



State and Trends of the Carbon Market 2005

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Franck Lecocq, Development Economics Research Group, World Bank¹
Karan Capoor, Carbon & Environmental Finance, Africa Region, Environment and
Sustainable Development, World Bank

Based on data and insights provided by Evolution Markets LLC and Natsource LLC

May 9, 2005

¹ The findings and opinions expressed in this paper are the sole responsibility of the authors. They do not necessarily reflect the views of the International Emissions Trading Association (IETA) or of IETA member companies, who cannot be held responsible for the accuracy, completeness, reliability of the content of this study or non-infringement of third parties' intellectual property rights. The findings and opinions expressed in this paper also do not necessarily reflect the views of the World Bank, its executive directors, or the countries they represent; nor do they necessarily reflect the views of the World Bank Carbon Finance Business Team, or of any of the participants in the Carbon Funds managed by the World Bank. Finally, findings and opinions expressed in this paper do not necessarily represent the views and opinions of Evolution Markets LLC or of Natsource LLC. The CF-Assist program of the World Bank Carbon Finance Business funded this research.

EXECUTIVE SUMMARY

The carbon market encompasses both the *generation of emission reductions (ERs)* through *project-based transactions* where a buyer purchases ERs from a project that produces measurable reductions in greenhouse gases (GHG), and *trading of GHG emissions allowances* allocated under existing (or upcoming) cap-and-trade regimes such as the European Emissions Trading Scheme (EU ETS).

This study reviews the state and trends of the carbon market as of May 2005, based on material provided by Evolution Markets LLC and Natsource LLC, and based on interviews with a large number of market participants. Its main findings are as follows:

- The regulatory framework of the carbon market has solidified considerably in the past 12 months, with the start of operations of EU ETS on January 1, 2005 and the entry into force of the Kyoto Protocol on February 16, 2005. While regulatory uncertainty continues, notably for the registration of Clean Development Mechanism (CDM) projects by the CDM Executive Board, the approval of climate mitigation plans in Japan and Canada, or the allocation plans under the EU ETS for the 2008-2012 period, the very existence of policies constraining GHG emissions up to 2012 is no longer in doubt.

Project-Based Transactions

- The market for project-based ERs is still growing steadily: 107 million metric tonnes of carbon dioxide equivalent (tCO₂e) have been exchanged through projects in 2004, a 38% increase relative to 2003 (78 mtCO₂e). We estimate that the volume exchanged so far in 2005 (January to April) is 43 MtCO₂e, most of which under either Joint Implementation (JI) or the CDM. In the past 12 months, the number of JI and CDM projects under development has also increased substantially, with notably a large supply of unilateral CDM projects.
- New buyers of emission reduction have emerged. Private and public entities in Europe now represent 60% of the volume of ERs purchased through project-based transactions (Jan. 2004 to April 2005), against 21% for private and public entities in Japan and 4% for private entities in Canada.
- The supply of emission reductions has remained heavily concentrated in a few countries: notably India—by far the largest supplier of project-based ERs on the market—, Brazil and Chile. Apart from a few small-scale deals, poorer or smaller countries have seen limited activity since January 2004. Africa, in particular, has seen to our knowledge only one new large-scale transaction during that period and, in comparison with other regions, has relatively few projects in preparation.
- HFC₂₃ destruction² is still the dominant type of emission reduction projects in terms of volumes supplied (25% from January 2004 to April 2005). Projects capturing methane and N₂O from animal waste now rank second (18%), ahead of hydro, biomass energy and landfill gas capture (about 11% each). Projects abating non-CO₂ emissions account for more than half of the total volume supplied, while traditional energy efficiency or fuel switching projects, which were initially expected to represent the bulk of the CDM, account for less than 5%.
- Due to the heterogeneity of the underlying projects and contracts terms, the spread of prices of project-based emission reductions at any given time is very large. The whole spread has also moved substantially upward since last year's report. Verified Emission Reductions have traded

² HFC₂₃ is a by-product of the production of HFC₂₂, which is used as a refrigerant and as a raw material for the production of fluorinated resins. HFC₂₃ is a very potent greenhouse gas. The release of one ton of HFC₂₃ in the atmosphere has the same long-term effect on climate change than the release of 11,700 tonnes of CO₂.

between \$3.6 and \$5/tCO₂e between January 2004 and April 2005, with a weighted average of \$4.23. Certified Emission Reductions have traded between \$3 and \$7.15/tCO₂e over the same period of time, with a weighted average of \$5.63/tCO₂e.³ The decline of the dollar relative to the euro can explain only part of the observed increase relative to last year.

Allowance Markets

- There are four active markets for GHG allowances as of May 2005: the EU ETS, the UK Emissions Trading System, the New South Wales trading system and the Chicago Climate Exchange. Volumes exchanged on these allowance markets has increased dramatically compared with last year, and is now comparable to the volumes exchanged through project-based transactions. Cumulative volume exchanged on these four markets from January 2004 to March 2005 is about 56 MtCO₂e.
- Of the four allowance markets listed above, the EU ETS is the largest, with an estimated 39 MtCO₂e exchanged since January 2004, the bulk of which was transacted since January 2005.
- Unlike project-based assets, allowances are homogeneous assets, and purchase contracts for allowances are fairly homogenous as well. As a result, the spread of prices for EUAs at any given point in time is small. In other words, one can speak of “the” price of EUAs.
- EUAs traded between €7 and €9 in 2004, but their price has increased substantially in recent months, to reach more than €17 in March and April 2005.

Price of EUAs vs. Price of JI/CDM ERs

- The widening gap between prices of carbon in JI / CDM and in the EU ETS is raising concerns from project sponsors and host countries. Three sets of elements can explain this differential.
- First, the markets for EUAs and for JI/CDM ERs are very different. Project-based ERs, as long as they have not been registered and delivered, are subject to important registration and delivery risks. By contrast, EUAs are government-issued, compliance-grade assets. And delivery risks in forward contracts for EUAs within Europe are likely to be smaller, on average, than in contracts for forward delivery of project-based ERs from developing countries.
- Second, the two markets are only partially connected. Precisely, for a project-based ER to be valid under the pilot phase of the EU ETS (2005-2007), the seller must be able to guarantee delivery of CERs from the 2005, 2006 or 2007 vintages, which can be challenging. In addition, certain technical aspects of the import of CERs into the EU ETS are still subject to some uncertainty.
- Third, there are reasons to believe that the current prices of EUAs does not reflect long-term equilibrium price between supply and demand on the EU ETS: few entities are selling allowances, there are still large uncertainties over some national allocation plans, and weather and high oil prices have had an important impact on prices. Relatively thin volumes traded so far have also resulted in high price volatility.

Outlook

- Taken together, these developments suggest that the carbon market is responding to the ratification of the Kyoto Protocol and to the beginning of operation of the EU ETS. Increased

³ It must be noted, however, that we have price information for only part of the transactions recorded in our database.

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activity, both on project- and on allowance-based markets is extremely likely in the coming years.

- Major uncertainties remain however, notably the absence of any price signal for emission reductions beyond 2012, which limits the impact of carbon finance on CDM in projects with regular lead times. The amount of AAUs that Russia and Ukraine will supply to the market is also a key uncertainty for the medium-term balance between supply and demand on the carbon market.

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1. INTRODUCTION

Several governments, firms and individuals are taking steps to reduce their greenhouse gases (GHG) emissions either voluntarily, or, increasingly, because of current or expected regulatory constraints. Since GHGs mix uniformly in the atmosphere, it is equivalent from an environmental standpoint to reduce emissions anywhere in the world regardless of political jurisdiction. Most of the regulations constraining GHG emissions take advantage of this property of “substituability” and allow for the purchase of emission credits both within and outside of the regulated area, thereby laying the ground for a global “carbon market”.

Among the markets for environmental services currently in operation, the carbon market is the only one, to our knowledge, with worldwide reach. Since abatement costs are thought to be lower in transition economies and in developing countries, the carbon market is an opportunity not only to generate global efficiency gains, but also to contribute to sustainable development by bringing new public and private investment in clean technologies to economies in transition and to developing countries.

As the reader will quickly appreciate, there are in fact several carbon markets, which involve different underlying assets, contractual structures, and governing regulations. These markets are linked, but not fully interconnected. The objective of this study is to review where these markets stand as of May 2005, and to discuss some of the trends that we see emerging. It is the fifth annual review of the carbon market prepared by the World Bank Carbon Finance Business,⁴ this year in partnership with the International Emissions Trading Association.

The study is organized as follows. Section 2 describes the structure and main segments of the carbon market. Section 3 explains the methodology that was followed to conduct the analysis. Sections 4 and 5 focus on project-based transactions, and particularly on Clean Development Mechanism (CDM) and Joint Implementation (JI) projects. Section 6 focuses on allowance markets, and particularly on the EU Emissions Trading Scheme (EU ETS). This section also discusses the relationships between the EU ETS and the JI and CDM market. Section 7 presents the major trends that we see emerging, and section 8 offers some concluding remarks.

Since most of transactions on the carbon market are over the counter, with few details, if any, made public, we have gathered data from two major players in the market, *Evolution Markets LLC* and *Natsource LLC*. We have also conducted interviews with a large number of market players, including various IETA members, various participants in the World Bank carbon funds, other consultants, project developers, and non-profit and multilateral organizations. We are extremely grateful to all of them. Without their cooperation, it would be difficult, if not impossible, to provide an extensive review of the carbon market such as this one.

We must emphasize, however, that the views and conclusions expressed in this study are solely those of the authors. They do not necessarily reflect the views of any of the individuals and organizations that we have consulted.

⁴ The previous reports are available online at www.carbonfinance.org.

2. THE STRUCTURE OF THE CARBON MARKET

2.1 Two Main Types of Carbon Transactions

In this paper, we define *carbon transactions* as purchase contracts whereby one party pays another party in exchange for a given quantity of GHG emissions “credits” that the buyer can use to meet its objectives vis-à-vis climate mitigation. Payments can take various forms, such as, for example, cash, equity, debt, or in-kind contributions, such as providing technologies to abate GHG emissions.⁵

Carbon transactions can be grouped in two main categories:

- *Allowance-based transactions*, in which the buyer purchases emissions allowances created and allocated (or auctioned) by regulators under cap-and-trade regimes, such as Assigned Amount Units (AAUs) under the Kyoto Protocol, or EU Allowances (EUAs) under the EU ETS.
- *Project-based transactions*, in which the buyer purchases emission credits from a project that reduces GHG emissions compared with what would have happened otherwise. Some project-based transactions are conducted to meet voluntary targets, but most are ultimately intended for compliance with the Kyoto Protocol or other regulatory regimes.

In cap-and-trade regimes, project-based transactions allow for the creation of new assets that can be used for compliance, above and beyond the initial supply of allowances. For example, Emission Reduction Units (ERUs) created through JI projects and Certified Emission Reductions (CERs) created through CDM projects can both be used to meet obligations under the Kyoto Protocol, in addition to AAUs. There is thus no fundamental difference in quality between allowances and project-based credits, *once the latter are issued*.

But all project-based transactions so far have been signed *before* the project-based credits were issued. In fact, no CER (or no ERU for that matter) has been issued as of yet. And purchasing project-based credits before they are issued involves more risks than purchasing allowances, and often significantly more so. For example, issuance of the credits now depends on such issues as whether the project performs correctly, or whether the credits are finally validated under the targeted cap-and-trade regime.

As we will see below, the risk of non-issuance varies depending on the nature of the project and on the targeted cap-and-trade regime. There are also many ways by which it can be shared between the buyer, the seller, and in some cases third parties. But the existence of a non-issuance risk remains the major difference between the allowance- and the project-based transactions that we report in this study.

2.2 Segments of the Carbon Market

As noted in the introduction, buyers mostly engage in carbon transactions because of regulatory pressures (present or anticipated), at an international, national or sub-national level. The main

⁵ On the other hand, we restrict the analysis to transactions where carbon credits are effectively measured and transferred. We thus exclude, for example, projects under the climate change focal area of the Global Environmental Facility, which might reduce GHG emissions, but where no credit is transferred.

regulations that constrain GHG emissions and allow for carbon transactions are listed below.⁶ They define different *segments* of the carbon market.

The *Kyoto Protocol* (1997) calls for industrialized countries and economies in transition—the so-called Annex B countries—not to exceed certain GHG emission targets during the first commitment period, that is between 2008 and 2012. In addition to domestic policies and measures, Annex B Parties can meet their targets by purchasing AAUs from other Annex B Parties, and by contributing to emissions-reducing projects both in Annex B countries (through Joint Implementation or JI), and in non-Annex B countries (through the Clean Development Mechanism or CDM).

The EU *Emissions Trading Scheme* (2004) puts a ceiling on emissions of large-scale point sources within the European Union, and allows them to trade EUAs on a Europe-wide market. A so-called “Linking Directive” governs the relationships between the EU-ETS and the Kyoto Protocol. It allows entities under the EU-ETS to use emission reduction credits from JI or CDM projects against their targets under the EU-ETS under certain conditions. The EU ETS has a pilot phase from 2005 to 2007 and a first phase in 2008-2012.

Canada and Japan are also developing national plans to meet their Kyoto obligations. These plans both include carbon trading. The Canadian plan, which has been put out but not adopted at time of writing, calls among others for a domestic trading system for large-scale point sources, and for the purchase of substantial amounts of outside credits. The Japanese plan, which is only a proposal at this stage, does not include mandatory obligations for firms, but also calls for large-scale purchases of emission reductions through project-based mechanisms.

All the regulations described above are driven by compliance with the targets of the Kyoto Protocol. But other regimes that constrain carbon emissions and that allow for carbon transactions have been developed in the USA and in Australia, even though the two countries have announced that they would not ratify the Kyoto Protocol. For example, the state of New South Wales (NSW) in Australia imposes benchmarks on the emissions of utilities and other entities, and allows for the purchase of GHG Emissions Certificates to meet these targets. Similarly, the state of Oregon in the U.S. imposes a performance standard to reduce emissions to 17% below the emissions rate of the most efficient combined cycle plant. Companies have the option of paying \$0.85 per tonne of excess emissions, and the Oregon Climate Trust pools these funds to by offsets from projects both in the country and abroad.⁷ These “non-Kyoto” regimes are different from (and some would argue, sometimes less stringent than) the “Kyoto” ones, in terms of the constraints they impose. It is still unclear how, if at all, these regimes will ultimately be linked with the “Kyoto” ones.⁸

In addition to responding to mandatory regulations, some firms are engaged *voluntarily* in the carbon market, either because they have adopted a voluntary emissions target, or for other strategic reasons.⁹ Their participation often takes the form of project-based transactions. The Chicago Climate Exchange (CCX), however, is a prominent exception to this rule in that it is a private and voluntary market for emission allowances between firms.

⁶ Here we focus only on regulations that allow for carbon transactions. They constitute only a subset of general climate mitigation policies.

⁷ The Pew Center on Global Climate Change (www.pewclimate.org) maintains an online database of State-level climate mitigation initiatives in the U.S.

⁸ A history of exchanges of GHG allowances between regimes that were not connected whatsoever also supports cautious optimism about the possibility of interlinking ‘Kyoto’ and ‘Non-Kyoto’ regimes.

⁹ Such as, *inter alia*, learning by doing, experimenting with diverse contract structures, strategic positioning, influencing policy, broadening the envelope of flexibility, public relations, goodwill generated by entry into market, strategic interest or management of corporate social responsibility obligations.

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The last segment of the carbon market is the *retail market*, distinguishable by the activities of companies and individuals without significant emissions (and therefore unlikely to be regulated under domestic regimes) who wish to be climate-neutral in order to demonstrate their social responsibility or promote a particular brand. These entities or individuals often purchase ERs in small quantities. These ERs are usually not intended for compliance, although they may have been generated in compliance with CDM or JI procedures. Several “retailers” serve this small but growing market, by implementing larger emission reduction projects, and then retiring slices of the emission reductions for their customers.

3. METHODOLOGY

3.1 Project-Based Transactions

Reviewing project-based transactions on the carbon market remains difficult because there is currently no public registry of carbon transactions and no internationally recognized price index. Most transactions so far are over the counter, with few details, if any, made public. Prices or contract structures, in particular, very often remain confidential.¹⁰

To try to overcome this limitation, we have assembled information on transactions from two key players in the market: Evolution Markets LLC and Natsource LLC,¹¹ who have supplied data under confidentiality agreements. In addition, we have conducted direct interviews with major market participants, including various participants of the World Bank carbon funds, and various members of IETA, and surveyed major relevant publications.¹²

The resulting information has been aggregated in a database of 487 project-based transactions between 1996 and April 2005.

The database includes both *signed* contracts and transactions *at very advanced stage of negotiation* (agreed term sheet or equivalent). This convention was adopted initially because the two major players in the market at the time the study was first conducted used to report their transactions this way. We have continued this approach to ensure time compatibility between reports, and also because it allows us to report transactions with agreed terms even when a contract is not formally signed.

For each transaction, we tried to identify the identity of the buyer, the identity of the seller, the type and volume of GHGs exchanged, the price, the structure of the contract and the nature and location of the project. For confidentiality reasons, and although the database is—per our agreements with the information providers—confidential, we were not able to obtain complete data for all the transactions that have been reported to us. For each category of information, Table 1 provides the percentage of transactions (as well as the share of the volume exchanged they represent), for which this specific piece of information is available. The completeness of data exceeds 80%, in most cases except for information related to contractual structure, and notably prices, which are available only in slightly more than half of the total volume. We must report, however, it proved more difficult to obtain project-level data this year than in the previous years. This might be due to the fact that, in an increasingly competitive market, information on carbon transactions has become more valuable and thus more sensitive.

¹⁰ The Marrakech Accords require Project Design Documents (PDDs) for CDM projects to be made public as early as in the validation stage. But the fact that a PDD appears on the UNFCCC website (www.unfccc.int) does not necessarily imply that a carbon transaction has occurred. Also, PDDs provide only partial indication about who the potential buyers of emission reductions are, and no indication about price or contractual structure.

¹¹ www.evomarkets.com, www.natsource.com. Again, the opinions and results expressed in this paper are solely those of the authors, and do not necessarily represent the views of these entities.

¹² Including online sources such as *climate ark* (www.climateark.com), *Joint Implementation Quarterly* (www.jiqweb.org), *PointCarbon* (www.pointcarbon.com) as well as the Climate_L list (www.iisd.ca).

Table 1: Completeness of Data on Project-Based Transactions

| Data Element | % of Transactions Where Available | % of Total Volume Exchanged Where Available |
|----------------------------|-----------------------------------|---|
| Buyer Country | 94.4% | 95.6% |
| Volume | 73.0% | -- |
| Type of Gas | 94.8% | 95.9% |
| Technology | 85.8% | 89.7% |
| Project Location (region) | 91.0% | 99.0% |
| Project Location (country) | 84.9% | 94.9% |
| Structure of Transaction | 85.1% | 95.0% |
| Vintage | 68.8% | 70.9% |
| Price | 61.3% | 53.5% |

Primary data have been processed to provide consistency across observations. First, since we aggregated data from various sources, and since the exact names of buyers and sellers were often not provided to us, a risk of double counting exists. To mitigate this, we crosschecked data wherever we could to eliminate duplicates, and adopted the conservative approach of deleting the entries if some uncertainty remained.

Second, volumes exchanged are all expressed in metric tonnes of carbon dioxide equivalent (tCO₂e) using the conversion factors of the UNFCCC. Volumes exchanged are also sorted in vintages up to 2012, and in vintages post-2012. This is because 2012 is the end of the first commitment period of the Kyoto Protocol and a milestone in most regimes. When the exact pre vs. post 2012 distribution was not available, we have assumed an even annual accrual of ERs.

Third, prices, when available, are expressed in nominal U.S. dollars per tCO₂e, regardless of the vintage purchased. In other words, this price information reflects the total amount of ERs purchased in the transaction divided by the total undiscounted amount of money that is to be paid by the buyer over the course of the contract.¹³ We used yearly average exchange rates to convert prices in non-U.S. dollars denominated contracts.

Fourth, the transactions have been divided between those intended for Kyoto compliance, those not intended for Kyoto compliance, and the retail market. The distinction between the first two categories is usually easy to make. On the other hand, the limits of the retail market are more difficult to assess. As a proxy, we defined a category of “small projects” including all those below 50,000 tCO₂e of total volume purchased. This is because we infer from interviews with market participants that our coverage of small-scale transactions is less comprehensive than our coverage of larger ones. Also, small-scale transactions (for instance those in the retail markets) tend to have very different economics than larger ones, with higher prices per tonne to compensate for transaction costs. The threshold of 50,000 tCO₂e is somewhat arbitrary, but setting the bar between 10,000 tCO₂e and 100,000 tCO₂e does not significantly alter our results.¹⁴

¹³ From an economic and a financial point of view, obviously, the schedule of payment also matters. Detailed information, however, is rarely available.

¹⁴ It is important to note that projects reducing emissions by more than 50,000 tCO₂e can still fall within the “small-scale” definition of the Marrakech Accords, i.e., below 15 MW of power generation, energy efficiency activities reducing energy consumption by less than 15 gWh per year, or projects emitting less than 15,000tCO₂e per year.

How comprehensive is our database? We are relatively confident that our database captures most of government activity. But the comprehensiveness of our coverage of private sector deals is more difficult to assess. Beyond transactions that were publicly reported, our research has provided us with information on a wide range of private sector deals, conducted through brokers and over-the-counter. It remains possible, however, that others have occurred for which we have no record. For this reason, and given the conservative approach adopted above, we consider that our analysis provides a rather conservative estimate of the carbon market.

3.2 Allowance-Based Transactions

Transactions of allowances under the EU ETS have so far mostly been conducted over the counter by brokers; though some trading platforms have recently been established.¹⁵ In stark contrast with the CDM and JI market, daily price information about the EU Market is freely available online. Information on aggregate volume is less easily accessible, but some information is available online as well.

To prepare this report, we compiled data from the various trading platforms, as well as aggregate information on the volume exchanged over-the-counter. We had also access to data on individual over-the-counter transactions representing about one third of the estimated total volume of EUAs exchanged.

Finally, we have also obtained detailed information on trades under the CCX, and aggregate information on trades having occurred under the UK Trading Scheme, and under the NSW Trading Scheme.

¹⁵ At the time of writing, three trading platforms were trading EUAs: Nordpool, the EEX and the ECX.

4. PROJECT-BASED TRANSACTIONS: VOLUMES AND FLOWS

4.1 A Market Building Up

The total volume exchanged through project-based transactions in 2004 was 107 MtCO_{2e}, a 38% increase relative to 2003. And our data show that about 43 MtCO_{2e} have been exchanged during the first four months of 2005, suggesting that the market for project-based transactions continues to grow, albeit at a slower pace than during the period 2001-2003 (Figure 1).¹⁶

This finding is seemingly at odds with the recent regulatory developments outlined in the introduction. In fact, when Russia announced that it would ratify the Kyoto Protocol in October 2004, it effectively put an end to years of speculation as to whether or not the Kyoto Protocol would enter into force. Since there is no doubt that meeting the Kyoto targets will be a challenge for most Annex I countries, and that their demand for JI and CDM credits will be much higher than the current volumes coming to market, it might appear surprising that we do not see a response in terms of volumes transacted.

This seemingly muted response can be explained by four main factors. First, *supply response to increased demand is slow*. There are indications that the incipient demand is high, with new buyers are coming into the market with large amounts of money. For example, the capitalization of carbon funds worldwide has increased from approximately 275m\$ in January 2004 to about 950m\$ in April 2005, a 250% increase.¹⁷ Yet the long time required to find supply of projects, and regulatory uncertainty on the Executive Board has allowed only a small slice of this new purchasing power to be translated into new transactions (less than 5% so far).

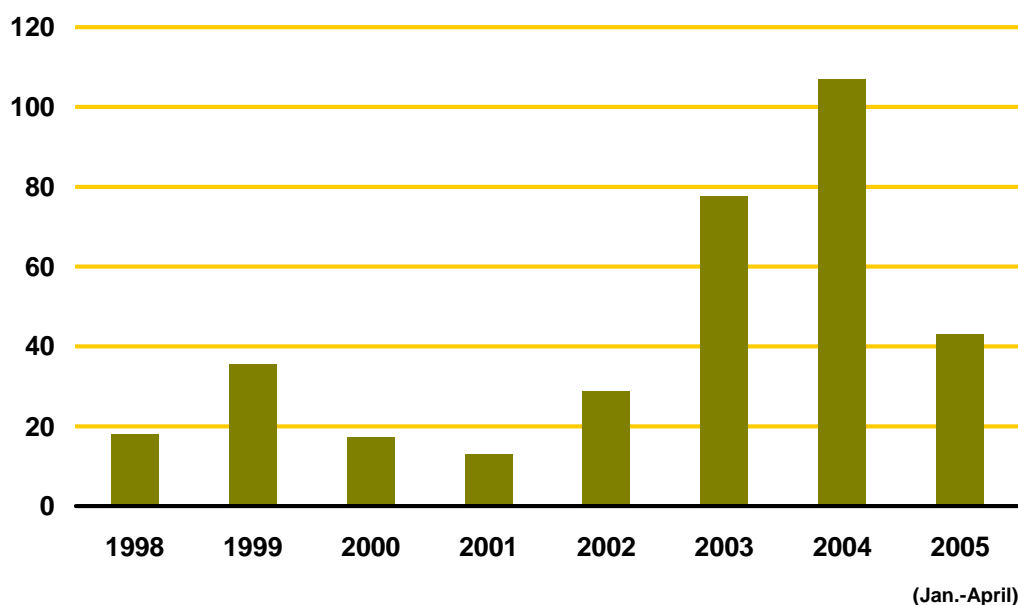
Second, *who needs to buy credits under the Kyoto Protocol is still unclear*. The obligations under the Kyoto Protocol apply to Annex I Parties. These countries are free to pass on part of the effort to their domestic private sector, but how much of the burden will be passed on, and under what conditions, is still largely unclear. As noted above, no policy has been definitely adopted in Japan or in Canada, and only a few European countries have given indications about the 2008-2012 allocation plans. As a result, it is still not clear for private buyers how much they should purchase.

Third, *governments appear to be the major buyers in the Kyoto Market, at least so far; and they might take longer to act*: So far, the transfer of burden to the private sector appears to be relatively modest in Europe and Canada, and it is not clear yet how it will be managed in Japan. So Governments are, so far, the entities most clearly anticipating that they might need to purchase emission reductions. Yet it can be argued by Governments might require more time to budget and purchase these emission reductions than the private sector would; and that the fact that they need to purchase large volumes calls for even greater caution.

Fourth, *some market players appear to be adopting a wait-and-see attitude*. Some corporate players and market players might be delaying purchase decisions in front of continuous regulatory uncertainty. In addition, some non-Annex I project developers appear not be selling now in the hope to get better prices in the future.

¹⁶ As noted above, these figures include only the volume contracted up to 2012.

¹⁷ This list includes the following funds: World Bank administered Prototype Carbon Fund, Community Development Carbon Fund, BioCarbon Fund, Italian Carbon Fund, Spanish Carbon Fund, and Danish Carbon Fund, the CDC-Ixis European Carbon Fund, Natsource GGCAP, the Japanese Carbon Fund, and the Baltic Sea Region Testing Ground Facility. Euro translated into dollar at a rate of 1.3 euros per US dollar.

FIGURE 1: ANNUAL VOLUMES (million tCO₂e) OF PROJECT-BASED EMISSION REDUCTIONS TRADED (up to 2012 vintages)

As Table 2 shows, compliance with regulatory regimes (for the most part with the Kyoto Protocol) is by far the main driver of project-based transactions. A small volume of voluntary projects, however, remains in the U.S.

Table 2: Volumes Exchanged and Number of Transactions per Market Segment

| | Total Project-Based Transactions | Compliance | Voluntary | Retail* |
|-------------------|----------------------------------|--------------------|--------------------|------------------|
| 1998 | 17,976,538 | 0 | 17,907,448 | 69,090 |
| 1999 | 35,423,491 | 0 | 35,265,724 | 157,767 |
| 2000 | 17,094,425 | 387,933 | 16,507,407 | 199,085 |
| 2001 | 13,004,103 | 4,724,591 | 8,161,652 | 117,860 |
| 2002 | 28,776,967 | 14,676,748 | 13,893,209 | 207,010 |
| 2003 | 77,641,815 | 70,429,780 | 6,773,367 | 438,669 |
| 2004 | 107,010,089 | 104,600,758 | 2,299,050 | 110,281 |
| 2005 (Jan.-April) | 42,863,095 | 39,823,182 | 2,995,000 | 44,913 |
| Total | 339,790,524 | 234,642,992 | 103,802,856 | 1,344,675 |

Note: All volumes are for vintages up to 2012 only. Data for retail incomplete.

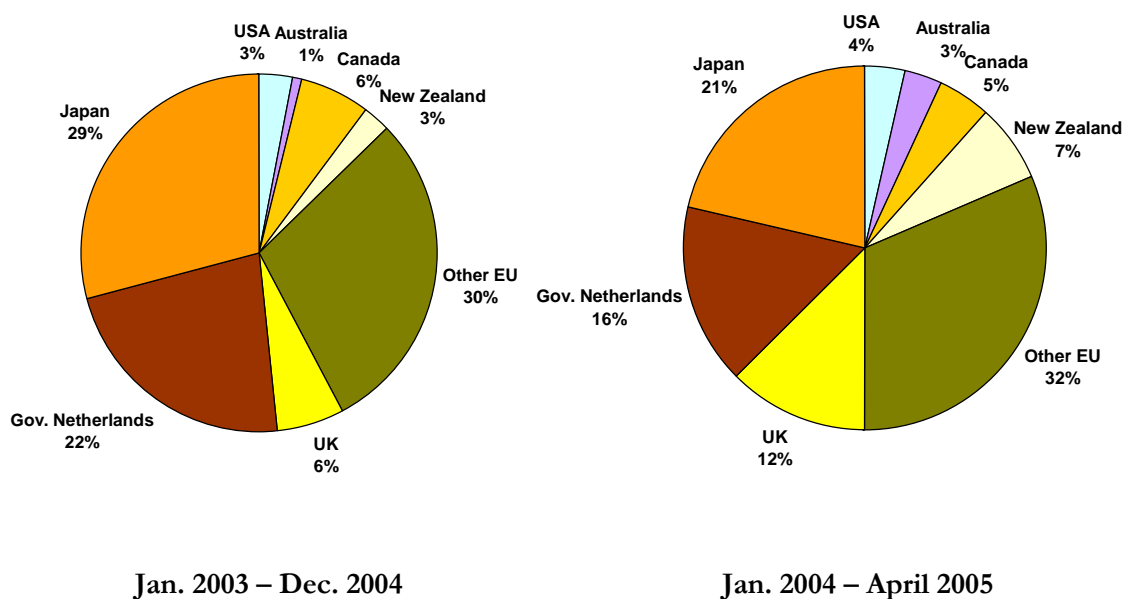
4.2 Who's buying?

In stark contrast with what we reported in May last year, European buyers now represent the bulk of the purchases of emission reductions with a combined 60% of total volume purchased between January 2004 and April 2005. Within this group, the Government of the Netherlands (through its various agencies and intermediaries except the CFB (Senter, and programs established within Rabobank, the International Finance Corporation, European Bank on

Reconstruction and Development, and the Corporación Andina de Fomento) is the largest single buyer with 16%, followed by private firms from the United Kingdom (12%). All other European purchasers combined account for 32% of the total volume purchased (Figure 2). The share of Japan (mostly private Japanese entities) has diminished from 29% (Jan. 2003 – Dec. 2004) to 21% (Jan. 2004 – April. 2005).

Interestingly, two-thirds of the volume purchased from Europe was purchased by private firms, against one-third by governments (mostly The Netherlands, Denmark, Sweden, and Austria). We have only anecdotal evidence about the motivations for the transactions by private European firms, but compliance with the EU ETS, both within the pilot phase and during the first commitment period, appears to be a key driver. And the same is true overall: private entities represent about two-thirds (69%) of total purchases of emission reductions. Whether this trend will continue, however, is unclear as demand from Governments (as expressed, for instance, in Government purchase tenders and funds) is growing rapidly, while it is not clear that private demand is growing as fast.

FIGURE 2: MARKET BUYERS (share of volume of ERs purchased), Purchases of World Bank Carbon Funds allocated to Funds Participants pro rata their shares



The share of the volume purchased by Canadian private and public entities has remained small (5% between January 2004 and April 2005). This figure can appear surprising since GHG emissions of Canada were 20% higher than their 1990 levels in 2002, while the target for the country under the Kyoto Protocol is –6% relative to 1990 levels; hence suggesting that Canada might be required to purchase large amounts of outside credits to meet its Kyoto commitment. The limited involvement of the Canadian private sector in transactions so far can probably be attributed to the fact that Canada’s climate change plan has only recently been announced, and that there is yet no clarity on allowance allocations to individual firms. Another contributing factor might be the fact that many private companies appear to believe that the non-compliance fee under this plan will be no more than 15 Canadian dollar per tonne of CO₂e (U.S.\$12 at exchange rate prevailing at time of writing); a figure sufficiently modest to raise questions as to whether the transaction costs associated with CDM and JI are worth the effort.

When purchases by the various funds managed by the World Bank Carbon Finance Business (CFB) are attributed to the CFB, and not to the funds' participants, the picture is slightly not very different. Simply, shares of purchases by all major groups diminish as part of their volume is now attributed to the CFB. Precisely, European entities represent 44% of the purchases from January 2004 to May 2005, before the CFB itself (22%) and Japanese entities (16%).

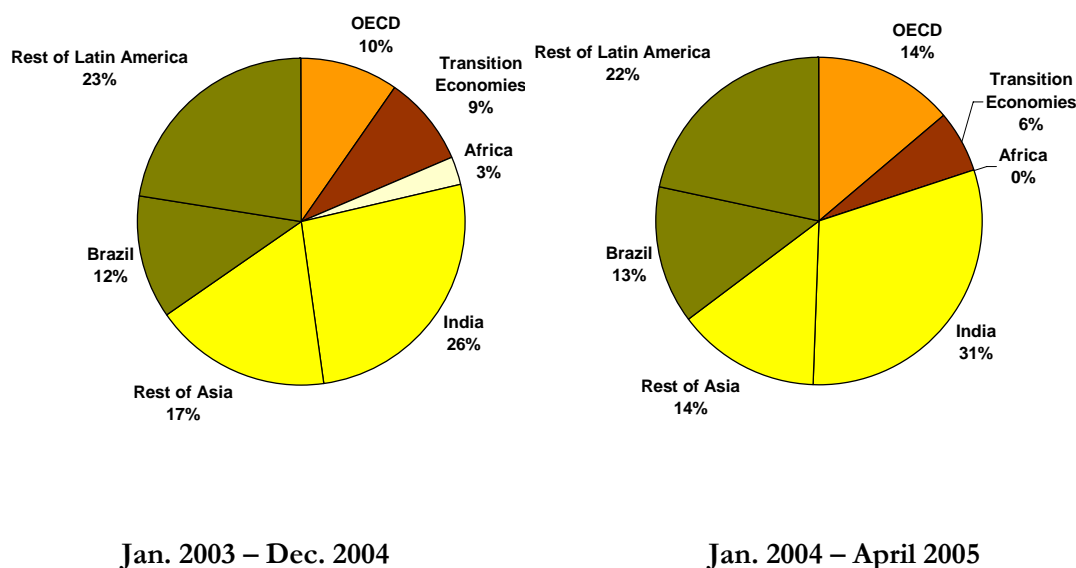
4.3 Who's selling?

The largest seller of ERs is Asia (45% from January 2004 to April 2005). Latin America is second with 35% of the volume supplied (Figure 3). Projects in OECD countries, which include both JI projects in New Zealand and voluntary activities in the U.S., rank third with 14%, while transition economies rank fourth at 6%.¹⁸

These aggregate figures, however, are strongly influenced by the dynamics of HFC₂₃ destruction projects, which are few in number but very large in volume, and for the moment, to our knowledge at least, all located in Asia. In fact, Latin America is by far the largest supplier of ERs from projects other than HFC₂₃ destruction (46%). Asia's share of non HFC-based ERs is stable (28% from Jan. 2004 to April 2005, against 28% from Jan. 2003 to Dec. 2004), and is lower than Latin America's.

This result might come as a surprise to observers of the carbon market, considering the very large flow of projects approved by the Indian DNA, which is reflected, *inter alia*, in many of the methodologies submitted to the CDM Executive Board. Most of these projects, however, are intended to be *unilateral CDM*, i.e., projects that are implemented without an Annex I participant. As long as no credit is sold, unilateral CDM projects (60 to 70 at least in India) are not included in our database of transactions, and thus not reflected in the above figures.

FIGURE 3: LOCATION OF EMISSION REDUCTION PROJECTS (in share of volume supplied)



¹⁸ We know of no JI project signed in Russia or Ukraine, although many projects are currently in preparation.

Figure 3 also shows that Africa continues to be bypassed by the carbon market, with very small volume transacted from January 2004 to April 2005. The portfolio of projects currently at validation stage (which is known because of public comments requirements) also shows very limited presence of African countries besides South Africa and, to a lesser degree, North African countries. This under-representation of Africa raises deep concerns about the overall equity of the distribution of the CDM market, as the vast majority of African countries have not, for the moment, been able to pick up even one first deal. In fact, to our knowledge, Uganda and South Africa are the only two sub-Saharan countries where large-scale carbon transactions have been completed, although transactions are being prepared currently in Nigeria, Ghana, Sierra Leone, Zambia and elsewhere.

In our database, 35 countries in the developing world or among transition economies have hosted an emission reduction project since 2001 (Projects are being developed in more, but we take into account only signed contracts, or projects at advanced stage of negotiation.) However, the three largest suppliers (again India, Brazil and Chile) account for 58% of the total volume delivered over that period, and the top five (which include also Bulgaria and Romania) account for nearly 70%. As can be seen in Figure 3, and unilateral CDM notwithstanding, India is by far the single largest supplier of emission reductions.

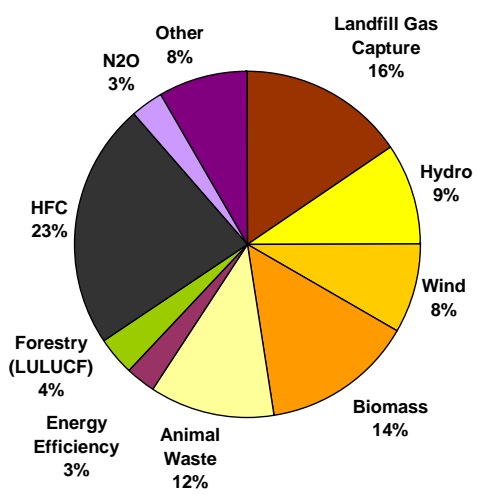
In terms of trends, the market seems to be concentrating in large, middle-income countries. Most of the new volume is going to India and Brazil. Emerging countries in the carbon market are China, where projects are now being accepted by the DNA, and Mexico, which has also seen large volumes transacted in the past 12 months. This concentration of CDM flows towards large middle-income countries is consistent with the current direction of Foreign Direct Investment.

4.4 Balance among Asset Classes

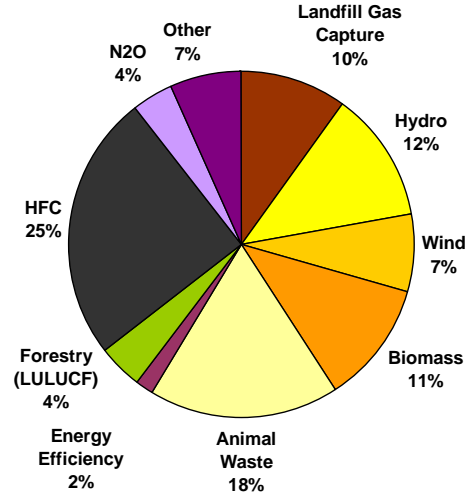
The balance among asset classes shows, as last year, that HFC₂₃ destruction dominate with about a quarter of the ERs supplied from January 2004 to April 2005. But methane and N₂O capture from animal waste is now second with 18% of the volume supplied. Biomass energy, hydro and landfill gas capture share the third place with about 10% of the volume supplied (Figure 4).

Projects abating non-CO₂ gases (N₂O, HFCs and methane) account for 57% of the volume supplied, and even for than two-thirds of the total volume supplied if biomass energy is added to this group. On the other hand, energy efficiency and fuel switching (included in the “Other” category on the Figure) account for only about 4% of the total volume supplied. This is likely to continue in the foreseeable future as projects with emission reductions that can be generated quickly are developed to meet first commitment period requirements.

FIGURE 4: TECHNOLOGY SHARE OF EMISSION REDUCTION PROJECTS 2003 - 2004 (in percent of total volume contracted)



Jan. 2003 – Dec. 2004



Jan. 2004 – April 2005

5. PROJECT-BASED TRANSACTIONS: CONTRACTS AND PRICES

5.1 Structure of Transactions

Most project-based transactions to date (nearly all in since January 2004) follow a commodity model, whereby the buyer of carbon purchases the emission reductions generated by the project as it would purchase any other commodity or service. Only a few transactions, to our knowledge, follow an investment model whereby the buyer invests either equity or debt in a project and get the emission reductions as part of its returns.^{19,20}

This has important implications for the financial structure of CDM and JI projects. Indeed, carbon buyers under a commodity model tend to pay for the carbon on delivery, thereby reducing their exposure to project risks. Although this future cash flow adds to the Internal Rate of Return, the projects often need upfront financing to cover, *inter alia*, construction costs. Most carbon contracts thus do not directly address the upfront financing barrier, but rather do so indirectly. Since carbon payments are payable in strong currencies (typically, dollars, euros or yens) and originate from buyers with high credit ratings, they can reduce risks, increase financiers' confidence in the project, and leverage additional capital.

So far, there are few cases where upfront financing (or better terms for upfront financing) was leveraged by a carbon contract. The relative small size of the market as well as the underlying uncertainties have up to now discouraged large financial institutions, leaving the market to specialized entities like mezzanine financiers. The simultaneous entry into force of the EU ETS and of the Kyoto Protocol might provide additional incentives for financial institutions to lend against carbon revenues. Some buyers increasingly offer upfront financing as well.

Even within the broad parameters defined above (commodity purchase, payment on delivery), there is as yet no standard contract for the purchase of emission reductions from projects.

Contractual arrangements still vary greatly depending on how various risks are allocated between buyer and seller: namely *project risk(s)*, that is whether or not the project will adequately perform and produce the expected amount of ERs; *country risk(s)*, and *Kyoto-related risks*, such as the risk that the project might ultimately not be registered under the Kyoto Protocol (if, for example, the project is not deemed additional by the CDM Executive Board). Various contractual features are used to allocate these risks between the buyer and the seller. They include, *inter alia*, transfer of risk of the ERs purchased (definition of the ERs, and point of delivery), guarantee structures, upfront payments, penalties and damage clauses, default clauses or the disbursement schedule.

To the extent we can tell given our limited data on the contractual structure of project-based transactions, the treatment of Kyoto-related risks appears especially variable across contracts.

¹⁹ This preference for the commodity model might stem from the fact that buying carbon requires very specific skills (e.g., in setting up the baseline, or interpreting the Kyoto Protocol requirements) which firms, even large utilities, are not automatically ready to invest in. Secondly, even for firms investing in JI or CDM countries, the projects they are interested in might not all be realistic in terms of CDM or JI at current carbon prices. Conversely, the types of projects where carbon finance appears to have the most impact at current prices— notably landfill gas to energy projects—might not fall within the core business of the firms looking for carbon, which are for a large part utilities.

²⁰ As noted in section 3, we do not include in our database projects undertaken within the existing boundaries of a firm (e.g., a firm investing in an offshore subsidiary to reduce emissions there), or a developing country firm investing in clean technologies with view to selling ERs under the CDM (“unilateral CDM”).

Some buyers, including the World Bank Carbon Finance Business (but excluding the Netherlands Clean Development Mechanism Facility) are buying Verified Emission Reductions (that is ERs after validation by an independent third party). Most buyers, however, purchase CERs, thereby passing on the registration risk to the seller. Penalties in case of non-compliance vary from none to fees or obligation to find other CERs to penalties including liquidated damages, and are in some cases borne by a broker instead of by the seller.

5.2 Observed Prices

Prices are only one among the many features of the contract. Since there is no standard contract for purchasing carbon, it is not easy to compare prices across transactions. For example, a contract with a high share of the payment made upfront will typically command a lower nominal price per tonne of CO₂e than another where all the payment is made on delivery to take into account the discount factor and the fact that, in the former case, the seller is more exposed to project risk.

Secondly, prices are often not publicly disclosed. As noted in Table 1, our database includes price information in only 61 percent of the transactions, which represent 53 percent of the total volume exchanged. In addition, reporting practices are not uniform across buyers: while most public buyers are required to disclose the prices they are paying (if not transaction by transaction, at least portfolio-wide), most private buyers are under no such obligation. This creates an obvious bias in our price analysis.

Given these two constraints, we have chosen to discuss prices only for two broad sets of commodities: ‘not for Kyoto’ compliance ERs, and ‘for Kyoto’ compliance ERs. Within the latter group, we distinguish between two categories of transactions:

- The transactions where the buyer takes the registration risk, i.e. purchases third-party Verified Emission Reductions or VERs, and will continue to purchase them even if the project eventually fails to get registration as CDM or JI or if the Kyoto Protocol fails to enter into force, and;
- The transactions where the seller takes most of the registration risk, i.e., the buyer purchases CERs and has the right to cancel the contract, under specific conditions, if the project fails to get registered.

Each category encompasses a rather wide range of transactions. For example, the compliance grade category includes both contracts where payment stops if the ERs are not issued as CERs, and stricter transactions structures where the seller must actually find equivalent replacement units elsewhere in the market at prevailing prices if the project fails to deliver CERs. Still other structures include clauses that trigger liquidated damages in the event that CERs are not delivered as expected.

FIGURE 5: PRICES FOR NON-RETAIL PROJECT-BASED ERs January 2004 to April 2005 (in U.S.\$ per tCO₂e)

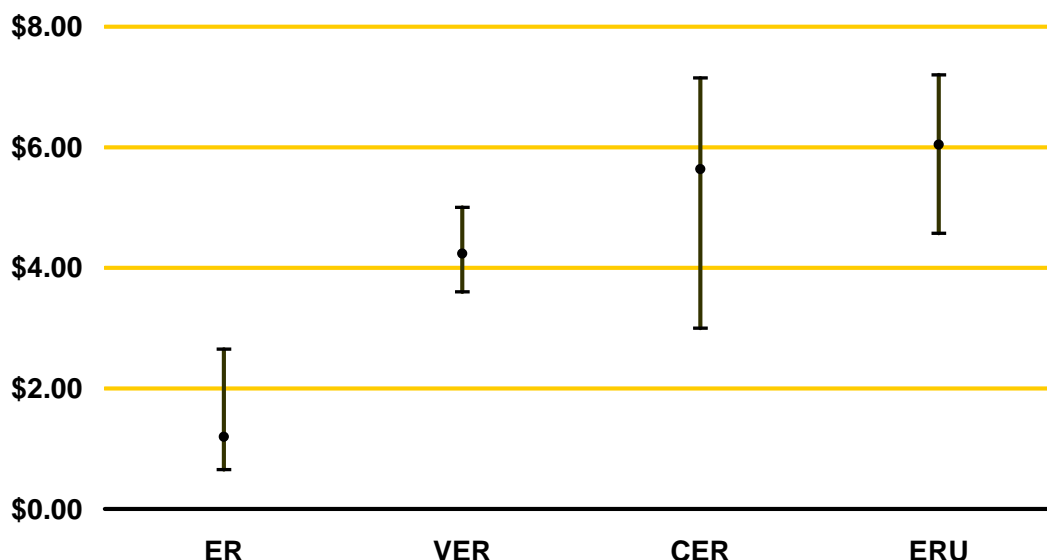


Figure 5 provides the range of prices we found for ERs, VERs, CERs and ERUs from January 2004 to April 2005, as well as the weighted averages (by volume). All prices are expressed in nominal U.S. dollars per tonne of CO₂e. We include no differentiation for vintages until 2012, which appears to be common practice in contracts where multiple vintages are traded. All prices are nominal. Prices in euros have been translated in dollar terms using monthly exchange rate over the period.

Figure 5 shows that prices vary greatly depending on the nature of the commodity traded. First, not for Kyoto compliance ERs command a price between \$0.65 and \$2.65/tCO₂e (weighted average, by volume, \$1.20). These prices are consistent with those observed last year, and again for small volumes.

Within the transactions intended for Kyoto compliance, we observe that with registration risk on the buyer, VERs sell at \$3.60 to \$5.00 (weighted average \$4.23), while contracts where CERs are purchased, i.e. when the registration risk on the seller, command a higher value of \$3.00 to \$7.15 (weighted average \$5.63). Finally, ERUs are sold slightly higher prices, ranging from \$4.57 to \$7.20 (weighted average \$6.04).

These figures show that prices have increased substantially from Jan.2003 – May 2004 to Jan.2004 to April 2005. The weighted-average price of VERs has increased by 10% relative to last year, and the price of CERs has increased by 21% over the same period.²¹ Though the higher value of the euro relative to the dollar has played a role, the data as well as anecdotal evidence from interviews suggests that there is genuine pressure upwards; which might be due to increased demand relative to a still rather tight supply.²²

²¹ There was an error in last year's report. The weighted average price for 'intended for Kyoto Compliance' credit was mistakenly reported at \$5.52. It was in fact at \$4.66. Within this category, which encompassed both CERs and ERUs, CERs weighted average price was \$4.55.

²² It is important to recall that Figure 5 aggregates transactions over the past 16 months. It is thus not necessarily representative of the *current* status of the market. In fact, there are indications that upward pressures continue,

The gap between ERUs and CERs – despite the fact that the rules governing JI are comparably less developed than those governing the CDM – might be explained by risk factor consideration. Since the Eastern European countries where these transactions have occurred are (or will soon be) part of the EU, such projects pose a comparably less risky proposition for the buyer.

5.3 Other Determinants of Prices

As the previous discussion suggests, the greater the guarantee the seller can provide regarding the robustness of the ERs purchased—especially the likelihood that the seller will deliver *compliance-grade* assets *on schedule*—, the higher the price is likely to be. The other key determinants of price, identified via information from market players, and from the World Bank Carbon Finance Business experience, are as follows:

- Creditworthiness and experience of the project sponsor and the viability of the Project;
- Confidence in the quality of the ongoing carbon asset management by the counter-party and hence expectation of delivery of ERs over the life of the project;
- Structure of the contract (e.g., spot vs. forward contracts as well as amount of upfront payment, applied discount rate in case of upfront payment), including liabilities the seller is willing to undertake in case it fails to deliver upon contract commitments, penalties for non-delivery, and seller's capacity to pay the penalties;
- ER Vintage and Seniority, since only some vintages are eligible to meet compliance obligations;
- Cost of validation and potential certification;
- Host country support and willingness to cooperate, and
- Additional environmental and social benefits.

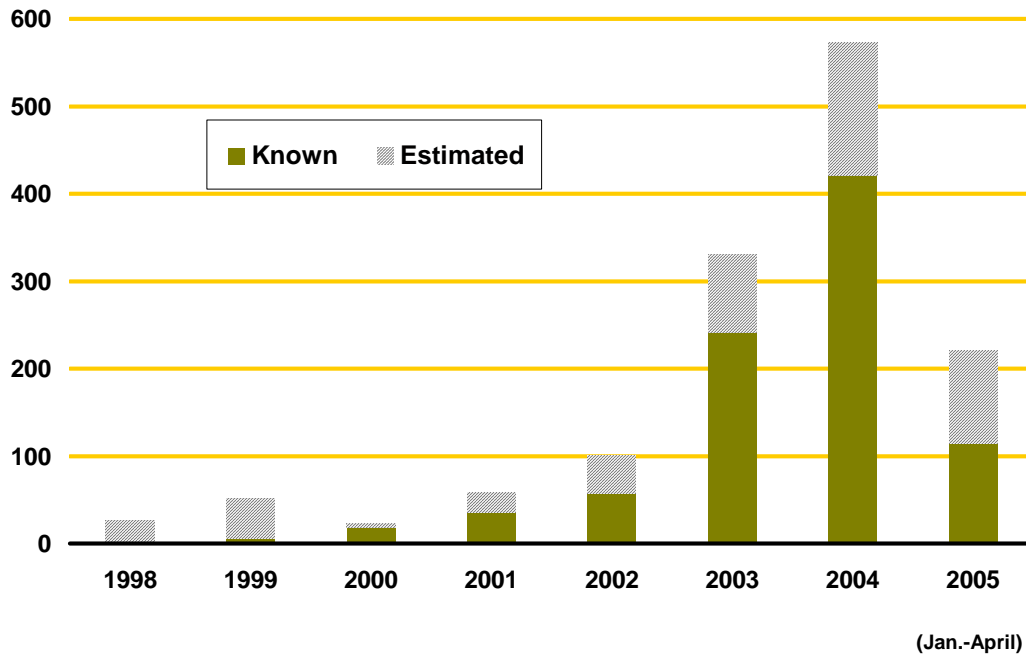
5.4 Total Value of Project-Based Transactions

Given prices and quantities, it is possible to estimate the total value of project-based transactions to date. Again, the result must be taken with caution, as data on prices is scarce. In Figure 6 below, the solid bars represent the product of prices contracted times quantities for the projects where the price is known. The shaded area represents the value of the remaining volumes contracted, multiplied by the weighted average price of ERs for that particular year.

Under these assumptions, the total value of contracts for the purchase of project-based transactions can be estimated at about \$570m in 2004, of which \$420m from transactions where both price and quantity are known, and at about \$110m in the first four months of 2005. The total estimated value of project-based transactions signed since 1998 can be estimated at \$1.38 billion, of which nearly \$900m from transactions where both price and quantity are known.

and that the most secure project-based assets are currently being negotiated around or even beyond the highest levels indicated in Figure 5.

FIGURE 6: TOTAL MARKET VALUE (ESTIMATE) PER YEAR in million U.S. dollars (nominal)



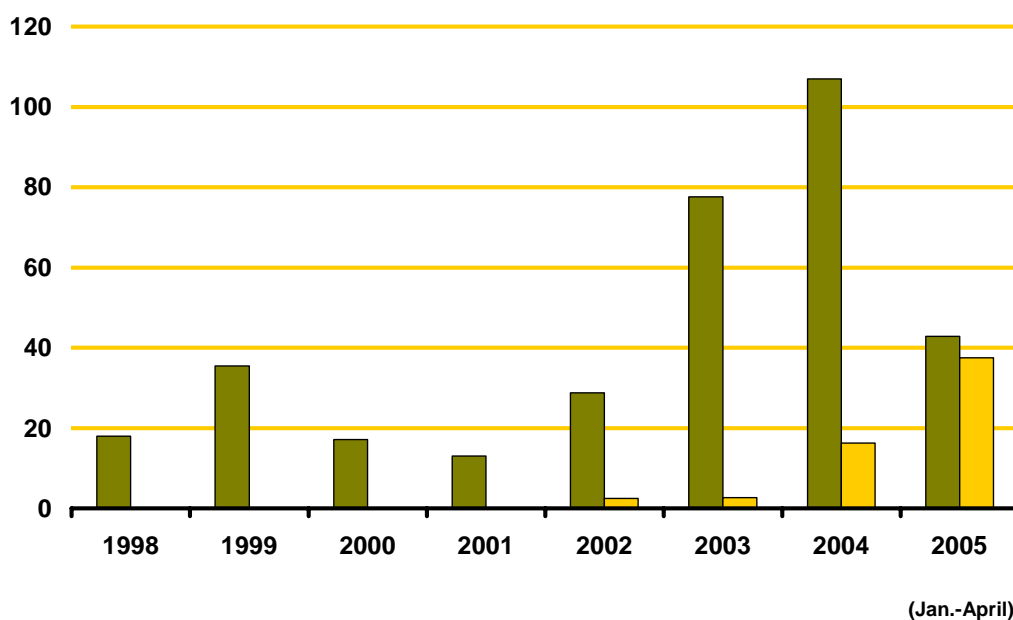
A sign of increasing liquidity in the market is that companies are beginning to engage in secondary transactions, selling part of their portfolios to other buyers. We have, however, only anecdotal evidence on this emerging market, and very little data about the nature of what is transacted (since no CER has been formally issued yet), or about the prices per tonnes of CO₂ equivalent.

6. ALLOWANCE MARKETS

6.1 A Fast-Growing Market

A key finding of the present report is that allowance-based transactions, which represented only 2.5% of the total volume of assets exchanged on the carbon market from its inception to May 2004, now account for nearly as much volume exchanged as project-based transactions (Figure 7).

FIGURE 7: VOLUME EXCHANGED THROUGH PROJECT- (green) AND ALLOWANCE- (yellow) BASED TRANSACTIONS (million tCO₂e)



Note: data for allowance markets are only for January to March 2005

Over the first three months of 2005, we estimate that about 37 MtCO₂e have been exchanged in the four allowance markets currently in operation (the EU Emissions trading scheme, the UK trading scheme, the Chicago Climate Exchange (CCX) and the New South Wales (NSW) GHG Abatement Scheme).²³ This is already twice as much as the estimated volume for the *whole* year 2004. Growth of activity has been particularly rapid in the EU ETS, with 3.5 times as many allowances exchanged in the first three months of 2005 relative to the whole year 2004.

Consequently, allowance trading, and notably the EU ETS, has much more impact on the overall carbon market than it had 12 months ago (especially, as we will see, on the price side).

²³ Some transactions have involved AAUs. In most cases, it was to allow for the crediting of emission reductions generated before 2008 by some projects intended for registration under JI. In a handful of cases, the AAU trade was not linked to a JI project. To our knowledge, however, even the latter have remained linked to a project, although not on a one to one basis. They have been included in the project-based transaction database.

6.2 The EU Emission Trading Scheme

The EU ETS, which formally entered into operation in January 1, 2005, is the single largest market for GHG emissions allowances. It covers more than 12,000 fixed sources, representing about 45 percent of the EU25 total CO₂ emissions.

The European Directive 2003/87/EC, which establishes the EU ETS, instructs Member States to allocate emission allowances (EUAs) to the point sources covered under the ETS for the pilot phase of the program (2005-2007). At time of writing, all National Allocation Plans (NAPs) but those of Greece and Italy had been approved by the EU Commission. However, only five countries had operational transaction registries. In addition, a “Linking Directive”—European Directive 2004/101/EC—, governs the relationships between the European Trading Scheme (ETS) and the Kyoto Protocol. The Linking Directive notably allows for the import of ERUs and CERs into the ETS under certain conditions that will be discussed later.

As early as in 2003, some companies started engaging in demonstration trades of spot and forward EUAs in anticipation of entry into force of the EU ETS. All such transactions were forward trades. The volume exchanged through these early trades has increased steadily, from an estimated 650,000 tCO₂e in 2003 to about 9 MtCO₂e in 2004. Since January 2005, the volume exchanged on the market has increased dramatically to reach an estimated 34 MtCO₂e in the first three months of 2005.

The market itself is also much closer to a fully functioning market: exchanges are now operational; allowances have been issued in registries, hence allowing for spot trading as opposed to forward; and harmonization of contracts on the market allows for increased liquidity.

About 90% of the volume traded is for vintage 2005 allowances, about 6% for 2006 allowances and about 4% for vintage 2007 allowances.²⁴ A few forward trades of EUAs for vintages 2008 and beyond have occurred, but this market appears to be thin at time of writing.

At any given point in time, prices of EUAs in over-the-counter transactions and on the various trading platforms operational at time of writing appear to be quasi-identical, with only very small spreads. *It is thus possible to speak of a unique market price of EUAs.* This is a major difference with the market for project-based transactions, where at any given point in time the spreads are much larger due to the heterogeneity of the underlying assets (no two projects have exactly the same risk profile).

Price variations across vintages appear to be very small (only a few percent), which is consistent with the fact that EUAs can be borrowed and banked within allocation periods.

Price variation over time has been very important. As it has been widely reported, the price of EU Allowances has increased from about €7-€9 in 2004 to record levels over €17 in March and April 2005. At time of writing, EUAs were trading at about €15/tCO₂e.

6.3 Are Current Prices on the EU ETS Representative?

Does this price reflect long-term equilibrium between supply and demand on the EU ETS market? As indicated above, the market today is much more sophisticated and active than it was 12 months ago. The current price of carbon can thus no longer be dismissed as a mere artifact resulting from a handful of transaction. Uncertainty about the overall demand for allowances has

²⁴ Allowances are allocated on January 1 of each year to each installation under the ETS. Since allowances for the previous year are retired only on April 1 of each year, the ETS *de facto* authorizes borrowing from future years. However, this is only valid within the 2005-2007 period. Installations will not be able to borrow from allowances of vintage 2008 to meet their 2007 commitments.

also decreased dramatically compared with last year, as most of the NAPs have now been adopted by the EU Commission.

Yet several other factors suggest that the current price might still not be representative of the supply / demand equilibrium during the pilot phase of the ETS. First, cold weather and high oil prices have been cited as a factor for the current price spike, by driving utilities to hedge against projected higher emissions and by buying EUAs.

In addition, and probably more importantly, there appears to be a significant imbalance at present between supply and demand. Analysis of a partial database of over-the-counter transaction reveals that, with few exceptions, only a limited number of companies from a very small number of countries (essentially the UK, Germany, France, Belgium, and the Netherlands) have participated so far in the market. There has been very limited participation of entities from Eastern European Member States, where the bulk of the supply is expected to come from. This suggests that the market is currently operating over only a fraction of the participants it could potentially acquire, and that, in particular, most of the supply does not enter the market.

A counter argument here is that, given current prices, potential suppliers of EUAs should have flooded the market with allowances to realize handsome benefits now. But (a) the uncertainty about the NAPs which has prevailed until recently, coupled with (b) the absence of properly functioning registries, with (c) limited knowledge about the ETS, with (d) the conservative attitude of most industries towards environmental issues and with (e) the fact that some entities in Eastern Europe might not have the credit sufficient to sell forward might well have left potential sellers, especially middle- and small-scale entities, uncertain about the volumes of assets they were able to trade, and thus reluctant to engage in any transaction at all.

6.4 The Relationship between the Price of EUAs and CERs

The Linking Directive allows for the import of CERs into the EU ETS during the pilot phase, with the exception of LULUCF projects (and nuclear). Given the current price differential between EUAs and CERs, buyers under the EU ETS or arbitrageurs would be expected to purchase CERs on the CDM market and sell them back into the EU ETS for a handsome profit. Over time, the price of CERs would then go up, the price of EUAs would go down, and they would finally be roughly equal. But as the previous sections have made abundantly clear, we do not observe price convergence, at least so far. The price gap between EUAs and CERs has in fact increased recently, mostly because the price of EUAs has doubled. The question is thus, why are the prices of EUAs and CERs so different?

One element discussed above is that *the current price of EUA might be higher than supply / demand equilibrium in 2005-2007*. As discussed, the factors explaining the current price spike of EUAs are for the most part unrelated to fundamentals of the market; and they all point in the direction of a current price being higher than the equilibrium price. This does not explain, however, why we do not see more import of CERs into the EU ETS at present. Several reasons have been advanced to explain this differential. We do not have enough information about market participants' behavior to point out which ones are most important than others, but we believe that overall they provide an accurate explanation of the gap.

First, *forward contracts for CERs are riskier than forward contracts for EUAs*. A forward contract for EUAs is not risk-free, since the seller can default. But it is reasonable to assume that, on average, sellers in the EU are more likely to have a higher credit rating than most sellers in CDM countries. In addition, because they are government-issued (like currency), EUAs have none of the project risks, country risks, and Kyoto risks that characterize CDM transactions. Registration risk, in particular, is perceived as particularly high at present. Of course, *issued* CERs would be equivalent to EUAs risk-wise (and would even have a potentially higher value due to their bankability). But there are no registered CERs at present.

A related point is that ensuring *timely delivery of CERs for vintages 2005, 2006 or 2007 is challenging*. The delivery timing uncertainty is particularly high for early vintages (2005, 2006, or 2007) because any delay in project implementation might result in the loss of one or two early vintages, and because regulatory uncertainty regarding additionality might also persist for some time. With the limited portfolio of CDM projects already built, the volume that can be reliably delivered in 05, 06 and 07 is thus limited (and there are indications that these are, in fact, the most expensive CER vintages).

Third, *there are some uncertainties related to the transfer of CERs into the EU ETS*. The International Transaction Log, necessary for CDM transactions to be validated, might not be in place until next year. In addition, buyers need to be authorized to use CERs for compliance and hold a registry account in the country in which they operate an EU ETS covered installation. These registries are not operational yet, and they might take time to emerge.

Will the price differential persist? The barriers to entry of CERs into the EUA outlined above are likely to be reduced over time. First, the technical issues and costs surrounding the conversion of CERs to EUAs will likely be resolved. Second, as time goes by, larger portfolios of CERs are likely to be built. Sellers will thus be able to offer larger amount of CERs, issued or well guaranteed. Credit-worthy sellers, in particular, will emerge with large “compliance” assets comprising of portfolios of CERs across which they can guarantee delivery.

The question, however, is when this convergence will occur: it is unclear whether it will be as early as in 2006 - 2007, or only in 2008 and beyond. It is interesting to note that some EU companies are already purchasing CERs on the market for both 2005-2007 and 2008-2012. Important volumes of 2005-2007 allowances have been recently purchased, but whether there is supply made available in the market for much more is an issue. Here projects with short lead times such as HFC or N₂O destruction will be critical.

6.5 The UK Emission Trading Scheme

The UK's voluntary emission trading scheme, which started in March 2002, is the longest operating GHG trading program in the World. Most participating companies agreed to join in return for an 80 percent discount on the Climate Change Levy, a tax on industrial and commercial energy consumption. To receive this discount, companies were required to adopt either an absolute or a rate-based limitation on either their GHG emissions or their energy consumption. The type of limitation adopted by each firm determines what rules govern its participation in the market and the timing with which firms receive their allocation of tradable emissions allowances from the government.

The UK market has seen limited activity in 2004, with an approximate 534,000 tCO₂e exchanged. Activity in the first three months of 2005 has been of very limited (about 107,000 tCO₂e exchanged). Prices have oscillated between 1.68 and 3.80 British pounds per tonne of CO₂e.

Installations under the UK ETS and the EU ETS partially overlap. The UK Government estimates that the ‘overlapping’ installations represent about 40% of the total emissions of the Direct Participants in the UK ETS. The EU has agreed to grant a temporary exclusion for these sources until the end of 2006.

6.6 The Chicago Climate Exchange

The Chicago Climate Exchange (CCX) is a pilot GHG cap-and-trade system through which entities, mainly U.S.-based private firms, have agreed to voluntarily limit their GHG emissions from 2003 to 2006. These entities can comply through internal reductions, purchase of allowances from other companies facing emission limitations, or purchase of credits from ER

projects that meet specific criteria. In 2004, an estimated 2.4mtCO₂e has been exchanged on the CCX in 241 deals. Prices have remained slightly below \$1/tCO₂e for the first half of the year, before increasing sharply to briefly spike at \$2 and settle around \$1.7 by the end of the 2004.

6.7 The New South Wales GHG Abatement Scheme

The New South Wales (NSW) GHG Abatement Scheme commenced on 1 January 2003 and is to remain in force until 2012. It imposes mandatory greenhouse gas benchmarks on all NSW electricity retailers and other parties. Participants are required to reduce their GHG emissions to the level of their greenhouse gas benchmark by offsetting their excess emissions through the surrender of abatement certificates. These certificates are created by accredited abatement certificate providers and can be traded. At the end of a compliance year excess emissions remaining after the surrender of abatement certificates is called a greenhouse shortfall and currently attracts a penalty of \$10.50 per tCO₂e.

This market has increased again compared with last year picked up compared with the last report. A total of 5mtCO₂e of NSW Greenhouse Abatement Certificates has been exchanged in 2004 in more than 100 transactions; and 2.2mtCO₂e have been exchanged in the first three months of 2005. The average price of allowances in this market is estimated at U.S.\$8.1/tCO₂e over the past 15 months.

7. MARKET OUTLOOK

This section discusses what we perceive as major drivers and issues for the carbon market over the next year or two.

7.1 Regulatory Drivers

Relative to last year, the regulatory landscape of the carbon market is much clearer. The EU ETS has started operations, with most of the NAPs validated. The Kyoto Protocol has also entered into force, lifting one of the most important sources of uncertainty on the market. Climate change plans in Canada and in Japan have yet to be adopted, but their contours are now clearer, and final decisions might be expected in the coming 12 months. On the Seller side, recent political developments in Ukraine have increased the prospects of JI projects in this country, and efforts are also being made in Russia to meet the requirements for Track One JI projects.

This does not mean that no regulatory uncertainty exists at all. Market participants notably point out that the regulatory uncertainty concerning CDM projects (and to a greater extent still JI projects) is still very large. This paper is not the appropriate venue to discuss the decisions of the CDM Executive Board regarding additionality.²⁵ But one can note this discussion cannot be avoided, because the additionality concept is central to the CDM. A second point most observers agree on is that the CDM EB and its various panels are currently under-resourced relative to the regulatory tasks that they have to perform.

7.2 Market Outlook

We do anticipate that the various segments of the carbon market will continue to grow in the next 12 to 18 months. On the JI and CDM fronts, large buy orders from European and Japanese entities (both Governments and firms) suggest that there is still a large demand in search of supply of CDM credits. There is greater uncertainty regarding the ability of non-Annex I countries to supply enough emission reductions before 2012. Current average volume per deal (a little less than 1MtCO₂e) is probably not conducive to supplying very large volumes; and the technologies that can supply large amount of emission reductions quickly, such as HFC₂₃ destruction, N₂O destruction, or coal mine methane, will be critical. Large-scale energy projects have also yet to happen (e.g. country-wide energy efficiency in electricity or gas transmission), as the carbon market remains a small market for large oil and gas producers or large utilities in the South. There are indications that some such projects could emerge in the near future.

The differential between the price of EUAs and the price of CERs is likely to persist until 2007 and maybe even 2008 (see the discussion in the previous section), although EUA prices averaged over a year could be lower than those observed over the first four months of operation of the ETS. But although temporary, this gap is critical in terms of perception by non-Annex B sellers. The development of the CDM could be severely hampered if the perception persists that the gap is too wide; and serious delivery risk could ensue. For buyers in CDM projects, including tools to mitigate the price risk in contracts might be one of the ways to resolve this issue, and more generally to address the risks generated on the CDM market by the volatility of the EUA prices.

Two key issues are worth mentioning to conclude. First, as already noted last year, the market is currently given little indication from regulators that CERs or ERUs generated by CDM

²⁵ At time of writing, 16 methodologies had been adopted, and 5 projects had been registered.

or JI projects beyond 2012 will have value under the post-2012 climate regimes.²⁶ In this context, because of project lead-time the window of opportunity for the CDM and JI will essentially close in 2006. Developing infrastructure projects is a long process which, depending on the technology and business environment, requires 3–7 years from identification, through licensing, financing, and construction to the first certification of ERs after the first year of operations.²⁷ Therefore, for projects to deliver a significant proportion of their achievable ERs by 2012, they need to become operational by 2006 or 2007 at the latest.²⁸ Some indication from the UNFCCC Parties that the ERs from CDM projects that were registered during the first commitment period and which baseline extends beyond the period will be valid would probably provide a higher confidence in the value of post-2012 CERs. Otherwise, the incentive structure of the CDM will continue to push towards fast-yielding, low-risk, high volume assets like HFC₂₃ or N₂O destruction.

Second, the major uncertainty on the carbon market, that is the availability of AAUs from Russia, Ukraine, and other transition economies, has yet to be addressed. Current pilot programs aimed at “greening AAUs” might provide a basis to start a discussion on this front, and there are indications that large-scale “greened AAUs” project are currently at advanced stage of preparation in Eastern Europe. Yet it is still unclear whether Russia and Ukraine, by far the two largest potential suppliers of AAUs, will meet the necessary requirements for International Emissions Trading, and if so how much AAUs they might be willing to put to market, and at which price. Since their supply could potentially be twice as large as the total combined demand for allowances from Canada, Japan and the EU, their decisions will obviously have major implications for the carbon market.

²⁶ That baselines for CDM can be established for a period up to 21 years implies that the ERs generated by these projects are intended to have value beyond 2012.

²⁷ Experience of the Prototype Carbon Fund, as well as energy and infrastructure projects developed by the World Bank.

²⁸ Some types of mitigation projects, however, involve lower project lead-time. LULUCF is often one example, HFC₂₃ destruction another.

8. CONCLUSION

The carbon market has gone a long way over the past 12 months. With the entry into force of the Kyoto Protocol, and the start of operation of the EU ETS, the carbon risk is increasingly perceived by Governments and firms alike as a strategic issue that should be carefully monitored, analyzed, and hedged against; and carbon transactions are among the most important tools to realize these goals. More than increase in volumes, the major change on the market over the past 12 months is probably in the realization that the carbon constraint is now serious. The increased number of players in the market, the large incipient demand flowing to carbon funds and Government tenders, or the apparition of sophisticated instruments for allowance trading are all signs that a major evolution is under way, as the market gears up for the a new and more operational phase.

There are still plenty of challenges ahead, not least to reduce the regulatory uncertainties about the CDM, or to clarify the confusion between the price of EUAs and the price of allowance-based assets. Here patience is in order, as it will take a few more months for the EU ETS to operate in conditions more or less resembling a full and efficient market, at which time the price of carbon might provide a better indication of the equilibrium price of EUAs. But the critical issues ahead are clearly the ability of the CDM and JI to supply large volumes of emission reductions, and the amount of AAUs that Russia and Ukraine might put into the market.



**A Joint Product of the Carbon Finance Product of the World Bank
and of the International Emissions Trading Association**