STATE AND TRENDS OF THE CARBON MARKET 2006

Update: (January 1 – September 30, 2006)

Washington DC, October 2006

STATE AND TRENDS OF THE CARBON MARKET 2006

Update: (January 1 – September 30, 2006)

Karan Capoor,
Sustainable Development Department (Africa), World Bank*

Philippe Ambrosi,
Development Economics Research Group, World Bank*

ACKNOWLEDGMENTS

We are grateful to many of our colleagues and friends for their cooperation and assistance in preparing this report, in particular to our survey respondents who provided us with valuable insights on the carbon markets. Special thanks are due to Eva Mund and Anushika Karunaratne for their contribution to this study.

We wish to also extend our thanks to Isabel Alegre, Zarina Azizova, Benoit Bosquet, Benedikt von Butler, Joelle Chassard, Charles Cormier, Garth Edward, Anita Gordon, Justin Guest, Albert de Haan, Masaya Inamuro, Maarten Jos De Jonge, Alexandre Kossoy, Franck Lecocq, Zijun Li, Torsten Malmdorf, Andrei Marcu, Jérémi Martin, Liz Mayfield, Marco Monroy, Lucy Mortimer, Roon Osman, Peter Pedersen, Neeraj Prasad, Venkata Ramana Putti, Brian Rapose, Laurent Segalen, Chandra Shekhar Sinha, Sara Stahl, Charlotte Streck, Nuyi Tao, Bruce Usher, Jari Vayrynen, Chris Warner as well as numerous unnamed but greatly appreciated colleagues from around the world and the Carbon Finance Unit at the World Bank.

EXECUTIVE SUMMARY

The carbon market grew in value to an estimated US$21.5 billion in the first three quarters of the year, more than doubling in value over the previous year (see Table 1). The market was dominated by the European Union Emissions Trading Scheme (EU ETS), which shrugged off signs of weakness following the sharp declines that accompanied the release of verified emissions data in May 2006. The project-based market also grew in value to US$2.41 billion in just the first nine months of the year.

	2005		Q1-3 '06	
	Volume (MtCO2)	Value (MUS$)	Volume (MtCO2)	Value (MUS$)
Allowances				
EU ETS	324.31	8,204.48	763.90	18,839.79
NSW	6.11	59.13	16.19	184.07
CCX	1.45	2.83	8.25	27.15
UK-ETS	0.30	1.31	2.26	9.27
Sub total	**332.17**	**8,267.75**	**788.34**	**19,051.00**
Project-based transactions				
CDM	359.08	2,651.44	214.26	2,260.96
JI	20.85	100.89	11.86	93.88
Other compliance	4.51	36.72	7.92	60.02
Sub total	**384.44**	**2,789.05**	**234.05**	**2,414.87**
TOTAL	**716.61**	**11,056.79**	**1,022.39**	**21,465.87**

Table 1: Carbon Market at a Glance, Volumes and Values for 2005 and 2006 (until September 30).

The volume of European Union Allowances (EUAs) transacted on major exchanges and over-the-counter rose to 764 million tonnes of carbon dioxide equivalent (tCO_2e) by the end of September 2006 compared to approximately 324 million tCO_2e in 2005. EUAs traded at a market value of US$18.9 billion so far in 2006, more than twice the previous year's US$8.2 billion. The Chicago Climate Exchange (CCX), the New South Wales Greenhouse Gas Abatement Scheme (NSW) and the United Kingdom Emissions Trading Scheme (UK ETS) all grew sharply, as did the trendy but non-standardized retail carbon market.

Developing countries supplied 214 million tCO_2e of primary project-based credits or 21% of total volumes traded for a total market value of US$2.3 billion. China continued to have a dominant market-share of the Clean Development Mechanism (CDM) with 60% and exerted its market

power to try and influence prices of Certified Emission Reductions (CERs), while Ukraine supplied one third of Joint Implementation (JI) volumes. CERs and Emission Reduction Units (ERUs) transacted at average prices of US$ 10.50 and about US$ 8 respectively across a range of prices varying with the terms of the contracts entered into. Buyers found it easier to close transactions than six months ago, while sellers managed carbon price risk by favoring fixed price forward contracts. Hydrofluorocarbon (HFC-23) reduction projects accounted for half of the market volumes, while renewable energy (especially wind) and energy efficiency projects together accounted for nearly 27% of the project-based market.

European buyers dominated the primary project-based market with a 86% share (versus 50% in 2005) with the Japanese sharply down at only 8%. The U.K., where the City of London is home to a number of global banks, led the pack for a second consecutive year with nearly 45% of project-based volumes, followed by Italy with 19%. Private sector buyers, especially banks and carbon funds, continued to buy large volumes of CDM assets, while public sector buyers led in JI purchases. The national identity of buyers became increasingly less meaningful as international banks and funds engaged in secondary transactions with other banks (primarily in Europe) or the compliance community (in both Europe and Japan). CER assets traded considerably higher in secondary markets than in primary markets, although accurate data was difficult to find. Analysts estimated that US$6.4 billion had been invested in 50 carbon funds[1] as of early September compared to US$4.6 billion in 40 funds in May 2006.[2] One analyst reported that 39% of private money and 23% of public money invested in carbon funds is managed from the United States, followed by the United Kingdom, Singapore, Spain and Norway.[3]

The spread between the EU ETS and the project-based market narrowed in September 2006 as both EUA spot and forward prices retreated following the collapse of the spot prices of natural gas in Europe and generators dispatched power using natural gas. Some market players observed that they might stop purchasing CERs and focus on Phase 2 EUAs if the EUA price slide continued. Other market participants speculated that project-based credits could trade independently of the EUA (perhaps in the retail, CCX or regional markets developing in the United States) and wondered if the credits could be worth more than EUAs in the future.

Most agreed that considerable price risk remained in the market for both CERs and EUAs. While some carbon companies and funds continued to focus single-mindedly on carbon project origination and execution and even acquired smaller rivals, other companies started to diversify their carbon businesses by buying equity in biofuels, electricity or other environment-related businesses. A few European entities opened offices in the United States where state and regional markets began to develop longer-term approaches to manage emissions.

As the EU Commission began its review of the National Allocation Plans (NAPs2), the growth of the CDM pipeline slowed as 2012 loomed closer. New developments in California, the eastern United States and Australia held the promise of continuity beyond 2012, without which the project-based market might otherwise see a sharp slowdown in transaction volumes. Precise allocation levels and final rules for the import of offset credits will clarify to what extent these emerging markets will sustain the current level of demand for project-based emission reductions. Market participants looked to local, national, regional and global policymakers to set credible emissions targets, harmonize flexible instruments across regimes, require transparent disclosure of quarterly emissions data and impose strict penalties for fraud or non-compliance.

[1] See New Energy Finance, Focus Report: http://www.newenergyfinance.com/NEF/HTML/Focus.html
[2] See R. Bulleid, "The capital begins to flow", *Environmental Finance*, April 2006.
[3] See New Energy Finance, op. cit.

METHODOLOGY

Carbon transactions are defined as purchase contracts or ERPAs (Emission Reductions Purchase Agreements) whereby one party pays another party in return for GHG emissions reductions, that the buyer can use to meet its compliance – or corporate citizenship – objectives vis-à-vis greenhouse gas mitigation. Payment is made using one or more of the following forms: cash, equity, debt, or in-kind contributions. 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;
- *Project-based transactions*, in which the buyer purchases emission credits from a project that can 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 mechanisms of the Kyoto Protocol, generating CERs and ERUs respectively.

Carbon cap-and-trade regimes currently in place allow, for the most part, for the import of credits from project-based transactions for compliance purposes. Once project-based credits are issued and are finally delivered where and when desired for compliance, then they are fundamentally the same as allowances[4]. Unlike allowances however, project-based credits are compliance assets that need to be "created" through a process that has certain risks inherent with it (regulation, project development and performance, for instance) and involve significantly higher transaction costs.

Accurately recording the project-based transactions market is becoming more difficult each year since the number of transactions together with the diversity of players involved is increasing dramatically. Prices and contract structures, in particular, are confidential in an increasingly competitive market. The authors have collected information from direct interviews and a survey of major market participants as well as a review of the major relevant carbon-industry publications. Our focus is on regulatory compliance; therefore our coverage of the voluntary and retail segments (individuals and companies seeking to offset their own carbon emission footprints) is not exhaustive. Retail price data are reported to show how they differ from the biggest segments of the market.

The information gathered has been aggregated in a database of more than 750 project-based transactions between 1996 and end of September 2006. Only *signed ERPAs* are included. Although the study received a very high level of cooperation from most market players, the authors were not able to obtain complete data for all reported transactions. The completeness of data exceeds 80% in most cases except for information related to contractual terms, especially prices, where reliable data were obtained for only slightly more than 60% of the volume. In between the periodic reports in this series, the authors have occasionally become aware of unrecorded transactions from previous years that have now been included in the database. This

[4] Some differences may continue to exist between credits and allowances because of regulatory design. 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), or price "triggers" or caps only above which certain offset assets are allowed in.

(upward) revision explains why data for the previous years may be slightly different from previous publications in this series.

The authors are relatively confident that the projects database for this series captures most transaction activity entered into by governments and a high proportion of all primary transactions. This confidence does not extend to the many secondary market project transactions that have not been captured by the database. Rather than estimate these, only those have been reported for which reliable data exists. For this reason, the authors consider that the analysis in this series provides a rather conservative estimate of the carbon market, one that provides.a good representative view of the carbon market.

In contrast to the projects-based market, daily price and volume information on allowances markets is available online. The report draws on data collected from the various trading platforms as well as aggregated information on the volume known to have been exchanged over-the-counter for the EU ETS. The authors 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.

I ALLOWANCE-BASED MARKETS

EU ETS IS THE LARGEST CARBON MARKET BY FAR

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 September 2006, the largest carbon market in terms of value and volumes. It was considerably larger than the Australian NSW, the U.S.-based voluntary CCX and the UK ETS markets. The EU ETS was also substantially higher in volumes – and values – than the project-based markets, including CDM (see Figure 1).

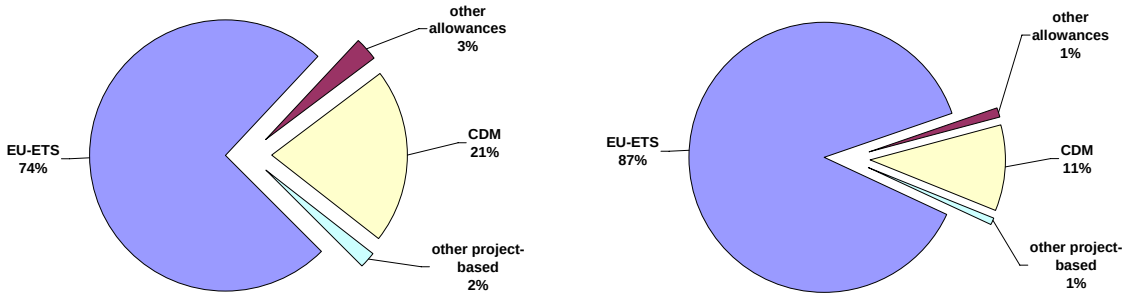


Figure 1: EU-ETS Takes All: Shares of Volume (left) and Value (right) Transacted in the Carbon Market (2006 until September 30)

Despite the events of May 2006, the EU-ETS market recovered and has already doubled in value over the previous year's numbers (see Table 1). In the first nine months of 2006, the EU ETS traded nearly 764 million allowances worth US$18.9 billion compared to 324 million allowances worth US$8.2 billion in all of 2005. This compared with US$184.1 million on NSW (US$59.1 million in 2005) and US$27.2 million for CCX (US$8.3 million in 2005). Confidence in the market declined sharply in May 2006 and a sell-off occurred. About 30% of the overall EUA volumes in the year so far were traded in the months of May (immediately following the release of verified emissions data) and in September (with the collapse of the spot price for natural gas).

Even if a market, as a whole, may be long, it does not follow that specific players – or sectors – are also always long. This, in part, explains the recovery of the EUA market in June and July as industrial companies started selling EUAs to utilities and financial players. A hot, dry July in Europe led to higher demand for electricity even as hydro resources were low and nuclear resources were off-line due to high temperatures and maintenance requirements. Generators dispatched power using coal leading to higher emissions and the need for utilities to cover their emissions in July, pushing the spot price of EUAs higher to around €16 (see Figure 2). In September, EUA spot and forward prices declined sharply following the collapse of spot prices of natural gas in Europe. The "spark spread"[5] in Germany collapsed as generators dispatched power

[5] 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.

using natural gas. This demonstrates that fundamentals affecting demand and supply still matter in a Phase I market that many considered too long.

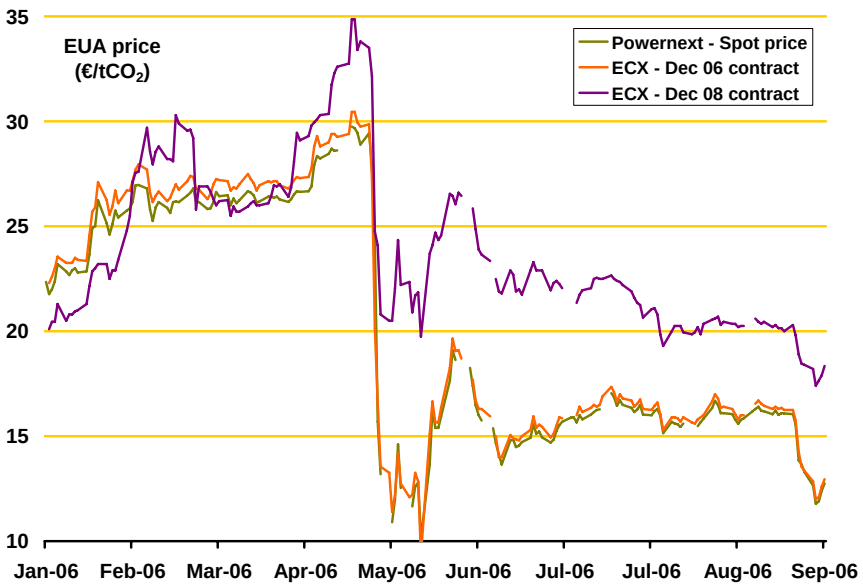


Figure 2: Spot and Futures Prices for EUAs Jan. to Sep. 2006 (Source: Powernext, ECX).

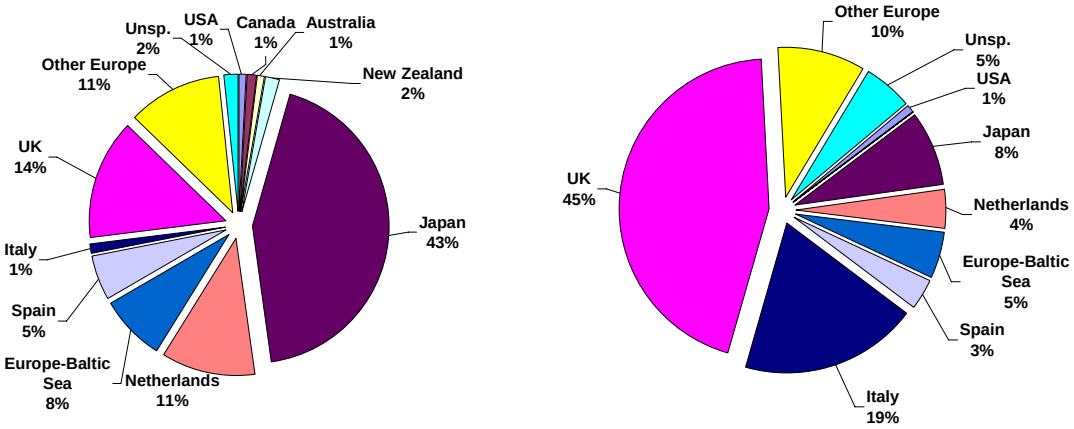
Over the next several months, the EU will review the proposed allocation plans by Member States for Phase 2 of the EU ETS. Several analysts anticipate that the Phase 2 market is likely to be short and the price charts for spot and Phase 2 future EUAs began to diverge sharply through the summer of 2006. Resolution of uncertainty over overall allocations and any supplementarity caps limiting the import of CDM and JI will help determine future market direction.

It will also be clear to what extent the long-term regulatory signal from the proposed new California law and the Regional Greenhouse Gas Initiative (RGGI) of seven northeastern states in the United States will result in the creation of active and effective markets for climate mitigation beyond 2012. A new national cap-and-trade program regulating emissions from the energy sector has been proposed in Australia and may also lead to the creation of a major climate mitigation market. These developments are discussed in more detail in the section on Regulatory Outlook.

II PROJECT-BASED MARKETS

2.1 WHO IS BUYING?

European buyers sidelined Japanese buyers and picked up whatever assets they could find, especially in China (see Figure 3). Several sellers reported that contract negotiations with the Japanese took longer than with the Europeans who were willing to pay very high prices for contracts, especially earlier in the year. More recently, Japanese buyers have been observed in diverse world capitals doing due diligence on prospective primary and secondary transactions. Canadian buyers are still conspicuous by their absence, even as the Canadian government states that it is developing a "Made in Canada" strategy to reduce emissions.



2005
Overall volume: 384.4 million tCO_2e

2006 (until September 30)
Overall volume: 234.1 million tCO_2e

Figure 3: Primary Market Buyers (as shares of volumes purchased, vintages to 2012)[6]

Cumulatively, Europe (EU, Iceland, Norway and Switzerland) has accounted for about two thirds of the CDM and JI market since 2003, while Japan has accounted for nearly one third. Private buyers accounted for 87% of European purchases of project-based assets in 2006 compared to about 80% and 70% in 2005 and 2004 respectively. For JI projects, the data shows that public buyers dominated with more than 90% market share. The authors estimate that EU and Japanese governments have only purchased about 20% of the assets identified for purchase from the flexible mechanisms (CDM, JI and AAUs)[7]. Since EU Member States and the Government of Japan have a picture of their compliance requirements, the authors can anticipate that public buyers are likely to become more prominent in the market in the coming year or two.

[6] 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 buyers.

[7] Estimated using information submitted as part of the Fourth National Communications of the Parties to the United Nations Framework Convention on Climate Change (UNFCCC).

Within Europe, the United Kingdom, led by the financial institutions located in the City of London, had a 45% market share of volumes transacted (up from 14% in 2005). Italy sharply increased its carbon acquisitions entering the market in 2005 (growing from 1% in 2005 to 19% so far in 2006). Buyers from Japan continued to be dominated by a handful of large trading houses originating and buying credits with the intent to re-sell to compliance buyers, although a few Japanese compliance buyers were also exploring transactions directly and through European brokerage houses.

2.2 WHO IS SELLING?

Asia leads other regions in the supply of CDM credits with 84% of **market volumes** so far this year (see Figure 4). China, with 60% market share (down from 73% in 2005 and 56% historically), and India with 15% (up from 3% in 2005 and historically 13%), continue to dominate the market. Contracted volumes in Latin America accounted for 9% of CDM supply from January to September 2006 (down from 19% in 2005 and 20% historically) with Brazil accounting for half of historical Latin American volumes. Noteworthy in the 2006 data is the share of Africa which now accounts for 6.5% (up from 3% last year and 4% historically) of overall CDM volumes.[8] JI in economies in transition also grew in 2006 to 5% (4% for 2005), with Ukraine accounting for one third of JI transaction volumes, followed by Bulgaria and Poland (roughly 15% each).

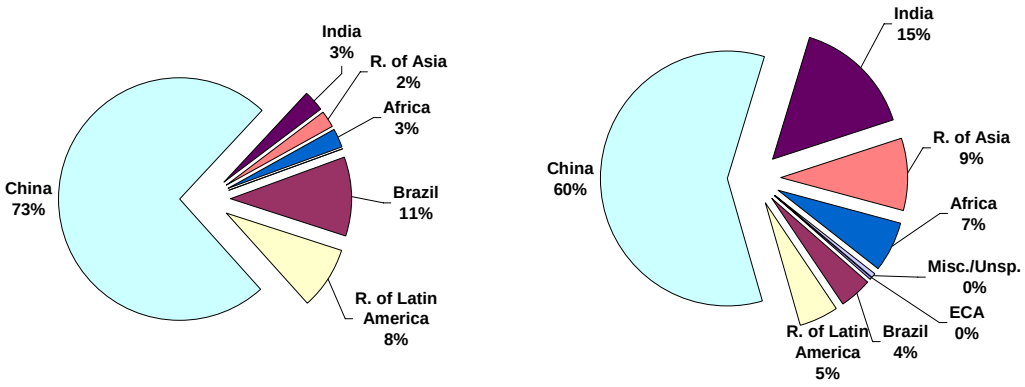


Figure 4: Location of CDM Projects (as a share of volume supplied).

Cumulative volumes transacted correspond closely with the aggregate regional pipeline of CDM projects as of September 2006.[9] A notable variation is India, with 13% cumulative market share versus a 20% share for projects at validation and beyond. The India gap may be explained by the high number of unilateral projects and by the fact that sellers delayed finalizing contracts as they awaited higher prices last year. A strong pipeline and a growing willingness to strike fair deals may suggest a higher market share for India in the future. In contrast, the biggest Chinese assets

[8] Eastern Europe and Central Asia accounts for less than 1 % and there is less than 1% of unspecified transactions, where we could not identify the seller's region.
[9] Consult the CDM pipeline by Jørgen Fenhann (UNEP RISØ Centre, Denmark), at http://cd4cdm.org/

have either been sold or are very close to finalization, suggesting that China's potential to bring large HFC-23 volumes to the market may peak this year.

Asia accounted for 40% of the **number of transactions** so far in 2006 (30% in 2005), with China and India at 24% and 15% (compared to 12% and 11% respectively in 2005). Latin America's share in the number of transactions in 2006 dropped to 18% (from 27% in 2005), with 6% (10% in 2005) for Brazil. Africa accounted for almost 11% of transactions in 2006 (5% in 2005). The **average size of transactions** ranged from 3.9 million tCO_2e in China to 1.6 million tCO_2e in India and 1.1 million tCO_2e in Brazil. The average transaction size in Africa was 0.9 million tCO_2e.

2.3 INSIGHTS ON THE PRICE OF PROJECT-BASED ASSETS

Prices are up across-the board in every segment of the project-based carbon market, with weighted average prices for primary CERs at about US$10.50 (up from US$7.10 in 2005), representing an almost 50% rise in year-to-year average prices (see Figure 5)[10]. These average prices mask a range that varies based on the specific terms of the contracts entered into: see section on "Terms of project contracts" below. Primary CERs transacted at a weighted average price of US$11.10 in the first quarter of the year but declined slightly to US$10.35 in the next two quarters. This confirms a link between EUA and CER prices so far as CER prices declined 7% (although the decline was substantially lower than the fall in EUA prices) after May 2006.

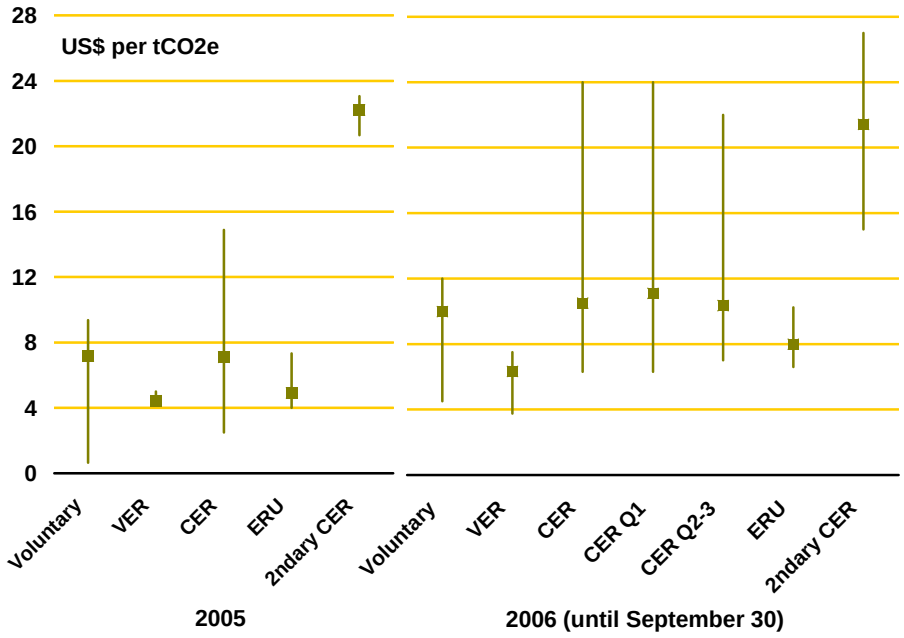


Figure 5: Observed Prices for Project-based Transactions in 2005 & 2006 (until Sep. 30)

The prices at which ERUs transacted in 2006 increased to an average of US$7.98, representing a 60% year-on-year increase, but remained cheaper than CERs on average. There is insufficient data for a meaningful price comparison between pre-EUA correction and post-correction average

[10] All prices in US$ per tCO_2e, unless otherwise indicated.

ERU prices. JI assets traded in a range from US$6.60 up to US$10.24, which is lower than the range at which primary CERs (US$6.30- US$24.00) and secondary CERs (US$15.00- US$27.01) were transacted.

Prices of project-based credits tended to be more stable than EUAs and did not necessarily react immediately to regional variables such as gas prices, power demand or weather patterns. CER prices were also influenced by Japanese compliance buyers who tended to focus on longer-term compliance needs than the predominantly financial buyers of EUAs and secondary CERs, a sign that EU ETS compliance is not the only driver of the CER market.

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

Prices on the voluntary and retail segment also increased and their weighted average price reached US$9.98 (increasing from US$ 7.17 in 2005). The range of prices moved upward (the low end of the range increased to US$4.50 in 2006 from US$0.65 in 2005, while the high end of the range jumped from US$9.36 to US$12.00). The single biggest impediment to stronger demand and a predictably higher price for these assets remained the lack of a broadly accepted standard for voluntary projects that combined simplicity and consistent integrity, qualities which should make them welcome across regulatory regimes and voluntary markets.

Project-based credits – not just CERs, but more generally, high quality, independently verified emission reductions – have the potential to be valuable across several markets, from the EU to Japan as well as in the northeastern U.S. regional markets, the voluntary Chicago Climate Exchange and the growing retail markets. This could shield project-based credits from regional fluctuations in any one market. However, this would require the key markets to allow standardized, independently verified project-based assets to be recognized across regimes.

2.4 TERMS OF PROJECT CONTRACTS

Most buyers offered sellers a choice of either fixed forward or indexed forward contracts. Quite often, parties negotiated a contract which offers a fixed price for part of the volumes to be delivered (e.g., for 50% of delivery) and an indexed price for the remainder. For indexed transactions, prices were often linked to a market spot price (calculated on an agreed basis between the parties, but was most often linked to an EUA Price Index).[11]

As an illustration of such a contract, a floor price is established at €6 payable upon delivery of the CERs. Should the index be over a certain level, then the buyer and seller would share the upside over that amount in an agreed proportion (e.g. 50/50). So, for example, if the index were €8, the buyer and seller would share the additional €2 equally with €7 being the effective value of the contract. In the illustration above, the seller may perceive that s/he is better off with a negotiated

[11] Typically the index corresponds to the average ECX CER Daily Settlement Price or the average ECX EUA Price Index 60 days prior to CER delivery.

fixed price of €8. Prices reflect terms and it is evident from our data and from our interviews that fixed forward transactions are again very popular with sellers.

Many contracts stipulated a minimum delivery volume contracted and several included a call option for additional CERs. Some, although not all, of these contracts included a premium for the option. Delivery shortfalls in a particular year were often subject to a discount payable upon delivery, sometimes reflected in a 15-20% price discount below what was contracted. Several contracts also had conditions precedent that require that the project be validated and registered with the CDM Executive Board within a specified time-period, typically 12 months from the date of the contract. Some contracts have provisions for either party to claim damages for losses suffered for willful default or gross negligence by either party in addition to making the other party whole under the contract. Some contracts had provisions for liquidated damages which required the seller to compensate the buyer in cash for any delivery shortfalls on the basis of prevailing spot prices for replacement CERs. Such contracts benefited from a significant premium of between 10%-33% over the average market price for all primary transactions.

A small percentage of buyers and sellers reported that advance payments were made as part of the contract. Most buyers stated that they did not secure any advance payments with bank guarantees, stand-by letters of credit or other security, although they did report conducting strong due diligence before agreeing to provide upfront payments. When they did provide upfront payments, they were done against the achievement of specified milestones necessary to progress the project, e.g., placement of an order for equipment, breaking ground for construction or project commissioning.

Since our last report, a number of insurance products have been developed to cover a range of risks e.g. regulatory risk, delivery risk and political breach of contract risk etc. Products to cover these risks have been developed by the World Bank's Multilateral Investment Guarantee Agency (MIGA), Carbon Re, Swiss Re or Munich Re, AIG, Allianz, and Rabobank, among others. Many project developers and asset managers that we interviewed stated said that they were not considering these products at the prices currently offered in the market. There are, of course, many ways to manage risk across commodities (e.g. EUAs and CERS, or carbon and energy) and the growth of the secondary market have enabled market participants to use carbon as an instrument to do so.

2.5 CARBON ASSET CLASSES AND TECHNOLOGIES

HFC-23 destruction projects continued to dominate with 52% of all project-based volumes transacted in 2006 (down from 64% in 2005, see Figure 6). The authors are aware of additional large transactions at advanced stages, so the remainder of the year should see the HFC-23 share remaining the same or even rise. Many buyers are keenly aware of the stiff competition for and the finite availability of this asset class beyond this year.

Renewable energy projects, despite their long lead time, are at 12% (up from 10% in 2005) with wind alone representing half of this asset class. Energy efficiency and fuel switching projects, after being nearly absent in 2005, accounted for 14% of the market volumes this year. Projects involving the destruction of nitrous oxide now can draw from two approved methodologies and in 2006 they took an 11% market share.

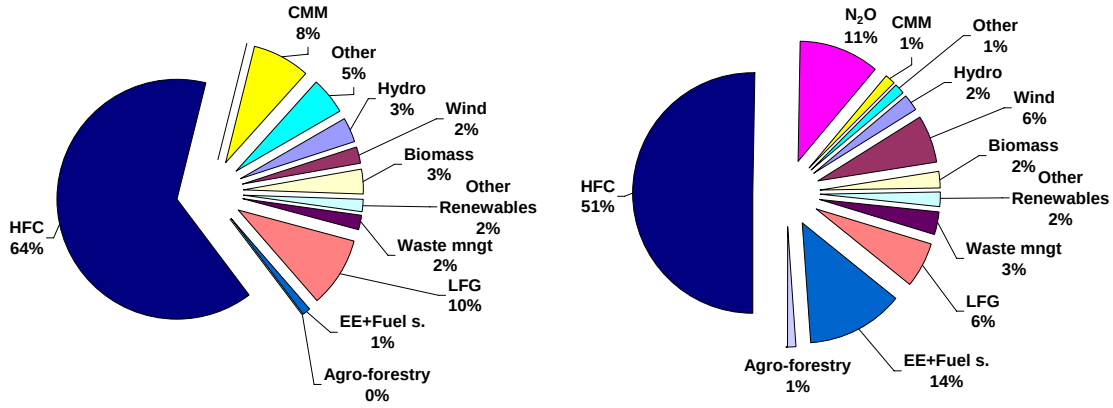


Figure 6: Technology Share of CDM Projects (as a share of volume contracted).

Landfill gas (LFG) project volumes are down to 6% of the market in 2006 from 10% last year. An analysis of the CDM pipeline conducted by Fenhann shows that the yield from submitted project design documents (PDDs) for projects, in general, to Issuance of CERs is 70%. For LFG projects, however, this yield is under 30%[12]. The reasons for this include the difficulties and errors in estimating methane yield, weak project development or implementation and revisions in monitoring plans. All of these reasons have been invoked by the Executive Board to justify the discounts applied to expected project volumes (or what project developers and buyers refer to as "haircuts"). Many developers have raised questions about these discounts which have caused project developers and buyers to significantly write-down the value of projects.

Coal Mine Methane (CMM) was cited by many of our interviewees as an attractive asset class, yet that interest is not borne out by market data which shows this asset class down to 1% of market volumes in 2006 from 8% in 2005. Although CMM assets are able to deliver more predictable volumes of methane reductions, specific regulations in some countries, e.g., China, require projects to generate electricity rather than simply flare the gas. As a result, developers have to invest in engines and generators, raising their investment costs and reducing the rate of return. This may explain the relatively small share of CMM.

Finally, assets from land use, land-use change and forestry (LULUCF) account for 1% of volumes transacted so far. Demand for these assets has been limited by both their regulatory complexity and barriers to their entry into the EU ETS. Limited market access to the EU is likely to constrain their demand (at least from private compliance buyers and their intermediaries). The authors would anticipate that the strong community benefits associated with such projects as well as the significantly lower costs (and prices: at an average US$4.00, ranging from US$3.00 to US$4.50) associated with them should attract public sector buyers. In addition, both the proposed list of eligible offsets in the northeast U.S. regional market (RGGI) and proposed in the Australian cap-and-trade system allow for offsets from afforestation. Large classes of LULUCF assets including possibly soil sequestration, fire management and avoided deforestation, among others, remain attractive opportunities to promote sustainable development in Africa and in other

[12] Since only about 15 million CERs have been issued so far (as of 30 September 2006), this analysis should be considered preliminary; we have mentioned LFG in particular because the early data for "yield" shows a marked variance from the mean, compared to other technologies for which CERs have been issued.

natural resource-based economies , but are still systematically excluded from the CDM and other regulatory markets.

CAN CARBON CAPTURE AND STORAGE BE THE NEXT BIG THING?

What is the next big asset class after HFC-23 and N_2O are exhausted? The eligibility of Carbon Capture and Storage (CCS) is before COP12/MOP2. There are considerable opportunities in countries as diverse as Angola, Botswana and Congo (DRC) in Africa to Brazil, Colombia and Mexico in the Americas, India, China and Indonesia in Asia as well as countries in Central Asia. It may be possible to sequester carbon dioxide in mines and use it to enhance the production of coal bed methane for flaring or generation. CCS has been proposed as an offset category in the new national cap-and-trade system under consideration in Australia; will be explored in Bull Mountain, Montana, as the U.S. state gears up to supply "emissions-free electricity" to California; and was recently welcomed by the Pembina Institute, a prominent Canadian environmental NGO, as a way to encourage climate mitigation in Canada.

CCS, like all other carbon asset classes, has risks associated with it such as permanence, leakage and possible future liability. As with other risks, these may be managed technically or contractually or both. The promise of CCS is that it may be able to help mitigate the risk of climate change at a scale not offered by any other means in the short-run. The ability to reduce emission reductions at this scale may also make ambitious emission reductions possible on a global scale well into the future.

For JI, energy efficiency improvement and fuel switching projects led the pack with just over 25% of volumes transacted for 2005-2006 (which is in line with their share in previous years). Wind came in right behind with 15% and all renewable energy combined were 40% of the volumes transacted, while nitrous oxide reductions from industrial installations accounted for 11%.

III INVESTMENT CLIMATE AND REGULATORY ENVIRONMENT

3.1 DOING C-BUSINESS AROUND THE WORLD

Why do some countries succeed in attracting CDM? Clearly, several respondents to our survey pointed to the overall investment climate, the size and growth of the economy and its structure, i.e. the more industrialized developing countries had greater opportunities for generating carbon credits. Poland was cited as an attractive JI destination on account of the "entrepreneurial spirit" in the country. Others cited the size of the potential carbon assets (which brings economies of scale in exploration, sourcing and transactions costs), for example Chile was cited for project replicability, while China was cited as being attractive now that standard application flow was now available (besides for the availability of large volumes of reductions).

One criteria almost universally cited by respondents to our survey was the host country regulatory frameworks, i.e. the Designated National Authority (DNA) rules for review and project approval, DNA efficiency, transparency and track record for projects approval. India and Mexico were thus cited in our interviews as being attractive for the CDM because of efficient DNAs. A United Nations Development Program (UNDP) report suggested that three to five years may be needed to build adequate host country capacity, implying that the Kyoto 2012 clock has all but run out for most countries who have not begun creating the required infrastructure.[13]

India (in 2004) and then China (since 2005) have led in terms of market share. The dynamic – and the contrasts – between the two countries' paths to success could not be more different. Market data suggests that China still maintains a commanding lead in the market and that several additional transactions are at advanced stages of preparation. However, Indian sellers have re-bounded since the middle of the year with strong pipelines of projects and buyers reported "more realistic" price expectations from Indian sellers than earlier in the year.

3.2 BEYOND CARBON

Twelve months ago, the dominant business model in the carbon space was managing risk and arbitraging price between CERs and EUAs. Most buyers had forward contracts with sellers and their business model was primarily to source and sell carbon. In our May 2006 report, we noted that the most successful deals were those that went beyond contracting for carbon and included other relationships, viz. equity, debt, equipment sales, other commodity sales etc. This trend has increased, as the market volatility of carbon has grown, making the earnings of pure play carbon suppliers very sensitive to the price of EUAs. Not surprisingly, many carbon companies have been diversifying their businesses by investing in a range of opportunities in the environmental and clean energy sectors[14]. We expect such types of investment activity to continue and rapidly increase as carbon becomes just one of the many assets from which investors seek to correctly value and grow.

[13] See UNDP Environment and Energy Group, "An Assessment of Progress with Establishing the Clean Development Mechanism (CDM)", Aug. 2006.

[14] One example is Trading Emissions plc which reports, in its recent public filings, that it has taken positions in sugar companies in Africa and Latin America with an eye to the rapidly growing biofuels markets and in hydroelectric and waste management companies in Latin America with an eye to the markets for electricity. In these cases, the "embedded carbon asset" may provide an upside, but the investors are buying real assets with real cash flows. This also reflects the growing move by private equity and other investors to diversify their positions from being commodity speculators to wanting to own "bricks and mortar"-type real assets.

CHINA & INDIA: DIFFERENT APPROACHES

China and India have very different processes to manage their Designated National Authorities (DNAs) which position their countries in the carbon markets. While both countries screen projects for sustainable development[15] and technology transfer, China differentiates the treatment of projects on the basis of sectors and whether they promote development in priority regions.[16] Both China and India also provide important information about approved projects and volumes publicly on the DNA website. In addition China identifies carbon credits buyers by name.

China, which has approved 79 projects so far, only approves CDM projects that are either wholly Chinese-owned or have joint ventures that have majority Chinese-ownership.[17] The price of the CERs is fixed at the time of the submission for the Letter of Approval (LOA). The National Development and reform Commission (NDRC) exercises price control on the CERs to be in line with prevailing market prices in similar projects around the world. There is no official fixed base price, although buyers report being aware of NDRC guidelines on price. There is some evidence that Chinese projects are leveraging China's strength in the market by proposing higher prices as we have seen some primary bids that are in the €11-14 range. However, we have very little evidence that transactions are closing at that price point, with most transactions in China reportedly still settling in the range of $10-$12. Buyers report that the high fixed floor price for Chinese CERs makes it difficult for them to offer Chinese sellers with upside through the use of partially fixed and partially indexed contracts.

In contrast, the India National CDM Authority (NCA) does not limit issuance of letters of approval to Indian companies or majority-Indian companies. The NCA does not get involved or influence CER price discussions or negotiations which are strictly between buyer and seller. However, the NCA works closely with industry associations to promote India Inc. as a destination for carbon purchases. The NCA states that it does not plan to levy a tax on CERs at the moment, but it has not ruled out the possibility of levying a tax once the CDM market develops in due course. The NCA had accorded host country approval to about 400 CDM projects by September 2006, which is by far the largest number of approved projects in any country. However, the CDM projects in India tend to be smaller than the average thus indicating the need for aggregation. Indian projects lost significant market share in late 2005 and early 2006 as they waited for prices to keep rising. Indian sellers have a strong pipeline to offer to the market and buyers report that it has been considerably easier to find and close fair deals in India since the events of May 2006.

[15] See *CDM Country Guide for India: Teri Report on CDM in India* downloadable at http://cdmindia.nic.in/

[16] In China, the National Development and Reform Commission (NDRC)[16] acts as China's DNA which also directly involves the National Coordination Committee on Climate Change (NCCCC), the National CDM Board (NCB) (established under the committee) and a CDM project management institute that is being established under the NCB. India's National CDM Authority (NCA) comprises of an inter-ministerial set-up chaired by the Secretary of Ministry of Environment and Forestry (MOEF) and drawing its membership from Secretary-level officials from the Ministries of External Affairs, Finance, Industrial Policy & Promotion, Non-Conventional Energy Sources, Power, the Planning Commission as well as the Joint Secretary responsible for climate change and the Director responsible for climate change in the MOEF (who serves as the secretariat).

[17] China attaches differentiated levies for CDM projects ranging from 65% for projects involving HFC, PFC and SF6 projects; 30% for projects involving N2O projects; 2% of priority project areas and afforestation/ reforestation. The proceeds of the levy which targets the so-called "industrial gases" support sustainable development projects. NRDC has accorded host country approvals to 79 CDM projects up to 09/10/06. Historically, since the early days of the market, projects from China have sold 384 million tCO_2e at an average price of US$ 7.53.

IV REGULATORY OUTLOOK

The authors welcome smart and well-designed market-based mechanisms as an integral tool to meet emissions targets. In this regard, the 2005 EU ETS Phase I experience had important lessons about what worked and what could be improved. The flexible mechanisms of the UNFCCC and its protocols are reasonably good, if not perfect, examples of effective environmental markets. These lessons need to be internalized and used to improve the design of markets, both for Phase II and for the new carbon and environmental markets worldwide.

WHAT'S NEW ON THE REGULATORY FRONT?

The opposition Australian Labour Party released a Discussion paper: "Possible Design for a National Greenhouse Gas Emissions Trading Scheme (NETS)", which proposes a cap and trade scheme to target the stationary energy sector and considers two scenarios for reductions (from 5% to 19 % in 2030 relative to 2005). The paper calls for regulatory certainty with a permanent ten-year future visibility on the level of the caps. The proposal includes offsets from forestry, carbon capture and storage, industrial process emission reductions, energy efficiency and renewables (and allows for the entry of assets created under the CDM or JI). In drafting the proposal, lessons from other schemes appear to have been sought, e.g. allocation rules and potential for windfall profits. The proposal disguises a price cap in the form of a non-compliance penalty which, when paid, fulfils the compliance obligations of the regulated entity. The proposal is open for stakeholder consultation until the end of December 2006.

The Final Rule of the Regional Greenhouse Gas Initiative (RGGI) of the seven American Northeastern States uses what it itself calls "prescriptive requirements" and a "standards-based approach" to help achieve compliance. Despite some positive features (e.g. requirement for facilities to report quarterly data, encouragement for early action and a mechanism to allow in CERs), the RGGI Rule, published on August 15, 2006, somehow manages to marry market mechanisms with price cap "triggers". It uses a mandatory standards-based approach and requires market penetration measures for energy efficiency offsets. The result appears to be a complex blend of market-type mechanisms and command and control approaches.

The U.S. State of California passed an important new law to manage greenhouse gas emissions reductions in late August 2006 which will use "market-based incentives" to reduce carbon emissions by 25% from today back to 1990 levels by the year 2020. The law also has made a long-term commitment to reduce emissions to 80% below 1990 levels by 2050. Mandatory caps will begin in 2012 for significant sources and ratchet down to meet the 2020 goals. The new law requires the California Air Resources Board (CARB) to develop regulations and market mechanisms to meet the 2020 target. The CARB would do well to note that innovation and cost-effective environmental protection can be promoted by coupling binding targets based on verified baseline data with flexible compliance mechanisms, strong disclosure and reporting requirements and strict penalties against fraud and non-compliance.

Issues before EU Member States include the revision of the National Allocation Plans (NAPs) for Phase 2 of the EU ETS, as well as clarity on the 2012-2017 period and the status of emissions from aviation. Regardless of how these issues are resolved, the Commission has to deal with issues of costs and quality of data verification as well as transparent and coordinated information disclosure to avoid a repeat of the events of April and May 2006. The EU needs to ensure that

the teething issues of the first year related to the late approval of the NAPs, late allocations and late establishment of registries are not repeated. The Commission should consider the costs of not allowing banking of allowances between compliance periods. Added flexibility might create a buffer and reduce the opportunity for some entities to try and manipulate the allocation process. There may also be EU-wide issues related to better integration with the power markets.

Since the publication of our last report, the most significant events have been the development of regulatory systems to manage greenhouse gas emissions in states and regions of the United States and proposed for national adoption in Australia. New South Wales (NSW) in Australia has proposed an interesting cap-and-trade approach that other states join its national call for emission reductions agreed for periods of ten years into the future. The seven U.S. States comprising the Regional Greenhouse Gas Initiative (RGGI) created a Final Rule for its regulation. Although the RGGI Rule has many promising features, some other elements open up as many questions as they answer about the extent to which RGGI would flexibly allow the import of offsets without erecting price distortions or other barriers for entry into the system. On the positive side, both RGGI and the proposal for Australia (as well as the California law) send both a long-term policy signal as well as shorter-term mandatory emissions targets.

Each system has different strengths, and it is possible to combine their strength and enshrine cross-system compatibility to balance the twin goals environmental integrity with maximum flexibility in achieving them. Well-designed markets can send a clear signal to the private sector to innovate and identify opportunities to mitigate climate change. Our experience in the carbon markets have demonstrated that capital markets respond to these signals. It is time for the policy-makers on national, state, regional and global levels to set credible targets over time, harmonize flexible instruments across different markets, require transparent disclosure of quarterly emissions data and impose strict penalties for fraud or non-compliance.