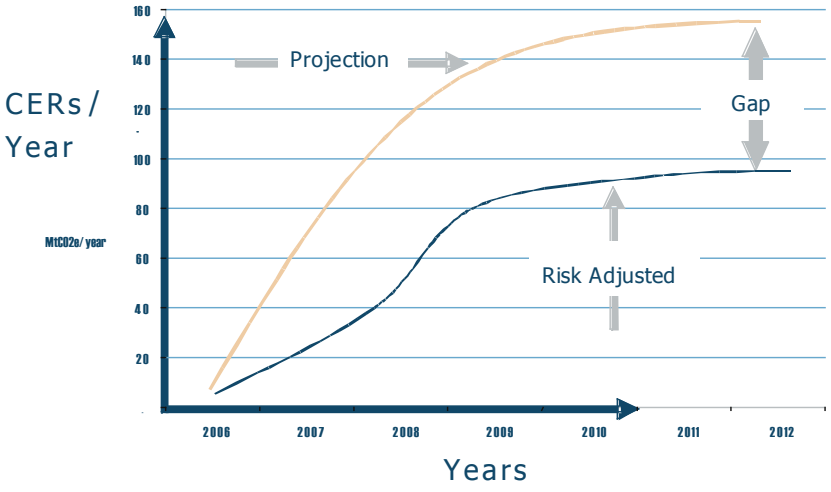
Contrary to the two former risks that mainly influence the delivery volume of CERs, the third layer in the CARE risk model, delay risk, influences the time of issuance of CERs. Delays can occur at many different stages, and the impact on the start date of issuance of CERs is cumulative.

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.

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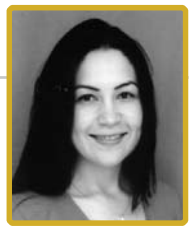


A LATIN AMERICAN PERSPECTIVE

Market Perspectives to Determine Fair Carbon Prices

In all markets, price signals are shaped by the forces of supply and demand, as well as those same forces for the substitutes and complements to the product being traded. Although the market for carbon emission reductions is basically governed by a regulated demand,[1] it is no exception to these general rules.

Indeed, the wide variety of tradable emission reductions quotas and credits that exist can be viewed in many respects as "substitutes" for each other.[2] Given that CERs are substitutes to AAU quotas established under the Kyoto Protocol, the price of a CER is one of the main pillars of a global price for carbon. CER prices are, in turn, impacted by a number of factors that determine how much the CDM instrument will be used, such as: *(a)* the outcome of national-level reduction efforts made by Annex I countries, *(b)* the extent of use of the JI mechanism; and *(c)* the extent of use of quota trading (for both AAUs and EUAs). To the extent that these alternative measures increase the number of transactions outside of the CDM, demand for CERs will drop and the price is likely to fall.

This essay examines these factors adding insights from the Latin American carbon market, in order to provide a clearer understanding of how CER prices are currently determined.

A brief history of recent market activity

In 2004, key market actors were just beginning to learn about CERs and ERUs, how the carbon market operated, and what contracting and trad-

1 This is because most of the expected emission reductions are the result of commitments under Kyoto or other mandatory compliance schemes.

2 Although, as already mentioned, some import restrictions may be enforced on the use of CERs. For example, in the EU these include forestry projects (tCERs and lCERs).

ing tools were available. Since that time, the supply of Kyoto credits greatly increased, mostly (approximately 85 percent) from the CDM. The global supply of ERUs has, however, also been constantly increasing.

Although trading volume greatly increased in 2005 and 2006, mainly due to the inception of the EU ETS and the Protocol's entry into force, prices for emission reduction quotas and credits were volatile, particularly for EUAs.[3] In early 2006, the EUA price was €7, reaching its peak in July at €30. The price then fluctuated between €20 and €24 during the second half of 2006, dropping finally to under €7 by the end of the year.

If an excess supply of allowances characterizes the European market and there are enough carbon credits to meet all of Europe's demand, then why has the carbon price not dropped to zero?

In retrospect, these results were not surprising; since EC rules allowed NAPs in phase one to be "flexible," final allowances exceeded emissions in many countries, which naturally affected the final demand for EUAs. Whenever supply exceeds demand, prices drop.

In 2005 and 2006, the differences between the various GHG emission assets (AAU, EUA, ERU, and CER) also became more apparent, and new features of transactions emerged, such as delivery conditions and noncompliance penalties. These differences, along with a greater awareness of risk, strongly affected pricing. Prevailing common practice remains to determine the final CER price on a project-by-project basis.[4]

Understaning CER price forumation

The plunge in EUAs prices in 2006 raised important questions about the state of the carbon market. How is the supply of CDM projects affecting the price of EUA? If an excess supply of allowances characterizes the European market and there are enough carbon credits to meet all of Europe's demand, then why has the carbon price not dropped to zero?

It must be allowed that market actors have incentives to keep excess supplies, due to their uncertainties regarding:

- what the outcome of international negotiations will be on reduction commitments beyond 2012
- what allocation levels will be approved under phase two NAPs
- whether scheme revisions will allow use of CERs from currently ineligible CDM activities (e.g., forestry projects)
- which new sectors will be included in the EU ETS
- whether, and how, surpluses from the first Kyoto commitment period can be used in the second.

Several European countries with an excess supply of emission allowances have kept them off

3 Emerging markets, such as the carbon market, are usually characterized by high price volatility in the first few years, as market players undergo a learning process on the main supply/demand characteristics and aspects of market flexibility and rigidity. To the extent that they become more acquainted with how the market operates, prices tend to stabilize, and price forecasts may get more accurate.

4 All data presented in the overview has been drawn from Henrik Hasselknippe and Kjetil Røine, "Carbon 2006," *Point Carbon*, (http://www.pointcarbon.com/getfile.php/fileelement_74094/Carbon_2006_final_print.pdf) and Karan Capoor and Philippe Ambrosi, *State and Trends of the Carbon Market 2006, Update: (January 1–September 30, 2006* (Washington, D.C.: World Bank and IETA, 2006).

the market, thereby assuring a higher market price.[5] At the same time, several countries have sent market signals that have deflated EUA and CER prices, and contributed to price volatility. For example:

- Italy has suggested restricting the use of CERs
- France and Germany have suggested that surplus allowances should be bankable, or allowed to be carried over, between different EU ETS compliance periods
- Spain and Japan have intimated that their shortfall is not as serious as initially estimated
- Canada and other countries have cut back their demand for emission reduction credits.

On the basis of our experience in Latin America, it is clear that such market signals and resulting market volatility are becoming the basis for more accurate price forecasts. These, in turn, have provided decision-making inputs for buyers and sellers, since future margins and risks have become more obvious.

Today, buyers and sellers have access to a more stable pricing structure than ever before (with daily updated information on the European market). Athough CER prices can vary widely depending on the contract and the expected demand, recent developments have given more confidence in future projects in general.

Price formation for CERs is a result of both fixed (i.e., linked to the price of EUAs) and variable (e.g., risk profile) components. In Latin America, for example, CER prices have stabilized at around €14 for less risk-averse sellers and €8 for more risk-averse sellers. In the case of the former, the seller assumes all penalties and fees for non-compliance, as well as a fixed volume subject to a delivery schedule. In case of the latter, the seller is permitted more flexibility in delivery and is not obligated to pay penalties or fees for noncompliance or under delivery[6].

In Latin America, for example, CER prices have stabilized at around €14 for less risk-averse sellers and €8 for more risk-averse sellers.

Last year's market trends demonstrated some important features of CERs price formation:

1) The decrease in CER prices during the first half of 2006 related to structural factors (i.e., reduced demand for emissions reductions, which reduced the price of all carbon market instruments across the board).
2) Sellers and project sponsors seek stabile long-run prices, while buyers care more about indexing CER prices to AAUs or EUAs (i.e., hedging against prices on the European market). In Latin America, fifty to seventy percent of the CER price is tied to the EUA price, with bids starting at €7.
3) Due to the drop in EUA prices, CER prices have decreased from their peak. But lower-end prices have been stable over time, implying that CER values have eroded less than EUA prices.

5 See various editions of Point Carbon's *Carbon Market Europe* report.

6 A minimum, but adjustable volume is set in order to account for involuntary non-delivery.

ERPAs: Distributing risks and costs

In order to fully understand CER prices, the following should be taken into consideration:

- Producing a CER is associated with a unique risk profile, compared to that involved in generating an ERU, AAU, EUA, or a domestic abatement project in an Annex I country.
- A project's overall stage of development and its risks to get to financial closure, construction, and start up are factored into the CER price at the time of sale. Selling CERs also entails drafting additional documents, such as the PDD.
- AAUs and EUAs are traded "on demand" (i.e., prices are given on the bidding day) whereas CERs are traded on a project-by-project basis. Thus, although market actors are usually aware of forthcoming bids, no real-time price data are available.

As other essays in this volume discuss, ERPAs structure the distribution of risk between the buyer and the seller. This negotiated outcome is factored into CER pricing. Costs and risks—delays are always an issue—can arise before the transaction takes place, in the pre-investment phase (exploratory and viability studies) and when preparing the project's concept note, PDD, baseline studies, validation report, and final registration.[7] Lower risk sharing and more flexible ERPA structures on the part of a seller ultimately decreases the price offered. Upfront payments also imply a higher risk to the buyer, and can make them less willing to pay top prices.[8] The highest priced projects are usually those that assume all the inherent risks, thereby sparing the buyer transaction costs.

In Latin America, fifty to seventy percent of the CER price is tied to the EUA price...

CER delivery risk is an important price factor. Higher expected CER volumes have a lower risk of delivery failure, which increases the contracted CER price. Some ERPAs call for the seller to compensate the buyer if the quantity of CERs stated in the contract is not guaranteed. These types of contracts are attractive at first sight—they carry high prices—however they also carry higher risk to the seller. Penalties may include:

- Replacing CERs, which at present is not completely possible due to the paucity of projects in the market at any given time
- Repositioning CERs with AAUs or EUAs, typically at a higher price than CERs
- Costs and damages for not delivering, or under delivering, CERs on time. The valuation of these damages is complex and often time consuming. According to the legislation of each country, fees and sanctions may include regional and local fees. For instance, penalty fees for the EU ETS are €40/t CO_2 for phase one and €100/t CO_2 for phase two.

Concluding recommendations

Several factors should be borne in mind in order to expedite fairer price negotiations in CDM transactions. The carbon market is still relatively new and likely to continue to be volatile, at least until more players fully grasp how the market

7 Even if a PDD has been validated and registered, the CER price may be low if the baseline or other components are underdeveloped. The cost of fees and marketing are usually charged to the seller, which also affects the price.

8 Highly rated buyers that can provide payment guarantees at the time of ERPA signing will pay less for CERs than buyers posing a higher risk to companies and institutions selling CERs.

works. The following issues need to be considered by buying and selling parties when negotiating:

- It is essential to understand the unique risks that a project faces, such as production failures, as well as the seller's degree of risk aversion.[9]
- Buyers' offers should clearly state relevant fees and commissions. The seller should determine what the net CER purchase price offer would be, after factoring in any commission and fees.
- Parties should determine who will bear responsibility for all legal costs at the outset and, in case of future dispute, how and in what language, arbitration will take place.
- Parties should assign the respective responsibilities of the buyer and the seller, such as who will bear the registration, issuance, verification and certification costs, before agreeing on a price.
- Parties should follow price trends in the European market, as the EUA market is considered to be a benchmark for all transactions.

9 Two options are available to deal with the high risk of production failures: 1) transacting only a fraction of CERs, so that the seller may regard the remainder as a guarantee; when a production failure occurs, the seller may thus still be able to deliver the right amount to the buyer; and 2) pricing within an intermediate range so as to provide delivery flexibility, thereby helping the seller to avoid penalties.


WALPIRES

Mark Meyrick
EdF Trading Ltd.

A TRADER'S PERSPECTIVE

What is a Fair Price for CDM Credits?

Fairness is highly subjective, meaning different things to different people. What appears fair to a person in one part of the world may be completely at odds with the viewpoint of someone else from another culture. Yet the concept of fairness exists as a principle of law. Commonly referred to as "natural justice," this principle emphasizes equity and flexibility. A central conceit of this article is to answer the question: How well does CER pricing reflect these aspects of natural justice?

Dynamics and influences

In order to answer this question, one needs to first look at the context, i.e. the overall structure of the carbon market, and wherein CER assets there lie. Before the EU ETS framework was developed, there were relatively few CER purchasers—mostly governments, plus some early private movers in Canada and Japan. It was unclear how to value a CER; rather, there was a sense that a CDM project should cover its CER production costs and generate a return.

Consequently, early contracts were concluded at relatively low prices[1]. However, once an active ETS market had developed, a clear reference point for the CER price was established. This development was predictable given the fact that compliance buyers in Europe were imagined, in theory, to be indifferent to using either EUAs or CERs to meet their obligations.

This linkage has become manifest through what is now known as the secondary CER market—the market in which CERs are sold by their original buyers to others. To CDM project sponsors this behavior may seem curious: Surely CERs are acquired from a project purely for compliance? In fact, the wide variety of entities purchasing CERs from projects clearly reveals that this is not the case.

1 It is believed that CERs from the earliest project to issue them, Rio Blanco in Honduras, were sold for as little as $5.

Market Participants

Buyers essentially fall into one of two categories: (1) those who need CERs for compliance, and (2) those who sell them again.

The first category includes compliance buyers obliged to reduce emissions under the Kyoto Protocol. This group includes Annex I governments and corporate entities covered by emission trading schemes—only the EU ETS is currently operational. Other buyers in this category are those in voluntary schemes, such as the Japanese in the *Keidaren*, and those who believe they will be affected by impending schemes. In Europe, demand tends to be concentrated in the energy sector, because the compliance obligation is heaviest and large energy companies can devote considerable resources to credit buying.

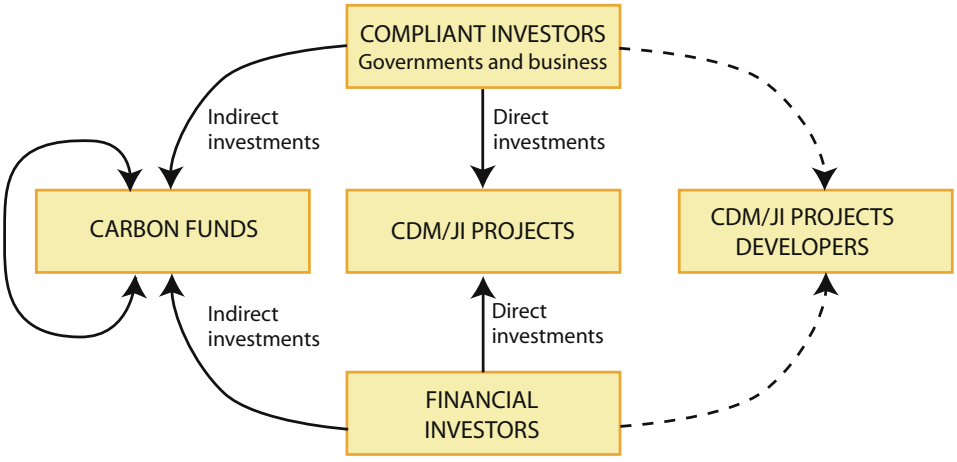
The second category includes investor groups, principally banks and funds. Banks are involved because they see clear financial opportunities, either from proprietary activities or client needs. Throughout 2006 fund involvement grew enormously and the capitalization of these funds was recently estimated at $6.4 billion, spread across fifty different carbon funds.[2] To put this into perspective, the value of the 324 million tonnes of CO_2 that traded in the first year of the EU ETS (2005) was approximately $8.2 billion.

Figure 1 shows the role funds play in the market. The demand they create depends on the price of CERs. According to Point Carbon, CER prices in the range of €6 to €12 could potentially purchase 270–640 million tonnes in phase two.

Carbon funds have two basic structures. One the one hand, "carbon credit" funds pool and distribute the CERs they buy to investors, most of whom have a direct need for them. These investors tend to view a fund as a less risky mechanism

2 Capoor, K., and P. Ambrosi. 2006. *State and trends of the carbon market 2006*. World Bank and IETA: Washington, D.C.

Fig. 1
The place of funds in the carbon market



Source: Point Carbon. A Review of carbon funds (4 Oct 2006). Whole lines represent the most common investment flows.

for obtaining CERs than contracting directly with individual developers. "Cash return" carbon funds, on the other hand, are entirely speculative. They are either run by a hedge fund or have pure financial players participating. The investor never takes delivery of the CERs and the CDM is seen as a financial opportunity, similar to those in other commodity markets.

Funds represent serious competition to both individual government and company buyers. The purchasing potential of these funds represents a substantial proportion of the total share of projected CERs from currently registered projects. This demand will clearly benefit project owners.

Price Dynamics

Having considered the actors in the market, let us now turn to price drivers. Because demand and supply are difficult to assimilate across the industrial sectors, analysts tend to focus on the sector with the biggest reduction obligation: the power sector. The main demand driver for EUAs in this sector is the price of coal relative to that of gas. The reason for this is that natural gas is the second best option to coal. As coal becomes cheaper relative to gas, coal becomes ever more attractive as a source of power throughout the day. The emission factor for coal-fired generation in Europe is about 0.9 metric tonnes of CO_2 per MWh, nearly double the factor for gas-fired generation. Consequently, the more that coal-fired stations run, the greater the demand for EUAs.

This is borne out in figure 2, which shows the correlation between gas, power, and 2008 EUA prices, using the UK as an example. CO_2 opportunity cost arises when an allowance holder chooses to use the EUA to support power generation activities, rather than shutting down the power plant and selling it in the market. It is effectively the EUA price, but we show the value in opportunity cost terms so as to be able to express it in scale equivalent terms.

Generally speaking, gas price shifts have been a leading indicator for power and EUA spot prices.

The linkage between the three variables is clear, particularly what has been driving the EUA price, and this directly feeds through to CER prices, albeit the correlation is not perfect. Generally speaking, gas price shifts have been a leading indicator for power and EUA spot prices.

There have been a few exceptions, such as the period between March and May 2006, when the EUA price outstripped the peak gas price. The subsequent price fall in EUAs around 9 May 2006—a market correction—was, in turn, more exaggerated than the change in gas prices. Since then, the two have followed each other closely.

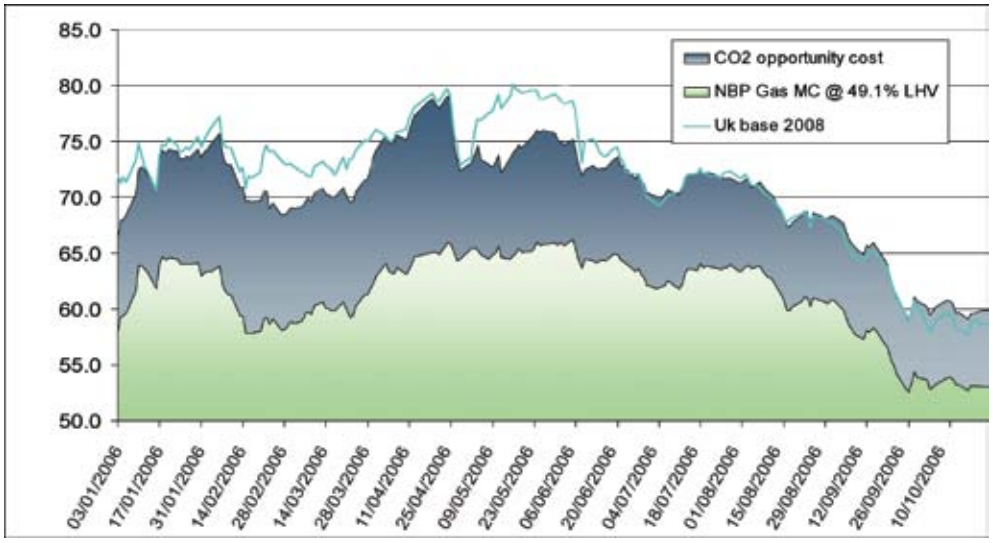
Phase one and phase two prices

Since the correction in May 2006 there has been a decoupling between phase one and phase two EUAs. When phase one prices dropped to €9.80 in May, phase two prices stayed nearly €8 higher.

This gap arose from the perception that the number of (phase one) EUAs available exceeded anticipated actual emissions. This was heavily fuelled by the first year's compliance numbers, which showed that the market had over allocated by nearly 65 million tonnes. Individual EU member state targets are much tighter in phase two than phase one in order to meet the EU's burden-sharing targets under Kyoto, which has translated into comparatively robust phase two EUA prices.

Fig. 2

Correlation between EUA prices, nearest winter UK gas contract, and UK baseload power prices



Source: EDFT own data (NBP: national balance point, MC: marginal cost, LHV: lower heating value)

Other factors are also affecting phase two prices, apart from European power and gas prices, including the perception that large volumes of Kyoto credits are waiting in the wings to be used in the ETS.

Until May 2006 there was little evidence of any correlation between EUA and CER prices. The CER market responded slowly to EUA price movements, and because prices are generally lower for CERs, buyers more easily absorbed the volatility in EUA prices. EUA traders are beginning to scrutinize UNFCCC issuance reports more and more, however, and some linkages between CER issuance and EUA pricing can clearly be seen. Consider figure 3, which shows the 2008 EUA price compared to that of already issued CERs from August 2006 until February 2007.

The ERU situation is even more difficult to determine. It is well-known that Russia and Ukraine are sitting on a vast amount of AAUs. Their arrival into the market via ERUs would be bearish. Clearly the owners of such assets (i.e., the governments of those countries) are aware that a market crash would make their AAUs worthless, so one has to assume there will be some subtlety in the way they arrive in the marketplace. Even so, there is a degree of nervousness about them which overlays the EUA market and which is, to some extent, effectively dampening higher price expectations.

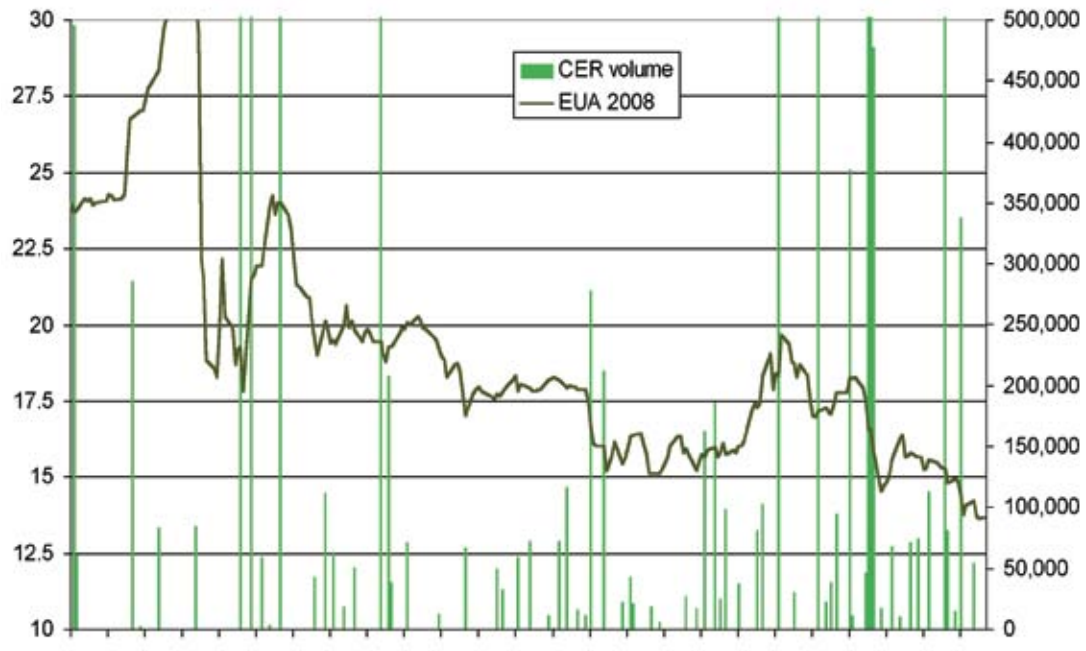
Another important consideration is how many Kyoto credits Europe can actually utilize. Since the market developed for secondary CERs, they have traded at discounts of anywhere from 10–25% of the EUA price, depending on market conditions. This is a function of the changing perception of CER supply with respect to perceived demand. With only Japan buying, apart from Europe, there is now some evidence that current demand is comfortably being met.

Yet demand is still very uncertain in the second phase of the EU ETS, with a variance of 150–200 million tonnes. EU Member States are currently working on installation level allocations for phase two. During this process, corporate compliance buyers may well be holding back from investing in CDM until they have a clearer idea of their position. Compliance buyers purchasing CERs are usually more forward thinking utilities concentrated in the power sector.

European demand for carbon credits is also limited by "supplementarity caps." Kyoto Protocol Article 6.1d states that any emission reductions from foreign offset projects, such as CDM, must be supplemental to domestic actions. The EU Linking Directive (2004/101/EC) Article 7 further states that "use of the [Kyoto] mechanisms (for each Member State) should be supplemental to domestic action. Domestic action will thus constitute a significant element of the effort made." What constitutes "significant" has wide-ranging interpretation within the EU, and countries are allowed to meet anywhere from 7–20% of their reduction obligation from such sources.

The likely effect in the short term is that European CER demand will be highly dependent on supplementarity caps, and the resulting perceived EUA shortage (with its consequent effect on prices). It is clear, though, that the EU ETS will not succeed unless there is a real shortage of allowances or credits, and investment (and research) into new GHG reducing technologies will not occur unless the EUA price is high enough to make such efforts worthwhile.

Fig. 3
Graph showing 2008 EUA price against CER issuance



Source: EDFT own data

New demand

Will significant demand for CERs emerge from outside Europe? Japan already has a presence in the market, and is the third biggest investor in terms of registered CDM projects. Japan's Kyoto target is very challenging as things stand, and it is difficult to believe that this cut will be achieved without a domestic scheme that sets out individual corporate abatement targets. This is one of the options under consideration. Should such a scheme emerge, there will be a surge in demand for CERs, and a consequent increase in price. In any case, it is highly likely that the Japanese Government and private sector will continue to buy.

Canada, an obvious candidate for CER purchases, has pulled back from this policy route under a new Conservative government, and observers are questioning whether there is any serious intention to meet their Kyoto target.

There is reason to be optimistic about recent developments in Australia and the United States, the two highest profile countries to not ratify the Kyoto Protocol. In both countries localized domestic emissions trading schemes are being set up to encourage CO_2 abatement, and it is conceivable that such schemes would allow Kyoto credit imports as one available compliance option. This may seem counterintuitive—how can non-Parties utilize such credits?—but there are ways around this concern. However, draft outlines of the schemes appear to employ price-cap mechanisms, with limits set close to or below current CER prices, making their use unlikely in the short-term.

Apart from increasing world demand for CERs, it is conceivable that growth may also come from different sectors in Europe. The EU ETS scheme currently applies to the following sectors:

- Energy activities > 20 MW
- Production and processing of ferrous metals
- Cement production
- Glass and ceramics production
- Pulp and paper production

The inclusion of intra-European flights from 2011 is in response to recognition that emissions from the aviation sector have been one of the fastest growing segments in the EU since 1990. In 2001 they were 3% of total emissions, representing a growth of 68% from 1990 levels.[3] Internationally they grew by 12% in 2004.[4] Action needs to be taken in this area in order not to negate efforts elsewhere. The EC proposes to start monitoring aviation emissions from 2010, with a view to joining them into the scheme by 2011. This would further boost CER demand from a low estimate of 15–39 million tonnes, up to 80 million tonnes if all flights to and from EU airports are included in 2012 (though this is less likely).

Having considered the factors that have been affecting, and likely will affect, CER demand (and therefore prices), it is possible to get a theoretical idea of the maximum price buyers would pay, given the alternatives (e.g., buying EUAs or adopting internal abatement measures). This latter alternative has not really been considered in this paper as it is predicated on a "business as usual" (BAU) scenario. In most cases the only realistic abatement opportunities open to industry in a five year phase are energy efficiency measures and production cuts. The five year timeframe, lack of history and consistency in EUA pricing, and lack of certainty beyond 2012 make it difficult, as things stand, to invest in large-scale abatement alternatives.

3 United Kingdom, Department for Environment, Food and, Rural Affairs, 27 December 2005, internet news release

4 Airportwatch, "Leap in Aviation Emissions," www.airportwatch.org.uk/news/detail.php?art_id=203 (accessed December 12, 2006).

CER versus EUA pricing

Since compliance buyers in Europe should be theoretically indifferent to using EUAs or CERs to meet their compliance obligations, some sellers have questioned why the prices are not the same?

It is important to consider several factors when comparing the value of an issued CER to that of an EUA. While EUAs can be used for compliance at the next compliance date for ETS participants. CERs first need to be transferred into an EU registry account. This cannot happen until the ITL is up and running. The ITL will be a virtual hub allowing Kyoto credits to flow to individual accounts in national registries, but until it is in place, CERs cannot be used for compliance purposes. While the UNFCCC had aimed to have the ITL in place by April 2007, at the time of writing it appears more likely that it will not be in place until November 2007, or later. Taking this into consideration, an issued CER should be worth less than a vintage 2007 EUA, except for the fact that CERs have the important attribute of being bankable (i.e., usable in phase two).

Should the market value of a 2008 EUA be considered the fair value of an issued CER? For a number of reasons, the answer is no. First and foremost, a purchaser of 2008 EUAs pays for them on 20 January 2009, whereas the purchaser of issued CERs has to pay for them immediately, which at the time of writing would include pricing in a cost of carry (the interest rate cost)[5]. There is also a small risk premium of perhaps a couple of percentage points because the ITL is not yet in place. This adds up to a total of around 10%, but buyers then primarily reference the increasingly liquid secondary CER market, and then discount by the aforementioned factors, producing a price which is around 84% of the EUA 2008 price. Is this *fair*, in terms of valuing CERs? Maybe not, but it is the cost of regulatory uncertainty at this point in time.

During this process, corporate compliance buyers may well be holding back from investing in CDM until they have a clearer idea of their position.

The other main reason why CERs trade at a discount to EUAs is higher approval and delivery risk. The probability that a CER will be issued increases as the project progresses beyond each stage. CDM buyers will assess this probability differently. But clearly a PIN with an unapproved methodology will have a somewhat low probability of ultimately producing a CER, whereas a project that is registered and working will have a considerably higher probability of producing CERs at this stage of its maturity.

The project owner/developer is bound to have a clearer idea of this than the potential CER buyer, so their probability assessments are likely to differ. This explains why buyers bid for projects in the way they do, and why some owners may decide not to contract for the sale of their CERs until actually produced. They know they can obtain a better price in relative terms.

There is, however, a potential opportunity cost—or profit—associated with such an approach. If the project owners decide to hold back from con-

5 For example, given some 26 months between paying for a credit on 1 November 2006 rather than in 2009, and EU interest rates at around 4.05%, this would mean a minimum discount of 7.75% once compounding is taken into account.

tracting the CERs as the project moves through the various approval stages (which can take many months, even with an efficient process and a good consultant), the prices can move against the seller. Of course it may just as easily move in the opposite direction, but what is relevant is the forecast assumed for the CER price at the time the project was scoped out and how to ensure that this price, at a minimum, is achieved.

With so much still untried, there has to be a pragmatic approach—based on realistic expectations—to price and risk sharing by both buyers and sellers.

From the buyer's perspective, there are delivery risks in addition to the approval risks described above. Broadly speaking these include:

- Industrial risks
- Credit risks
- Country risks
- Force majeure
- Regulatory risks

These risks speak, by and large, for themselves, and in any case are dealt with more extensively by other contributors. With *industrial risk,* it is important to consider whether CER production is the main activity, or a by-product of another process. If the former, then the project exists solely to produce CERs; an example would be flaring methane from landfills, where methane cannot help being produced, and flared, as long as the equipment works. When CER production is, however, a by-product, another level of uncertainly is introduced for the buyer, because CERs are not the main driver. For example, a waste gas to power project from a steel mill only produces CERs if there is demand for steel. If the price for steel drops and there is no production, then no CERs will be created either.

Credit risks are a concern for buyers and arguably more so for the seller. Upfront payments or direct investments in CDM projects can be challenging, because it is difficult to identify collateral that is useful to a European lender. Buyers worry about non delivery; if they have bought forward CERs from a project which subsequently fails, they may face high replacement costs if market prices (subsequent to contracting with the seller) rise higher. Understandably, sellers are nervous about credit risk, too, and clearly this uncertainty, as well as the relative creditworthiness of the two bargaining parties, will strongly influence the negotiated price. A seller with a poor credit rating may be forced to transact only issued CERs, in order to avoid having to utilize expensive bank guarantees. Unfortunately, this immediately puts the seller at a disadvantage as the flexibility afforded in optimizing the timing of the sale is extremely curtailed.

Finally, *regularly risk*s must be considered. Apart from the ITL and supplementarity caps, the unpredictability of the regulatory climate post-2012 is a concern. Another, more immediate, issue for many European buyers is "Article 17" risk. This requirement under the Marrakech Accords states that countries wishing to transfer AAUs need to have fulfilled certain eligibility requirements that no country currently has satisfied. This risk, and the Commitment Period Reserve restriction[6], affect liquidity in the secondary CER market, and thereby affect prices.

6 To address concern that Annex I Parties could "oversell" units and subsequently be unable to meet their own emissions targets, each Party is required to hold a minimum level of ERUs, CERs, AAUs and RMUs in its national registry. (http://unfccc.int/kyoto_protocol/mechanisms/emissions_trading/items/2731.php accessed May 7th 2007)

All these risks, and their effect on delivery certainty, are cumulative rather than discrete and have implications for the price buyers are willing to pay.

The CER price is thus going to be a negotiated outcome of two differing perceptions of the risks discussed. This outcome may not be *equitable*, based on an objective assessment of these risks; rather, as in any commercial transaction, it is a function of each side's relative bargaining power.

Contracting

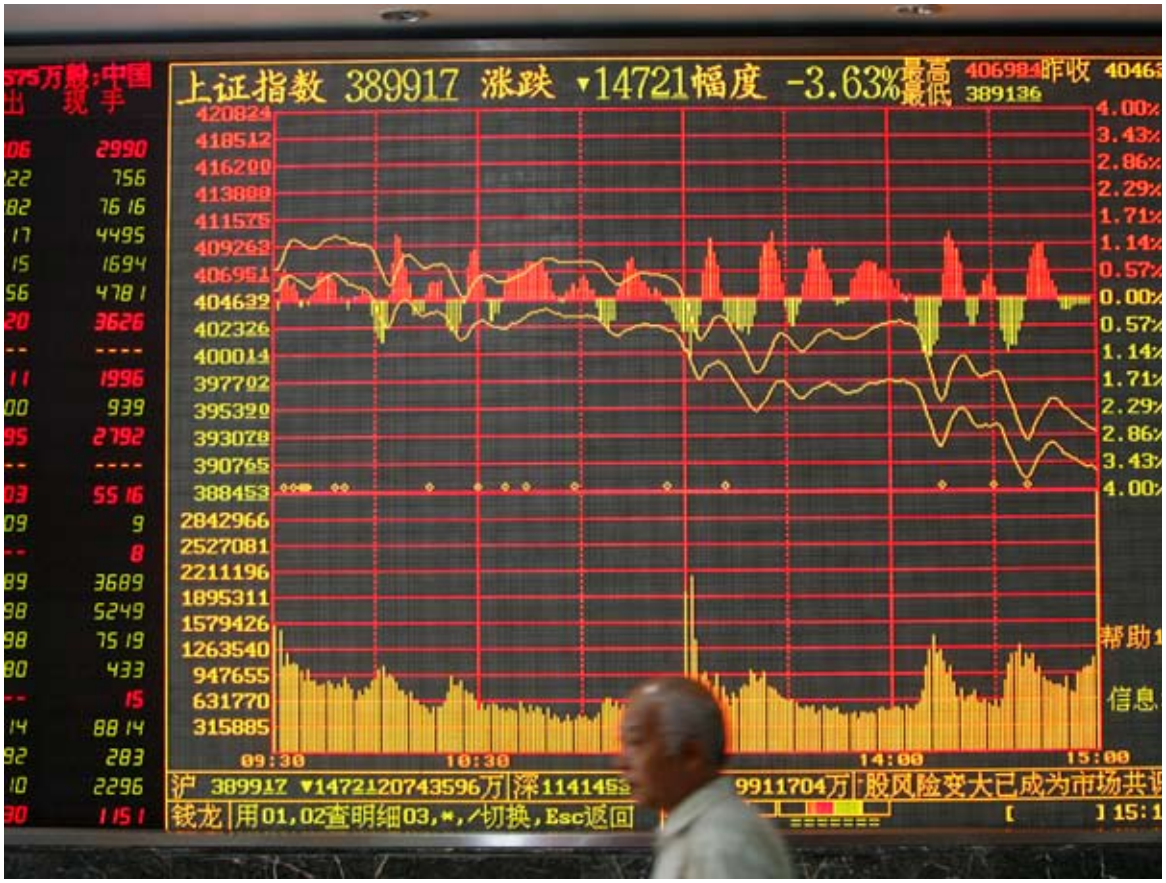
The contract between buyer and seller, the ERPA, is ultimately a risk-sharing exercise, providing for a variety of eventualities. The entity best prepared to assume the greater part of these risks is entitled to expect a price advantage. Price volatility during the negotiation period is a key issue, and counterparts should consider ways to address this, such as some kind of adjustment mechanism linked to EUA price movements, so as to avoid disappointed expectations.

When the CER volume being created by a project is uncertain, fixed price buyers tend to require damages for shortfalls against expectations. A popular device to address this is the use of floating price mechanisms, whereby the buyer consciously accepts a variable volume at a variable price, and can therefore replace shortfalls in the market at a price similar to that current at the time of delivery. Not all sellers embrace the uncertainty this brings over the life of a contract, but, again, it is a matter of assuming either more risk or an uncertain return. The huge price volatility seen over the last twenty months has meant that attempting to introduce a degree of minimum price certainty via a "floor" can be a very expensive solution.

How is the relative bargaining strength of the buyer and seller constituted? Many CDM projects in India and China are developed and operated by large industrial companies and, likewise, financed on their own balance sheets. Well resourced and advised, they can deliver large volumes of CERs and are, seen from this vantage, attractive counterparts to suppliers. After all, it takes almost as much work to negotiate a contract for 100,000 CERs as for 1 million. They have, therefore, a certain amount of leverage and can easily access most buyers.

At the other end of the spectrum are the small project developers/owners. These are typically agricultural or small power projects and very often lacking funding and credit status. Then there are projects which are advised, set up and developed by intermediaries, such as EcoSecurities, Econergy, and Camco. Without their intervention, many potential CDM projects would not have come into being and these intermediaries assume much of the risk of creating the CER asset. Consequently, they capture a considerable amount of the value. The project owners get a lesser, but still acceptable return.

One of the challenges facing the CDM is how to make smaller, independently developed projects attractive to buyers while providing a fair price to the project owners. Such projects require investment funding at an acceptable rate of interest. Regional development banks have a big role to play in building up lending capacity for CDM among national banks. For most buyers, project finance is not their main business, and any funding they provide is, therefore, likely to highly discount the CER price as a result.



Conclusion

This essay focuses on what is a fair price for carbon. The fairness of a system in which a project owner negotiates in good faith to sell CERs and is, in return, subject to the vagaries of an immature, developing commodity market over which she has no control or influence can be debated. Without the ETS market, however, the CER price a CDM project owner would receive would be lower than its current level, as some of the earliest sellers will testify.

Fairness has to be about risk sharing and partnership. The CDM is a complex device, created as part of the most far reaching and important multilateral environmental agreement in history. Both the mechanics of the Kyoto Protocol generally, and the EU Linking Directive specifically, are still new and hardly fully operational. With so much still untried, there has to be a pragmatic approach—based on realistic expectations—to price and risk sharing by both buyers and sellers.

Is CER pricing flexible and equitable? It is certainly flexible. We have seen a great variety of contract structures to reflect the varied preferences of project participants. The huge level of investment from Annex I countries in sustainable development projects in non-Annex I countries would simply not have happened without the

Kyoto Protocol, so from this point of view, there certainly appears to be a high degree of equity.

Of course sellers will always want to get more. That is human nature. But the enormous volume of projects being developed is a testimony to the incentive the scheme provides, and were it very one-sided we would not be seeing so many being developed and coming to market. The overall equity of the scheme is, however, questionable when one remembers that there are 168 signatories to the Kyoto Protocol, yet the benefits of CDM are concentrated in only a handful of these countries.

The CER price is thus going to be a negotiated outcome of two differing perceptions of the risks discussed.

Regardless of whether pricing is entirely fair, and leaving alone for the moment claims that the CDM's GHG abatement role is still unproven, there have been demonstrable benefits. At the end of the day important technology transfer is taking place and many of the world's countries are, to a significant degree, demonstrating a collective will to tackle climate change in an economically efficient way.

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A PRIVATE CARBON FUND'S PERSPECTIVE

Negotiating a Fair Price for CERs

As a European entity, the European Carbon Fund (ECF) invests exclusively in carbon assets eligible under the EU ETS: EUAs as well as CERs and ERUs sourced from around the world. Since 2005, ECF has been signing ERPAs to forward purchase CERs from CDM projects under development. By April 2007, ECF had contracted and structured projects generating over forty million tonnes of CO_2e emission reductions, including syndication of the largest non-industrial gas CDM transaction to date. At the time of writing, transactions representing another fifteen million CERs were under advanced negotiation with project sponsors in Asia, Latin America, and North Africa.

This essay aims to help CDM project sponsors efficiently sell carbon credits through 2012, providing recommendations on how to obtain more fair and balanced terms. It also makes some notes of caution. Although obtaining the best possible price is key to an equitable carbon transaction, other aspects of the negotiation are central to a fair exchange.

First I focus on the correlation between CER and EUA prices—historically, presently, and anticipating a time when the carbon market becomes truly global—and explain why prices may partially decorrelate in the long run if and when other major local carbon markets emerge. I then present a series of points that help explain why pricing and contractual conditions may vary from one CDM project to another, even at the same point in time. CDM sponsors should understand their project's carbon value based on various risk profiles, as well as its time to market. I conclude with a post-2012 outlook and elaborate on how decisions made outside of the Kyoto domain may have a strong impact on CER pricing, even before the end of the first Kyoto commitment period.

Correlation between EUA and CER prices

Though only a few years old, the project-based carbon credit market is indeed working. CER prices are set, as with any other market, by supply meeting demand. A fair price for CERs is not the price paid at any point in time other than during a specific transaction—one where a seller is willing to accept what is offered, depending on the buyer's own needs assessment and evaluation of the underlying project risks.

Since the European market is currently by far the largest and most organized carbon market, CER prices remain strongly correlated to the supply-demand balance for compliance instruments in Europe, and hence EUA prices. The price spread between the carbon credit market and the EU ETS allowance market has and will continue to evolve over the Kyoto period as a result of real and/or perceived changes in the overall supply-demand balance for both instruments.

CER prices historically less volatile

Over its short history, the project-based credit market has been much less volatile than the EU ETS. Indeed, over the past year, the spread between high and low CER prices never exceeded roughly €9 while the same spread for EUAs for phase two reached almost €18, and peaked at €28 for phase one.

In my view, this difference arises because sellers apply an absolute floor price of €6, below which they will not forward sell CERs, and, at the same time, most buyers (including ECF) apply an absolute ceiling of €15. These floor and ceiling prices are determined in relation to the perceived long-term price of EUAs, factoring in volatility and worst-case scenarios.

Since the end of September 2006, the EU ETS market has manifested an increasing disconnection between phase one and phase two prices. At the time of writing, spot EUAs traded at €0.52 and phase two EUAs at €18. The same spread from the period of January 2005 to September 2006 was only €1.15. Credits from CDM and JI may only be used for EU ETS compliance in phase two, although the latest European Commission (EC) decisions significantly restrict usage; as a result, CER prices have totally disconnected from phase one EUA prices and the current price for unguaranteed CERs remains largely correlated to the price of phase two EUAs. Currently the discount ranges between 20% and 50% depending on each project's perceived risks, and ultimately lands within the aforementioned range.[1]

When phase two EUA forward prices rise above €18–19 (as they did in April 2006, when the price was over €30), CER prices hit the ceiling. Similarly, when those prices retreat, the spread between the EU ETS and the carbon credit market narrows. The latter phenomenon occurred in the first quarter of 2007. EUA prices dropped following the collapse of local natural gas prices, but the EUA-CER spread had started narrowing in September 2006. Yet unlike EUAs, CER prices tend not to react immediately to regional variables such as gas prices, power demand, or weather patterns.

Finally, EU ETS compliance is not the only driver of the CER market. CER prices are also influenced by Japanese buyers who tend to focus on longer-term compliance needs, whereas EUA buyers, on the other hand, are predominantly financially motivated. The impact of other developing carbon markets, or of market globalization (with

1 Unguaranteed CERs are attached to significant project performance risk, whereas the seller assumes responsibility with guaranteed CERs to deliver to the buyer irrespective of the underlying project's emission reduction performance.

all or part of the US potentially participating), could mean an even greater decoupling of CER and EUA prices in the future.

Supply-demand balance and perspective until 2012

Most market participants expect an increasing EU ETS short position in phase two, which will be met through domestic reductions and imported carbon credits (both CERs and ERUs). We expect EU ETS participants to import the maximum possible quantity of Kyoto credits (a yearly 250 Megatonne supplementarity cap will likely be imposed), and to arbitrate using CERs instead of EUAs for compliance, as long as CER prices remain below EUAs.

The demand balance for CERs (and ERUs) will come from participants outside of the EU ETS. These include Kyoto Parties (e.g., EU, Japan, Canada) purchasing credits for compliance, and private actors either already subjected to emission constraints by their national authorities (e.g., Japanese companies) or acting voluntarily in the anticipation of future constraints (e.g., companies within US regional schemes, EU airlines, and entities seeking carbon neutrality).[2]

Maintaining CER credit supply will be vitally important in phase two. These CERs could come from CDM projects that have either sold forward in previous years, or from those selling spot as developers cash in the proceeds of CER sales to pay for capital expenditures. It is, however, widely assumed that the supply of credits will slow down towards the end of the period due to post-2012 uncertainty on Kyoto, and the flexible mechanisms, in particular. Indeed, as time passes and the Kyoto Parties fail to establish a clear institutional framework for the next period, new emission reduction projects will find it increasingly difficult to raise financing with only one or two years of certain carbon revenues.

As a result, it can be anticipated that CER/ERU deliveries will decrease from 2010 to 2012. This may even reach a level where supply is insufficient to cover the short EU ETS position and additional demand from entities outside the scheme. In this scenario, the EUA-CER price spread could narrow to as low as 3–5%, a discount estimated to be equivalent to the cost of achieving domestic emission reductions for companies within the EU ETS.

Advice to project sponsors

In the following sections, I provide various considerations targeted towards CDM project sponsors. The objective is to help them understand their project's carbon value based on perceived quality, various risk profiles, as well as time to market so they may efficiently and optimally sell their expected CERs for a fair price.

Before turning to details, it is important to state that a fair price will reflect the quality of the underlying project. This explains why a buyer may price two projects at the same point in time very differently, even if they are both registered as CDM projects by the UNFCCC.

Quality considerations include the reliability of the seller, their ability to operate and monitor emission reductions from the project, and the sustainable development and social benefits of the project. Most compliance buyers, indeed most buyers on the secondary market, do not want to buy CERs from projects that do not fit within their corporate sustainability and social responsibility standards. An increasing number

2 EU airlines will be included in the ETS scheme in 2011 and will start purchasing before.

of buyers refuse, therefore, to purchase CERs generated by projects with no or limited social benefits, specifically including HFC23 projects (which, consequently, should be priced with a discount compared to other CERs). ECF for example applies strict sustainability selection criteria, resulting in an HFC-free CER portfolio.

Choosing the right time to go to market

CDM projects have a wide variation in terms of time to market, both from an industrial and a CDM process perspective. Some developers attempt to forward sell CERs when they only have a PIN, or, sometimes, just the idea for a project. In this case, buyers may express interest, but in our view no serious buyer will actually commit to purchase CERs.

At the other end of the spectrum, some project sponsors come to market with a project that is both already in operation (and therefore already abating emissions) and registered as a CDM by the UNFCCC, in which case CERs are not far from initial issuance. In this situation, the sponsor will maximize revenues from the sale of CERs, but relative to the performance of the benchmark EUA market at the time of sale.

Outside of these extremes, a variety of projects are coming to market at various stages of development. For example, some projects are already in operation but not yet registered by the UNFCCC, and some are registered but have not even reached financial closing. Both of these may achieve forward carbon sales and obtain good prices, but ERPAs will most likely always include conditions, including *(a)* the registration of the project as a CDM project, and/or that *(b)* the project is commissioned or (c) starts operating.

There is no single "best" time to bring CERs to market, because time to market value depends on the perceived quality of the project as well as the developer's risk adversity. All other things being equal, in order to obtain good offers from quality buyers, I believe that a project sponsor must at least: 1) have a draft CDM PDD, preferably written by a recognized consultant; and 2) be able to provide evidence, from an industrial perspective, that the project's construction and operational start is fully financed.[3]

Step 1: Assemble the initial information package

All serious buyers of forward CERs will require a minimum of information on both the project and the seller before even considering making a preliminary offer. My recommendation is that project sponsors compile all the information that may be necessary before getting in contact with potential carbon buyers. In order to speed the evaluation process by buyers it may also prove extremely useful for the seller to summarize all information in a single document (the initial information package).

Standard information includes:

- the seller's identity (name, contact details, and shareholding structure), financial standing or credit rating (if any), and ownership of the project
- information on the project (description, key figures including cost, financing plan, technical completion, and schedule)
- information on the CDM process of the project (PIN and/or PDD, validation, registration, and name of the consultant)

3 As an example, at the same point in time last year (and in the same country) ECF was offering forward purchase prices with a €5 spread between a registered project being commissioned and a project with a draft PDD that had not secured financing.

- and estimated quantity of CERs for sale, if no PDD is yet available.[4]

Step 2: Define a clear and transparent buyer selection and negotiation process

Before contacting carbon buyers, project sponsors should clearly define their objectives for selling CERs. These may include: to help secure future revenues, to raise additional financing, to obtain an advance payment to finance the project's development, to increase the project's future cash flow to lower the project's debt coverage ratio (in case of project financing), to generate an additional revenue, and to play the market (in case of high risk appetite). The objectives will thus determine the selling strategy.

This clarification process will help sellers target the most appropriate buyers and maximize the efficiency of the transaction. Similarly, a seller's selection and negotiation process should be disclosed in a clear and transparent manner to potential buyers, including:

- Laying out the seller's objectives (and eventually expectations)
- Discussing the timetable for decision making
- Identifying the selection process (e.g., shortlist and competitive dialog) and selection criteria (e.g., reliability of the buyer and best price).

In order to obtain the best conditions, my recommendation to sellers is not to change the selection and negotiation rules in the middle of the process, as this will only generate frustration and is likely to discourage the most reliable, serious buyers. Transparency and the application of a clearly defined process will facilitate the building of mutual trust.

As an example, for a wind farm project from which ECF forward purchased CERs, the seller set up a public tender using a clearly defined process, including two rounds: 1) selecting a shortlist of potential buyers on the basis of their financial capacities and CDM contracting experience, and then 2) selecting the best offer (measured by the level of acceptance of predefined contractual terms) combined with the best price. Although the tender process may have initially appeared heavy, it turned out to be much more effective than less transparent buyer selection processes, and the seller obtained the best possible terms.

Step 3: Narrow selection to reliable buyers

There are many carbon buyers in the market, but not all of them are reliable counterparties. Since CERs are likely to be sold on a forward basis, the seller wants to ensure that its chosen buyer will not default in adverse market movements. In addition, over the short history of the CDM, a few buyers have already disappeared and some have defaulted (including carbon boutiques and at least one large European investment-grade company) after the European carbon market experienced sudden downward corrections. Indeed, reasonable terms from a reliable buyer are preferable to fantastic terms from an unreliable one.

Thus, a successful strategy for selling CERs should include carefully short-listing only reliable buyers after evaluating their creditworthiness. Sellers who undertake their own due diligence should review buyers' balance sheets and/or credit ratings, as well as making enquiries about their reputation in the carbon market.

4 As an example, for most of the projects from which ECF has forward purchased CERs in the past, the seller initially provided information by filling in a simple yet complete initial information note (cf., ECF's website, http://www.europeancarbonfund.com/projects.php).

If a buyer's creditworthiness is in doubt, I recommend that sellers request either *(a)* a custodian bank certificate (if the buyer is a carbon fund), or *(b)* a LOC (if the buyer is corporate) for the total fixed value of the ERPA.

Step 4: Select the best offer

Once assured that they are negotiating with reliable potential buyers, sellers should select from among the best offers based on the following criteria:

- Price level and structure
- Distribution of costs and payment schedule
- Other terms and conditions (including events of default and liquidated damages).

Once an offer is selected, I recommend that the parties come to agreement in advance on all key points of the transaction, as this will later facilitate negotiation of the ERPA. This means the seller will need to indicate to its selected buyer any deviation from the offer terms at the earliest possible moment in the transaction negotiation process.

Price level and structure

Obtaining the best possible price is obviously the seller's main objective; nevertheless, sellers must also take into account various pricing formulas being offered, depending on their own objectives. Most carbon buyers can provide fixed forward prices, variable prices (i.e., indexed—usually to the EUA market) or hybrid formulae including both fixed and variable components.

Examples of pricing structures currently offered by most CER buyers include:

- Fixed price
- Floating price linked to a liquid Index (for example the EUA index published by ECX)
- Fixed price with a floating component linked to a liquid index (e.g., a fixed floor plus a percentage of the index minus the floor, or whichever of the two is higher)
- Collars (i.e., a fixed floor, a fixed ceiling, and an in-between floating price linked to a liquid index)
- Put and call options on CERs.

ECF has contracted CERs using all of these structures. For example, early in 2005, ECF was the first buyer to offer forward purchase CERs from

Box 1
Two ECF case studies

In 2006 ECF forward purchased CERs from two projects in the same country at more or less the same time. For the first transaction, the project sponsor had fully financed the project and had a high risk appetite (i.e., was prepared to take full market risk); therefore, the price agreed to be paid upon delivery was purely variable (i.e., a set percentage of an index representative of the EU ETS market).[1]

In the second transaction, the project sponsor was more risk adverse and wanted to raise additional financing for the project; the seller also hoped to benefit from a potentially rising EU ETS market. A "floor plus upside" formula was negotiated, whereby a minimum floor price of €8 per CER was guaranteed if the European market index is low upon delivery. Similarly, the seller will benefit from an upside if the European market is high (forty percent of the EUA value above the floor).

1 In this case, the variable was 65% of an EU ETS index defined as the average closing price of EUAs quoted on the European Climate Exchange over the full calendar month following delivery.

their projects at prices fully or partially indexed to EUA prices, thus providing a fair value to local project proponents. A few months later, this became standard market practice, at least among European buyers. As the market grows and the participants diversify, pricing structures will evolve to encompass even more complex structures that reflect the specific country/industry needs of buyers.

Although sellers are often tempted by variable prices in order to benefit from bullish market trends, I recommend that CDM project sponsors who need to raise additional project financing elect for a fixed price. Carbon revenues cannot be used as collateral for project or corporate financing if CERs are priced relative to a floating index.

Distribution of costs and advanced payment

After two years of CDM transactions, a market practice has emerged in terms of the cost distribution between buyers and sellers for CER asset creation (see Table 1).

For quality projects (i.e., those with a reliable seller and technology, plus high sustainable development or social benefits), some buyers may be willing to accompany the project throughout the CDM project cycle, and eventually to share in its performance risk (some of which can now be covered by new insurance products). Occasionally, and exclusively for high quality projects, the buyer may share with the seller all or part of the CDM-related upstream costs (e.g., drafting a PDD, developing a methodology, validation costs, registration fees, share of proceeds, etc.). Upon a project's request for registration with the EB, some buyers may advance payment of the registration fee. This is usually recovered out of the first CER delivery. A buyer's willingness to cover all or part of these costs should also be taken into account by sellers when evaluating purchase offers.

Table 1

Cost distribution for CER asset creation

1. Project development tasks	Costs usually borne by
Drafting of PIN/PDD	Seller
Baseline calculation and monitoring plan	Seller
Validation (contracting DOE)	Seller
Initial verification report	Seller (or Buyer)
Verification (contracting DOE)	Seller (or Buyer)

2. CDM fees and taxes	Costs usually borne by
CDM EB registration fee	Seller (or Buyer)
CDM EB share of proceeds	Seller (or Buyer)
CDM EB levy for adaptation fund	Seller
Host country tax	Seller
Annex I country tax	Buyer

Similarly, some project sponsors may benefit from advance payments that can cover CDM development costs, capital expenditures, or both. Such advance payments will always be granted by reliable buyers subject to the execution of an ERPA (and, eventually, fulfillment of conditions precedent) and the provision by the seller of some form of guarantee and/or collateral.[5] Such advances are usually repaid from future CER sales, either by deduction from the proceeds of the first CER vintage or from a percentage of the proceeds over the entire stream covered by the ERPA.

Whether a buyer finances the CDM-related costs of a project directly or grants an advance payment to a developer, such carbon-backed financing solutions are only available to high quality projects, reliable sellers, and robust CER purchase agreements.[6]

Other terms and conditions

A fair offer should be more than just a fair price. Other terms and conditions should also be balanced between buyer and seller, particularly representations and warranties, effect of events of default (penalties), and rights to terminate a contract. The best offer might not, therefore, always mean the best price, but rather a balance between: (a) a fair price reflecting the project's quality; (b) even-handed contractual terms; and (c) a reliable buyer.

Sellers should be particularly cautious in accept-

5 Such collateral could include a first demand bank guarantee issued by the seller's local bank, a mother company corporate guarantee, an export contract used as collateral, a pledge of an escrow account, etc.

6 For example, ECF has advanced registration fees for two quality projects in China (which shall be recovered by deduction of payments due upon first delivery), and has financed the PDD drafting for a Brazilian CDM project (in this case, costs were included in the overall pricing).

ing contracts with clauses regarding unilateral penalties and liquidated damages due in case the other party defaults. In the standard ERPA used by ECF, most representations and warranties, as well as all effects of an event of default, are mutual (i.e., identical for both parties). Because of this risk sharing, a Brazilian seller recently decided to contract with ECF, despite the fact he had received better price offers from other buyers with more stringent penalties for the seller.

Additionally, since most non-Annex I sellers have no credit rating, the delivery guarantee that they may provide on CERs has little or no value; therefore, such sellers may only sell "unguaranteed" CERs. I recommend sellers be particularly attentive to their delivery obligations under ERPAs, specifically any penalty (or liquidated damages) that may be due for delivery failure. A fair contract should include a best offer obligation to operate the project and a firm obligation to deliver upon issuance, as opposed to an obligation to deliver irrespective of project performance.

In ECF's case, both ECF and the seller are equally liable to pay penalties, but only if either party fails to deliver CERs due to an intentional breach of obligations under the ERPA (for example, because they have caused delivery of contractual CERs to a third party).

Step 5: Facilitate the buyer's due diligence process

All serious buyers will perform an exhaustive due diligence of both the project and the seller before committing to any forward purchase of CERs (and eventually granting any advance payment or other form of financing).

In sourcing primary carbon, ECF's origination team takes a very hands-on approach, based on the conviction that two elements are essential for efficient and equitable transactions: 1) each CDM project sponsor must be considered a partner who gets a fair trade, rather than just a supplier, and 2) each project must receive due diligence with care, both technically and legally. The only way to achieve this is for the buyer to be involved in the field, whenever possible—including site visits and direct negotiations with a seller's representatives—for all projects from which CERs are sourced.

The purpose of the due diligence process is to:

- establish that the seller owns legal title to CERs being sold
- assess the quality of the project by evaluating the technical, financial, CDM, environmental, sustainable development, and social value aspects
- assess the quality of the seller by evaluating their credit, financial capacity, and ability to operate the project
- vet the seller against a buyer's internal compliance rules[7].

A seller should, at an early stage, prepare all necessary materials for the buyer to efficiently carry out its due diligence process. This process usually includes a site visit by one of the buyer's team members and/or a local or international technical consultant. This is especially important when technical due diligence of the underlying project requires a high level of technical or specific technological expertise. As always, transparency and openness are the key elements of success, and the best chance for a seller to obtain a fair trade. A project developer in Brazil, for example, provided ECF at an early stage of the negotiation with a CD ROM containing all key legal, financial,

7 For example, when a financial institution is subject to "Know Your Client" compliance guidelines and compulsorily needs very specific information.

and technical documents on the company and the project. This greatly facilitated the process, which was concluded within six weeks.

Step 6: Agree on an ERPA

If the seller and buyer have already come to agreement on all key terms of a transaction (see step four), negotiation of the ERPA may well be a formality, with simply the legal wording to be approved by both parties. For example, ECF and a Brazilian project developer had agreed on all key terms at an early stage, when ECF's intial offer (nonbinding and subject to due diligence) was made. After due diligence was successfully completed, ERPA negotiations only took one week.

The main topics that may have already been vetted, or that will need to be in the ERPA include:

- conditions precedent
- quantity and price
- delivery and payment terms
- advance payment (if any)
- costs and taxes
- project participants and focal point (under CDM rules)
- undertakings/representations and warranties/indemnities
- events of default/termination events
- resolution of disputes/governing law
- confidentiality
- assignment of title.

Like other buyers, ECF uses its own proprietary ERPA, developed with legal advisors from Baker & McKenzie. This ERPA was quite innovative when first used in June 2005, because its terms resulted in a more balanced deal between buyer and seller. Under pressure from project proponents in several developing countries, such contractual terms later became standard.

Step 7: Eventually raise additional financing using ERPA as collateral

Once an ERPA is signed with a quality buyer, and all requisite conditions have either been performed or levied, a seller may be able to raise additional carbon financing on the back of the ERPA, to finance either the underlying project (e.g., equipment, operation, and/or CDM aspects) or other projects developed by the same seller.

Raising carbon financing should not be viewed by sellers as a fair transaction criterion, but more as a bonus that only a few carbon buyers are able to structure (typically, only banks or carbon funds associated with banks). It is important to stress that banks providing financing on the back of an ERPA will only be willing to do so if they can accept the credit risk of the carbon buyer. It is, therefore, unlikely that any bank will use an ERPA signed with a non-rated carbon boutique as collateral. This should also be taken into account by sellers when short-listing buyers, if they intend to raise additional financing using a forward purchase agreement as collateral.

Carbon financing may include the following structures:

- Advance payment on the ERPA, similar to a corporate loan with full recourse to the seller, whereby a first security interest is created over the ERPA in favor of the bank
- Commodity financing: CERs are considered an exportable commodity and financed as such by pledging revenues under the ERPA (to be paid directly to an offshore escrow account) to guarantee repayment of a commodity-backed loan (with limited recourse to the seller)
- Enhancement of a project's finance and/

or export finance structure, whereby revenues from the ERPA are pledged by the bank(s) providing project/export financing to improve the project's debt cover ratio, and therefore improve financing terms for the project developer (with no or limited recourse to the seller).[8]

Post-2012 outlook: the view of a private buyer

The CDM is undoubtedly the most innovative and appreciated measure laid out in the Kyoto Protocol. At the time of writing, some 500 projects—totaling over 760 million tCO_2e in expected emission reductions until the end of 2012—have been registered by the CDM EB.[9] These achievements are unequivocal proof of the CDM's importance in fighting climate change.

The Kyoto signatories anticipated neither this tremendous success, nor the efficiency with which the private sector would use it to the triple benefit of the planet, developing countries, and itself. Some of them even created public funds in the early days (e.g., the Netherlands) to buy project-based credits with the intention of helping establish the CDM and to associate it with their own aid policies. Most of those public funds have been managed by the World Bank, which in doing so is loyal to its mission of global public service. This pioneering action also triggered the massive inflow of private money into the CDM.

Today, uncertainty over the institutional framework after the first Kyoto period, in 2013, is threatening the global carbon market. A new agreement will be difficult to shape due to the reluctance of several large countries to have their emissions capped. Negotiations must move fast, since the uncertainty surrounding their outcome will compromise a lasting success of the CDM by driving private capital back out of the market.

Given the time it takes to assure the success of a CDM project and to obtain the CERs, project sponsors could leave the CDM market as early as 2009. This could kill the market. In fact, it takes an absolute minimum of two years to develop an emission reduction project, submit it for verification and receive the go-ahead from the CDM EB (often much longer for clean energy projects). With the 2012 deadline coming closer, soon there will be no time left to generate and sell the CERs necessary for the financial viability of a venture before that date.

This may be illustrated by the example of a 30 MW wind power station initiated today. At the earliest, it will be in operation by mid-2009. It needs a total investment of approximately €40 million. Depending on the emission factor of its host country or region, it will reduce GHG emissions by some 900,000 tonnes over its fifteen-year lifetime. But over the three and a half years it will operate within the current Kyoto timeframe, only 200,000 CERs will be generated to trade on the market, in other words, a production shortfall of almost 80%. This shortfall affects the financial viability of the project as both investors (providing capital) and banks (providing debt) usually need longer-term visibility in order to provide financing. If they fear that the CDM will come to an abrupt stop in 2012, investments could become scarce long before that date, simply because of lack of time.

8 ECF has structured commodity-backed financing for a project in Africa (ERPA revenues have been pledged by a European bank who provided a loan to the project developer) and allowed a Brazilian bank to provide additional financing to a CDM project sponsor in the Sao Paulo region by pledging the ERPA signed with ECF.

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

Today, global carbon demand is widely driven by European energy utilities, who critically lack a stable long-term outlook on the market. Large shares of the existing European electricity generation portfolio need to be replaced and extended between now and 2020, and new power plants will operate for several decades. The utilities' arbitrage between traditional and more expensive clean power generation technologies directly depends on the imposition of long-term carbon constraints; hence, this variable further exacerbates the uncertainty about future demand for carbon credits.

Given the time it takes to ... obtain the CERs, project sponsors could leave the CDM market as early as 2009. This could kill the market.

Similarly, uncertainty over the post-2012 institutional framework, or even the existence of any carbon constraint, significantly reduces the perspective for private involvement and renders it difficult for private funds to firmly commit to the purchase of post-2012 carbon assets. Despite the murky outlook, however, a small market for post-2012 credits is emerging—larger than expected.

Through 2005 and 2006, approximately five million tCO_2e from post-2012 vintages were purchased, predominantly by European private buyers. Another nineteen million tonnes of 2013 vintage were contracted from HFC projects in China developed by the World Bank.[10] Given the obvious difficulty of fairly pricing these second commitment period CERs in accordance with their risk profile and sellers' expectations, however, buyers generally have preferred to purchase options rather than to make firm commitments.

ERPAs signed with ECF generally offer sellers the option to purchase post-2012 vintages under the same terms and conditions as pre-2013 CERs. It is impossible to value the price of such options given the uncertainty of the underlying asset's institutional existence, and no option premium can, therefore, be paid by the buyer. What ECF does, on the other hand, is value the post-2012 call option in the overall project evaluation. Consequently, when such an option is granted, the firm price offered for pre-2013 stream CERs is slightly increased compared to an equivalent project that would not grant any option. Several of the forward CER purchase transactions concluded by ECF include such arrangements.

I strongly believe this deal structure allows for more fair and mutually beneficial balancing of the institutional risk between seller and buyer post-2012. It potentially enables the buyer to access CER vintages otherwise impossible to contract, and allows the seller to generate higher income from the sale of pre-2013 CERs. The sponsor also benefits from added financial security, since it can lock in current CER prices over the entire project period.

CDM project sponsors must understand that, as long as the post-Kyoto framework remains unclear, *no serious private buyer can take the risk of committing to purchase post-2012 carbon credits at today's prevailing conditions and prices.*

Kyoto Parties reaffirmed in Montreal (2005) and in Nairobi (2006) that the existence of the CDM would continue after 2012. The EC has also underlined its commitment to extend and enhance the EU ETS past 2012 in order to reduce EU GHG emissions by 20% until 2020. Initiatives

10 Karan Capoor and Philippe Ambrosi, *State and Trends of the Carbon Market 2006* (Washington, D.C.: World Bank and IETA, 2006).

announced by several American and Australian states, raise optimism for the emergence of a global carbon market, potentially with the Kyoto mechanisms at its core.

Words are, however, cheap; in the absence of a clear regulatory framework, the market will be unable to replicate the CDM's current success. Tangible action and results are now needed from governments. They must again pioneer the market for the next Kyoto period as they did in the early days of the CDM. This will mean placing the political responsibility and price risk in the same hands, hence guaranteeing a minimum level of stability to private project developers and investors, and hopefully preventing the CDM project flow from drying up.

Until this happens, the value of a post-2012 project-based carbon credit will remain close to zero. But it is our conviction that whatever institutional framework governments decide upon, it will use such credits in one form or another. Those credits, whatever their (new) name may be, have the potential to become a truly global environmental currency.

Alfred Ofosu-Ahenkorah
Energy Commission of Ghana

AN AFRICAN PERSPECTIVE

CDM Participation and Credit Pricing in Africa

CDM was intended to help Annex I countries meet their GHG reduction commitments, while providing developing countries financial benefits and cutting-edge green technology to help them reduce their own emissions and achieve their own sustainable development goals. While countries in Europe, the Americas, and Southeast Asia have put in place structures and mechanisms to promote the development of emission reduction projects, including carbon exchanges, countries in Africa, as well as some in Central Asia and the Pacific, continue to be largely by-passed by the carbon market. This raises deep, fundamental concerns about equity in the CDM market.

From an African perspective, the low prices for carbon credits offered to African project participants, and the relative immaturity of the carbon market overall, are cause for concern. For example, Ghana was offered a price of $4.50–5.00 per CER in the beginning of 2006, at a time when the EUA price was roughly €20; throughout most of that year, EUA prices (both spot and futures) never went below the €10 mark.[1] In addition, the absence of the United States from the market has induced a low world price for CERs.

In this piece, I examine the low level of participation of African countries in the CDM and seek to determine whether the CER prices offered to them are fair. I conclude by recommending how to bring African countries back on track, i.e., what particular actions or measures African countries can take to systematically mitigate the risk of investing in CDM projects in the region, and to enhance the pricing profile of their national CDM project portfolio. These include "going-it-alone," or Unilateral CDM.

Africa in the CDM Market

A pipeline of CDM projects has developed more slowly in Africa, because the process of implementing the mechanism there is fraught with

1 Source: Powernext, ECX.

challenges. For example, due to the complexity of the regulatory process and the high level of human expertise required to develop CDM projects, the transaction costs involved are very high. So much so to the extent that potential project sponsors are reluctant to move forward. In addition, African participants face considerable challenges related to the implementation of CDM projects, including managing complex bureaucracies and spending time to track down the necessary additional information in order to qualify. African countries, which would benefit most from CDM, are thus hindered from fully participating.

Despite notable gains over the past year, African projects still represent a low fraction of the global CDM pipeline. The first projects to enter the pipeline from Africa appeared at the end of 2004 (when sixty-four projects in other regions existed, mostly from Latin America): the Essaouira wind project in Morocco and the Kuyasa housing energy upgrade in South Africa.[2] At the end of October 2006, seventeen projects from the Middle East and North Africa (MENA) and nineteen projects from Sub-Saharan Africa (SSA) were in the CDM pipeline, out of a total of 1,274. Eleven countries from these regions have at least one CDM project at the stage of validation (public commentary stage) or registration[3]. South Africa leads the pack, hosting thirteen projects. At the end of October 2006, six projects were registered in MENA and four in SSA, all in South Africa.

In terms of CER volumes, the aggregate pipeline of Africa amounts to about 7% of the total for all developing countries. This compares to a 10% share in global GHG emissions in 2000 (12.63% including LULUCF). Half of these potential volumes come from Nigeria and Equatorial Guinea, and one-quarter from Egypt and South Africa.[4] Only one-third of this volume (27.8 $MtCO_2e$) had been transacted by October 2006, revealing a very different geographical balance.[5] South Africa sold almost 40% of this volume and Egypt roughly 30%.

Some ERPAs have been signed at a very early stage of the project cycle, before projects appear in the (public) pipeline. Such projects may eventually use currently unapproved methodologies or face regulatory risks (the existence of a DNA, registration, etc.). This partially explains why forward CERs from some African projects have traded through 2006 at $8.30, or at a $2 discount to the average primary CER price.[6]

According to the World Bank, fugitive emissions from the oil industry dominate the African pipeline with 70% of potential CER volumes. Landfill gas comes second at 17% followed by Nitrous Oxide (N2O) destruction projects (10%). Put together, renewables account for 7.5% of CER volumes and energy efficiency and fuel switching projects for 6.2%. This sectoral distribution contrasts starkly to that of the global CDM pipeline.

It is worth noting that, in 2006, Africa accounted for 6% (up from 3% in 2005 and an average of 4% historically) of the overall volume of CERs, but only 4.6% of the primary CER market. Africa accounted for almost 11% of transactions in 2006 (5% in 2005). The average *transaction size* in Africa was 0.9 million tCO_2e. Compare this to 3.9 million tonnes in China, 1.6 million in India, and 1.1 million in Brazil.

2 Capoor, K., and P. Ambrosi. 2006. *State and trends of the carbon market 2006*. World Bank and IETA: Washington, D.C.

3 Egypt, Israel, Morocco, Qatar, and Tunisia in MENA, and Equatorial Guinea, Ivory Coast, Nigeria, South Africa, Tanzania, and Uganda in SSA.

4 The CDM projects in Equitorial Guinea and Nigeria reduce fugitive emission reductions associated with the petroleum industry.

5 Of this amount, a little more than half was contracted during the first ten months of 2006.

6 Capoor, K., and P. Ambrosi, 2006.

Investment Climate and Regulatory Environment

The exact geographical location of a CDM project should not matter much, in theory, provided that the project reduces emissions. But actual CDM investments have mirrored foreign direct investment flows, while taking into consideration country risks, as in any other investment decision. Weak institutional capacities of DNAs and other regulatory agencies accounts for the low interest in Africa among carbon credit buyers and investors.

As with any international transaction, several factors influence the trading and risk strategies, and, ultimately, the investment decisions of CDM investors. Consequently, the price that one is prepared to pay for carbon credits in an African country depends on the associated risks perceived for that particular country. Point Carbon argues that three key drivers shape carbon market developments and prices: (1) policy and regulatory issues, (2) market fundamentals, and (3) technical indicators (market psychology).[7]

One must also understand how these drivers interact, which carry more weight, and to what extent and under what circumstances they impact carbon prices. Apart from these drivers, several other factors may influence CDM investment flows:

- DNA status and government attitudes toward CDM
- investment climate (i.e., the degree of stability and investor friendliness, and capital and service markets)
- CDM project potential and track record (i.e., number of projects approved by the DNA and registered by the EB).

The carbon market was created through political decisions and must be legally framed. Similarly to other energy commodity markets, decisions concerning framework conditions and operating guidelines could have a material impact on price developments. According to a World Bank survey, a host country's CDM regulatory framework was a criterion almost universally cited for investment attractiveness.[8] This includes clear rules for CDM project review and approval, efficiency, transparency, and a track record of project approvals. India and Mexico, for example, were cited as being particularly attractive for this reason.

Relatively weak and nontransparent regulatory frameworks in Africa have weakened the bargaining power of African project developers or sponsors seeking fair prices for their CERs.

There are twenty-nine DNAs in Africa, nearly as many as in Asia (thirty) or Latin America (twenty-five); however, this has had no real bearing on Africa's share of the carbon market. Unfortunately, many African DNAs lack full political, financial, and legal backing, rendering them technically and legally weak, and unable to wield their authority.

Relatively weak and nontransparent regulatory frameworks in Africa have weakened the bargaining power of African project developers or sponsors seeking fair prices for their CERs. Perhaps Africa needs more time to build adequate host country capacity, but as we approach 2012 there is very little time left for the majority of African countries who have not yet begun creating the required institutional frameworks.

7 Point Carbon. "What determines the price of carbon?" Special issue, *Carbon Market Analyst* (October 2004).

8 Capoor, K., and P. Ambrosi, 2006.

The size of potential carbon assets (which brings economies of scale in exploration, sourcing, and transactions costs) is a major factor influencing CDM investment flow. For example, Chile was cited in a World Bank report for project replicability, while China was noted as being attractive now that a flow of standard applications (replicable CDM project proposals) is available (in addition to the availability of large volumes of reductions). Africa, on the other hand, lacks both projects with high emission reduction potential and human expertise, which altogether underscores the high level of risk in Africa.

Challenges to carbon finance in Africa

Much has been written regarding barriers to trade and direct foreign investment in Africa. CDM projects face many of the same constraints; only the commodity being bought and sold is entirely different. Apart from the criteria mentioned above, there are other specific issues that hinder CDM in Africa.

Size and structure of the economy

Industrialized developing countries have greater opportunities for generating CERs than their agrarian counterparts, because prevailing CDM rules favor single-site projects and are more oriented toward GHG mitigation in the energy and industrial sectors, rather than GHG removal in the agricultural and forestry sectors. Since many African countries are principally agrarian with little heavy industry, the size and scope of potential CDM activities is more limited.

Almost all agricultural commodities produced in Africa and then exported are sun dried. Agriculture is manual and the entire agro-processing industry chain, which accounts for over 60% of GDP in many non-oil producing African countries, has no CDM potential. For example, cocoa production in Ghana is almost 100% manual and thus has no carbon footprint.[9] Thus, unless emerging Programmatic CDM and sectoral bundling of projects are nurtured, many African countries will end up being observers rather than players in the market.

Weak relative capacity of private developers

Local access to technology, management, and intellectual capital—alongside language barriers and lack of data to construct emission baselines and to populate PDDs—are common constraints for private developers wishing to participate in CDM in Africa.

Lack of finance

Multilateral finance predominates, and CDM projects relying on private finance are exceptionally difficult to find. Since most African countries are classified as "risky," they cannot directly access global capital markets. In much the same way that investments offering a quick and high return are offered at a premium, the higher perceived political risks involved with African investing translate into depressed carbon prices offered to African projects hosts.

Over-reliance on foreign investors tends to make African countries producers of low priced "raw carbon," which is bought cheaply on the primary market and resold on secondary emission trading markets at a higher price. Indeed, this practice is not so different from other commodity markets, whereby investors add value to raw materials purchased in Africa, and resell those commodities at a much higher price elsewhere.

Many African project developers have requested advance (or prepayments) for CERs. This also

9 The only exception is for the spraying of insecticides and the haulage of dry cocoa beans to ports or factories for processing and export.

drives down the offered price, as CERs must be discounted to take into account the period between prepayment and issuance of the CERs. The Ghana Air Conditioner Standards and Labels Programme, for example, will require the establishment of a test facility for air conditioners. Since the Ghana Standards Board cannot afford the nearly $1.4 million price tag immediately, a request was made to the potential carbon buyer to pay for the facility upfront. Under such circumstances, one cannot expect average primary or competitive prices for the CERs.

Pricing trends and contracts

At the time of writing, prices have been up across-the-board in every segment of the carbon market, with weighted average prices for primary CERs at about $10.50. The adjustment came ahead of speculation that EU allowances were going to be tightened in 2007. These average prices mask a wide range based on the specific terms of the contracts.

Primary CERs transacted at a weighted average price of $11.10 in the first quarter of 2006, but fell slightly to $10.35 over the next two quarters. This indicates a correlation between EUA and CER prices, insofar as the latter declined by 7% (although the decline was substantially lower than the fall in EUA prices) after May 2006.

Much of the uncertainty that surrounded the future of the Kyoto Protocol dissipated with the Russian Parliament's approval of Kyoto. Now, however, a key market uncertainty is whether or how Russia will affect the world price for carbon by restricting supply or in other ways exercising market power.[10] Russian "hot air", coupled with Washington's repudiation of Kyoto, will probably create a vast surplus in the period 2008 to 2012, i.e., the global market will be oversupplied. This does not necessarily imply that prices will collapse, or even be lower. Analysis by Point Carbon[11] suggests that Russia could earn up to $10 billion by restricting supply. If Russia developed a full-fledged trading strategy involving both selling and buying allowances, this amount could be even higher.

Over-reliance on foreign investors tends to make African countries producers of low priced "raw carbon," which is bought cheaply on the primary market and resold on secondary ... markets at a higher price.

Project developers and market aggregators have been able to source primary CERs and resell them on the secondary markets. This is usually done through back-to-back transactions, often at a significant premium to the primary CER price. Precise information about such transactions is extremely difficult to obtain, but anecdotal evidence suggests that a disconnected market has recently emerged. European financial buyers were more likely to buy—and sell and resell—contracts involving a hybrid of guaranteed base prices with EUA-indexed prices. In 2006, Japanese compliance buyers were exploring secondary market transactions in the $15–17 range for fixed price contracts.

10 Since Russia's Kyoto target was to stabilize emissions at 1990 levels, but its emissions have decreased by nearly 30% since 1990 in part due to economic restructuring, Russia has potentially vast volumes of surplus GHG allowances to sell.

11 Point Carbon. *Carbon 2006* (Olso: Point Carbon, 2006).

Prices in the voluntary and retail carbon market segments have also increased, with weighted average prices reaching almost $10 in 2006. The range of prices also moved upward (the low end of the range increased from $0.65 in 2005 to $4.50 in 2006, while the high end of the range jumped from $9.36 to $12). The single biggest impediment to stronger demand and a predictably higher price for these assets remains the lack of a broadly accepted quality standard for voluntary projects that combines simplicity and consistent integrity.

Under some current practices, as I have experienced, parties negotiate a contract that offers a fixed price for part of the volume to be delivered (e.g., for 50%) and an indexed price for the remainder. For indexed transactions, prices are often linked to a market spot price (calculated on an agreed basis between the parties, most often to EUAs). Many contracts stipulate a minimum delivery volume and some include a call option for additional CERs. Some, although not all, of these contracts include a premium for the option. Delivery shortfalls in a particular year are often subject to a discount, sometimes 15–20% below the contracted CER price, payable upon delivery.

The way forward for Africa

African countries are only able to use the CDM since they do not have any GHG emission caps. Unlike Russia, international emission trading is not available to African countries. Host countries and African project sponsors could, however, self-finance CDM investments and trade CERs themselves, which is known as Unilateral CDM. Examples abound in India, China, and Brazil where projects and programs have been implemented, not for the sake of CDM, but for national development. These have resulted in huge emission reductions. The Brazilian gasohol program is a typical example.

African countries would be better off doing Unilateral CDM and selling CERs after issuance, thereby eliminating part of the project implementation risks that are driving down the offered price. For example, many African countries will fare better investing in local development solutions such as afforestation and reforestation projects, or undertaking large-scale biodiesel and bioethanol projects that reduce emissions.

Although Programmatic CDM appears to be an answer to problems associated with the lower relative volume of emission reductions, the issue of high transaction costs associated with project aggregation makes it difficult for African countries to pursue Programmatic CDM activities. African countries will have to embark on greater capacity building in terms of personnel and equipment in order to reduce the cost of such transactions. They also have to find ways to mitigate the political risks associated with the CDM.

Official development assistance (ODA) has an important role to play in many African countries to help CDM achieve its sustainable development goals. ODA is needed for activities including:

- designing and preparing pilot projects that can be taken to scale or replicated with carbon finance
- bridging the financing gap
- alleviating CDM transaction costs.

Despite the aforementioned challenges, it is gratifying to note that African countries have led the way in finding *innovative ways* to sequester carbon through afforestation and reforestation activities that deliver strong local community, environmental, and economic benefits (see Box 1).

Conclusion

Given the low potential CER volumes and the high perceived risk that surrounds African countries, the low prices being offered by investors to African countries will likely continue. The way forward is for Africans to develop Unilateral CDM projects, especially in the forestry and renewable energy sectors, where Africa has an edge. Afforestation and reforestation could: *(a)* replenish Africa's rapidly dwindling natural resources, *(b)* lead to propping up natural resources such as watersheds and biodiversity, *(c)* create jobs while, at the same time, while fostering an enabling environment for African participation in the CDM.

The new EU energy policy unveiled in January 2007 calls for a 30% cut (compared to 1990 levels) in GHG emissions, a 20% improvement in energy efficiency, and a 10% increase in the use of biofuels by 2020. The international community will enter the post-Kyoto era after that date, and it must start making plans now. Africa has an opportunity to enter into the market, now that EU policy points toward the continuance of efforts to reduce emissions worldwide.

The new policy calls for the EU to "speak with one voice" when dealing with third countries and form relations with them based on "transparency, predictability, and reciprocity." Africa must take its cue from this and begin to "speak with one voice" for sustainable development. After all, Africa will benefit more from homegrown CDM investments than foreign investments in primary CER generation. At the same time, urgent steps should be taken to build the human and institutional capacities, and the transparent regulatory frameworks, that are necessary to enable Africa to participate fully in the CDM.

Box 1
African LULUCF project examples

In Madagascar, the Andasibe-Mantadia Biodiversity Corridor Project will enhance native species viability, contribute to the restoration of degraded soils and lands, and stabilize hydrological flows through the creation of biodiversity corridors between protected reserves. The project will combine a reforestation component of 3,020 hectares (a CDM project) and innovate with an avoided deforestation component through fuel wood plantations and the establishment of forest and fruit gardens.

In Niger, a project will develop 8,800 hectares of acacia plantations on degraded land— mostly managed by local communities—to promote sustainable agro forestry. Its environmental benefits include: soil regeneration and erosion control, increased natural habitat for native species, raising the water table, fixing the dune, and wind and sun protection. Social benefits will include the creation of employment for the establishment of plantations, an increased income from Arabic gum sale, production of fuel wood and animal forage, and training communities in sustainable intercropping and plantation management.

In Uganda, the Nile Basin Reforestation Project will establish a plantation of pine and mixed native species in grassland areas within the Rwoho Central Forest Reserve. The plantation will be established in 64 blocks of 25 hectares each, grouped in 5 small-scale CDM projects. This cluster design allows for potential involvement of private and community-based investors. The project will sequester around 0.11 $MtCO_2e$ by 2012 and 0.26 $MtCO_2e$ by 2017. Environmental benefits of the project include the provision of suitable habitat for biodiversity, reduced erosion, induced discharge in water flows, and increased dry season flows. Fire management activities will also contribute to reduce the severe soil erosion in the area.

Charlotte Streck
Climate Focus

A TRANSACTIONAL ADVISOR'S PERSPECTIVE

Maximizing Revenue in CDM Transactions:

Strategies and Contractual Issues

This paper seeks to show how CDM project developers can mitigate risks through contracts that take into account the particularities of their project, and to assist them in selecting legal models that can maximize carbon revenue and enhance their project's attractiveness for financing. I begin by reviewing the most common transaction structures in today's carbon market, starting with a brief history of how CDM transactions have evolved. I then analyze the risks and opportunities associated with selling CERs, comparing forward sales with spot transactions, and follow by describing existing contract templates. In conclusion, I highlight the key issues that must be considered when drafting a contract.

The carbon market is based on the creation and transfer of emission (or carbon) rights. Such rights can be allocated under an emission trading scheme or created by pollution-reducing activities. the CDM, as defined in Article 12 of the Kyoto Protocol, introduces a baseline-and-credit system under which project developers[1] can earn emission rights for implementing projects in a developing country that leads to the removal or mitigation of GHGs. The rights created by such activity, also known as CERs, can be transferred to industrialized countries.

Cooperation between developing and industrialized countries on CDM projects can take various forms. It may involve the transfer of technology and knowledge, the provision of equity or project financing. In most cases, however, it is limited to the sale and purchase of CERs. Once a CDM project has reduced or removed GHG emissions that have also been verified by an independent, UNFCCC accredited auditor, CERs can be issued. These rights have an inherent value, and can be transferred and acquired independent of the activity that contributed to their creation.

1 The paper assumes that the project developers are also the owners of the CDM projects, thus holding title to ensuing carbon rights.

In general, contracts record agreements between parties, identify responsibilities, allocate risks, establish rights, and create clear and enforceable obligations. Carbon contracts describe the contractual arrangements under which CERs, and carbon rights in general, are transferred. For CDM projects, in particular, such contracts have to be innovative and robust enough to enable parties to implement and sustain cooperation, long after the initial developers and consultants have moved on to other tasks. They define relationships between parties in an emerging market characterized by uncertainty and risk.

CDM projects are often developed by entities that lack the means to obtain advice from international law firms. Unlike CER buyers, sellers are rarely represented in forums like the International Emission Trading Association (IETA) and do not have the capacity or resources to follow the international discussions in detail. Their legal advisors are, in most cases, generalists without specific expertise in the carbon market; therefore, the advice given here is practical in nature.

... such contracts have to be innovative and robust enough to enable parties to implement and sustain cooperation, long after the initial developers and consultants have moved on to other tasks.

The market: forward and spot transactions

Most CERs are transacted under sales and purchase contracts. Alternative contractual structures, such as those under which CERs are used to repay a loan, or to distribute dividends, do exist, but are much less common; therefore, I will focus here on contracts that foresee payment against transfer of CERs.

CERs are the product of a complicated project cycle involving the physical implementation of a GHG-reducing project and the completion of an international validation and verification process. From a developer's perspective, CERs are products that imply the implementation of a project, and require careful assembling to be completed. This CER generation process is prone to risk and potential failure. The buyer on the other hand sees CERs as a commodity to be purchased for trading or compliance purposes.

CERs that are issued and traded on secondary markets reach higher prices than CERs sold under forward contracts, because the latter still carry production risks. The price discount between CERs purchased on secondary markets and those purchased directly from project developers (i.e. primary CERs) reflects the project-specific construction, regulatory, and host country risks of the CDM project. Project developers can sell CERs at any point in the project cycle. The optimal timing will depend on appetite for risk as much as on financing and technical assistance needs.

Most CERs are sold under forward contracts. In a forward contract, the seller agrees to deliver a specific commodity to the buyer at some point in the future. Unlike futures contracts (which occur through a clearing firm), forward contracts are individually negotiated, and are not standardized. These CER forward contracts, or ERPAs remain the preferred contractual structure for most CER buyers.

In an increasingly sophisticated market, project developers have started to appreciate risk and opportunity. Upfront payments, flexible price structures, price re-openers, technical assistance, and

payment guarantees are now common features of ERPAs; most significantly, developers and other sellers have started to hold carbon credits back in anticipation of further price increases. Today, more and more sellers decide not to forward sell CERs, but rather to sell on the spot market. This is a risky proposition, particularly since the seemingly unstoppable upwards trend in EU ETS allowances and CER prices has started to reverse.

Project developers that can sell their CERs on the spot market may benefit from higher prices for a more secure product; however, they run the risk of not being able to cash in on this advantage if prices drop further. On the other hand, if prices rise, then the pay-off for those who can afford to speculate could be even greater than today.

Risks and opportunities for project developers

Project developers should carefully evaluate their options to market and sell the CERs they expect to generate. This is not easy. Many developers are small-to-medium-sized entities located far away from sophisticated markets and the centers of carbon expertise. While the internet holds a wealth of information, not all sources are reliable, and much of what can be found is contradictory, or based on an insufficient understanding of the market. Ironically, the rapid development of the international carbon market has led to a situation where the generation of knowledge cannot keep pace with the availability of funds and supply of CERs.

Table 1

Comparison of forward and spot transactions

	Forward contracts	**Spot market contracts**
Financing	• Allows for advance payments • Future CERs can serve as collateral for bridge financiers	• A financier may take the prospect of future CER spot sales into account
Market and price risk	• Price risk normally shared • An advance payment adds risk for the buyer	• Seller takes price risk • Premium CER prices
Cash flow	• Forward contracts guarantee stable cash flow	• No predictable cash flow • Seller should not be dependent on the CER revenue to meet debt repayments or ongoing operational costs
Production and delivery risk management	• To be negotiated • Seller should be careful in accepting delivery guarantees	• The CERs are production risk free • Seller assumes the delivery risk
Contractual arrangement with the buyer	• Individually negotiated long-term off-take and financing agreements	• Highly standardized spot contracts (once the ITL is operational, quick, direct transfer of CERs is expected)
Pricing	• Negotiated forward price that reflects the risk sharing and expectations of the parties at the time of signing	• Depends on the market value of CERs at the time of trade

Table 2

Strategic checklist for CDM project developers

Is the CER cash flow essential for my project?	• If yes, the sales strategy should be risk averse. • Sell at least a part of future CERs under a forward fixed-price contract. • The CER revenue should be sufficient to cover the project investment and operating costs.
Do I need additional funds to cover my investment costs? Do I need an advance payment?	• If yes, find a buyer willing to make advance payments. • Evaluate the possibility of issuing a guarantee for the advance payment (parent/performance guarantee, or a LOC). • Compare whether the discount for any advance payments is attractive compared to the cost of financing.
How would outsiders value my company? Do I have any credit rating or a balance sheet backing the transaction?	• The credit rating and reliability of the seller will influence the buyer's purchase decision, particularly if an advance payment is involved.
Would I benefit from technical advice and knowledge transfer?	• If yes, consider choosing a buyer knowledgeable about the relevant project type or technology. • By providing advice and reviewing the project design and implementation, the buyer will share some of the project risks.
What is the general risk profile of my project?	• Carefully evaluate the project's ability to generate CERs. Project-related risks include: the risk of obtaining financial closure, technical and project design risks, supply and construction risks, and regulatory and political risk. • Be conservative. Developers tend to underestimate project risks. • If the project is very risky, be conservative in CER projections and avoid delivery guarantees.
What are the CDM-specific risks of my project?	• CDM project risks need to be evaluated separately. • CDM project risks include: the validation and registration risk, the baseline risk, the risk of a highly political regulator (the Executive Board).
How large is the project's CER yield? How many will I have to sell every year and over the crediting period?	• Smaller CDM projects that generate few CERs (under 70,000 CERs/year) should opt for simple and cost-efficient transaction structures. • Bigger projects can adopt more sophisticated sales and marketing strategies. Consider combining secure with riskier transaction structures, and entering into more than one contract.
Is this my only CDM project or do I have more projects in the pipeline?	• Consider bundling several projects under one contract. • Consider selling CERs from a project pool, thereby hedging the delivery risk for each.
Do I have full market access?	• Degree of market access often determines a marketing strategy. • Consider getting professional advice before starting to market CERs.
What price do I expect and which price can realistically be achieved under a forward contract?	• Solicit price offers from various buyers. • The price will depend on the risk profile of the project and the seller's negotiation skills.

Development of a sales strategy

As a first step in determining a CER sales strategy, a project developer should carefully assess their position in the market and expectations from potential buyers. See table 2 for a list of points to consider when positioning a project in the market.

Enhancing financing through the CDM

Many CDM project developers operate within capital-constrained environments. This is partly a "hangover" from the rash of failed independent power producer investments in many markets in the 1990s, which left investors particularly risk averse to the power sector. "New" energy technologies have a higher perceived risk, because investors are still working their way up the learning curve. Risk management tools (e.g., insurance) can reduce this risk, but in-depth knowledge of their use will only follow actual investment experience, or a commercial track record. Another challenge faced by project developers is scale. Major banks are reluctant to finance small projects; in many cases financing under several milion euro will not be considered by big financial players. In this context, the CDM and carbon markets have helped to access new sources of financing.

A project's CDM potential may help to attract financing or close an investment gap. Most CER forward contracts are long-term off-take agree-

ments. A variety of project financing models in the power and utilities sector exist, whereby such agreements are used as the primary source of repayment for construction and term financing (e.g., power purchase agreements). A project developer in need for financing might consider the following options:

[D]evelopers and other sellers have started to hold carbon credits back in anticipation of further price increases.

Advance payments

A project developer could negotiate an advance payment against future delivery of CERs. It is, however, difficult to find buyers willing to advance more than 50% of the expected yield. Advance payments normally come with a discount applied to the CER price. Many buyers also require a guarantee covering the advance payment. Still, this is often the cheapest way to raise money.

Securitization

Alternatively, the project developer may assign the value of a future CER revenue stream as collateral to a lending institution. Finding a lender who would attribute value to an ERPA used to be quite difficult, but an increasing number of financial institutions recognize the security provided by a flow of CERs, and its associated cash. In addition to traditional finance institutions, a number of boutique banks that specialize in providing financial services to the carbon market have emerged.

A condition for such contract-based revenue financing is that the ERPA it must be clear, concise, and legally enforceable. They must also appropriately allocate risks between the project developer, or sellers, and the buyers. As financing institutions step into the shoes of the CDM developer, and begin to take on many of their rights and obligations, risk allocation becomes crucial.

Equity investment

Finally, the project developer may attract specialized equity investors. Private investors and funds are selectively investing equity in specific types of CDM projects and operating entities, and in certain geographical areas. Priority or preferential access to the CER rights is often a precondition of these investors. This upside potential can allow developers to attract capital at terms or volumes beyond usual lending practices.

The evolution of carbon contracts

Carbon contracts describe the legal arrangement under which emissions rights are transacted. In their simplest form, they are standardized sales and purchase agreements transacting a defined and existing right. Such contracts are being used under regulatory regimes such as the EU ETS or the US SOx/NOx trading system. Similarly simple contracts are used to trade CERs in the secondary market. Forward CER contracts tend to be more tailor-made, reflecting the specifics of a particular project.

When the CDM was defined in the last hours of the Kyoto negotiations, few diplomats had the vision to create an operational worldwide emission trading mechanism. Neither legal instruments nor contractual models had been defined when the pioneers—the World Bank (through its Prototype Carbon Fund) and the Dutch Government (through its CER Purchase Tender) started to do CDM deals. Article 12 of the Kyoto Protocol was the sole source of knowledge and, as such, said nothing with respect to implementation. Many

negotiators had expected that the CDM would trigger direct investments by industrialized countries into projects.

As it turned out, the assignment of value to carbon credits was easiest to achieve under a sales-and-purchase transaction. The first carbon contract templates were, therefore, developed as ERPAs. Since then, ERPAs have become the standard format for forward purchases of CERs.

The World Bank and IETA have developed template ERPAs that are publicly available. As the carbon market has grown, these templates have helped to shape standard industry practice, and encapsulate much of the intelligence in this emerging legal discipline; however, the contracts are sophisticated and relatively inaccessible to project developers lacking previous experience with carbon transactions.

Existing models: World Bank and IETA ERPAs

The actual World Bank ERPA is based on non-negotiable "General Conditions"[2] and a CDM CER Purchase Agreement.[3] The use of General Conditions guarantees consistency across World Bank contracts. It facilitates both a management approval of the transactions, and the implementation and compliance monitoring. One disadvantage is, however, that a counterparty's ability to negotiate alternative arrangements with the World Bank is limited.

The basis of the IETA ERPA is a Code of CDM Terms (version 1.0 2006), also known as "the Code."[4] IETA encourages the use of the Code, either in conjunction with its own ERPA template or separately. The legal and commercial details of the ERPA can be found in its annexes. Annex One allows the user to incorporate referenced provisions from the Code into the ERPA. Annex Two summarizes the commercial terms of the transaction. This system - constructing the agreement through referencing - turns the ERPA into a rather complicated legal document.

Both the World Bank and IETA have tried to standardize ERPAs. While the World Bank's main aim was to standardize its own transactions, IETA had the more ambitious objective of developing a standardized agreement for the whole carbon market. Market participants generally appreciate such efforts; however, experience also shows that CDM projects come in all shapes and sizes. Regional context, project type, project size, financial status, and nature of the project owner all determine the conditions of forward CER transactions. Following the needs of the project, agreements governing the transfer of CERs on the primary market continue to vary greatly. Unlike CER spot trades and secondary market transactions, the primary market is less prone to make use of standardized contracts. It is therefore un-

Finding a lender who would attribute value to an ERPA used to be quite difficult, but an increasing number of financial institutions recognize the security provided by a flow of CERs, and its associated cash.

2 See Web site for The World Bank, Carbon Finance Unit, " General Conditions Applicable to Certified Emission Reductions Purchase Agreement," 1 February 2006, http://carbonfinance.org/docs/CERGeneralConditions.pdf.

3 See Web site for The World Bank, Carbon Finance Unit, "CER ERPA Template," http://carbonfinance.org/Router.cfm?Page=DocLib&CatalogID=28153. The World Bank also offers a VER Purchase Agreement.

4 See Web site for International Energy Trading Association, "IETA CDM Code of Terms v1.0," 9 November 2006, http://www.ieta.org/ieta/www/pages/getfile.php?docID=1794.

likely that any standardized ERPA will be used widely without modifications and adaptations to suit the specific project in question.

It is worth mentioning another publicly available template. A group of lawyers, predominantly from developing countries, convened in order to develop a new contract template: the CER Sales and Purchase Agreement (CERSPA).[5] Their objective was to help sellers to gain equal footing with more experienced buyers. The agreement and supporting documentation are expected to continue to evolve over time as more lawyers, project developers, and other stakeholders use it and provide their input and expertise. This new model contract consists of one document without references to codes or conditions and aims to be more understandable to users without specialized legal training.

In many instances, these forward contracts include delivery guarantees, penalties, and strict enforcement clauses. These clauses can easily turn a carbon contract from an asset into a liability.

Main contractual clauses

It is important that anyone selling CERs under a forward contract receive proper legal advice. The CDM provides project developers with an opportunity to access a hard currency cash flow and to leverage upfront financing; however, this money comes at a price. In many instances, these forward contracts include delivery guarantees, penalties, and strict enforcement clauses. These clauses can easily turn a carbon contract from an asset into a liability. This obviously could undermine the usefulness of such a vehicle to secure debt financing and put at risk the whole project, and even the company behind it. Many carbon contracts are also still missing elements common to other long-term purchase agreements, such as price adjustment clauses, inflation adjustment, or limitations of liabilities.

Looking at the various contractual clauses included in an ERPA, a project developer should pay particular attention to the following points:

What is being sold?

CERs are a highly regulated commodity, and can only result from a CDM project registered with the EB. Because of their inherent value under the Kyoto regime, and their fungibility under EU ETS, they are traded at a premium compared to voluntary, unregulated emission rights. Some project owners elect, however, to sell VERs in order to shift the regulatory risk (i.e., acceptance and approval of the project as CDM) to the entity acquiring the emission reductions. Alternatively, a project may not be eligible to generate CERs under the CDM, but is developed to generate offsets for the voluntary market. If VERs are to be contracted, attention should be paid to their definition: a VER is a contractual right that is created and defined on the basis of an individual contract. The definition is, therefore, crucial for determining the robustness of the right.

5 See http://www.cerspa.org

How should the right quantity of CERs/VERs be set?

It is advisable to be prudent and conservative when establishing the quantities of CERs/VERs to be sold. Most developers and consultants tend to be overly optimistic with respect to the yield of emission reductions. The quantity calculated in PDDs has, in most cases, proven to be higher than that actually produced.

A seller of forward CERs/VERs must carefully consider whether the conditions of delivery can be realistically met over the lifetime of the contract. Sellers should not give any guarantees regarding delivery of annual quantities of credits unless they are sure that the project will generate them. Careful risk assessment is necessary, particularly in cases where the seller accepts penalties for under-delivery. Hedging the shortfall risk, the seller may decide to sell percentages of annual CER/VER yields instead of promising the delivery of firm quantities. An alternative solution may be to include annual nonbinding target quantities into the contract. If the contract contains enforceable and penalized default values, they should be set low enough to allow for some (structural) delivery. Acceptance of any delivery guarantees (annual or total) should command a price premium.

When and where does the seller have to deliver CERs/VERs?

In most carbon contracts, delivery is defined as the receipt of CERs in a registry account nominated by the buyer. This definition implies that the seller carries the transfer risk, accounting for the possibility that the EB will not issue the CERs and that the registry administrator will not transfer the CERs into the relevant registry account. When delivery is defined as such, a seller should control the communication with the EB. One should avoid a situation where fulfillment of a delivery obligation is dependent on an activity by the buyer.

There are no precedent cases indicating how courts or arbitration panels may interpret carbon transactions. It is, however, likely that carbon contracts will soon become subject to dispute ...

CER sellers should further be wary of accepting firm delivery dates. They do not fully control the commodity they sell. They often do not hold registry accounts, and arrange for delivery of CERs directly from the pending account of the CDM registry. The registry administrator transfers CERs based on instructions from the project participant. The administrator should make this transfer promptly, but a predefined time frame is usually not specified. Thus, the last step is not in the seller's hands, even after arranging for timely verification and submission of CER verification and certification reports to the EB for contractually compliant delivery.

When and how is the seller paid?

If a seller needs the carbon revenue to service a loan or to make other annual payments, then the contract should be structured in such a way as to ensure that payments are due around the same time of each year. The contract should include a section for agreeing on price, calculation method, currency and payment period, and an agreement on the allocation of responsibilities regarding the payment of fees and taxes. The seller is also advised to add a clause whereby if applicable taxes increase beyond an acceptable threshold, the contract can be adapted or terminated.

Who is responsible for the registration of the project as a CDM activity?

Provided the project in question has not yet achieved international approval and registration, the contract should contain clauses allocating the responsibilities for achieving project registration and should equally ensure therein enough time for this process. In the vast majority of cases, the seller is responsible for registration. The contract should build in some form of margin allowing for potential delays with the approval of the methodology, or for the possibility that the project activity will be subject to a request for review at registration. It may be wise to make registration a condition precedent to the effectiveness of the contract. This way, parties avoid delivery obligations becoming valid before there is a registered project. The contract should also contain arrangements for ensuring that the project is implemented in accordance with applicable CDM rules.

What happens in case of a shortfall in delivery?

Clauses that apply in the case of a delivery shortfall have to be negotiated with particular care. Liabilities arising from a delivery shortfall create significant risk for the seller and their projects. If buyers insist on listing annual delivery volumes, such quantities should be nonbinding, or only trigger comparatively mild remedies. To account for instances where a project under-delivers CERs, and buyers need to reallocate funds, the project developer may accept a clause that allows the buyer to reduce the purchase commitment in case of structural under-delivery.

Many contracts also limit damages and/or penalty clauses to cases in which under-delivery was produced by willful misconduct, intentional breach, or gross negligence. When a buyer insists that the seller provide for damage and/or penalty payments in case of under-delivery, the seller may reduce some of the resulting risk by negotiating a wide definition of *force majeure*.

What are the other default and remedy clauses?

The seller should consider the consequences of each default provision. These typically include material breach of the contract, and insolvency, or bankruptcy, of the seller. Other contracts add more specific clauses such as delays in construction and commissioning, delays in registration, or changes in the ownership structure, or design of the project. In any of these cases, the seller should not accept any clauses that could force the project owner to implement measures against the project's best interest. Not all measures that increase the yield of CERs are reasonable improvements of the project.

Which law governs the contract and what is the chosen dispute settlement mechanism?

So far, few carbon contracts have become subject to open dispute. There are no precedent cases indicating how courts or arbitration panels may interpret carbon transactions. It is, however, likely that carbon contracts will soon become subject to dispute, which makes defining an appropriate dispute settlement imperative.

The absolute majority of contracts establish arbitration as the mechanism to settle disputes. Counterparties are reluctant to submit themselves to the jurisdiction of a local court, in particular in countries with weak and overloaded judiciaries. Appropriate sets of rules to govern carbon contracts include: The Permanent Court of Arbitration's Optional Rules for Arbitration of Disputes Relating to Natural Resources and/or the Environment; the International Chamber of Commerce Arbitration Rules, and United Nations Commission on International Trade Law (UNCITRAL) rules.

Regardless of whether the negotiating parties have experience in CDM and carbon transactions, the choice of governing law will almost certainly come up during contract negotiations. It is the reflex of almost any lawyer to request the law in which she was educated as the governing law. Western trained lawyers familiar in transactions on international financial markets may also agree to New York law. The English law often constitutes an acceptable compromise in international contracts.

It is also worth taking a closer look at the jurisdiction of the host country. The project will be implemented in the legal and regulatory context of the host country, and most project-related contracts are governed by host country law. The carbon contract should be read in conjunction

with any other contracts governing the project. Host country law may also become relevant when enforcing an arbitration award. While sellers are almost certainly comfortable using local governing laws, more and more buyers may finally be convinced to do so as well.

Carbon contracts need to be both flexible and robust. ... It is therefore important that they include the obligation of the parties to cooperate.

Are the liabilities of the parties limited?

In order to allow a seller (and buyer) to calculate their exposure under the contract, the remedies and liabilities should be final and exclusive. When a seller accepts damages clauses, they should strive for capping its liabilities. This is particularly important in cases where a financial institution views the ERPA as collateral for a loan, or where a carbon contract forms part of a structured financial product.

What about the case of a force majeure event or market upheaval?

Carbon contracts need to be both flexible and robust. They have to be structured to accommodate insecurities, react to changes, and be adaptable all at the same time. It is therefore important that they include the obligation of the parties to cooperate. A CDM project developer should seek that the force majeure clause covers regulatory events beyond its control, including the activities of the EB. Finally, counterparties should consider including clauses that allow termination, or adaptation, of the contract in case of massive market changes.

Conclusion

The CDM draws on markets to provide the economic incentives to promote sustainable development. The early CER market was dominated by government and institutional CER buyers, but the last two years have seen an increased interest on the part of private entities. By now most of the new money flowing into international carbon markets comes from private sources. Increased demand for CERs has put project developers in the position of being able to choose between various buyers and offers. The evaluation of such offers requires that developers carefully assess their needs and demands, as well as their perspective on the state of the carbon market.

Price is an important feature of each offer; however, it is not the only one—not even the only important one. If a project developer decides to sell CERs under a forward contract, it is likely that this contract will span over several years, in most cases until early 2013. Taking into account the risks associated with the generation of CERs, buyers and sellers need to closely cooperate in the implementation of the agreement. In this situation, a project developer is advised to choose a CER buyer who has some technical understanding of the project, and potential delays and hurdles in its implementation. It is worth spending time studying the full implications of the carbon contract one is about to sign. Banks and legal experts may further help highlight risk areas. In sum, CDM project developers are advised to look for a partner rather than just a buyer—one who can share knowledge as well as risks.

List of Acronyms

AAA	highest credit quality
AAU	Assigned Amount Unit
ACX	Asia Carbon Exchange
AE	Applicant Entity
AFOLU	Agriculture, forestry, and other land use
BAU	business as usual
CARE	carbon asset risk evaluation
CDCF	Community Development Carbon Fund
CDG	carbon delivery guarantee
CDM	Clean Development Mechanism
CER	Certified Emission Reduction
CERSPA	CER Sales and Purchase Agreement
CERUPT	Certified Emission Reduction Unit Procurement Tender
CMM	coal-mine methane
CoP/MoP	Conference of the Parties/ Meeting of the Parties
CO2e	carbon dioxide equivalent (emissions)
DNA	Designated National Authority
DNV	Det Norske Veritas
DOE	Designated Operational Entity
DPA	Direct Purchase Agreement
DSCR	debt service coverage ratio
EB	Executive Board (of the CDM)
EC	European Commission
ECF	European Carbon Fund
EE	energy efficiency
EIT	economies in transition
ERPA	Emission Reduction Purchase Agreement
ERU	Emission Reduction Unit
EU	European Union
EU-15	Comprising the following 15 countries prior to the accession of 10 candidate countries on 1 May 2004: Austria, Belgium, Denmark, Finland, France, Germany, Greece, Ireland, Italy, Luxembourg, Netherlands, Portugal, Spain, Sweden, and the United Kingdom
EU ETS	European Union Emission Trading Scheme
EUA	European Union Allowance
EUT	expected utility theory
GEEL	Global Energy & Environment Ltd.
GEEREF	Global Energy Efficiency and Renewable Energy Fund
GHG	Greenhouse Gas
GIS	Green Investment Scheme
GS-CAP	Greenhouse Gas Credit Aggregation Pool
HCFC	hydroclorofluorocarbon
HFC23	trifluromethane
tCER	temporary CER
IET	International Emission Trading
IETA	International Emission Trading Organization
IFC	International Finance Corporation
IPO	Initial Public Offering
IPP	independent power producer
ISDA	International Swaps and Derivatives Association
ITL	International Transaction Log
JBIC	Japanese Bank for International Cooperation
JETRO	Japanese External Trade Organization
JI	Joint Implementation

KfW	Kreditanstalt für Wiederaufbau
kWh	kilowatt hour
lCER	long term CERs
LoA	Letter of Approval
LoE	Letter of Endorsement
LOC	letter of credit
LULUCF	Land use, land-use change, and forestry
MENA	Middle East and North Africa
MtCO2e	Megatonne of carbon dioxide (emissions)
MPP	merchant power plant
MW	megawatt
MWh	megawatt-hour
N2O	nitrous oxide
NAP	National Allocation Plan
NCCC	National Committee on Climate Change (of China)
NDRC	National Development and Reform Commission (of China)
NETS	National Emission Trading Scheme (Australia)
NOx	Nitrogen oxides
OBA	Output-Based Aid
ODA	Official Development Assistance
OECD	Organisation for Economic Cooperation and Development
ONDD	Office National Du Ducroire
OTC	over-the-counter
PCF	Prototype Carbon Fund
PCN	Project Concept Note
PDD	(CDM) Project Design Document
PFC	Perfluorocarbons
PIN	Project Idea Note
RGGI	Regional Greenhouse Gas Initiative
RIT	CDM Registration and Issuance Team
RMU	(GHG) Removal Unit
SO2	Sulfur dioxide
SOx	Sulfur oxide
SSA	Sub-Saharan Africa
tCER	Temporary CERs
UN	United Nations
UNCITRAL	United Nations Commission on International Trade Law
UNEP	United Nations Environment Programme
UNFCCC	United Nations Framework Convention on Climate Change
US EPA	United States Environmental Protection Agency
VER	Verified Emission Reduction
WWF	World Wide Fund For Nature
/tCO2	per tonne of carbon dioxide (emissions)
/tCO2e	per tonne of carbon dioxide equivalent (emissions)

The annual CD4CDM Perspectives Series will feature a topic of pivotal importance to the global carbon market. The series seeks to communicate the diverse insights and visions of leading actors in the carbon market to better inform the decisions of professionals and policymakers in developing countries. The first theme of the series focuses on determining an 'equal exchange' between carbon buyers and sellers in CDM transactions. Each of the contributors presents their perspective on the emerging market for emission reductions—its structure, dynamics, and likely evolution—as well as how these and other factors, such as risks and financing, influence the negotiation power of CDM project sponsors. These insights can help CDM stakeholders to better understand each others' needs and to maximize the benefits accruing to all parties through more equitable transactions.

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