The World Bank

STATE AND TRENDS OF THE CARBON MARKET 2006

Washington DC, May 2006

With data and analysis provided by
Evolution Markets and Natsource

STATE AND TRENDS OF THE CARBON MARKET 2006

Karan Capoor,
Carbon Finance Unit, World Bank*

Philippe Ambrosi,
Development Economics Research Group, World Bank*

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

 The CF-Assist program of the World Bank Carbon Finance Unit funded this research.

ACKNOWLEDGMENTS

We are grateful to many of our colleagues and friends for their cooperation and assistance in preparing this report. Special thanks are due to Mahua Acharya for her active contribution to this study.

We wish to also extend our thanks to Ajay Mathur, Albert de Haan, Alexandre Kossoy, Andrei Marcu, Anita Gordon, Anushika Karunaratne, Bertrand Gaillard, Bruce Usher, Chandra Shekhar Sinha, Charles Cormier, Charlotte Streck, Einar Telnes, Emily Tyler, Franck Lecocq, Garth Edwards, Gautier Le Maux, Gerhard Mulder, Hiromi Nagai, John Buckman, Justin Guest, Ken Newcombe, Laurent Segalen, Marco Monroy, Mark Meyrick, Martina Bosi, Masaya Inamuro, Mike Wriglesworth, Nikolaus Kramer, Rob Short, Roon Osman, Tobias Haumer, Werner Kornexl as well as numerous unnamed but greatly appreciated colleagues from the Carbon Finance Unit at the World Bank.

EXECUTIVE SUMMARY

What a year this has been! The overall value of the global aggregated carbon markets was over US$10 billion in 2005. In the first quarter of 2006, overall transactions worth US$7.5 billion had led some to predict that this new financial market would be valued at between US$25-30 billion in 2006, although the authors view such projections with caution.

These values had been driven by soaring prices in the European Union Emissions Trading Scheme (EU ETS) market for Phase I European Union Allowances (EUAs). EUAs worth US$8.2 billion traded in 2005, which corresponded to 322 million tons of carbon dioxide equivalent (tCO_2e) and represented almost a forty-fold increase over the previous years' volumes. It is important to note that these numbers reflected financial transactions for allowances, which is quite different from the physical exchange of allowance certificates for compliance.

The strong price signal in the EU market raised price expectations in the project-based markets as well, where the demand from European and Japanese companies was very strong.[1] In 2005, 374 million tCO_2e, mainly of Certified Emissions Reductions (CERs), were transacted at a value of US$2.7 billion with an average price climbing over US$7.23. These numbers reflected an increase of more than three times above the previous year's volumes from project-based transactions and over five times above the previous year's value. In the first three months of 2006, prices for project-based emission reductions soared with an average reported price of US$11.45 per tCO_2e for the 79 million tons transacted in the first three months of 2006 alone, corresponding to a value of nearly US$0.9 billion.

Developing countries began to participate meaningfully in the market and brought real emission reductions to the table. The market share of Clean Development Mechanism (CDM) credits from developing countries was about 49.2% of overall volumes transacted globally. In the first three months of 2006, the CDM's market share of the overall carbon market volume was about 27.2%. Joint Implementation (JI) remained a very small contributor at about 4.7% of project-based volumes (about 2% of the entire volume of carbon markets), at relatively low prices reflecting the perception of regulatory and institutional risks. European and Japanese private entities dominated the buy-side of the market, scooping up nearly 90% of all transacted project emission reductions in 2005 and in 2006 alike, while China was the dominant player on the sell-side.

The evidence from the market, documented in our report, is that price signals in the carbon markets have stimulated innovation, especially in developing countries. A new urgency enveloped business managers in developing countries last year who had an incentive to reduce emissions. A quick look at our market data — and the pipeline of CDM Project Design Documents (PDD) — confirms that the lowest-cost options, i.e. those involving the so-called industrial gases (i.e. HFCs) are the first asset classes to be systematically tapped globally, followed by nitrous oxide, and so on.

The capital markets also responded. A growing number of companies successfully raised capital for those efforts through IPOs on the London Alternative Investment Market (AIM) or attracted hedge fund capital to arbitrage between markets. Financial innovation thrived as a plethora of

[1] The "EUA-effect" appeared to have been felt in unconnected markets such as the U.S. voluntary Chicago Climate Exchange (CCX) and in Australia's New South Wales (NSW) market, where carbon prices in those non-Kyoto markets have also seen upward movement.

clever carbon-based securities and hedge instruments became available to hedge carbon price risk against price volatility in other commodity markets. Brokers, consultants, carbon procurement funds, hedge fund managers and other buyers scoured the globe for opportunities to buy credits associated with projects that reduce emissions in developing countries. Innovative structures that managed both down-side and up-side carbon price risk and reduced delivery risk began to emerge, which aligned purchases of carbon with an interest in the underlying project, through equity, debt, mezzanine finance, technology or operating agreements. The City of London developed as a sort of hub for many of these activities and a vibrant new climate services industry developed.

EUAs influenced, and were, in turn, influenced by European markets for natural gas, petroleum, power, fuel and weather derivatives. Carbon's interaction with those related markets — some of which are not yet fully competitive — had an impact on prices in those markets. Business decisions began to be made with the price of carbon as a criterion. The new carbon markets exerted a global influence on other parts of the economy and society at large. Price volatility in carbon had significant impacts on values of European power companies as well as the stock price of chemical companies. In the case of Rhodia, a French chemical company, for instance, the stock price increased 35% in the eight days following regulatory approval of a proposed CDM project methodology. In contrast, the same stock price declined 16% as news about the verified emissions reports of European countries leaked to the market in late April 2006.

The authors welcome the development that new capital and innovation have entered the carbon markets ever since carbon became a commodity with value. Reducing climate change risk and promoting investment in clean energy systems is a long-term venture requiring billions of dollars of annual investment: it is estimated that about US$ 40 billion annually of incremental capital will be required for climate change mitigation in developing countries over the next two decades[2]. This will require long-term solutions, long-term capital and long-term legally-binding constraints. It is our view that private capital markets are the primary global force that can generate enough long-term resources in order for the world to transition to a future with cleaner energy and a safer climate.

Long-term carbon constraints, while necessary, are not, however, a sufficient condition for the scale of change required. In order for the market to generate sustainable long-term capital at the scale required, the market needs a strong compliance system, more transparent and credible processes about formulating and releasing emissions data, and clear signals about future policy direction. Only then will the market attract the long-term capital required for this change.

Market Outlook

The market correction in the EU ETS in the last few days of April 2006 wiped out over half of its market value. Wholesale German power prices also fell on the news that several countries in Europe were longer carbon or less short carbon than had been expected. We will not delve into all the reasons for the EUA price correction here, except to state that market fundamentals should drive value, not momentum.

The fundamental demand in the EU ETS Phase I market is more or less at levels it was when EU allocations were made, although weather and fuel prices may have led to seasonal variations in the positions of power companies. The official release of verified emissions reports from EU

[2] See *Clean Energy and Development: Towards an Investment Framework*, Development Committee, IMF and the World Bank, April 2006.

Member States on May 15, 2006, will clarify the position for EU ETS Phase I. In early May, EU 2008 futures rebounded to around €20-24 as the market focused on the likelihood of tighter compliance caps in EU ETS Phase II, reflecting the commitment of Member States to meeting their Kyoto Protocol targets.

In the immediate future, the prospects for the project-based market are quite solid, provided the EU does not erect any barriers limiting entry for CDM and JI imports for Phase II. Several EU governments had already made commitments to purchase credits for Kyoto compliance last year. Demand from the Japanese private sector remains largely unchanged and its Government announced new plans to purchase emission reductions on the market. Canada's recent announcements[3], while significant for overall demand, did not move the EUA market at all when they were made (and in any event, Canadian buyers have been largely absent from CDM and JI transactions for the past year).

On the supply side, the outlook actually improved considerably as project-based reductions began to make a significant contribution to the compliance markets, *albeit* with limited 2005-07 delivery. The ability to harvest sufficient volumes of CERs should create enough comfort for installations facing more stringent EU ETS Phase II caps. CDM's strong project pipeline should also encourage all UNFCCC and Kyoto Protocol Parties, other compliance markets, e.g. RGGI, voluntary markets, e.g. CCX, and corporate and retail buyers that developing countries can and will participate meaningfully in climate change mitigation.

Markets now price carbon and this has created the opportunity for the private sector to efficiently support investments to reduce emissions. Binding emission reduction commitments not only gave rise to these markets, but the level of future caps and the integrity of the market's information transparency and compliance systems will continue to influence to what extent new capital will be mobilized to support climate mitigation. The success of the carbon markets will ultimately be judged by their ability to achieve their environmental goals and preventing climate change.

For this, clear market signals for credible constraints need to be sent. The first test of this is whether regulators will set the EU ETS Phase II caps at credible levels to enable the EU Member States to meet Kyoto objectives. The next test is whether there can be a long-term signal for post-2012 commitments from Parties to the UN Framework Convention on Climate Change (UNFCCC). In this context, we welcome other drivers of the global (if fragmented) carbon markets, such as the imminent establishment of the Regional Greenhouse Gas Initiative (RGGI) in the North-Eastern United States, the continued operation of the New South Wales carbon market in Australia and growing liquidity in the Chicago Climate Exchange (CCX), as well as corporate and retail markets.

[3] The Government recently announced that it will revise its national plan of action, which raises uncertainty as to what extent Canada will make use of the Kyoto Mechanisms to meet its emission reduction commitments under the Kyoto Protocol.

TABLE OF CONTENTS

I INTRODUCTION

Greenhouse gas (GHG) emissions are invisible and odorless. Although the impacts of climate variability and the ability to adapt vary widely, the global warming impact of these gases on the atmosphere is equal irrespective of where they are emitted. This indifference ("equivalence") from an environmental perspective to where the greenhouse gas is emitted — or reduced — is the key insight that lends itself well to a global management system.

This "where" flexibility for compliance is given shape by the establishment of the Kyoto Protocol's and the EU ETS flexibility mechanisms which allow entities with caps on their overall emissions to trade among themselves ("Cap and trade" or "emissions trading") as long as they are within their caps. Cap-and-trade approaches are distinguished by the fact that their environmental performance is guaranteed at the level the cap is imposed.

The Kyoto mechanisms also create a flexible framework beyond traditional "cap-and-trade" approaches by allowing "credit trading" with countries that do not have overall emission caps. A project in any Kyoto Protocol Party can monetize the assets it creates by certifiably demonstrating that it has reduced emissions below what they would otherwise have been.

This element of flexibility is expected to lead to emitters actively scouring the globe for the most economically cost-effective ways to reduce emissions. It is believed that some of the lowest marginal costs of carbon abatement lie in the developing world, where new capital stock is being added and efficient technologies can reduce emissions more readily than in countries with more mature infrastructure in place. This is also expected to create an incentive for the use of low-carbon technologies throughout the globe, promoting sustainable development and fostering investment in clean (or cleaner) production modes.

Since the first 'State and Trends of the Carbon Market' study, this report has maintained that properly designed market-based regulation has the potential to unlock private ingenuity and capital to solve complex environmental problems. The Kyoto Mechanisms have created an architecture and framework for market-based management of the global atmosphere. This has spawned — and in turn been influenced by — similar approaches and policies in the EU and other Kyoto Parties as well as notably on the regional and sub-national levels in the United States and in Australia.

There is increasing price transparency in the EU-allowance markets through carbon exchanges and there have been several publications in the marketplace recently about price discovery and the role of fundamentals in this important segment of the market[4]. The project-based market is very diverse, with unique risks inviting a range of confidential transaction structures and legal terms defining contracts. Price discovery is difficult and prices in this segment reflect the various risks associated with guaranteeing delivery of the compliance asset when and where required. Specific issues such as buyer and seller credit risk have significance for issues of future delivery and future payment alike.

[4] The authors urge the reader seeking a comprehensive view of the market to read this report along with other recent reports on the carbon market, such as: Point Carbon (2006), "Carbon 2006: towards a truly global market". H. Hasselknippe & K Roine eds, 60 pp (and other notes and reports downloadable at PointCarbon.com); several notes by Caisse des Dépôts (www.caissedesdepots.fr) and reports by analysts from investment banks.

As such, we dedicate a significant portion of our effort in this study to exploring the project-based market in particular. This segment is also of the most interest to the World Bank's Borrowing Country clients. Our interest in the EU ETS and other emerging Kyoto- and non-Kyoto allowance markets is strong to the extent that events in those markets help explain the development of the project-based markets. The objective of this study is to get a representative sense of the activity of the carbon markets, their evolution over time up to April 2006, and sketch what we see as the likely trends in the future.

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. Section 4 focuses on allowance markets, and particularly on the EU ETS. Section 5 focuses on project-based transactions, and particularly on the CDM and JI projects. Section 6 presents the major trends that we see emerging.

Since most project-based transactions (and many EUA 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, several Participants in the World Bank carbon funds, consultants, project developers, non-profits and multilateral organizations. We are extremely grateful to all of them. Without their cooperation, it would truly have been 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 are associated with the study.

II MARKET STRUCTURE

2.1 DEFINITION OF CARBON TRANSACTIONS

In this report, we define *carbon transactions* as purchase contracts whereby one party pays another party in exchange for a given quantity of GHG emission reductions, either in the form of allowances or "credits" that the buyer can use to meet its compliance objectives vis-à-vis greenhouse gas mitigation. Payment for emission reductions can be made using one or more of the following forms: cash, equity, debt, or in-kind contributions such as providing technologies to abate GHG emissions.[5]

Carbon transactions can be grouped into two main categories:

- *Allowance-based transactions*, in which the buyer purchases emission allowances created and allocated (or auctioned) by regulators under cap-and-trade regimes, such as Assigned Amount Units (AAUs) under the Kyoto Protocol, or EUAs under the EU ETS. "Cap-and-trade" allowance markets have high environmental credibility because they establish a flexible structure to achieve the desired level of environmental performance established by the level of caps set.
- *Project-based transactions*, in which the buyer purchases emission credits from a project that can credibly and verifiably demonstrate that it reduces GHG emissions compared with what would have happened otherwise. The most notable examples of such activities are under the CDM and the JI Framework under the Kyoto Protocol, generating CERs and Emission Reduction Units (ERUs) respectively.[6] These project-based mechanisms have strong environmental credibility because they are created using approved methodologies and benefit from being independently certified before they are issued.

2.1.1 Role of Project-based Credits in the Market

Carbon cap-and-trade regimes currently in place, allow, for the most part, for the import of credits from project-based transactions that can be used for compliance, above and beyond the initial supply of allowances. For example, ERUs and CERs issued and delivered to an account in a Registry can be used to meet obligations under the Kyoto Protocol. Similarly, the EU Linking Directive allows obligated installations to use credits from CDM (with some limitations) during Phase I.[7]

[5] We restrict the analysis to transactions where carbon assets are transferred from a seller to a buyer. We thus exclude, for example, projects under the climate change focal area of the Global Environment Facility, which might reduce GHG emissions, but where no ownership rights are transferred.

[6] Other project-based mechanisms are included as domestic offsets projects in various countries e.g. in New Zealand (a pioneer, with two tenders in 2003 and 2004, totaling 42 projects and leading to 11.9 million tons of carbon dioxide equivalent (tCO_2e) emission reductions contracted) or activities that can generate abatement certificates under the Greenhouse Gas Abatement Scheme (GGAS) in New South Wales. Another variation is the projects funded by a one penny levy on petrol sold in Switzerland. Some project-based transactions are conducted to meet voluntary targets (eg under the Chicago Climate Exchange (CCX)), but most are ultimately intended for compliance with the Kyoto Protocol or other regulatory regimes (mostly the EU ETS and the Keidanren Voluntary Action Plan in Japan).

[7] Cap-and-trade models of environmental performance management, e.g. the SOx market in the U.S., are typically closed systems in that all participants have overall caps and there are no imports allowed from outside the system.

The U.S.-based voluntary Chicago Climate Exchange (CCX) also allows for flexibility with the inclusion of project-based credits and the import of EUAs. Norway's emissions trading system as well as the proposed RGGI (a U.S.-based regional greenhouse gas initiative) also allows for the import of project-based credits. The Swiss "penny tax" on diesel and petrol (not a cap-and-trade system at all) as well allows for an interface with CDM and JI projects. These speak to the high quality and performance standards that are associated with project-based transactions.

Once project-based credits are issued and are finally delivered where and when desired for compliance, then they are fundamentally the same as allowances[8]. For example, from a compliance perspective, an allowance in a registry (both EUAs and AAUs) is fully fungible with an issued and delivered CER or ERU.

Allowances are compliance assets that do not need to be "created" like project-based credits. As an example, EUAs are issued by regulators and are compliance instruments right away. As long as the national registries are connected, there are no barriers to having EUAs transacted and delivered when and where needed (into the appropriate registry when needed for compliance purposes).

A CER contract (as opposed to an issued, delivered CER) has certain risks inherent with it:

- a CER does not legally exist until it is issued; its volume depends on project performance (and verification), actual issuance, and its delivery into the compliance buyer's registry requires that the International Transaction Log is operational;
- it is not valid for compliance (although it may be valuable from a trading perspective) until it is delivered into an Annex 1 account in the CDM Registry;
- once it is delivered into a buyer's account in the CDM registry, it loses its ability to be transferred across borders prior to 2008.[9]

Contracting project-based emission reductions involves higher transaction costs and more risk than purchasing allowances. Projects, after all, have to be planned, financed and executed according to schedule and operated as planned for the credits to materialize when and where required. Regulators in buyer and seller countries have to issue their approvals. Concern about delays in implementing the International Transaction Log (ITL), although somewhat overplayed in our view, also limit the confidence of the market that credits for compliance would be available where and when required. As the first credits have been issued, observers have noted that some projects had over-estimated the volumes they were to generate. Since January 2005, CER contracts have generally traded at a discount to EUA allowances, undoubtedly reflecting some of these risks.

[8] "Residual" difference between those units pertains to the regulatory framework under which they are used for compliance purposes. Some of the rules indeed may limit the substitutability of these units at a given point in time (for instance, issue of supplementarity and existence of a cap on the imports of project-issued units, type of projects deemed non acceptable) or over time (relative degree of carry-over allowed across compliance periods).

[9] Under Article 17 of the Kyoto Protocol. To get around this difficulty, swap transactions between EUAs and CERs can be settled for as long as cross-border trade is not allowed.

2.2 SEGMENTS OF THE CARBON MARKET

There are several fragmented carbon markets, encompassing both allowance and project-based assets that co-exist with different degrees of interconnection. For this reason, some analysts have usefully compared the carbon markets as being more analogous with currency markets rather than the more traditional, undifferentiated, standardized global commodity markets. These carbon markets are each complex and fast-moving and they continue to be influenced by both the development of policy and regulation that led to their creation and by market fundamentals. These markets are developed to different degrees in different parts of the world as national and regional policies themselves evolve.

The carbon markets can be segmented in a number of different ways: chief among these, compliance or non-compliance, and mandatory or voluntary markets. Buyers largely engage in carbon transactions because of carbon constraints (current or anticipated) at international, national or sub-national levels. Markets can also be segmented by size and value: the Kyoto Protocol is the largest potential market and the EU ETS, a "tributary" scheme, has spawned a thriving market in the trade of allowances and for the import of project-based reductions. The main compliance buyers are government buyers interested in Kyoto compliance; European private buyers interested in the EU ETS; Japanese companies anticipating a domestic emissions trading scheme; U.S. multinationals operating in Japan and Europe or preparing in advance for the Regional Greenhouse Gas Initiative (RGGI) in the Northeastern U.S. States; power companies regulated by the New South Wales (NSW) market in Australia; and North American companies with voluntary but legally binding compliance objectives in the Chicago Climate Exchange (CCX). There is also a growing retail carbon segment that sells emission reductions (ERs) to individuals and companies seeking to offset their own carbon emission footprints.[10]

2.3 DEVELOPMENT OF MARKET INSTITUTIONS

2.3.1 Markets Created by Binding Constraints

The principal carbon markets in operation today have been created by binding constraints, primarily regulation (e.g. Kyoto Protocol, EU ETS), but also by legally-binding voluntary commitments (e.g. under the Chicago Climate Exchange). In 2005, strong carbon market growth occurred as regulatory certainty and credibility increased, as the first phase of the EU ETS was launched on January 1, 2005 and the Kyoto Protocol entered into force six weeks later.

Demand in the market is fundamentally derived by the level of the cap, e.g. by the limited number of AAUs issued under the Kyoto Protocol and by EUAs authorized for the EU ETS. Caps on emissions (or allowances) have to be set carefully - not too stringent to be unattainable and not too lenient to be meaningless.[11] Time ("when") and place ("where") flexibility allows comfort

[10] In this segment of the carbon market, one can also observe an increase in activity together with an entry of financial players. An example is the entry into this space of Climate Wedge Ltd. in partnership with Cheyne Capital Management. Launched in August 2005, the Cheyne Climate Wedge Fund is reported to be actively seeking to purchase emission reductions from projects and re-selling Voluntary Carbon Units (VCUs) from a diverse range of carbon abatement projects worldwide.

[11] Many observers believe that the caps for the EU ETS Phase I 2005-07 level were set at levels that were relatively generous to most installations. This was designed to invite participation in the pilot phase of EU ETS Phase I and to learn from early experience. An alternative way to set caps was piloted by the CCX, which sent a clear, certain signal that caps would progressively tighten by a fixed percentage annually.

that strong reduction objectives can be set and that installations are given the time and means to make or buy the necessary level of reductions. Ideally, the level of the caps is driven on the basis of the best scientific information available to achieve the ultimate objective of the UNFCCC, i.e. to prevent dangerous global warming. The integrity of the market is predicated on the belief that policy makers will take their legally binding obligations seriously under the UNFCCC, the Kyoto Protocol, the EU ETS or the RGGI and develop credible plans to achieve them.

2.3.2 Compliance

A cap is not an effective motivator of compliance if the market does not believe that the regulator is serious about compliance. So far, there have been signs that both the Parties to the Kyoto Protocol and the EU Commission are equal to the task before them in this regard. The Kyoto Protocol has established a Compliance Committee and the EU Commission has so far shown a welcome willingness to hold Member States accountable to the various commitments - and deadlines - for which they have obligations under the EU ETS.[12] These are considered as welcome signs of market maturity and stability, as the regulated community has a strong indication that national governments take their compliance responsibilities seriously.

2.3.3 Emergence of Market Institutions

The emergence of viable market institutions are usually a sign of a market's maturity. In this regard, the carbon market is considered to be still in its infancy. Carbon markets need greater transparency, regulatory certainty over time, and flexibility wedded with strong compliance and enforcement in order to guarantee performance. Markets also need predictable and transparent sources of information so that facts, not leaks or rumors or innuendo help form price information.

A mature market needs to address the range of issues relevant to the accounting, legal and financial landscape surrounding emissions trading. These include, for example, standardized accounting conventions for treatment of allowances and credits. Continued growth of sustainable value on the carbon markets also depend on the general institutions governing oversight and transparency of the securities industry, derivative products or the hedge funds community. These elements support sustainable value of allowances and credits traded.

2.3.4 Market Design and Related Markets

Fundamental demand in the carbon market is also influenced by related factors, e.g. the weather, the prices and availability of oil and natural gas, as well as the demand for electricity and heat. For example, the Russia-Ukraine dispute on transporting natural gas through pipelines had serious impacts on the price and availability of gas in Europe last winter. As such, many European power generators dispatched power generated by coal, not gas on the margin, despite the price of carbon. A well-designed carbon regulatory system should take into account the market structure of related markets. The RGGI is currently considering the implications of allocating allowances versus auctioning allowances to power companies that operate in competitive energy markets.

[12] The Commission has demonstrated that it would not merely serve as a rubber-stamp for National Allocation Plans (NAPs) submitted by Member States. To illustrate, the last of the NAPs was approved only in February 2006 after having been rejected earlier (like other NAPs) because of concerns about its effectiveness, as long as two years after the process had begun.

Market participants have different resources, information, objectives and strengths, creating the conditions for a market to exist. To illustrate, natural players such as traditional power companies have "compliance books" for which they hold compliance assets and against which they are less likely to constantly trade. The company may have a "spec book" and its commodity trading desks are more likely to trade constantly, adding liquidity to the markets. The same is likely to be true for financial sector firms that have strong commodity trading businesses. On the other hand, traditional manufacturing and industry may have less experience with trading and less information and experience than power traders about momentary fluctuations in gas prices, in power prices or in weather impacts on the merit order of power dispatch.

2.4 MARKET ORGANIZATION

In the past, the carbon market was dominated by third-party intermediaries such as carbon funds, emission brokers and consultants. Over the past year, exchange platforms and auctions emerged as two mechanisms aimed at simplifying transactions, reducing risk and helping to make price more transparent.

In the EU market, there are currently six exchange platforms, which represent about half of traded EUA volumes. Among those, the European Climate Exchange (ECX) claims that it has captured 70-80% of the market share over other platforms. Italy and Poland are preparing exchanges that are likely to be operational soon. There are six to eight classic inter-dealer brokers plus an increasing number of small brokers that have begun operating on the EU ETS. The most prominent big bulge investment banks, hedge funds and other financial institutions are very active on exchanges where they account for a large share of trading volumes. Banks often represent industrial participants and small obligated installations, many of whom do not have direct experience of trading. Some investment banks also speculate and act as primary brokers for hedge funds.

Some exchanges also trade other commodities, e.g. power (European Energy Exchange, Powernext, NordPool for instance) and several are preparing for CERs trade, e.g. ECX has established a relationship with the European Carbon Fund and Climex with Asia Carbon Fund. Brazil has announced the establishment of the Brazilian Carbon Market (MBRE), an online facility expected to be launched as a joint initiative between the Brazilian Mercantile and Futures Exchange (BM&F) and the Brazilian Ministry of Development, Industry and Foreign Trade (MDIC).

Wholesale over-the-counter (OTC) brokers provide EUA forward trading largely used by utilities in which there are defined contracts, established credit relationships with trading partners, and defined delivery dates. Energy companies often use wholesale markets because they have established credit relationships with other utilities. The wholesale market (which includes exchanges) is still largely dominated by OTC. Retail OTC brokers provide more customized transactions and flexible structures for compliance buyers who seek to address their compliance shortfall.

The Irish Government held the first auction of EUAs on February 17, selling 250,000 EUAs at €26.30 (US$ 31.56). Winners then sold the EUAs on ECX at €27.15 (US$ 32.58). The Asia Climate Exchange (ACX-Climex) held four auctions over the study period, with approximately 1.8 million tCO_2e under negotiation, and bids between €3.30 (US$ 3.96) and €11.75 (US$ 14.1). Only a small portion of these volumes have been actually transacted to date. Unlike the ECX or

other European exchanges, the ACX does not act as a principal on transactions, but rather simply provides an electronic trading platform.

III METHODOLOGY

3.1 PROJECT-BASED TRANSACTIONS

Reviewing project-based transactions on the carbon market has become increasingly difficult because there is currently no public registry of carbon transactions. At a time when the volume of transactions has increased dramatically as has the number of players involved, there also exists no internationally recognized price index for project-based transactions. 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. [13]

To try to overcome this limitation, we have assembled information from a variety of sources. We 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 industry publications.[14] Once again this year we have engaged Evolution Markets and Natsource,[15] two prominent market players, to supply data they have gathered under strict confidentiality rules. We have been able to obtain information about transactions from a wide range of primary sources. In turn, the World Bank has pledged them complete confidentiality: we would publish aggregate analysis and would not release any specific, non-public details of any transactions that they share with us. The resulting information has been aggregated in a database of 614 project-based transactions between 1996 and end of March 2006.

As opposed to previous years, the database *only* includes *signed contracts*. Transactions *at very advanced stage of negotiation* (agreed term sheet or equivalent) are no longer included in volumes and prices computation as well as other analyses. Indeed, in a market context where negotiations in 2005 and early 2006 were much more difficult and many were eventually not to be successfully executed as Emission Reduction Purchase Agreements (ERPAs) despite agreed terms, we would rather reflect what is actually agreed. We have applied this convention retroactively to previous years' data to reflect actual ERPA signature date and this explains, in part, why the data for previous years is somewhat different than was previously reported.

For each transaction reported, we tried to determine 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. Although we received a very high level of cooperation from most market players, we were not able to obtain complete data for all reported transactions. 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.

[13] 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 (vintages purchased, guarantee, indexation, option, etc.).

[14] 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), *Ecosystem Marketplace, Environmental Finance* and websites of market players (DNAs, DOEs, Project developers, aggregators, exchange platforms, governments, companies and purchasing vehicles).

[15] www.evomarkets.com and 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.

The completeness of data exceeds 80% in most cases except for information related to contractual structure and especially for prices, where reliable data were obtained for only in slightly more than 60% of the total volume. We must report, however, it proved more difficult to obtain project-level data this year than in 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. That would suggest an even greater need for a publication of this sort in the future.

Data Element	% of Transactions Where Available	% of Total Volume Transacted Where Available
Buyer Country	91.7%	97.1%
Volume	95.0%	--
Type of Gas	92.2%	91.0%
Technology	92.2%	96.4%
Project Location (region)	84.9%	98.4%
Project Location (country)	84.9%	95.6%
Structure of Transaction	71.5%	80.2%
Vintage	78.0%	90.1%
Price	60.4%	58.9%

Table 1: Completeness of data on project-based transactions

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 sometimes not provided to us, a risk of double counting exists. To mitigate this, we crosschecked data to eliminate duplicate entries, and adopted the conservative approach of deleting the entries if some uncertainty remained.

Second, volumes exchanged are all expressed in metric tons of carbon dioxide equivalent (tCO_2e) using the conversion factors of the UNFCCC. Volumes exchanged are also sorted in vintages pre-2008, 2008-12 and in vintages post-2012. We have tracked early delivery vintages (prior to 2008) because they are relevant to learn more about markets for compliance from installations under the EU ETS. When the exact distribution of annual vintages was not available, we have assumed an even annual accrual of ERs and check consistency with the PDD (when available).

Third, prices, when available, are expressed in nominal U.S. dollars per tCO_2e. We used yearly average exchange rates to convert prices from non-U.S. dollars denominated contracts. Generally, 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.[16] In some instances, more precise information was available with price data for specific vintages. For indexed transactions, they are calculated as a percentage of the EUA price prevailing on the Powernext exchange at the time of contract signature (which may differ of course from the eventual price of EUA at the time of actual delivery of/ or payment for emission reductions units).

Fourth, the report distinguishes between transactions intended for regulatory compliance (i.e. Kyoto and EU ETS, and other markets, including the Australian NSW compliance market), for voluntary purposes (such as the Chicago Climate Exchange voluntary market) and transactions on the retail market. Our coverage of voluntary and retail markets is not exhaustive and prices are reported here to convey an idea of how they differ from the biggest and most active segments of the market.

Fifth, we distinguish between transactions where the seller assumes the carbon regulatory risk (CERs) and where the buyer assumes the carbon regulatory risk (Verified Emissions Reductions - VERs). CERs refer to transactions for projects registered with the CDM Executive Board, while VERs refer to transactions that have been validated on the basis of CDM requirements, but that have not yet been registered.

How comprehensive is our database? We are relatively confident that our database captures most transaction activity entered into by governments. 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 confirmation. For this reason, and given the cautious approach adopted above, we consider that our analysis provides a rather conservative estimate of the carbon market. However, we believe that there is sufficient data to obtain a good representative view of the carbon market.

3.2 ALLOWANCE TRANSACTIONS

In stark contrast with the CDM and JI market, daily price information about the EU Market is freely available online. To prepare this report, we compiled data from the various trading platforms, as well as aggregated information on the volume known to have been exchanged over-the-counter. We also had access to data on individual over-the-counter transactions.

Finally, we have also obtained detailed information on transactions conducted under the CCX, as well as aggregate information on transactions under the UK Trading Scheme and under the NSW Trading Scheme.

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

IV ALLOWANCE MARKETS

4.1 IN A NUTSHELL: EU ETS HAS BEEN THE FASTEST GROWING ALLOWANCES MARKET

The EU ETS, created by the EU as a center-piece of its efforts to meet its Kyoto commitments, was, as of the end of March 2006, the largest carbon market in terms of value and volumes. It was considerably larger than the New South Wales, the Chicago Climate Exchange and the UK ETS markets. It was also substantially higher in volumes than the project-based markets (see Table 2).

	2004	2005		1st Q06	
	Volume ($MtCO_2$)	Volume ($MtCO_2$)	Value (MUS$)	Volume ($MtCO_2$)	Value (MUS$)
EU ETS[17]	8.49	322.01	8,220.16	202.51	6,552.24
NSW	5.02	6.11	57.16	5.51	86.55
CCX	2.24	1.45	2.83	1.25	2.71
UK ETS	0.53	0.30	1.31	na	Na
TOTAL	**16.28**	**329.87**	**8,281.46**	**209.26**	**6,641.50**

Table 2: Volumes transacted and corresponding values on the main carbon allowance markets.

The EU ETS was worth US$8.2 billion in 2005 and traded US$6.6 billion in just the first three months of 2006. This compares with US$57.2 million on NSW and US$2.8 million for CCX. Recent developments at the end of April after news suggested that overall position of installations for 2005 could be marginally long instead of being short as expected, suggests that market activity and value could be considerably slower in the coming months.

In this section of the report, we review overall performance of the EU ETS as the most prominent of the allowance trading markets. We examine determinants of price in the market and review certain features of market design, in the light of 16 months of operation. We conclude with a view on other allowance markets under development.

4.2 THE EU ETS

The first phase of the EU ETS was launched on January 1, 2005 as a pilot to help the EU and its Member States prepare for compliance with the Kyoto Protocol. Many observers believe that the

[17] These transactions include OTC trades and activities of exchange platforms where spot and future transactions occur.

ETS is well on the way to achieving its primary goals, i.e. obtain experience from emissions trading, achieve the environmental performance desired, discover prices, get guidance on design issues, including on the best ways to distribute allowances (i.e. allocation versus auctioning) and develop the institutions to regulate the markets.

The EU ETS, in its first phase from January 1 2005 to December 31 2007, regulates CO_2 emissions from installations representing some 40% of EU emissions. Those emissions are capped at 6,600 Mt CO_2 over the 2005-2007 period. Germany has almost one quarter of all EUAs, while the UK, Poland and Italy have almost 10% each. The power and heat sector received almost 55% of allowances, minerals (cements, glass and ceramics), metals (steel production facilities) roughly 12% each, oil and gas industries roughly 10%.

4.2.1 Market Developments

The first forward transactions of EUAs between European companies were contracted in 2003 (volume of under 1 million tons) followed by about 9 million tons in 2004. Since then, EU ETS trading volume has grown dramatically at a combined average growth rate (CAGR) of 3700% and reached 322 million tons in 2005. Compared to the fourth quarter in 2005 (Q4 '05), volumes traded in Q1 '06 increased by 41%.

In 2005, the EU ETS had relatively thin liquidity in both the spot and futures markets, although liquidity grew over time. We measured the annual turnover of the EUA market (volume traded annually as a percentage of total allowances) at only 14.6% for the whole year. This suggests that relatively small volumes transacted could have had a large impact on prices. Only 75% of the potential allowances were even able to reach the marketplace as the registries for countries such as Poland were not operational and were not connected to the Community Transaction Log (CTL).

Market data suggests that power companies were among the most active initially on these developing markets. Many power companies have extensive experience of trading in related gas and power commodity markets and adding a carbon desk was not a very big deal for many of them. Obligated installations from other sectors initially held back from trading because they were relatively new to trading or had corporate cultures that were quite conservative and they wanted to wait and see how the market developed. Still others were too small to participate in the market. As the exchanges developed around the middle of the year in 2005, banks and investment funds started to seek these players out and offered to trade EUAs on their behalf.

Prices

The average closing spot price for EUAs, as quoted on Powernext, spiked at €28.53 (US$34.24) in July 2005 - and has since traded in a band around €20-25 (US$24-30), mostly above €21 (US$25) through the end of 2005 before rising in January 2006 up to €23.92 (US$28.7). Average closing spot prices in February and March 2006 reached very high levels again, averaging €26.19 (US$31.43) and €26.37 (US$31.64), peaking on April 18 at €29.75 (US$35.70) until late April, when the EUA slid to a low of €10.90 (US$13.08) on May 2, 2006 (see Figure 1).

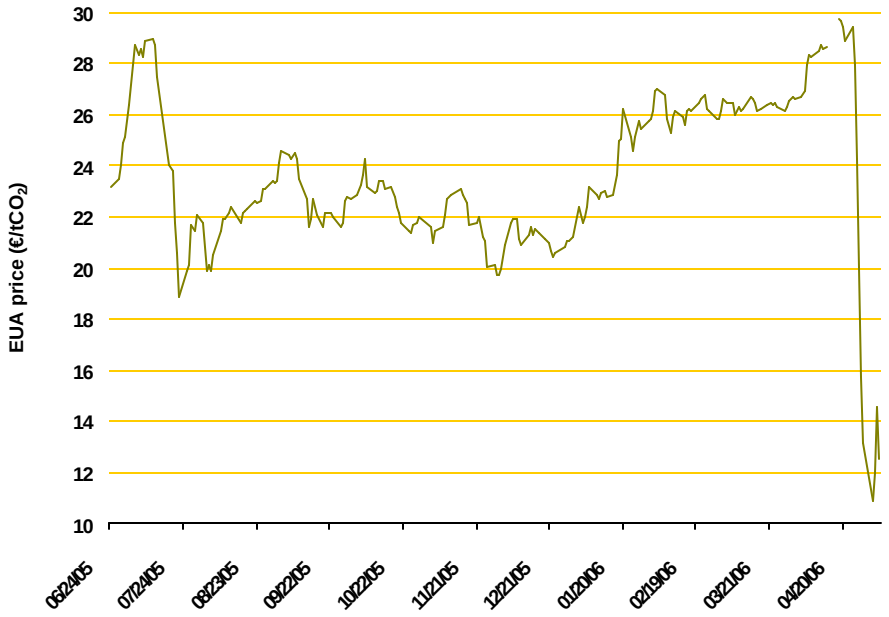


Figure 1: EUAs Spot Market (Daily Closing Price, Powernext) from start of operations (24 June 05) to 5 May 06.

As opposed to the project-based transactions market place where confidentiality - and hence conjecture is the norm - we want to stress here the importance of the emergence of prices and volumes information being disclosed on a daily basis through platforms and London Energy Brokers' Association (LEBA) market data and indexes. Carbon prices are, to coin a phrase, a "survey of the market" and observing prices of futures contracts conveys the expectations of market players. For instance, in early May 2006, Dec-'08 and Dec-'12 ECX futures recovered relatively quickly after the previous week's price collapse, reflecting market expectations regarding the likely tightness of caps for Phase II (see Figure 2).

4.2.2 Determinants of Price

Policy and Regulation

In the early days of the market in 2003 and 2004, slim forward trading mostly responded to political and regulatory expectations rather than to market fundamentals. At that time, expectations regarding the tightness of the NAPs, the inclusion of the CDM and JI (sector scope and barriers to entry, if any), political will of the European Commission to ensure the integrity and operation of the scheme, and the then open question of ratification of the Kyoto Protocol by Russia had variously influenced the direction of prices and volumes. This trend continued as the European Commission finally accepted Italy's NAP as late as February 2006 after having rejected it for not being stringent enough.

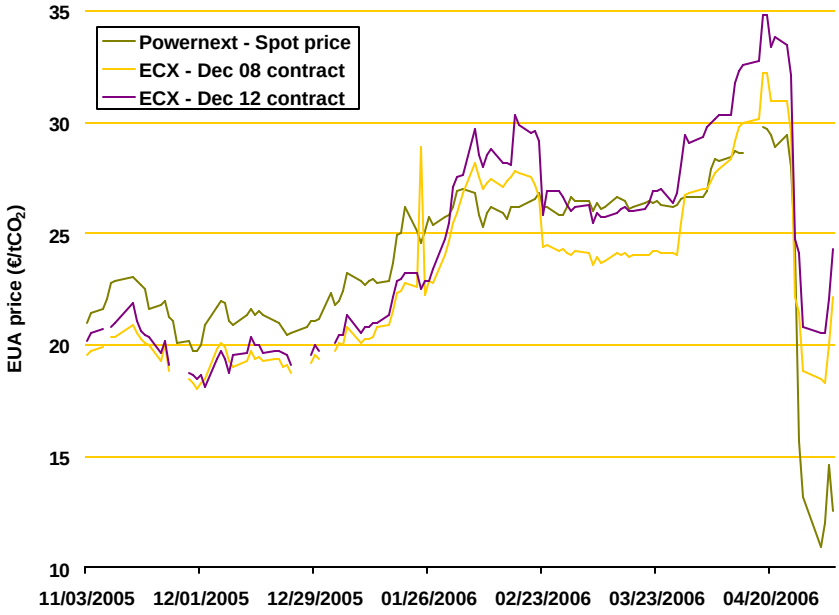


Figure 2: Spot and Futures prices for EUAs (Source: Powernext, ECX).

Market Fundamentals: Demand and Supply

Demand in the EU ETS is a direct consequence of the stringency of Member States' national allocation plans set out by governments for Phase I (2005-2007) and subsequently approved by the EU Commission. Most observers agree that these were set at reasonably generous levels in Phase I in order to encourage participation in the EU ETS.

The demand (or level of effort required to stay under the cap) will vary based on the rate of corporate growth, actual output, efficiency measures undertaken as well as weather patterns and fuel prices. Up to recently, analysts estimated that the likely level of effort was in the range of 60-90 million tons for each of the three years. Each obligated installation faced managerial "make-buy" choices about how to meet their compliance obligations. Some, it is argued, would make investments and upgrade their capital stock to generate allowances for themselves and in order to sell to others. Others, it is argued, would find it more rational to simply buy the allowances from another obligated installation. And with the Linking Directive, it will be possible to import CERs (and ERUs for Phase II) for compliance in the EU.

Given the disconnection between Phase I and Phase II, one could have expected significant volatility in the marketplace, especially as installations approached the true-up periods. Since the CDM was not expected to deliver sufficient volumes by 2005-7, CERs were also not able to contribute much in this regard. Finally, the inability to carry forward allowances from Phase I to Phase II also limits the ability to reduce volatility in Phase II. In the current, dynamic context of the EUA market, it is not surprising then that any information, rumor, expectation or fact about the position of installations would have brought – and may continue to bring high volatility to the market.

With the collapse in EUA prices in Phase I, it is now very likely that compliance installations will purchase relatively low-priced EUAs to meet Phase I obligations. They are also quite likely to bank any CERs likely to be delivered within 2005-07 until they need them for compliance in 2008-12. It is our belief that more flexibility between periods, including the ability to bank (or borrow) allowances, is more likely to encourage regulators and business to accept tighter caps in the future.

Weather, Fuel and Power Prices

About 55% of EUAs are held by the heat and power sectors. EUA prices are closely correlated with both oil and gas prices and with the weather. To illustrate: a cold, dry winter as Europe experienced spiked demand for both heat in Europe and reduced generation from hydroelectric sources. This encouraged coal generators to run their plants at higher capacity during peak hours, making them "short" EUAs, and increasing the demand – and price of EUAs.

To the extent substitution between coal and gas is technically feasible, utilities compare dark (coal) and spark (gas) spread to determine which plants should be operating. Spreads are defined as the difference between (peak) price for power and cost of fuel (coal or gas). Given the constraint set on emissions, these spreads have to be corrected (clean sparks) to account for the price of EUAs corresponding to the emissions generated through power production.

In the current international context, natural gas market fundamentals are related to both gas access as well as high gas prices fuelled among others by the tensions between Russia and Ukraine. A cold winter in Europe spiked power demand, and the "clean dark spread" (the cost of dispatching power from coal after adjusting for the price of carbon required to cover the extra emissions) still exceeded the "clean spark spread" (the corresponding cost of generating using natural gas), thereby continuing to favor coal-based power generation during peak hours. At some point, it was expected that additional demand for EUAs would push the EUA price high enough to collapse the clean spread implying that coal would no longer be preferred to gas.

In February 2006, the EUA price that would have closed the gap between coal and gas was estimated to be around €40 (US$48). Decrease of gas prices and a slight increase in coal prices in March led to a collapse of both spreads and their coming closer to EUAs observed prices.[18] Trading activity suggests that the investment and hedge funds entered the EUA market strongly in February. Power generating companies had, by then, already hedged their positions for much of the Phase I compliance periods and used this as an opportunity for some profit-taking.

The Price Collapse of the End of April 2006

Forecasts of the overall market's 2005 position came under question as reports of the first verified annual emissions reports reached the market in late April 2006. At the time of this writing, it was publicly reported that the Czech Republic, Estonia, France, the Netherlands, Spain and the Walloon region of Belgium had made announcements showing their position was longer or less short than expected: Czech Republic longer by 9 $MtCO_2$ had an overall surplus of 14 $MtCO_2$; Estonia long by 4 $MtCO_2$; France, believed to be short by 9 $MtCO_2$ and actually long by 20 $MtCO_2$; the Netherlands, believed to be short by 3 $MtCO_2$ and actually long by 6 $MtCO_2$; Spain finally short by 11 $MtCO_2$ (not by 18 $MtCO_2$ as expected) and Wallonia long by 4 $MtCO_2$. On the whole, the surplus from these regions adds up to 50 $MtCO_2$ (which is in the range of the shortfall

[18] See for instance *Tendances Carbone*, edited by Powernext and Caisse des Dépôts.

that had been expected in the market for 2005). Overnight, market expectations were reversed, revised from a 50 $MtCO_2$ market to an eventually long market for 2005.

This information led to a sharp decline in EUA prices and significantly higher volumes were traded in the last three working days of April. Reports for several other Member States have not yet been made public, and of particular interest are anticipated reports from Germany, Italy, UK and Poland. While most experts state that the early reports signal what lies ahead for Phase I, the authors emphasize that nobody knows what the position is until all reports are released to the public on May 15. In the meantime, financial markets react with increased volatility caused by the smallest rumor, innuendo or speculation, making it critical that national regulators safeguard such information.

A common observation is that the market focused excessively on the power markets and the position of power companies. Not too much was known about emissions estimation in many industrial sectors, which are longer than most had expected. For power companies, while they are also longer than might have been expected, their positions could still change over the coming two years as a result of weather conditions, power demand and gas prices, although the authors believe that most of them have largely already hedged their carbon-positions for 2006 and 2007. Some analysts still firmly believe that an overall shortfall for Phase I is possible. If this is the case, then the overall surplus for 2005 - if confirmed - can be carried forward to 2006 and 2007 and the price drop may be temporary.

4.2.3 Issues Raised by EU ETS Experience

Emission caps need to be set at the desired level of environmental performance, with the emissions data and baselines disclosed transparently. Many analysts had observed that the allocations under the EU ETS Phase I were too generous. This had been widely recognized by the market at the time they were announced, and it was justified as a good way to invite market participation so that market players and regulators could gain experience and insights into emissions trading. Clearly, this objective of the Pilot Phase of the EU ETS was met and the sixteen months of its operation have provided valuable insights.

From an environmental performance perspective, the market has achieved or is well on the way to achieving Phase I compliance based on the level at which caps were established. The precise performance details will be clearer when verified emission reports will be released on May 15 2006. Stronger environmental results in the future will be enabled by more stringent emission caps coupled with the flexibility over time and space to achieve them.

Consider how the cap drove environmental performance: without a carbon price to consider, high gas prices in Europe would have made coal the only available choice to meet the winter spike in power and heat demand. With a carbon price in the equation, power generators compared gas against coal + EUA prices and chose to dispatch electricity generated from burning coal. Strategic and geopolitical issues such as access to natural gas and the Russia-Ukraine dispute over pipeline access were also considered. In order to generate using coal, utilities bought more EUAs to cover their position, pushing EUA prices higher. This, in turn, led to higher electricity prices for European power consumers, which, in turn, created an incentive to conserve energy both on the demand and supply-side. Higher EUA prices also sent the right signal to developing countries and encouraged transactions to import CERs into the EU.

There has been a lot of attention on the fact that power operators - and regulated installations from all sectors - received free allowances equal to their cap through the NAPs. As a result, they

were able to pass on the carbon price as part of the power they sold on the wholesale power markets on the basis of their short-run marginal costs (which included carbon on the margin). This has raised the question of whether grandfathering or auctioning allowances should be further explored as a design option.

One area of potential improvement is to have available and verified disaggregated information regarding emissions data used for the baselines on which the level of installation caps have been set. The Commission and the regulated companies could also consider periodic release of emissions data estimates for installations in the same way that public companies release quarterly earnings reports. This would reduce the element of surprise or shock at true-up periods.

It is also important to consider the impact of flexibility between compliance periods. In particular, the ability to bank allowances across compliance periods can increase flexibility of compliance and reduce market volatility. We note that the ability to bank CERs across compliance periods would have also contributed to lower volatility in the EUA Phase I market, if only there had been sufficient lead time to deliver enough CER volumes in Phase I. Many observers believe that greater time and place flexibility should enable greater stringency in the level of emission caps.

Greater certainty about the expected level of the cap for future periods will send a longer-term signal to the markets, providing certainty to covered installations as they decide how best to respond strategically to the regulation. It, together with clarity around supplementarity, will send a signal about open access to the EU carbon markets and would provide a clear indication to project developers in developing countries and economies-in-transition regarding the certainty and timing of likely future demand. Investments in clean energy infrastructure or in cleaner burning fuels have to be analyzed using appropriate time horizons. Many such investments have lifetimes of 15-30 years. If the value of carbon is to be truly incorporated into these decisions, then regulatory signals need to reflect that time-frame.

4.3 THE NEW SOUTH WALES GHG ABATEMENT SCHEME

Some 6.1 million certificates were exchanged in 2005, a 20% increase over 2004 activity. During the first three months of 2006, trading activity has almost been as high as all of 2005, when 5.5 million certificates were exchanged. The overall value for 2005 is estimated at US$57.2 million and some US$86.6 million for Q1 '06. 222 transactions were recorded in 2005 (concentrated in the first and last quarters of the year) and 138 for Q1'06. This increase is predictably in line with the compliance deadline under the scheme (on March 18th).

Prices were in a range of AU$11-15 (US$8.14-11.10), nearly as much as the current fine of AU$11 for non-compliance (AU$15 post-tax, equivalent to US$8.14 - 11.31 post-tax). Why are power companies buying at these prices instead of paying the penalty? Some state that this is because companies are concerned about their corporate images. A second explanation relates to market expectations that the fine may well rise in the future. Forward contracts are currently trading at prices well above the fine.[19]

On the whole, 159 projects were accredited as of 6 March 2006, the most part under "generation" and "demand side abatement" rules. Credits issued from carbon sequestration into the biomass

[19] A 2010 transaction has been settled at AU$ 17.10. See news from *Ecosystem Marketplace*.

have also entered the scheme in 2005 (65,000 tCO_2 from a government forestry agency) and a deal was closed in April 2005 to provide some 3.2 million tCO_2 offsets from 30,000 hectares of a eucalyptus planting in rural NSW.

The scheme being considered a success, the NSW government has announced it would extend the regime beyond 2012, up to 2020. The big question is if the scheme will be extended nationally.

4.4 THE CHICAGO CLIMATE EXCHANGE

Activity under the Chicago Climate Exchange was more limited. The cap for Phase I (2003-2006) participants is slowly decreasing at a rate of 1% per annum from a 1998-2001 baseline. Every year, this implies a slightly tighter target.

In the past it was apparently not much of a constraint: for instance for 2004 (true-up period in third quarter of following year, i.e. September 2005), all members were found to be globally in compliance with limited trading. Trading volumes were even lower in 2005 than in 2004. While an estimated 2.24 million tCO_2 were traded in 2004, in 2005, some 1.45 million tCO_2 (less than 1% of the 2005 cap) were exchanged ('03, '04, '05 & '06 vintages consolidated) – essentially towards the end of year: 59.6% of trades are concentrated in the last quarter. Prices fluctuated between US$1.30 and US$2.82 with a weighted average of US$1.95, leading to a global value for 2005 of US$2.8 million. Prices slowly decreased Q1'05 from US$1.89 down to about US$1.30 before increasing towards the end of the year up to US$1.90.

For Q1'06, the market has been much more active with some 1.25 million tCO_2 exchanged ('03, '04, '05&'06 vintages consolidated) - 86% of 2005 volume - for a total value of 2.7 million US$ (96% of 2005 value). Records of volumes traded were broken in February and in March and prices have been increasing across all vintages. Post 2006 vintages ('07, '08, '09&'10) were listed in mid April and the data shows that prices for all vintages were above US$3.5 - with a spike around US$5.

Is next year expected to be more active? New participants can join in the scheme and directly aim at the end of phase II target: 6% reduction in emissions below baseline by 2010. Also, in mid-March, the CCX announced the formation of the New York Climate Exchange (NYCX) and the Northeast Climate Exchange (NECX) to develop financial instruments relevant to the emerging northeast Regional Greenhouse Gas Initiative (RGGI). It is likely that potential market participants would wish to familiarize themselves with emissions trading and eventually begin to hedge their positions during the current year.

4.5 THE UK ETS

The UK had initiated an emissions trading scheme prior to the EU. Launched in March 2002, the UK ETS[20] was at the time the first domestic economy-wide GHG trading scheme. Participation was on a voluntary basis and combines incentives (reduction by 80% of the Climate Change Levy for some participants, under the Climate Change Agreement), penalties (withholding of fiscal abatement, contraction of allowances) and flexibility (through an exchange). Only credits under the UK ETS could be traded. Over its duration (end of 2006), the scheme is scheduled to reduce

[20] Consult www.defra.gov.uk/environment/climatechange/trading/UK/index.htm

emissions by 11.88 million tCO_2e for "Direct Participants". During the first three years (2002, 2003 and 2004) of its existence, the Scheme delivered emission reductions totaling 5.9 million tCO_2e. At the end of 2006, "Direct Participants" installations eligible for the EU ETS that opted-out and are covered by the UK ETS are expected to join in the EU ETS from January 2007 onwards. Installations covered by Climate Change Agreements have opted-out of the whole of the first phase of the EU scheme (2005 - 2007).

After Q1'05 (compliance period for year 2004), activity on the UK ETS cooled down. Spot prices that hit £4.5 at the beginning of the year decreased to about £2 in May. 2005 was not a compliance year for Climate Change Agreement (CCA) market participants, who took on relative emission reduction targets in exchange for an 80% discount in their Climate Change Levy. Those participants tend to trade only at or near compliance time.

Direct participants (i.e. participants who had taken on absolute reduction targets after winning a bid for Government subsidies) generally tend to be natural sellers as they took on targets because it was feasible for them to do so. Quite expectedly, they over-complied and they all went to the market seeking buyers at the same time, leading to massive oversupply. As demand is limited, prices have been low and have stayed low during the period covered by this study. In order to create scarcity of allowances in the market, the UK Government asked direct participants to retire 9 million allowances, with the possible threat of withdrawing subsidies if they did not do so. Although they agreed, prices did not change following this action because demand remains low and the market remains oversupplied.

V PROJECT-BASED TRANSACTIONS

5.1 DEVELOPING COUNTRIES MEANINGFULLY PARTICIPATE IN CLIMATE MITIGATION

In 2005, three times as much volume of emission reductions was traded (374 million tCO_2e) from project-based transactions than was transacted in 2004 (see Table 3, Figure 3 and Figure 4). The project-based market is largely comprised of transactions of assets that are compliance-grade, i.e. good for compliance under Kyoto/EU ETS, or good for compliance in other markets created by law, e.g. NSW.

	2004		2005		1stQ06	
	Volume ($MtCO_2e$)	Value (MUS$)	Volume ($MtCO_2e$)	Value (MUS$)	Volume ($MtCO_2e$)	Value (MUS$)
Compliance	107.07	543.59	368.30	2,665.31	79.12	906.14
of which						
CDM	*97.00*	*485.01*	*346.15*	*2,544.30*	*75.61*	*886.85*
JI	*9.10*	*54.19*	*17.78*	*82.41*	*3.29*	*19.29*
other	*0.96*	*4.39*	*4.37*	*38.59*	-	-
Voluntary and Retail Markets	2.92	5.57	6.05	43.03	0.08	0.55
TOTAL	**109.99**	**549.16**	**374.34**	**2,708.34**	**79.19**	**906.69**

M = million

Table 3: Volumes transacted and corresponding values for project-based transactions.

As of the end of March 2006, contracts for over 79 million tons of emission reductions, largely for CERs, had been signed in the first three months of the year, continuing the blistering pace struck in 2005. The EU ETS market influenced price expectations in the CDM market and helped stimulate the supply of carbon in the market. Prices for CERs in primary market transactions appreciated considerably from an average of US$5.15 in 2004 to US$7.04 in 2005 and US$11.56 in the first three months of 2006 as EU ETS Phase I approached its first "true-up" period. Since the sharp declines in EUA price starting in late April 2006, both buyers and sellers have substantially slowed down the pace of transactions as they try and make sense of the impact on demand for CERs and ERUs.

The market share of CDM credits from developing countries was about 49.2% of overall volumes transacted globally (but reflected only about 23.2% of the overall value of contracts signed in 2005). In the first three months of 2006, CDM's market share of overall carbon market volume was about 27.2% although a vigorous secondary market in allowances meant that the project-based segment attracted only about 12.7% of overall market value generated.

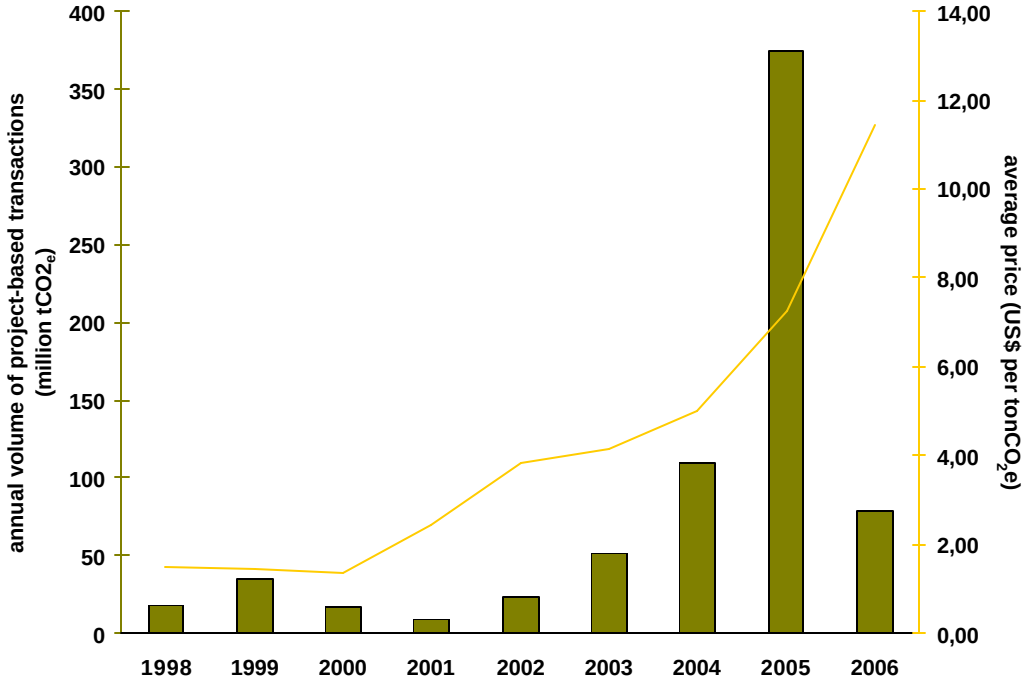


Figure 3: **Annual volumes (million tCO_2e) of project-based emission reductions transactions (up to 2012 vintages) and annual average price in US$ per tCO_2**

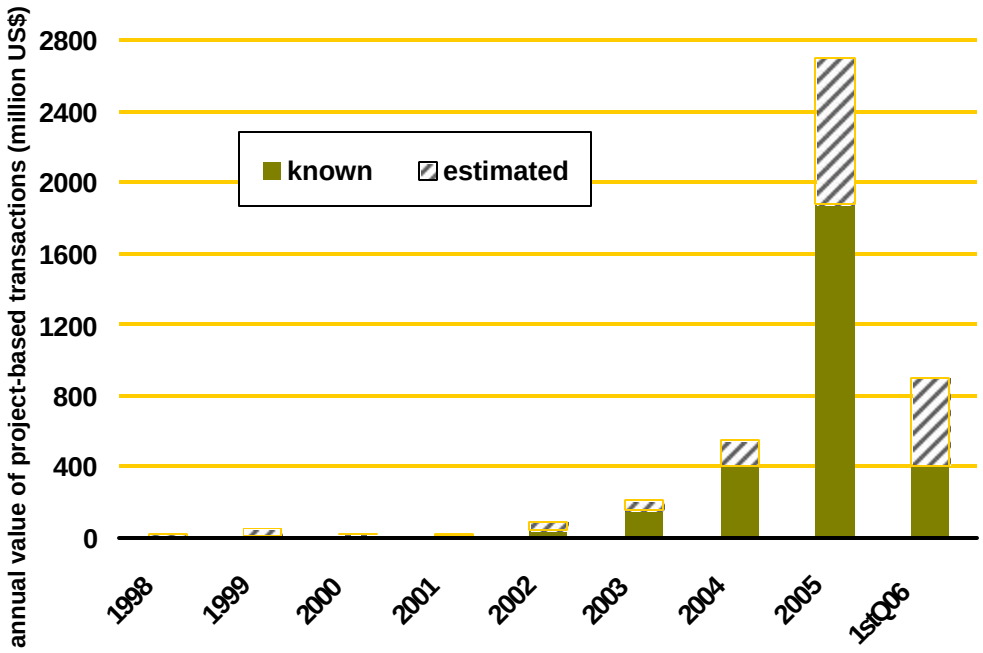


Figure 4: Annual value (millions of US$) of project-based emissions reductions transactions (up to 2012 vintages).

JI remained a very small contributor at about 4.8% of project-based volumes at relatively low prices reflecting the perception of regulatory and institutional risks.

As in previous years, primary transactions dominated the market in 2005 (and early 2006). The authors estimate that at least one third of the project-based transactions were entered into by buyers with intent to enter into secondary transactions. These refer largely to trading houses in Japan as well as European buyers who had targeted transactions of early vintages (i.e. 2005 – 2007) for compliance buyers during EU ETS Phase I. Buyers hedged their risks by selling CER contracts back-to-back, often on the basis of bank guarantees. Others protected their down-side by buying put options to sell CERs at a fixed price in the future.

A strong balance sheet became a differentiator in this segment as blue-chip sellers began to bring "compliance assets" into the market, sourced from a range of projects. As more CERs and ERUs enter the market as compliance assets, we expect that compliance will trade as a commodity and a spot market composed of secondary CERs and ERUs will develop.

Figure 5 shows the range of prices observed for all project-based emission reductions, including ERs (assets transacted for voluntary compliance), VERs, primary-market CERs, secondary-market CERs and ERUs. Prices paid vary depending on whether the buyer or the seller assumes what share of the risks for the project.

ERs also benefited from the general price increase of compliance units: their average-weighted price was US$1.91 per tCO_2e in 2004 and reached US$7.2 per tCO_2e. In the meantime, the range widened considerably from US$0.65 per tCO_2e to US$ 9.36 per tCO_2e over the period covered by this study. Though the average-weighted mean for retail does not exhibit such a trend (not shown), maximum prices for transactions we have record of have also been increasing, from US$ 14.35 per tCO_2e in 2004 to US$ 17.34 per tCO_2e in 2005 and 1stQ06. This may reflect the atmosphere that prevailed, particularly in Europe, for compliance assets last year and in early 2006. The highest prices reflected a willingness to pay based on the perception of high community benefits of the projects concerned.

Since its inception and until last year, the project-based market for carbon credits was dominated by buyers. Our previous report noted that we expected that sellers would start to assert increasing power in the marketplace, and that this would be reflected in the terms and prices negotiated for carbon contracts. Indeed, our review of contracts signed in 2005 and especially in early 2006 confirms that sellers were able to emerge as price-makers rather than takers and this shifted the balance of power away from the buyer and toward the seller. It is not clear whether this trend will continue with the recent collapse of the prices under the EU ETS.

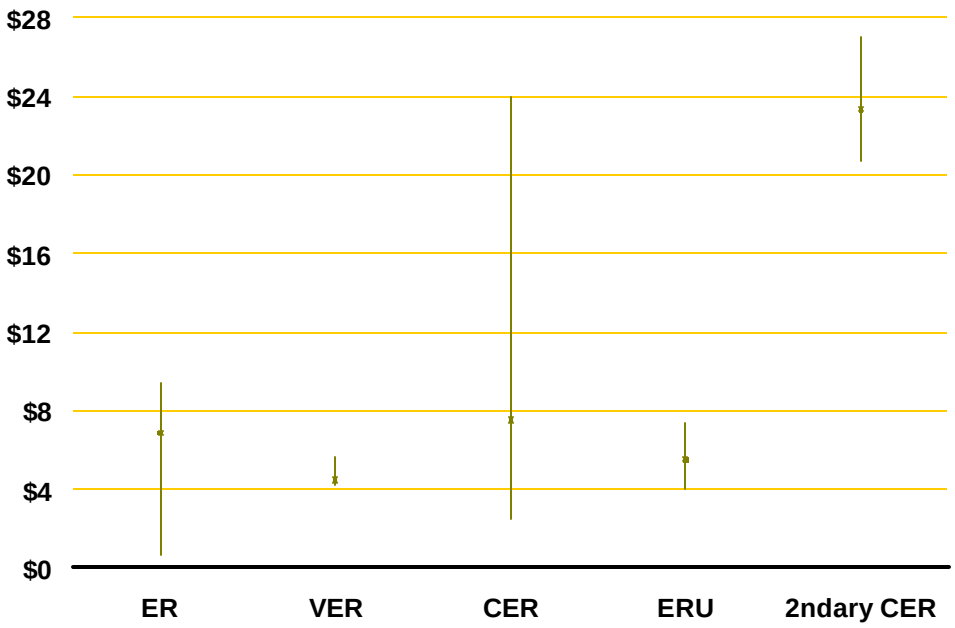


Figure 5: Observed prices for project-based transactions January 2005 to 1stQ06 (in US$ tCO_2e)

5.2 MARKET DIFFERENTIATES BETWEEN CDM AND JI

Regulatory risks largely reside upstream of project implementation. Among those, host country carbon regulatory risk, refers to risk resulting from a host-country's carbon capacity, regulations and practices. JI projects appear to have been left behind by the price appreciation that occurred in the EUA and CDM markets. In 2004, ERUs were contracted at US$5.95 per tCO_2e (slightly higher than CERs, at US$5.15 per tCO_2e). For 2005 and the first three months of 2006, ERUs were contracted at an average price of US$5.51 per tCO_2e, compared to US$7.51 for CERs. The highest price paid for a primary ERU contract was US$7.32, which is below the average price of CERs in the same period (US$7.51) and substantially below $24, the highest price paid through a fixed price contract for primary CERs. The most likely explanation for this apparent discontinuity in the market is the perceived lack of clarity in JI's institutional framework, involving regulatory and sovereign risks.

Prices observed for JI during the first three months of 2006 were US$7.18 compared to their US$4.63 in 2005. The pipeline for JI transactions has been steadily increasing and host countries are currently actively engaged in setting up the required institutional frameworks. However, the premium paid to CERs for their greater regulatory certainty also increased between 2005 and early 2006, as the gap widened from US$2.41 in 2005 to US$4.38 in early 2006. The discussion with interviewees has shown that this gap should close relatively quickly this year with JI projects under negotiation receiving prices closer to the range of CDM projects. One area of uncertainty regarding JI Track I is that projects do not require independent third-party certification prior to issuance, raising some questions about their perceived environmental credibility. Several countries with economies in transition have expressed that they are likely to have such assets independently verified, and that they intend to use domestic certifiers for this process.

5.3 WHO'S BUYING?

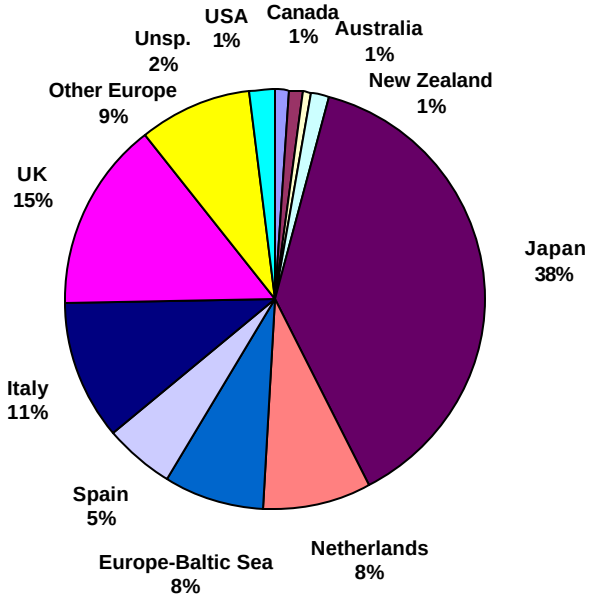
Buyers based in Europe (56% of volumes versus 41% in 2004) and Japan (38% versus 36%) completely dominated the market for project-based transactions in 2005 (see Figure 6).

Within Europe, Italy (11%) and Spain (5%)[21] sharply increased their purchasing, while the share of the Netherlands - one of the earliest buyers in the market and the biggest European buyer in 2004 - declined. Within Europe, buyers from the Baltic Sea Group (including Finland, Sweden, Norway, Germany, Denmark and Iceland) also made significant purchases.

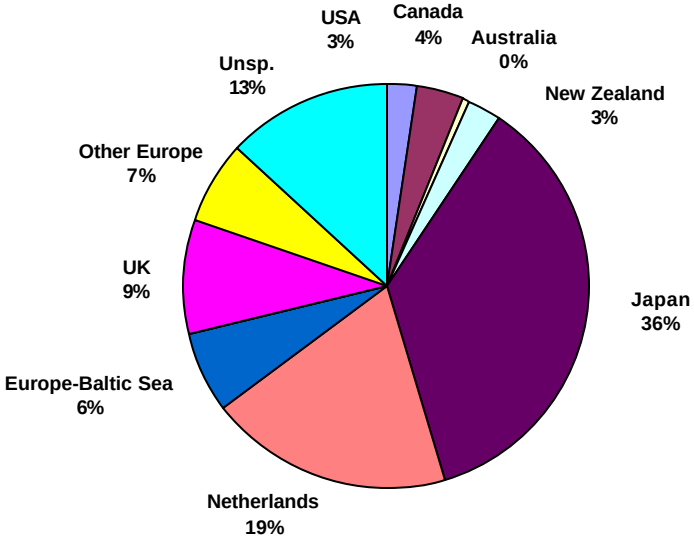
Buyers from Japan continued to be dominated by a handful of large trading houses originating and buying credits with the intent to sell on the secondary market. Almost all Japanese contracts signed were with the private sector, whereas the share of the private sector in the EU was almost 70%. Towards the end of 2005 and in early 2006, nearly all European project-based transactions had a private buyer. Canadian buyers were conspicuous by their negligible presence in the market in 2005 and early 2006 (even before the Government's recent announcements).

Far from being crowded out of the market, the private sector clearly emerged in 2005 as the dominant buyer in the project-based market with over 80% of the volume transacted (see Figure 7). In the first three months of 2006, that number grew to 90% of volume transacted. This represents a significant increase over our data for 2004, when about two-thirds of transactions were purchased by buyers in the private sector.

[21] Two EU-Member States with the highest projected Kyoto gaps and projected by the European Environmental Agency (together with Denmark, Ireland and Portugal) as not to meet their national targets.



Overall volume: 453.5 million tCO_2e January 2005 to March 2006



Overall volume: 110.0 million tCO_2e January 2004 to December 2004

Figure 6: Market buyers (as shares of volumes purchased)[22]

[22] Purchases by the World Bank-managed family of funds have been attributed to the fund participants' countries *pro rata*. The chart refers to Europe-Baltic Sea (Finland, Sweden, Norway, Germany, Denmark and Iceland); Other Europe (France, Portugal, Switzerland, Austria, Belgium, Luxembourg, and Greece + Italy and Spain in 2004); Other European purchases refers to buyers based in Europe; and Unsp. refers to purchases where we could not verify the origin of the buyer.

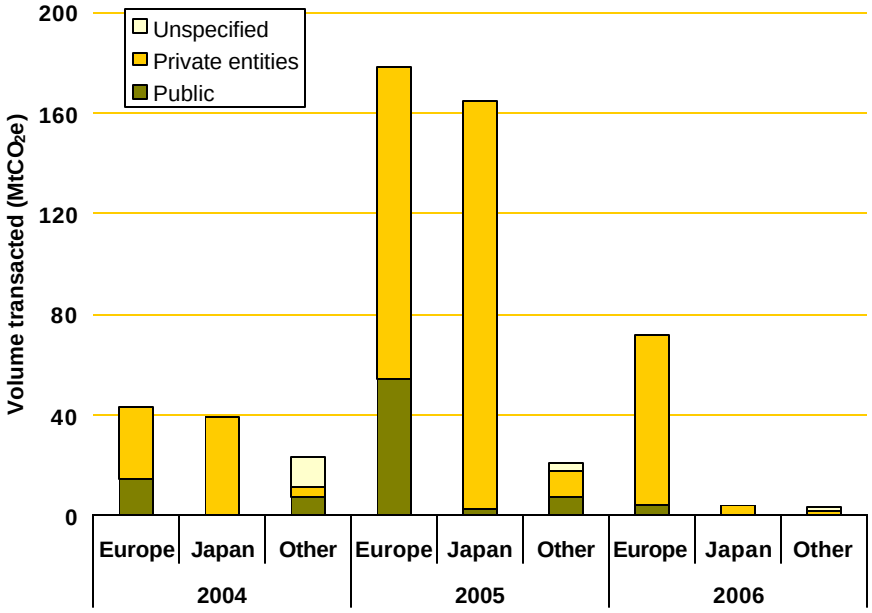
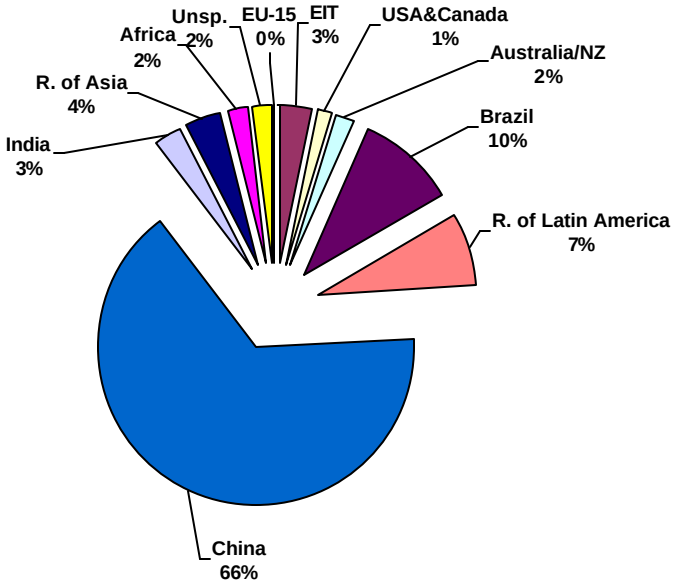


Figure 7: Breakdown of CDM and JI credits purchases for compliance along the nature of buyer (volume in million tCO_2e).

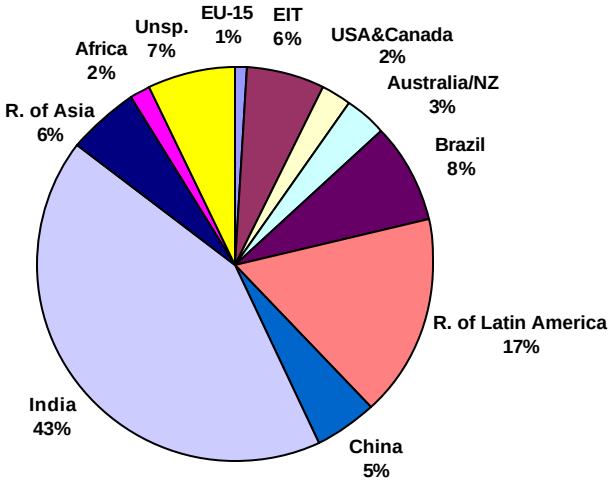
Natural buyers i.e. those who seek to purchase assets for their own compliance needs have traditionally dominated the buyers on the private sector market. In 2005, a new breed of buyers emerged. This category included at least three distinct sub-groups: the first comprised "old hands" in the climate change/carbon finance business that raised carbon procurement funds or developed project portfolios; the second comprised banks and financial institutions that entered into transactions on their own account and on behalf of their clients; and the third comprised hedge funds, "funds of funds" and private portfolio aggregators.

5.4 WHO ARE THE PRIMARY SELLERS IN THE MARKET?

Asia accounted for the largest share (73%) of contracted volume of project-based transactions signed between January 2005 and March 2006 (Figure 8). China alone accounted for 66% of global volume and India (leader in 2004 with 43%) goes back to 3%. Contracted volumes in Latin America accounted for 17% of project-based transactions. JI in economies in transition comes third (3%). There are still a number of voluntary projects in North America and in Australia. Note that though some shares may seem to be receding, the volumes contracted may have increased.



January 2005 to March 2006



January 2004 to December 2004

Figure 8: Location of emissions reductions projects (as a share of volume supplied).

In terms of the number of transactions per country for 2005-06, Asia had 32% (with China at 11%), while the share of Latin America has consistently been a steady 26-28% of transactions, with countries other than Brazil entering the market.

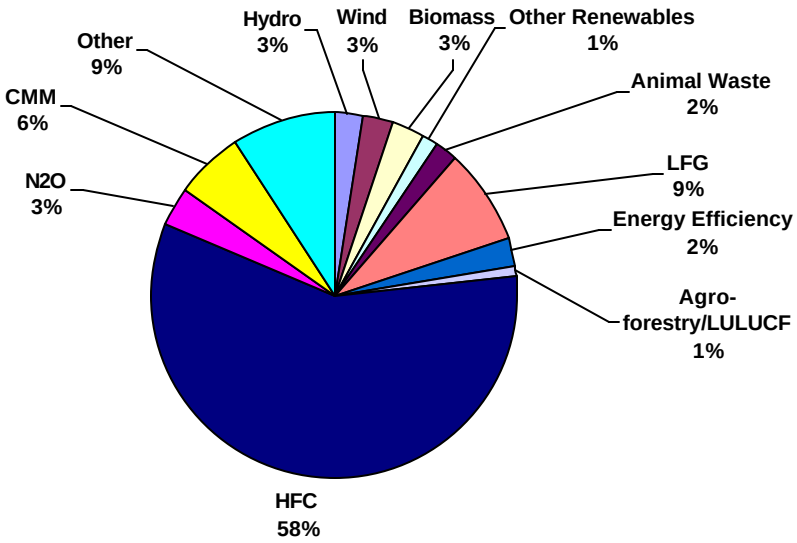
A number of projects in Africa appear on the UNFCCC PDD pipeline and a few transactions have taken place in South Africa, Egypt and the Maghreb, representing about 2% of project-based volumes. Despite these gains, Africa as well as countries of Central Asia and the Pacific continues to be largely bypassed by the carbon market. The under-representation of these regions raises deep concerns about the overall equity in the distribution of the CDM market.

The vast majority of approved methodologies deal with energy, industry and synthetic gases. Most African countries have low energy and industrial footprints, while agriculture and forestry are large contributors to the economies. Yet, the EU ETS denies market access altogether in Phase I to Land Use, Land-Use Change (LULUCF) assets. And the Kyoto Protocol itself only authorizes afforestation and reforestation activities, completely excluding categories such as soil carbon storage, sustainable forest management and avoided deforestation. Even in currently eligible categories, LULUCF assets have been singled out to require particularly complex methodologies and only one methodology has been approved so far. It should be noted that several official submissions regarding LULUCF have recently been made by several Parties from Africa, Asia and Latin America regarding the sustainable development benefits associated with making such assets more attractive to the market.

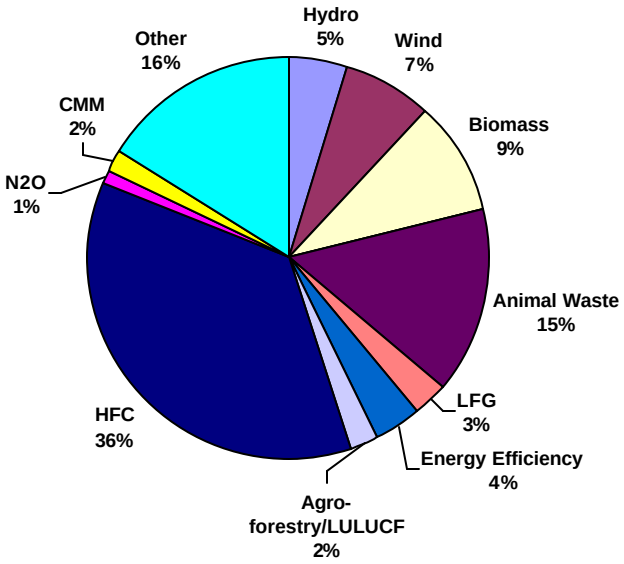
The recent approval by the Methodology Panel in a modified version of a so-called simplified methodology "Avoidance of methane production from biomass decay through composting" (AMS IIIF) makes it very difficult for sites across the continent (largely dumps and a handful of sanitary landfills) to develop composting projects. Clearly, changing approved methodologies, even if the intent is to consolidate them, sends a signal of uncertainty to potential developers and investors of carbon assets. These reasons, along with the lack of experienced project sponsors, limited capacity and insufficient access to capital markets as well as perceptions of risk conspire to make it very difficult to do CDM projects.

5.5 BALANCE ACROSS ASSET CLASSES

HFC destruction projects amount to 58% of the volumes transacted in 2005 compared with 36% in 2004 (see Figure 9). These so-called "synthetic" or "industrial" gases represent the extreme "low hanging fruits" in climate mitigation. HFC projects, for example, generate reductions at a cost of around US$0.75 - US$1.00 per ton CO_2e and require a relatively short lead time to implement.



January 2005 to March 2006



January 2004 to December 2004

Figure 9: Technology share of emission reduction projects (as a share of volume contracted).

The Executive Board has an approved methodology for such projects. Not only are they relatively low risk to implement, but they also have high global warming potential (GWP) and represent significant volumes of CO_2e – and a highly profitable opportunity for developing countries to take to market. The potential of this asset is concentrated at a handful of discrete sites, predominantly located in Asia (China, India, and South Korea) and in Latin America (Mexico, Brazil).

The potential of reducing HFC-23 and of reducing nitrous oxide (N_2O) is being tapped very efficiently, whereas coal mine methane and landfill gas assets are entering the marketplace. The latter amounted to 5% of volumes in 2004 and now represent 15% of volumes over 2005-06. Among the contracted volumes in 2005 and 2006, fuel switch, energy-efficiency, biomass and other renewables amount to a share of 10% by volume and 51% by number of projects - and 71% if landfill gas (LFG) and animal waste management are included. The share of biomass transactions has decreased from 18% to 8%, while that of energy efficiency transactions remained constant (~6-7%).

The window of opportunity to initiate CDM projects is beginning to close if market uncertainties regarding post-2012 commitments persist, and Buyers appear to have a preference for bigger projects (with proportionally lower transaction costs). It is likely that demand will focus on proven technologies with short lead-time projects. In this context, landfill and coal mine methane projects are likely to be very attractive since they are not capital intensive, have short lead times and apply approved methodologies. Small-scale projects, such as certain renewable energy and energy efficiency projects, can be expected to benefit, but less than the other asset classes. Given their high marginal costs of abatement, a small variation from the expected schedule of carbon deliveries, say 10%, would result in fewer payments and this may make some underlying projects uneconomic. Although buyers (especially retail buyers) often express a preference for agro-forestry projects that show actual community benefits, their market share is likely to remain relatively modest because of regulatory complexity and limited market access in the EU.

Carbon capture and Storage (CC&S) is another promising asset class, although issues of "permanence" of storage still need to be addressed. A CDM project in Vietnam based on enhanced oil recovery was registered recently. The high capital costs of such projects (capture, purification, dehydration compression and transport) may initially limit their development to those projects involving enhanced oil and gas recovery where the basic infrastructure is already in place.

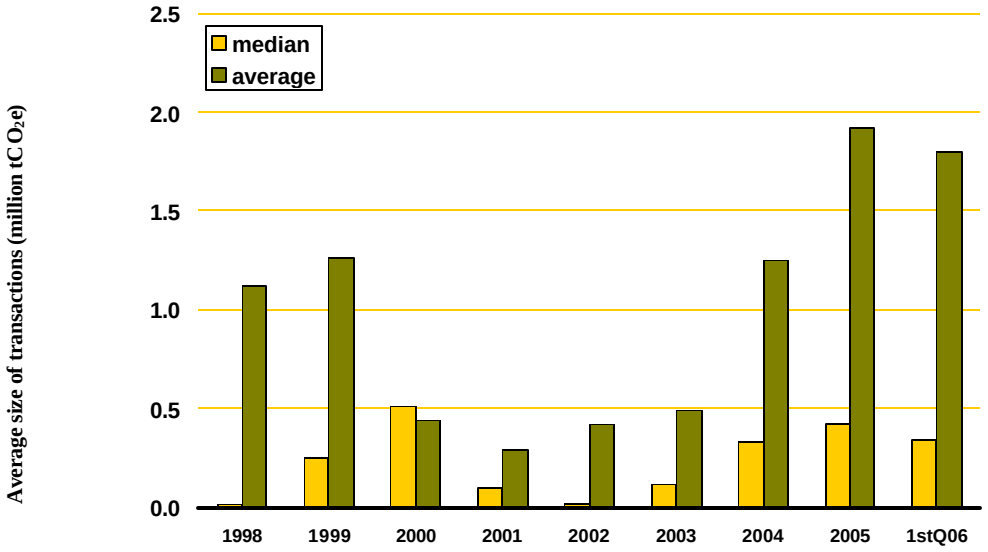


Figure 10: Towards bigger transactions.

Our analysis shows an increase in the size of transactions (see Figure 10). From 2004 to 2005-06, the average transaction size increased from 1.24 million tCO_2e to 1.90 million tCO_2e. This is in part explained by the handful of mega-projects that reduce synthetic gases. Transactions with projects generating less than 50,000 tCO_2e for delivery annually tend to be few and far between, demonstrating a market preference for lower transaction costs. Not surprisingly, the median size of projects has increased from 332 kilo tCO_2e in 2004 to 450 kilo tCO_2e for 2005-06 – a sign of an increasingly left-skewed distribution. Consistently, the number of deals with deliveries greater than 5 million tCO_2e prior to 2012 has increased from 4 in 2004 to 11 in 2005-06.

5.6 INSIGHTS ON THE OBSERVED PRICES FOR CERS

5.6.1 Sellers Continue to Bear Registration Risk in the Vast Majority of Transactions

In the vast majority of contracts, the seller continues to bear the CER registration risk and issuance risk. Only 2% of the contracts signed in 2005 and the first three months of 2006 were for VERs, compared to 11% the previous year (largely from the World Bank portfolio). In early 2006, there were reports of hybrid structures in the market, where the buyer provided a floor price and took registration risk for the entire volume, but the contract usually included a higher fixed price for the 2005-07 vintages and an EUA-indexed price for the remainder (usually 2008-12).

Some of this activity suggests that sellers were more comfortable taking on registration risk as the Methodology Panel and the CDM Executive Board appeared to be moving in the right direction. The premium paid to sellers for taking the registration risk was US$ 3.15 in 2005-early 2006, compared to US $1.20 in 2004. We have insufficient VER data to draw any conclusions about the premium paid for registration in early 2006.

5.6.2 A Premium for Pre-2008 Vintages?

Contracted volumes of pre-2008 vintages more than doubled in 2005 relative to 2004 volumes, with nearly 76 million tCO_2e being contracted for delivery in that period. European (62%) buyers and Japanese (35%) accounted for nearly all the early delivery volume in 2005. In 2005, almost 290 million tCO_2e of 2008-12 vintages were contracted, with Europe and Japan contracting 46% and 48% respectively (see Table 4).

		pre 2008	2008-2012	post 2012
2004				
	World	34.65	71.46	6.24
	of which			
	Europe	48.9%	37.2%	66.5%
	Japan	42.1%	34.9%	22.7%
2005				
	World	75.96	287.97	22.71
	of which			
	Europe	61.5%	45.8%	73.0%
	Japan	34.8%	48.0%	23.1%
2006				
	World	5.60	73.29	0.90
	of which			
	Europe	77.1%	91.8%	97.1%
	Japan	9.0%	4.9%	1.8%

Table 4: Breakdown of CDM and JI credits purchases for compliance along the origin of buyer and the vintages purchased (volume in million tCO_2e).

Our database shows that the project market in 2005 and early 2006 paid a premium of up to US$2 tCO_2e for pre-2008 over 2008-12 vintages. This suggests market expectations were that the 2005 EU verified emissions reports would show that Member States were considerably short on EUAs, which is not certain at the time of writing considering the leaking of verification reports prior to their publication on May 15, 2006. The 2005 project data could also suggest that the market may have been discounting the stringency of the cap under the EU ETS Phase II or expecting an increase in Phase II CER/ERU deliveries. The collapse of EUA Phase I prices is expected to reverse this earlier observed trend.

5.6.3 Is there a Market for Post-2012 Vintages?

Our data suggests that there is a limited but growing market for post-2012 vintages. The volumes contracted were much larger than we had expected – 23 million tons in 2005 and less than 1 million tons in 2006. We caution readers however, that much of this data can be accounted for because of a very simple – and potentially misleading - reason: some very large China HFC transactions included 2013 vintages. Without the HFC China data, only 4 million post-2012 vintages were contracted in 2005. Besides China, countries such as Chile sold post-2012 vintages. Most of the post-2012 vintages were sold to European buyers, predominantly private buyers.

5.7 GREATER CONCERN ABOUT PROJECT PERFORMANCE AND DELIVERY RISKS

With sellers increasingly bearing registration risk, the primary concern of buyers has moved downstream to project performance, issuance of CERs and delivery into the buyer's account. Some of these concerns have been prompted by the under-delivery of CERs from contracts signed in the early days of the carbon market. Under-delivery has been significant even for assets generated from landfill gas capture and flaring, where delivery risk was thought to be low. Finally, sellers appear to be concerned about the readiness of the International Transaction Log in time for the 2007-08 compliance deadline under EU ETS Phase I[23]. On average, Japanese buyers paid US$ 6-$10 with contract provisions that usually did not include liquidated damages for non-delivery of CERs. This contrasted with a wider range (US$ 8-24) offered by EU buyers for firm delivery of CERs, backed by liquidated damages or market-to-market compensation.

In an effort to reduce potential operational and performance risks, many buyers are becoming more actively involved in the development of the project as a means to deal with technology risks, especially the risks associated with the operational and commercial aspects of the technology used in the project activity. For instance, they offer extended assistance during the early stages of the project or once it has started, participate in the operation and maintenance of the project, or in the monitoring of the CER data.

Some buyers invest in the underlying project itself - especially when the buyer is familiar with the technology to be implemented (multi-service energy company developing renewable energy projects, for instance, or companies selling catalyst incinerators for N_2O projects). These actions to hedge against technology risk can also create a closer tie between buyers and sellers, which has been a key element in successful negotiations in 2005 and early 2006.

5.7.1 Signing Contracts in 2005 and early 2006

In the first quarter of 2006, many established carbon market players report being largely priced out of the CDM market. Some started to look at JI assets as substitutes. Although such assets are potentially riskier than CERs, more experienced carbon players are hoping that they understand their risk sufficiently and can negotiate for these assets currently at a more manageable price point. The few CDM deals that these more experienced players report include a handful of very large HFC transactions, as well as other transactions with partners with whom they either already had long-standing relationships or are developing new relationships.

The most successful players in the market appear to be those that go beyond simply negotiating a price for an asset developed by the seller. They go well beyond an interaction limited to a price and volume negotiation, and focus as well on the development of mutually beneficial relationships around drafting PDDs, access to technology, access to debt and/or equity, financial engineering and even agreements to operate projects. This web of interlocking relationships has the added benefit of helping to provide more secure delivery guarantees from projects (and across portfolios) and enable the CERs or ERUs to be marketed as "quasi-EUAs" to take advantage of the prevailing prices in the EU ETS.

[23] This finally may not be so much of a concern since UNFCCC clarified that before the ITL becomes operational, transfers from non-Annex I entities to Annex I entities after issuance will be tracked and checked by CDM registry international tools. (*Source*: PointCarbon)

5.7.2 Managing Risks through Contract Terms

All project-based transactions entail several elements of risk, ranging from regulatory risk to credit risk and project performance risk. Project risks are usually allocated contractually through provisions in ERPAs and price without contract terms is a meaningless concept. Since there is still no standard contract in place for project-based transactions, provisions in contracts for delivery of CERs vary widely based on the types of guarantees and conditions provided by the buyer and seller and other considerations.[24]

5.7.3 Successful Contracts & Financial Innovation

Higher prices in the carbon market place have unleashed an eruption of financial innovation. Diverse players, many with little or no experience in emerging markets, let alone carbon – have been attracted to what they perceive as arbitrage opportunities between CDM projects and the EUA markets. While some have little or no knowledge of the regulatory underpinnings of the carbon market, this has not stopped significant sums of speculative money from entering this space in search of a quick, high return, in a market with significant volatility and uncertainty.

2005 and early 2006 was a good time to be a seller in the market and a tough time to be a buyer. Our discussions with market players reveal that they have had to be much more creative in contract structures for carbon in the competitive markets that existed in 2005 and early 2006. In 2006, the most successful transactions were those that managed buyer and seller risks while preserving the upside for both partners to the transaction. It is our view that the most mutually beneficial and thoughtfully constructed agreements are the most likely to be sustainable and are least likely to default.

Parties that had long-term relationships in place with each other were more likely to build sustainable deals. Our favorite example is of a Japanese trading house that negotiated a carbon contract with a long-time customer with which it enjoyed a coal-trading relationship. The strong relationship reduced the risk of non-delivery and also enabled a swift transaction. Other successful buyers reported that their most secure deals are those where they went beyond the transaction and also developed other sources of value, including contract terms with floor prices for carbon and terms that included sharing of upside potential that encouraged projects to succeed.

5.7.4 Fixed Price across more than one Project

A good practice in ERPA negotiations was contracting a slice of carbon assets at a fixed price from more than one project. From the buyer's perspective, this increased the likelihood of timely delivery; while for the seller, it preserved the option of selling the remainder of the assets to the market in the future. In this case, the seller could have protected himself against a market downturn by buying a put option to sell the remaining assets at a floor price.

[24] For the most part, contract terms are confidential and specific information regarding these transactions is difficult to obtain and compare. Our best source of information about contracts has been through detailed interviews with both buyers and sellers. Most signed contracts are customized and reflect the different risks that need to be allocated between parties.

5.7.5 Price Indexation

Price volatility is not easy for buyers and sellers to manage, and in 2005-06 as prices soared many buyers who had signed early contracts for delivery were worried that their earlier contracts would not be valid. This also made it harder to sign contracts as sellers, particularly from India, were reported to have been extremely concerned about signing contracts at fixed prices because of their fears about potentially negotiating at a lower price in a market where prices were expected to significantly increase. For this reason, several Indian sellers held on to their assets and did not bring them forward.[25]

One contract structure that was common in 2006 was the inclusion of a price that was indexed to the price of EUAs, supported by a floor price to protect the seller from downside surprises. The most common way that these contracts were written was to offer the seller a certain percentage of the EUA spot price prevailing on or around the date of CER delivery. Another was for the contract to set a floor price and float with the EUA until a certain level, above which the buyer and seller would share the benefit. This was intended to create an upside for both buyer and seller in the event of future market volatility and surprises.

We were able to collect specific data on only twenty such transactions, where some buyers reported that many sellers were only persuaded to sell after being convinced that only indexation would ensure that they would benefit from ever increasing prices of the EUA. Some sellers were able to protect themselves from the downside by negotiating for a floor price, which was sometimes agreed by the buyer in order to increase the probability of project viability and CER delivery.

Transactions where indexing occurred often took the form of hybrid transactions, i.e. the entire volume was not indexed. Instead, a portion of the contracted volumes were bought at a fixed price, typically 2005-07 vintages, whereas 2008-12 vintages were usually indexed to an EUA price paid on the basis of an agreed formula and payable on delivery.

The sensitivity of indexed ERPA values to the price change seen in EUA prices at the end of April 2006 was very high, and unless a floor price had been agreed, many ERPAs for smaller, renewable-energy projects may not be viable and delivery may be jeopardized. We are aware that many did not have negotiated floor prices, putting into question whether those projects can count on a reliable stream of revenue to be viable.

In retrospect, it is clear that these structures can put sellers at considerable risk, especially sellers of smaller, more marginal transactions that need predictable CER revenues to make projects move forward. Several buyers also report that they are less likely to continue to index CER contracts to an EUA price in the future, because of the risk that Member States may impose supplementarity restrictions and restrict market access of CERs. In that event, CERs may be priced at a discount to EUAs.

[25] This view must undoubtedly have changed in late April 2006, when suddenly fixed forward prices must have looked like quite a bargain! Many who held on to their assets in late April were reportedly calling buyers in Europe on the last days of April.

Indexation, while a noble attempt to align buyer and seller upsides, may not be the panacea to protect both buyer and seller from downside risk while preserving upside potential. We expect fewer future project-based transactions to be indexed to EUA prices.

5.7.6 Delivery Guarantees

Several contracts signed in 2005 provided for a firm delivery guarantee of emission reductions units for at least a portion of the CERs contracted. Others made payments contingent on project performance and actual issuance of CERs. There are different forms of guaranteed delivery that sellers provide, with the strongest commanding a price premium.

The most common guarantee structures for primary transactions cover a fraction of the CERs to be delivered, usually between 25% and 50% of contracted CERs. The seller guarantees to replace compliance units or the equivalent market value in the buyer's account, providing a structure where there is a firm delivery contract. The premium paid for firm delivery by a credit-worthy seller into the buyer's account was reported to fetch a premium of US$4-6 or more across contracts. The highest fixed-price payment that we have in our database was for such a guaranteed delivery contract was US$24 paid by a government buyer in 2006. Some sellers were also able to negotiate undiscounted and unsecured upfront payments from hedge fund buyers, although most upfront payments required either a bank guarantee or a corporate guarantee from a credit-worthy seller.

Many of the CERs so contracted with partial guarantees were intended for secondary market transactions. Some were sold back-to-back by a seller with a strong balance sheet who could provide a guarantee for firm delivery to new buyers. In other cases, primary buyers hedged against delivery risk by pooling a portfolio of projects and selling compliance pools of different risks into the market. The most secure guaranteed tranches of these assets fetched strong prices in the secondary markets, averaging between US$22.21 per tCO_2e in 2005 and US$26.90 per tCO_2e in early 2006. Most secondary transactions for CERs involved re-selling Issued CERs on a spot market, although some buyers reported doing secondary forward transactions for registered CERs and guaranteed CERs using other structures.

Some market players have put together carbon portfolios or launched procurement funds in an attempt to bring together demand and supply by reducing risk and transaction costs to bring "compliance" products into the market. The most sophisticated reportedly are bundling "compliance assets" across several projects and providing guarantees to deliver "quasi-EUAs" to take advantage of prevailing prices on the EU ETS markets. The most secure of these portfolios are balanced in their exposure to technologies and geographies. At the time of this writing, it is unclear how many of such "compliance assets" would enter the market, given recent volatility.

Clearly, buyers and sellers have hedged their risks differently. This brings into focus that the carbon market is one that has been created by regulation and its fundamentals are driven by an understanding and expectations of the role that regulation would continue to play in the markets. Simply put, fundamentals matter. Understanding the risk that continues to exist on these markets is what will differentiate performance on this market. A successful player in this market understands these risks and is likely to be one that has hedged these risks well. Clearly, some will have done this better than others. For the ones that did not, it is unclear to what extent the changed environment will test the patience of public investors of the newly-minted IPOs which

took advantage of the heady days by raising capital on the London Alternative Investment Market (AIM).[26]

[26] One cannot help but wonder what will happen to the many ERPAs that they have signed in the frenzy of the past year? If the prices of CERs decline sharply, how will this impact those contracts already signed? Will Buyers try to cancel them just as Sellers tried to in the strong market? Will a market for "distressed CERs" develop? How will this impact projects that were counting on the CER revenue to be implemented?

VI OUTLOOK

Markets Send Price Signals

A market's overall environmental performance is linked to the level at which its cap is set at and the integrity of compliance and well-functioning market institutions. The EU ETS Phase I was intended as a pilot and has been a successful learning experience. The fact that carbon is now priced and that 'bid' and 'offer' information is available publicly through some exchanges is a welcome development. This price signal gets translated into a price of carbon that has an impact on decision processes of firms and individuals as they weigh the consequences – and price – of emissions-intensive choices.

The price signal has stimulated action to reduce climate change. This is especially clear when we see the strong response from developing countries and project-based mechanisms. The market has priced in a strong Phase II cap in the EU ETS 2008-12, reflecting market expectations of a robust cap.

Meaningful Participation by Developing Countries

Developing countries have become engaged and active in promoting CDM as they recognize the large potential of the market. Many CDM host countries have eased their administrative processes for approval by the Designated National Authorities (DNAs). Countries such as China have demonstrated their commitment to support sustainable development by announcing that they intend to re-invest significant proceeds from the sale of carbon credits from HFCs and other gases to support renewable energy development through the China Clean Development Mechanism Fund.

Developing countries have responded positively to the challenge of mitigating climate change and to expected demand from the carbon markets. The high compliance quality of project-based assets should encourage Member States to keep the EU market open and to continue to send a positive signal for continued innovation.

Many of the emerging economies of Central and Eastern Europe are similarly drawn by the environmental credibility of project-based emissions, and are exploring ways to bring liquidity to their assets of excess Assigned Allowance Units (AAUs) by proposing Green Investment Schemes (GIS) to invest the proceeds to promote environmental outcomes.

Certainty of Demand

A longer regulatory signal beyond 2012 can extend the horizon over which capital investments are analyzed and carbon can be appropriately priced over the horizon. This would also benefit a wider range of CDM assets, including projects with high sustainable development contributions, e.g. renewable energy. Various ways of aggregating demand beyond 2012 should be explored.

"When" (time) and "Where" (place) Flexibility is Critical

Many participants intend to bank early CERs and ERUs for 2008-12 compliance. This creates a buffer to reduce excessive volatility in Phase II. Similar flexibility for allowances, e.g. banking

between compliance periods, can also help manage for spikes in demand caused by unexpected weather events or price shocks caused by oil or natural gas prices.

The authors recommend that the principle of place flexibility is maintained and that barriers to market entry in the name of strict supplementarity are not erected by national governments in this regard. Market experience thus far has shown that greater "when" and "where" flexibility can encourage more efficient compliance and lead to future acceptance of stronger overall caps. The resulting price signal can encourage early action and promote stronger overall environmental performance.

Transparent Information is Important for Markets

Significant volumes of allowances – and virtually all project-based transactions – are traded over-the-counter, brokered or made through private bilateral deals. This creates information asymmetry in the market, making reports such as this one necessary. The lack of transparency – and absence of disclosure requirements - is particularly relevant in a young market with high price volatility. One approach to meet this gap is for host country DNAs to consider publishing price, volume and terms data on transactions related to projects that receive host country approval.

Selective leaks have sometimes played a constructive role in the international climate change negotiation process. However, leaks and early release of information in a financial market can contribute to lower confidence in the markets. The authors also recognize the critical importance of maintaining total confidentiality of the performance reports until they are released to the public.

In general, markets tend to prefer more transparency rather than less. As the market behaves more as a financial market, perhaps innovations such as encouraging installations (or operators or companies) to release quarterly estimates of emissions data is likely to increase market information and reduce excessive volatility in the markets.

How Robust is Demand for CERs and ERUs?

Well over US$ 4.6 billion has been committed through at least 40 funds to purchase CERs and ERUs.[27] More capital has entered the market through public offerings and at least ten hedge funds are involved in the overall carbon market. Clearly, the apparent collapse of the EUA market in late April 2006 is not a good sign for the immediate prospects for CDM and JI. Undoubtedly, European private sector buyers are recalibrating their views on how many CERs and ERUs they will require for the remainder of Phase I and are beginning to assess the likely Phase II allocations.

Notwithstanding recent events, there appears to be a solid residual of demand for CERs and ERUs in the market related to Kyoto Protocol commitments, expectations of the EU ETS Phase II and the details of the Japanese plan for compliance. This residual consists largely of those buyers that have a long-term view on the carbon market (i.e. at least until 2012).

[27] See R. Bulleid, "The capital begins to flow", *Environmental Finance*, April 2006.

Multilaterals and Public Sector Buyers

The most secure source of purchasing in the market comes from multilateral agencies and public sector buyers e.g. the World Bank and several bilateral government buyers. Several governments have announced their purchasing targets to meet their Kyoto commitments. The Japanese Government, for example, has announced that it will acquire 100 million tCO_2e from the flexible mechanisms. As Japan's economy shows signs of growth after over a decade of economic stagnation, many analysts believe that it is likely to need to purchase even more. Japanese private sector entities will also likely continue to purchase carbon, albeit without the frenzy of their European counterparts in early 2006.[28]

Nine EU Member States (Austria Belgium, Denmark, Finland, Ireland, Italy, Luxembourg, the Netherlands and Spain) are setting aside a combined amount of €2.7 billion over the period up to 2012 to acquire 365 million tCO_2e from the flexible mechanisms[29]. Switzerland has created a fund to acquire credits from abroad with revenues from the climate "penny tax" with imports to be capped at an annual 1.6 million tCO_2e[30].

France and Portugal have announced their intent to set up funds to purchase carbon credits. Spain and Italy have increased the capitalization of their national funds and opened them to private participation. The Baltic Sea Testing Ground Facility has closed its second subscription at the end of March with US$39 million, of which just a little under half is from private entities. Denmark and the Netherlands announced new 2006 rounds of tenders. New Zealand is also reportedly reviewing its climate policy and is considering whether or not to purchase carbon credits.

Private Buyers

European installations may prefer to buy EUAs instead of CERs and ERUs for Phase I compliance, if EUA prices remain moderate. Natural players that have purchased carbon directly from projects report that they will continue to purchase CERs and ERUs, but that they would likely bank any early deliveries for EU ETS Phase II compliance.[31] In the days after the collapse of the EUA spot and futures markets, we observed that the 2008 futures prices climbed steadily

[28] Japan has formulated the "Kyoto Target Achievement Plan" last April. Targets have been established for each sector, such as industry, transportation, and the household and commercial sectors, and the plan includes more than 60 policies and measures among which the Keidanren Voluntary Action Plan. As such, the plan is based on an estimated 150 million tCO_2e per year shortfall; it is to be filled in as follows: 54% through emissions reductions from BAU by mitigation measure, 33% through call on domestic sinks and 14 % through purchase of credits (CER, ERU and AAU only with JI, Project-type GIS, no LULUCF project and no nuclear CDM).

[29] European Environmental Agency (2005) *Greenhouse gas emission trends and projections in Europe 2005*, Copenhagen (Denmark).

[30] Climate policy in Switzerland will include a carbon tax (70% of CO2 emissions come from fossil fuel use) that is still under discussion, various sectoral policies and measures (agriculture and transport sectors, mostly), the implementation of domestic offsets and the purchase of emissions reductions abroad – both in party funded through the introduction of a "climate penny" (CHF 0.015/ approx US$ 0.012 per liter of gasoline and diesel to start with, leading to an estimate of SFR 100 millions/ US$ 76.9 millions per year). On a shortfall estimated to 2.9 millions tCO_2e per annum, 1.8 million tCO_2e (60 %) are to be met through domestic offsets (11%) and credit imports (89%). Consult www.umwelt-schweiz.ch/buwal/eng/fachgebiete/klima/index.html

[31] Endesa, Spain's biggest power utility, announced its Endesa Climate initiative committing to purchase 15 million tCO_2e, from project-based transactions with one third targeted for EU ETS Phase I and the rest for EU ETS Phase II. We would not be surprised if 2006-08 deliveries would be banked for EU ETS Phase II.

back toward €20 as the market recognized the probability that the Phase II cap would likely be more stringent. We believe that this will continue to drive buyers' interest in project-based mechanisms. The Japanese private sector, especially the trading houses, will also be likely to continue to buy CERs, with high expectations for resale.

There are now also several dedicated private sector carbon procurement funds, e.g. the European Carbon Fund (ECF) which has committed – and paid-in – € 143 million of resources under management. Such players are likely to take a longer view of the market, including for the 2008-12 period and it is unlikely that they will stop buying project-based transactions, although they are likely to be more selective about what project-based assets they contract and on what terms.

It is plausible that speculative investors are the least likely to remain committed to the market. Similarly, the future of boutique firms that have rapidly grown from a few employees to over one hundred in a year is unclear. The longevity and credibility of the buyer and the buyer's credit quality are now an issue as sellers have a strong interest in being certain that they will be paid for what they deliver. This also suggests that as the market matures, the single-minded focus on price will be replaced by a more careful and holistic consideration of risks from both the buyer and the seller.

In sum, it appears that firm, residual demand for project-based reductions continues to exist. The emergence of the U.S. RGGI market and the growth of the CCX will likely create additional demand for project-based reductions, including CERs and VERs. With the exception of Canada's recent "Made-in-Canada" announcements and short-term EU ETS sentiment aside, nothing fundamental has changed regarding what is required for compliance by the Parties to the Kyoto Protocol.

Prospects for EU Phase II and Post-2012

The volatility in EUA Phase I and price signals for EU forward contracts for 2008 have alternated between contango (future price higher than spot) and backwardation (future price lower than spot) over the past several months. This suggests continued market uncertainty about Phase II allocations. Fundamental demand in the carbon market is created by the cap. While weather and energy prices may add to the mix, it is the level of the constraint that helps establish market prices. The recent market reaction to the generous caps allocated in Phase I may give a fresh impetus to the Phase II caps, if the EU ETS is to be a centerpiece of the EU's plan to meet or exceed Kyoto obligations.

We have a handful of reports that some buyers have been purchasing small volumes post-2012 options. Their stated reasons is to overcome the closing window, i.e. by offering to purchase emission reductions for a number of years, even beyond 2012, to ensure that carbon finance can overcome any financial barriers. We believe that post-2012 vintages will continue to be a growing market segment, not only as new markets such as the RGGI form, but also as the EU ETS considers a third phase (or an extension of Phase II), and voluntary and retail markets grow. We also await further developments related to the Asia-Pacific Partnership on Clean Development and Climate.

The big unknowns in the longer-term market include the prospects for post-2012 binding commitments and the extent to which Russia and Ukraine, in particular, bring AAUs to the market. To some extent, the proposed RGGI and the architecture of the EU ETS envisage a market beyond 2012. A clear market signal from the UNFCCC and/or Kyoto Protocol Parties about a post-2012 commitment will help scale this market even more. As far as AAUs are

concerned, it is clear that decisions about AAUs will be made in part out of larger geopolitical considerations, including European concerns for energy security and their access to natural gas from Russia and Ukraine. The future of global post-2012 negotiations may rest on various flexible and environmentally credible ways of unlocking this value over time as well as bold ways for G-8 (or G-15) governments, among others, to create appropriate incentive frameworks for the global capital markets to encourage the financing of clean energy and low-carbon investments well into the future.