



**STATE AND TRENDS OF  
THE CARBON MARKET 2006**

*A Focus on Africa*

**Washington DC, November 2006**

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## EXECUTIVE SUMMARY

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In early October, the authors prepared an update on the global carbon market as of September 30, 2006 which was released at Carbon Expo Asia in October. To coincide with the international climate change negotiations in Nairobi, Kenya and the first-ever Carbon Finance projects event on the continent, the authors are presenting the report in Nairobi, adding a special emphasis on the role of Africa in the carbon market. It draws on global research on the market, but also focuses on special challenges—and opportunities—for African countries.

Africa saw its share of the overall carbon market *volume* increase to 1.4% in 2006 so far and more than doubled its share in the project-based market from 2.3% to **5.1%** of the project-based market and to **5.7%** of the primary market for Clean Development Mechanism (CDM) credits. These numbers account for a very small share of the global market and occur even though the overall investment climate across many African countries has improved over the past several years. Political stability has returned to many parts of the natural resource-rich continent in the past decade and countries such as Botswana, Ghana, Mozambique and Uganda have witnessed several years of consistently high economic growth, while high oil prices have fuelled record revenues in resource-rich countries such as Angola, Nigeria and Equatorial Guinea.

Many African countries have thin energy and industrial sectors with limited opportunities to reduce carbon emissions, certainly relative to countries such as China and India. Carbon sequestration from avoided deforestation and from agriculture—potentially important areas for climate mitigation and important in many African economies—has been systematically excluded from the Clean Development Mechanism (CDM). At the same time, CDM-eligible assets from afforestation and reforestation are excluded from entry into the large European Union-Emissions Trading Scheme (EU ETS), substantially limiting their market value and potential share in the multi-billion dollar global carbon market. The Africa share of the CDM market is lower than the share of African countries to developing nations in Foreign Direct Investment (FDI) over the past few years, which has been around 10%.

The overall global 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 entire previous year (see Table 1). The market was dominated by the European Union Emissions Trading Scheme, which had recovered over the summer and autumn 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 and newer data analyzed by the authors over the past month suggests that over US\$3 billion of transaction value were reached in the year as of October 30, 2006.

The volume of European Union Allowances (EUAs) transacted on major exchanges and over-the-counter rose to 764 million tons of carbon dioxide equivalent (tCO<sub>2</sub>e) by the end of September 2006 compared to approximately 324 million tCO<sub>2</sub>e 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.

	2005		Q1-3 '06	
	Volume (MtCO <sub>2</sub> )	Value (MUS\$)	Volume (MtCO <sub>2</sub> )	Value (MUS\$)
<b>Allowances</b>				
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
<b>Sub total</b>	<b>332.17</b>	<b>8,267.75</b>	<b>788.34</b>	<b>19,051.00</b>
<b>Project-based transactions</b>				
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
<b>Sub total</b>	<b>384.44</b>	<b>2,789.05</b>	<b>234.05</b>	<b>2,414.87</b>
<b>TOTAL</b>	<b>716.61</b>	<b>11,056.79</b>	<b>1,022.39</b>	<b>21,465.87</b>

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

Developing countries supplied 214 million tCO<sub>2</sub>e of primary project-based credits for a total market value of US\$2.3 billion by September 30, 2006 (and an estimated 295 million tCO<sub>2</sub>e for over \$3 billion as of October 2006) 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 an 87% share (versus 50% in 2005) with the Japanese sharply down at only 7%. The U.K., where the City of London is home to a number of global banks, led the pack for a second consecutive year). 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 as of early September compared to US\$4.6 billion in 40 funds in May 2006.

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. The spot-forward spread broadened again considerably in early November as spot prices declined to below €10, while 2008 vintages traded around €15 as market players priced in expectations that the EU Commission would likely hold a firm line on allocations proposed by Member States for the Phase II compliance period.

Some market players observed that they might have second thoughts regarding purchasing CERs and focus on buying Phase II EUAs instead 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 at some point 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 for Phase II (NAPsII), 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—or even expand—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.

## METHODOLOGY

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Carbon transactions are defined as purchase contracts or ERPAs (Emission Reductions Purchase Agreements) whereby one party pays another party in return for greenhouse gas (GHG) emission 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:

- 1 *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;
- 2 *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. 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 (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 AFRICA EMERGES IN THE CARBON MARKET

## 1.1 AFRICA IN THE CDM MARKET: CDM PIPELINE AND PROJECTS TRANSACTED

The African CDM pipeline has taken time to develop. Despite notable gains over the past year, African projects still represent a low fraction of the entire CDM pipeline. The first projects to enter the pipeline appeared at the end of 2004 (when other regions had some 64 projects in existence, mostly from Latin America): the Essaouira wind project in Morocco and the Kuyasa housing energy upgrade in South Africa.

At the end of October 2006, 17 projects from Middle East and North Africa (MENA) and 19 projects from Sub-Saharan Africa (SSA) were in the CDM project pipeline, out of a total of 1274 projects for all developing countries. Eleven countries have at least one CDM project at the public comment period of the validation stage or beyond: Egypt, Israel, Morocco, Qatar and Tunisia in MENA and Equatorial Guinea, Ivory Coast, Nigeria, South Africa, Tanzania and Uganda in SSA. South Africa leads the pack, hosting 13 projects. At the end of October 2006, 6 projects were registered in MENA and 4 in SSA, all in South Africa.

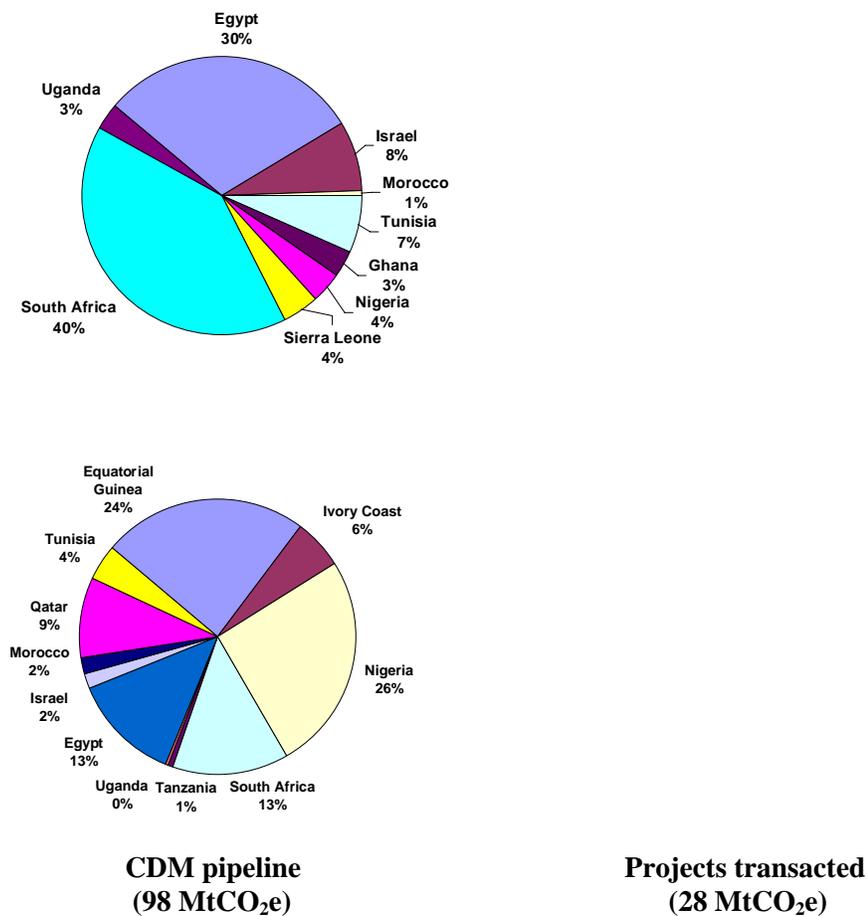


Figure 1: CDM Pipeline and Projects Transacted in Africa, as of 31 Oct. 06 (share of volume in million tons of carbon dioxide equivalent)

In terms of volumes (see Figure 1, left), the aggregate pipeline of Africa amounts to 7.1 % of the developing countries total (SSA: 5%- MENA: 2.1%). This compares to a 10% share in global GHG emissions in 2000 (12.63% including LULUCF). Half of these potential volumes come from Nigeria and Equatorial Guinea and one quarter from Egypt and South Africa.

One third only of these volumes have been transacted to date, revealing a very different geographical balance. Transacted CDM volumes in Africa amounted so far to 27.8MtCO<sub>2</sub>e, of which 54% contracted during the first ten months of 2006 and 30% through 2005. With regard to sellers, South Africa captures almost 40% of this volume and Egypt roughly 30%. Some ERPA have been signed at a very upstream stage of the CDM project cycle, before projects appear in the (public) pipeline. Such projects may eventually use not-yet approved methodologies or face regulatory risks (existence of a DNA, registration, etc.). This may contribute to explain why African projects have traded through 2006 at a US\$8.3 per tCO<sub>2</sub>e, *ie* a US\$2 discount of the average Primary CER price observed for the same period.

## 1.2 AFRICA SHOWS THE WAY IN AFFORESTATION AND REFORESTATION

**A**frican countries have led the way in finding innovative ways to sequester carbon through afforestation and reforestation activities that also deliver strong local community, environmental and economic benefits.

In **Kenya**, the **Green Belt Movement Project** is a small-scale CDM project that will reforest about 1,800 hectares of indigenous species within the Mount Kenya and Aberdares regions of Kenya. The activities included in the project are expected to sequester around 0.375 MtCO<sub>2</sub>e by 2017. The reforestation will bring important environmental benefits by reducing the erosion process, protecting the water sources, and regulating water flows. Biodiversity will also benefit from the re-introduction of a wide range of natural tree species. Local farmers will enjoy a direct improvement of their income through the payments for environmental services. Indirect social benefits will also stem from the forest products and improved social organization and capacities. Indirect social benefits will also stem from the forest products and improved social organization and capacities.

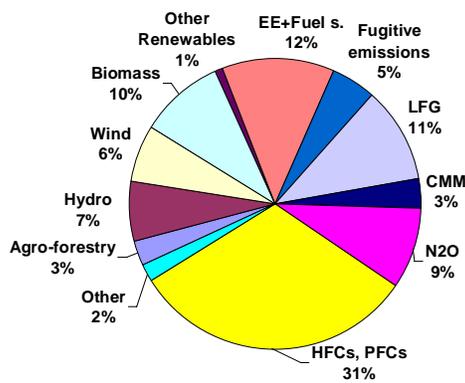
In **Madagascar**, the **Andasibe-Mantadia Biodiversity Corridor Project** will enhance native species viability, contribute to the restoration of degraded soils and lands and stabilise hydrological flows through the creation of biodiversity corridors between protected reserves. The project will combine a reforestation component of 3,020 hectares (a CDM project) and innovate with an avoided deforestation component through fuelwood plantations and the establishment of forest and fruit gardens. Among its social benefits, one might expect the creation of employment for agroforestry management and other project activities and the creation of additional sources of income from sale of timber and non-timber products.

In **Niger**, a project will develop **8,800 hectares of acacia plantations** on degraded land, mostly managed by local communities, to promote sustainable agroforestry. Soil regeneration and erosion control, increased natural habitat for native species, water table raised, dune fixing and wind and sun protection are among its environmental benefits. Social benefits will include the creation of employment for the establishment of plantations and Arabic gum production, an increased income from Arabic gum sale, production of fuelwood and animal forage and the training of communities in sustainable intercropping and plantation management.

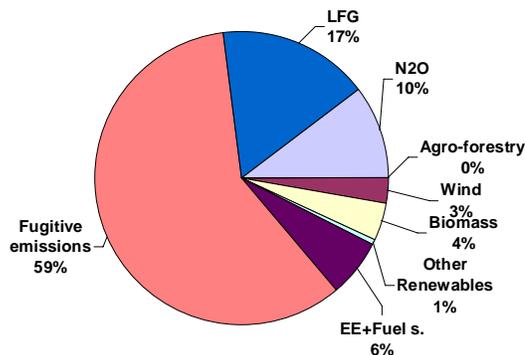
In **Uganda**, the **Nile Basin Reforestation Project** will establish a plantation of pine and mixed

native species in grassland areas within the Rwoho Central Forest Reserve. An area of around 2,137 hectares will be covered with 75% *Pinus caribaea*, 20% *Maesopsis eminii* and 5% *Prunus Africana*. The plantation will be established in 64 blocks of 25 ha each, grouped in 5 small-scale CDM projects. This cluster design allows for potential involvement of private and community-based investors. The project will sequester around 0.11 MtCO<sub>2</sub>e by 2012 and around 0.26 MtCO<sub>2</sub>e by 2017. Carbon payments will provide additional source of income for the project implementation. Environmental benefits of the project include the provision of suitable habitat for biodiversity as well as reduced erosion induced discharge in water flows and increase dry season flows. Fire management activities will also contribute to reduce the severe soil erosion in the area.

### 1.3 ASSET CLASSES IN AFRICA: POTENTIAL FOR CDM



Fugitive emissions from the oil industry dominate the African pipeline with 70% of potential volumes (see Figure 2). Landfill gas comes second at 17% followed by Nitrous Oxide (N<sub>2</sub>O) destruction projects (10%). Put together, renewables accounts for 7.5% of volumes and energy efficiency and fuel switching projects for 6.2%. This is in stark contrast with the whole CDM pipeline, where fugitive emissions account only for 6% of potential volumes (10 times less), CMM for 8% (almost inexistent) and all renewables for 24% (3 times more) and energy efficiency and fuel switching projects for 12% (double).



**Africa**  
(98 MtCO<sub>2</sub>e up to 2012)

**All developing countries**  
(1,374 MtCO<sub>2</sub>e)

## **Figure 2: Assets Classes in the CDM Pipeline (as of 31 October 06)**

Most African countries have low energy and industrial footprint (to the exception of the oil and gas industry) and the vast majority of approved methodologies deals with energy, industry and synthetic gases. However there are potentials for CDM in Africa and opportunities for development. We review here some of these potentials, pointing out the methodological and technical barriers to their full achievement. The institutional and financial barriers in Africa to the Carbon market are reviewed in the next section.

Most countries in sub-Saharan Africa have very limited access to electricity. In countries such as Uganda, the access rate is between 5 and 10% of the population. Countries like Uganda have traditionally relied on hydro resources to generate electricity. Climatic changes and over-use of the hydro resource have led to substantially reduced hydroelectric generation in the past few years. The government is turning to emergency thermal generation to keep supply up. A simple CDM methodology that would reward clean generation from hydro or bagasse would provide much-needed energy services to the country. One obstacle to more hydropower projects in Africa is the combined margin methodology in ACM002, which insists on compiling complex dispatch data, which only a handful of African countries have.

Many African countries suffer from high rates of technical and non-technical energy losses. Efforts to bring these losses under control could benefit from CDM, if methodologies were available that could handle the technical, economic and social complexity of addressing this situation.

Many African countries are rapidly urbanizing, yet few have sanitary landfills. Rather, most countries use managed dump-sites to dispose off waste. Using the carbon revenues from composting waste at such sites could help solve the growing solid waste management challenges, while managing GHG emissions. Recent Methodology Panel decisions impacting the crediting of reductions from composting have severely limited the ability of African countries to progress such opportunities. An opportunity in the World Bank's pipeline in Benin was recently cancelled because the revised lower volume of credits made the composting operation unviable.

There are some large, untapped sources of methane emissions from lakes and volcanic activity in Africa and other developing countries. These sources have an impact on the world's climate and potentially on the safety of local communities. Yet activities to reduce such emissions are currently not eligible under CDM rules, because these emissions are not anthropogenic.

The CDM can only be relevant in many parts of Africa if it encourages more clean energy choices, including the ability and the ease of use of the CDM as a tool to:

- bring more clean generation to the grid, e.g. regional hydroelectric and/or gas projects;
- encourage distributed and off-grid energy access;
- promote cleaner and modern biomass resources.

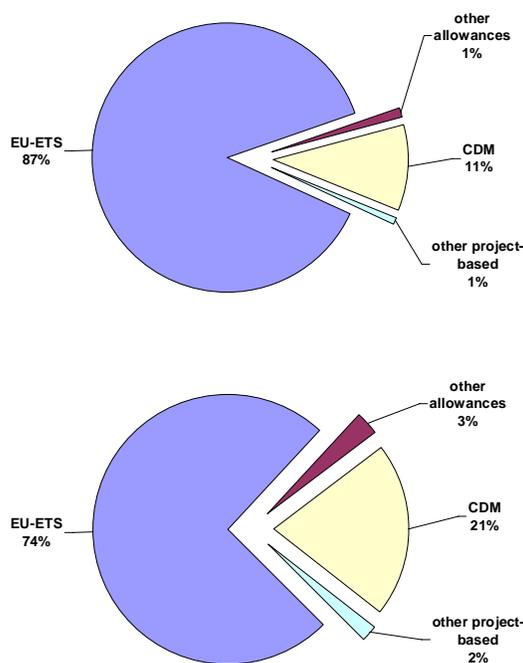
The CDM has the potential to provide useful resources to abate barriers to rural development efforts, especially in the areas of waste-to-energy (agricultural, animal, urban waste), water and sanitation, and transport. Given the household to small village-scale of these activities, tapping this potential would require the CDM to adopt rules that encourage program-based activities. This would include allowing bundles of micro-projects of varying crediting period and composition which may exceed 15MW of installed capacity.

## II CONTEXT: EU IS THE LARGEST MARKET BY FAR

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### 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 3).

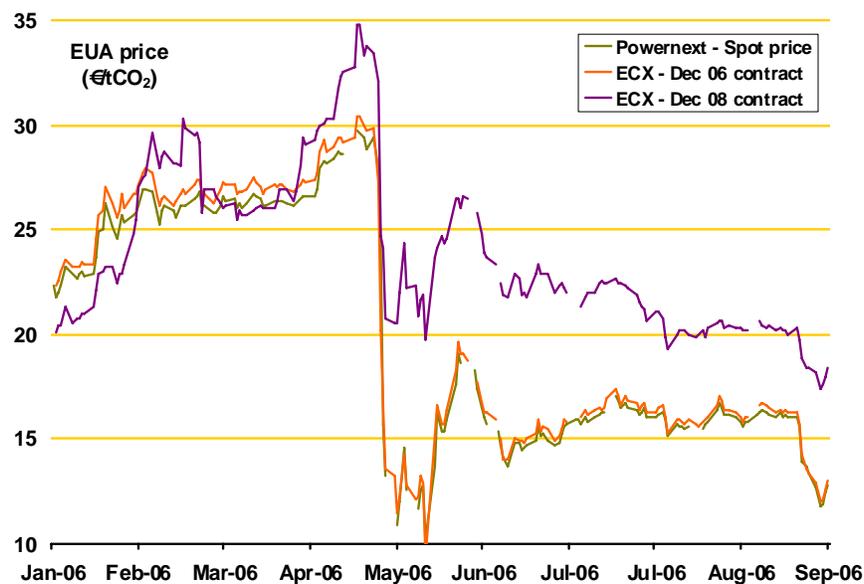


**Figure 3: EU-ETS Takes All: Shares of Volume (left) and Value (right) Transacted in the Carbon Market (2006 until September 30)**

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 4). In September, EUA spot and forward prices declined sharply following the collapse of spot prices of natural gas in Europe. The “spark spread” in Germany collapsed as generators dispatched power using natural gas. This demonstrates that fundamentals affecting demand and supply still matter in a Phase I market that many considered too long. For the power and heat sector and the financial community, Phase I EUAs thus still have some value, for compliance, risk management and hedging purposes. Selective IETA survey of market analysts shows a 90% probability for Phase I to be long and an 80% probability that Phase I EUA price tend below €5. For the respondents who provided us with quantitative answers (all but one, who expects EU-ETS Phase I to be long), the mean expected position of EU ETS at the end of Phase I is long, by 55MtCO<sub>2</sub>. The range stretches from long by 160 MtCO<sub>2</sub> to short by 300 MtCO<sub>2</sub>. This suggests that compliance buyers will likely use Phase I EUAs and save CERs for Phase II. Moreover, for those installations in France and Poland that are allowed to bank Phase I EUAs, there may be a rationale to buy and bank Phase I EUAs depending on the market expectations for Phase II and their own situation at the end of Phase I.



**Figure 4: 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 II of the EU ETS. Several analysts anticipate that the Phase II market is likely to be short and the price charts for spot and Phase II future EUAs began to diverge sharply through the summer of 2006. Given the information available on NAPs II (that were hardly all submitted at the time IETA sent the questionnaires), IETA survey indicates a 95% probability for Phase II to be short, on average by 700MtCO<sub>2</sub> (reaching up to 1,250 MtCO<sub>2</sub>) and a 95% probability for EUAs to trade above €10 at the end of Phase II (range of estimates: €7-100). Resolution of uncertainty over overall allocations and any supplementary caps limiting the import of CDM and JI will help determine future market direction. Stavros Dimas, Member of the European Commission, Responsible for Environment, recently stated “many of the plans take insufficient

*account of 2005 emissions, proposing a cap about 15% above the actual emissions in 2005. We must and we will ensure a rigorous but fair assessment of these allocation plans in line with the Kyoto reduction commitments and the verified emissions data for 2005.”*

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.

### III PROJECT-BASED MARKETS

#### 3.1 WHO IS BUYING?

European buyers sidelined Japanese buyers and picked up whatever assets they could find, especially in China (see Figure 5). 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, although it is not clear to what extent Japanese private buyers will continue to purchase carbon assets. Canadian buyers are still conspicuous by their absence and the Canadian government states that it is developing a “Made in Canada” strategy to reduce emissions.

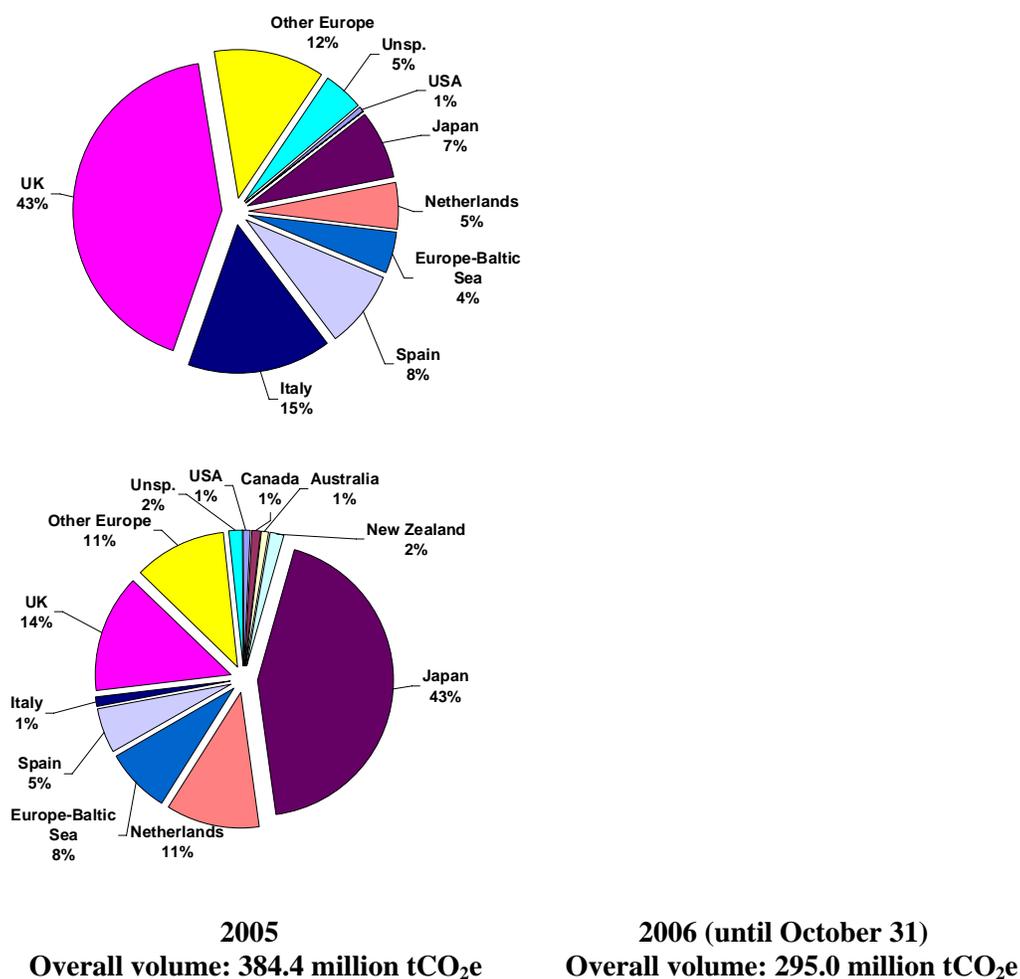


Figure 5: Primary Market Buyers (as shares of volumes purchased, vintages to 2012)

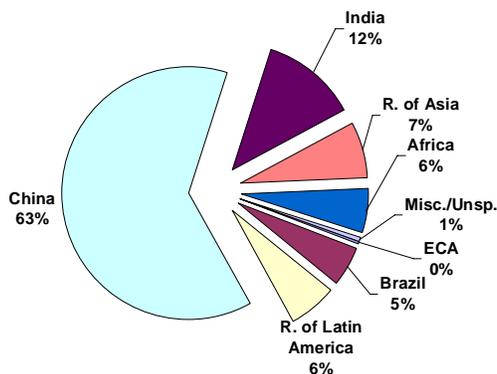
Cumulatively, Europe (EU, Iceland, Norway and Switzerland) has accounted for about two thirds of the CDM and JI market since 2003, while Japan has accounted for nearly one third. Private buyers accounted for 84% of European purchases of project-based assets in 2006 compared to about 80% and 70% in 2005 and 2004 respectively. For JI projects, the data shows that public

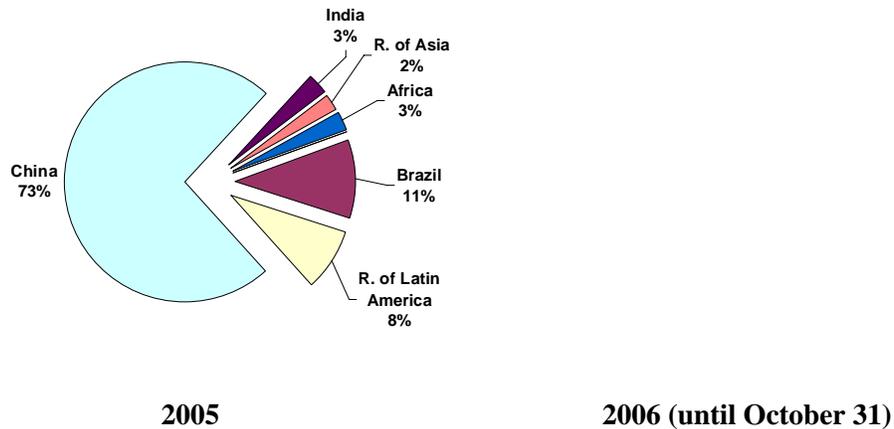
buyers dominated with more than 90% market share. The authors estimate that EU and Japanese governments have only purchased about 22% of the assets identified for purchase from the flexible mechanisms (CDM, JI and AAUs). Since EU Member States and the Government of Japan have a picture of their compliance requirements, the authors can anticipate that public buyers are likely to become more prominent in the market in the coming year or two.

Within Europe, the United Kingdom, led by the financial institutions located in the City of London, had a 43% 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 15% 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.

### 3.2 WHO IS SELLING?

Asia leads other regions in the supply of CDM credits with 84% of **market volumes** so far this year (see Figure 6). China, with 63% market share (down from 73% in 2005 and 56% historically), and India with 12% (up from 3% in 2005 and historically 13%), continue to dominate the market. Contracted volumes in Latin America accounted for 11% of CDM supply from January to October 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% (up from 3% last year and 4% historically) of overall CDM volumes, but only 4.6% in share of Primary CDM market value. 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).





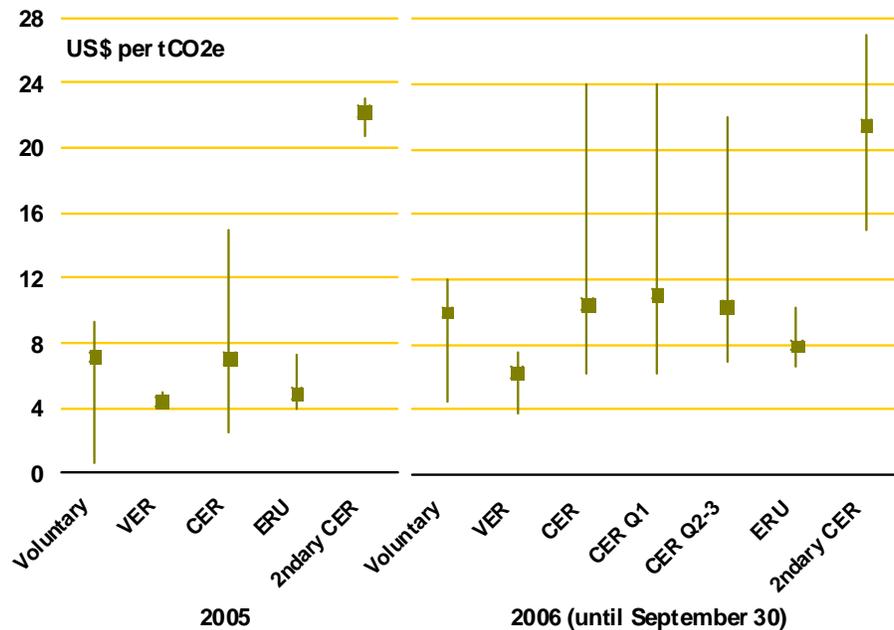
**Figure 6: Location of CDM Projects (as a share of volume supplied).**

Cumulative volumes transacted correspond closely with the aggregate regional pipeline of CDM projects as of September 2006. 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 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<sub>2</sub>e in China to 1.6 million tCO<sub>2</sub>e in India and 1.1 million tCO<sub>2</sub>e in Brazil. The average transaction size in Africa was 0.9 million tCO<sub>2</sub>e.

### 3.3 INSIGHTS ON THE PRICE OF PROJECT-BASED ASSETS

**P**rices 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 7). 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 7: 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 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 (or EUAs prices). CERs 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. This is 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.

### 3.4 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).

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 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.

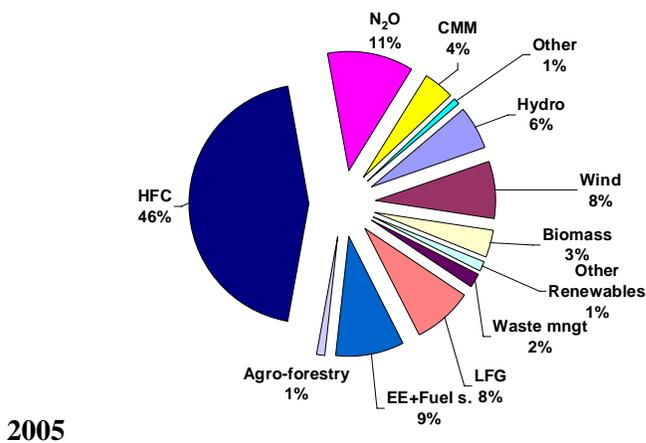
Since our last report, a number of insurance products have been developed to cover a range of risks e.g. regulatory risk, delivery risk and political breach of contract risk etc. Products to cover these risks have been developed by the World Bank's Multilateral Investment Guarantee Agency (MIGA), Carbon 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.

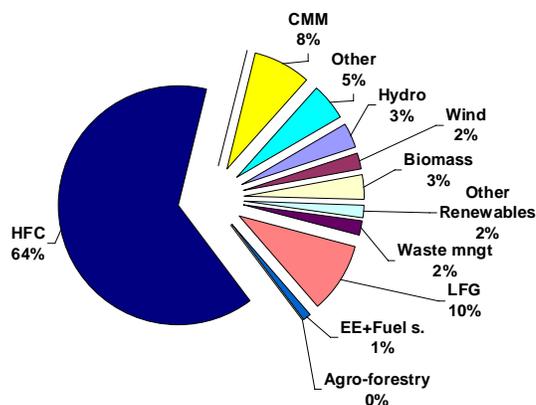
### **3.5 CARBON ASSET CLASSES AND TECHNOLOGIES**

**H**FC-23 destruction projects continued to dominate with 46% of all project-based volumes transacted in 2006 (down from 64% in 2005, see Figure 8). 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 18% (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 9% 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.



2005



2006 (until October 31)

**Figure 8: Technology Share of CDM Projects (as a share of volume contracted).**

**CAN CARBON CAPTURE AND STORAGE BE THE NEXT BIG THING?**

What is the next big asset class after HFC-23 and N<sub>2</sub>O are exhausted? The eligibility of Carbon Capture and Storage (CCS) is before COP12/MOP2. There are considerable opportunities in CCS in Angola, Botswana and Congo (DRC) in Africa. 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.

Landfill gas (LFG) project volumes are down to 8% 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%. 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 4% 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.

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 natural resource-based economies, but are still systematically excluded from the CDM and other regulatory markets. A recent World Bank report discusses how global carbon finance can be a powerful incentive to stop deforestation, by providing an incentive to slow down deforestation, preserve the environment and boost income in remote rural areas.

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%.

## IV INVESTMENT CLIMATE AND REGULATORY ENVIRONMENT

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### 4.1 DOING C-BUSINESS AROUND THE WORLD

**W**hy 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. Among 112 DNAs, there are as much DNAs in Africa (29) as in Asia (30) or Latin America (25); however, this is not unfortunately reflected in Africa’s share of the carbon market. 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.

#### **BARRIERS TO CARBON FINANCE IN AFRICA**

A lot has been written regarding barriers to development, in general, in Africa and the CDM also faces many of the same constraints to other forms of investment. There are, however, some issues more particular to the CDM in particular.

One, the rules of the game are designed to deal with energy and industrial mitigation, rather than climate mitigation from the agricultural and forestry sectors,

Two, the capacity of private developers is relatively weak. Access to technology, management and know-how are very often constraints to participating in the CDM. Among other, the language barrier and the lack of data to support PDDs (*eg* baseline construction) are often quoted.

Three, multilateral finance predominates and trying to do carbon investment projects relying on private finance is exceptionally difficult. Most African countries cannot access the global capital markets directly. Institutions such as the Aga Khan Foundation and the Emerging Africa Infrastructure Fund are pioneering many innovative financing arrangements on the continent which has a low savings rate and relatively few indigenous financial institutions that invest at home;

Four, with a handful of notable French and British exceptions from the colonial period, not many examples of successful overseas investors abound. In recent years, however, several South African companies have been successful across the continent in telecoms and retail, while Chinese and Indian companies are active in extractive industries and infrastructure. More

recently, Brazil has shared its experiences with bio-fuels with African countries.

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

- providing resources for designing, preparing and implementing pilot projects that can be taken to scale or replicated with carbon finance;
- bridging the financing gap existing in most projects in the region; and
- alleviating CDM transaction costs.

## **4.2 BEYOND CARBON**

**T**welve 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. For example, a London-based carbon company reported in its public filings that it had purchased an equity share in a sugar company in Ethiopia. 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.

## V REGULATORY OUTLOOK

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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 State and Trends of the Carbon Market 2006, 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.