



State and Trends of the Carbon Market 2004

Washington DC, June 2004

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2004

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Based on data and insights provided by Natsource LLC and PointCarbon

June 7, 2004

¹ The findings and opinions expressed in this paper are the sole responsibility of the author. They do not necessarily reflect the views of the World Bank, its executive directors, or the countries they represent; nor do they necessarily reflect the views of the World Bank Carbon Finance Business Team, or of any of the participants in the Carbon Funds managed by the World Bank. They do not necessarily represent the views and opinions of the two contributors: Natsource LLC and PointCarbon.

The author wishes to thank Karan Capoor for interviewing key market players, and providing insights and comments on the paper. The author also wishes to thank Jorund Buen, Johannes Heister, Masaya Inamuro, Yugo Nakamura, Robert O'Sullivan, Richard Rosenzweig, Kristian Tangen, Jary Vayrynen, Robert Youngman, for their insights and their very useful comments on an earlier version of this paper. The remaining errors are only the authors'. This research was funded by the CF-Assist program of the World Bank Carbon Finance Business.

EXECUTIVE SUMMARY

The emerging carbon market encompasses both project-based emission reduction transactions—where a buyer purchases emission reductions (ERs) from a project which reduces greenhouse gases (GHG) emissions compared with what would have happened otherwise—and emissions trading of GHG emission allowances, where allowances are allocated under existing or upcoming cap-and-trade regimes.

The major findings of this latest review of the state and trends of the carbon market as of May 2004 (based on material provided by Natsource LLC and PointCarbon, and on interviews with market participants) are as follows:

- The carbon market is growing steadily. A total of 64 million metric tonnes of carbon dioxide equivalent (tCO₂e) has been exchanged through projects from January to May 2004, nearly as much as during the whole year 2003 (78 million), which suggests that the market might double by the end of the year. The vast majority of this volume is from project-based transactions intended for compliance with the Kyoto Protocol.
- Beyond the market data reported in this document, there is a clear sense of momentum in the market, notably in Asia and Latin America. The approval of some methodologies by the CDM Executive Board clearly reinforces these dynamics.
- HFC₂₃ destruction represent nearly a third of the volume supplied in 2003-2004—from only two project sites.² Landfill gas to energy projects are the second largest suppliers of emission reductions, with 18%. This is a dramatic change compared to last year, which underlines the important potential of this technology, which has low mitigation costs, a approved and published methodology, and a large total supply per site.
- The demand remains heavily concentrated. Japanese companies now represent the single largest group of buyers in the carbon market, before the World Bank Carbon Finance Business and the Government of the Netherlands. These three groups of buyers account for nearly 90% of the demand in 2003-2004.
- Asia is now the largest supplier of emission reductions, followed by Latin America, developed economies, and Eastern Europe. Five countries (India, Brazil, Chile, Indonesia and Romania) represent two thirds of the supply in terms of volume. Increased concentration of CDM flows to a limited number of countries continue to leave Africa essentially bypassed, raising concerns about the long-term distribution of the benefits of the Clean Development Mechanism. The fact that the potential HFC₂₃ destruction projects are heavily concentrated in a handful of countries reinforces this concern.
- Prices of project-based emission reductions in early 2004 have remained essentially stable compared with 2003, and depend strongly on the segment of the market, and on the structure of the transaction. They reflect the distribution of risks between buyer and seller. For example, assuming the risk that the ERs might ultimately not be registered under the

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

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Clean Development Mechanism or Joint Implementation commands a significant premium.

- End of 2003 and early 2004 have seen major regulatory breakthroughs that also contribute to the sense of momentum in the markets. Chief among them is the approval of the EU Emission Trading Schemes (EU-ETS) which, along with the “Linking Directive” connecting it to the world of project-based opportunities, creates a welcome and appropriate structure for managing and pricing carbon. The EU-ETS sends a strong signal to the markets and can be a driver of additional volume of carbon trades achieving climate mitigation in the future. At the time of writing, most EU Member States had published their National Allocation Plans for the scheme’s pilot phase (2005-2007) which were less stringent than expected. This has apparently contributed, along with the approval of the Linking Directive, to a significant drop in the price of European allowances on the early market, although the early market for EU Allowances is still very thin and does not *a priori* reflect long term equilibrium between supply and demand.
- While these developments send the right signal to the markets, interested parties should note that, absent clarification of the validity of project-based emission reductions beyond 2012, the window of opportunity for initiating project-based transactions is rapidly closing. Given the long lead time between project preparation and the first “yield” of ERs, project developers have only a couple of years to act before carbon payments for only a few years cease making a meaningful contribution to project finance.

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Several governments, firms and individuals have started to take steps to reduce their greenhouse gases (GHG) emissions either voluntarily, or, increasingly, because of current or expected regulations. Since GHGs mix uniformly in the atmosphere, from an environmental standpoint it is equivalent to reduce emissions anywhere in the world regardless of political jurisdiction. Most of the regulations constraining GHG emissions and most of the voluntary actions take advantage of this substitutability and allow for the purchase of emission credits both within and outside of the regulated area, thereby laying the ground for the so-called “carbon market.”

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

The goals, and the full potential of the carbon market, however, are far from being realized and many obstacles remain. The objective of this paper is to review where the carbon market stands as of May 2004, and to discuss some of the trends that are emerging. It is the fourth annual survey of the carbon market prepared by the World Bank Carbon Finance Business.³

As the reader will quickly appreciate, the “carbon market” encompasses a wide range of disparate transactions, involving various underlying assets, contractual structures, and governing regulations. We therefore start by providing an overview of the main segments of this market, and how they inter-relate (section 2). We then focus on project-based transactions, which constitute, in volume terms, the biggest part of the current market (section 4 and 5). Section 6 provides a glimpse into the various GHG emissions allowances markets, and section 7 discusses the major trends we see emerging. Section 8 concludes

Since most of transactions on the carbon market are over the counter and confidential, with few details, if any, made public, we have gathered data from major players in the market, Natsource LLC and PointCarbon, and from direct interviews with selected market participants. We must emphasize that the conclusions we draw in this document, although derived from the insights provided by these players, are solely those of the author, and do not necessarily reflect the views of any of these organizations, nor any of any of the other sources we have consulted. Section 3 details the methodology we have followed in the analysis.

³ *Review and Analysis of the Emerging Greenhouse Gas Market*, PCFplus Research Report No.4, July 2001; Lecocq F., Capoor K., *State and Trends of the Carbon Market 2002*, PCFplus Research Report No.13, October 2002 ; Lecocq F., Capoor K., *State and Trends of the Carbon Market 2003*, PCFplus Research Report No.16 (<http://www.prototypecarbonfund.org/router.cfm?Page=Research>)

2.1 Two Types of Carbon Transactions

In this paper, we define carbon transactions as contracts whereby one party pays another party in exchange for a given quantity of GHG emissions “credits” that the buyer can use to meet its objectives vis-à-vis climate mitigation.⁴

Carbon transactions can be grouped in two main categories:

- *Trades of emission allowances*, such as, for example, Assigned Amount Units (AAUs) under the Kyoto Protocol, or allowances under the EU Trading Scheme (EUAs). These allowances are created and allocated by a regulator, usually under a cap-and-trade regime.
- *Project-based transactions*, that is, transactions in which the buyer participates in the financing of a project which reduces GHG emissions compared with what would have happened otherwise, and get “emission credits” in return. Unlike allowance trading, a project-based transaction can occur even in the absence of a regulatory regime: an agreement between a buyer and a seller is sufficient.⁵

Emissions allowances account for only a small fraction of the total volume of assets exchanged on the carbon market (only 3 percent in 2004), although they represent the majority of transactions (more than two-thirds over the same period).⁶ The main reason for this imbalance is that allowance markets are still largely in their infancy, with large activity only in the UK allowance market at the moment. This situation is likely to change rapidly as details of the National Allocation Plans (NAPs) for the European Trading Schemes⁷ (EU-ETS) are released, and as allowance markets also become operational in Canada and elsewhere.

Most of the volumes of trades are from project-based transactions. Yet within this broad category, two types of assets can be discerned: projects intended for compliance with the Kyoto Protocol, i.e. under either Joint Implementation (JI) or the Clean Development Mechanism (CDM); and projects not intended for Kyoto Compliance, a group that covers a wide range of transactions depending on the intentions of the buyer and the regulatory regime he or she is operating in.

⁴ We restrict the analysis to transactions where the credits are effectively measured and transferred. We thus exclude, for example, projects such as those under the climate change focal area of the Global Environmental Facility, which might reduce GHG emissions, but where no credit is transferred.

⁵ As will be seen below, companies have undertaken project-based transactions since the mid-1990s, before the Kyoto Protocol was signed and without any regulation constraining greenhouse gas emissions in place.

⁶ In some projects intended for certification under JI, AAUs are given in exchange for payment for ERs generated before 2008 (and not creditable under JI). We still account for these transactions as “project-based”, since the transfer of AAU is directly linked to a particular project.

⁷ European Directive 2003/87/EC

2.2 Segments of the Carbon Market

As noted in the introduction, buyers mostly engage in carbon transactions because of regulatory pressure (present or anticipated). These regulations, at an international, national or sub-national level, define various segments of the carbon market.

The most prominent of these regulations is the Kyoto Protocol (1997), which calls for industrialized countries and economies in transition—the so-called Annex B countries—not to exceed certain GHG emission targets during the period 2008-2012, which is also known as the first commitment period. In addition to domestic policies and measures, Annex B Parties can purchase Assigned Amount Units (AAUs), and implement emissions-reducing projects within Annex B (Joint Implementation or JI), and in non-Annex B countries (Clean Development Mechanism or CDM).

The EU Emissions Trading Scheme is a similar structure for large-scale point sources within the European Union: those entities are allocated European Emissions Allowances (EUAs) by EU member governments, which they can trade on a euro-wide market. A linking directive⁸ governs the relationships between the EU-ETS and the Kyoto Protocol. It allows entities under the EU-ETS to use emission reduction credits from JI or CDM projects against their targets under the EU-ETS under certain conditions. When it starts operating on January 1, 2005, the earlier U.K. trading system will merge into the wider ensemble.

Other Annex B countries, notably Canada and Norway, are developing similar domestic cap-and-trade schemes as part of their strategies to meet their Kyoto targets. Both, to our knowledge, would allow entities subject to emissions quotas to use project-based mechanisms to offset part or all of their obligations. These schemes, however, are not yet operational and, to our knowledge, no transaction has occurred to date related to these two 'prospective' markets. Mitigation plans are less advanced in Japan, where it is not clear yet whether industrial sectors and electric utilities will face mandatory emission reduction requirements, and whether a domestic emissions trading program will be created.

All the international or national regulations described above are related to, and driven by, the Kyoto Protocol (although most are formally independent of it). Other regulations constraining carbon emissions have been developed in the U.S. and Australia, even though the two countries have announced that they would not ratify the Kyoto Protocol. For example, the state of New South Wales in Australia imposes benchmarks on the emissions of utilities and other entities, and allows for the purchase of GHG Emissions Certificates to meet these targets. Similarly, the state of Oregon (U.S.) imposes a performance standard to reduce emissions to 17% below the emissions rate of the most efficient combined cycle plant. Companies have the option of paying \$0.85 per tonne of excess emissions, and the Oregon Climate Trust pools these funds to buy offsets from projects both in the country and abroad.

These 'non-Kyoto' regimes are different from and sometimes less stringent than the 'Kyoto' ones, in terms of the constraints they impose. It is unclear at this stage if these regimes will ultimately be linked with the 'Kyoto' regimes. The fact that the rules governing

⁸ The final version of the linking directive was approved by the European Parliament April 20, 2004.

the CDM tend to influence project-based transactions under other regimes, including ‘Non-Kyoto’ ones, suggests that links between regimes might be found.⁹

In addition to responding to mandatory regulations, some firms are engaged voluntarily in the carbon market, either because they have adopted a voluntary emissions target, or for other strategic reasons.¹⁰ Their participation often takes the form of project-based transactions. However, the Chicago Climate Exchange (CCX) is a prominent exception to this rule in that it is a private and voluntary market for emission allowances between firms.

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

⁹ A history of exchanges of GHG allowances between regimes which were not connected whatsoever also supports cautious optimism about the possibility of interlinking ‘Kyoto’ and ‘Non-Kyoto’ regimes.

¹⁰ Such as, *inter alia*, learning by doing, experimenting with diverse contract structures, strategic positioning, influencing policy, broadening the envelope of flexibility, public relations, goodwill generated by entry into market, strategic interest or management of corporate social responsibility obligations.

Reviewing transactions on the carbon market is difficult because there is currently neither a public registry of carbon transactions¹¹ nor an internationally recognized price index. In fact, most transactions so far are over the counter, with few details, if any, made public. Prices or contract structures, in particular, often remain confidential.

To try to overcome this limitation, we have assembled information on transactions from key players in the market: one broker, Natsource LLC; and one market analyst, PointCarbon,¹² who have supplied data under confidentiality agreements. In addition, we have conducted direct interviews with major market participants and surveyed major relevant publications.¹³

The resulting information has been aggregated in a database of 354 project-based transactions completed between 1996 and May 2004. By convention, the database includes both signed contracts and transactions at very advanced stage of negotiation (agreed term sheet or equivalent). The reason for this choice is that the two major buyers of project-based emission reductions during that period—namely, the Government of the Netherlands and the PCF—have adopted this convention for reporting their activities.

For each transaction, we sought the identity the nationality of the buyer, identity the nationality of the seller, identify the type and volume of GHG's exchanged, price, structure of the contract and nature and location of the project. For confidentiality reasons, and although the database is—per our agreements with the information providers—confidential, we were not able to obtain complete data for all the transactions that have been reported to us. For each category of information, Table 1 provides the percentage of transactions (as well as the share of the volume exchanged they represent), for which this specific piece of information is available. The completeness of data exceeds 80%, in most cases except for information related to contractual structure, notably price.

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

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

¹¹ One exception is the UK Trading Scheme, where a transaction log for 2002 is publicly available. (etr.defra.gov.uk/Web_TsAndCs.asp).

¹² www.natsource.com, www.pointcarbon.com. The opinions and results expressed in this paper are solely those of the authors, and do not necessarily represent the views of these entities.

¹³ Including online sources such as *climate ark* (www.climateark.com) or *Joint Implementation Quarterly* (www.northsea.nl/jiq), as well as the Climate_L list (www.iisd.ca).

Table 1: Completeness of Data on Project-Based Transactions

Data Item	% of Transactions where Item is Available	Share of Total Volume Exchanged
Buyer Country	99.4%	100.0%
Volume	96.1%	--
Type of Gas	94.7%	97.2%
Project Location (region)	88.9%	99.0%
Technology	82.5%	87.9%
Project Location (country)	81.7%	94.2%
Vintage	68.3%	72.8%
Price	60.3%	54.7%

Third, following a convention widely adopted on the market, prices, when available, are expressed in nominal U.S. dollars per tCO₂e, regardless of the vintage purchased. In other words, this price information reflects the total amount of ERs purchased in the transaction divided by the total undiscounted amount of money that is to be paid by the buyer over the course of the contract.¹⁴ Prices are expressed in nominal U.S. dollars. We used yearly average exchange rates to convert prices in non-U.S. dollars denominated contracts (thus providing an estimate of the current value of the contract).

Fourth, the transactions have been divided between those intended for Kyoto compliance, those not intended for Kyoto compliance, and the retail market. The distinction between the first two categories is usually easy to make. (A handful of indeterminable cases were all included in the “not intended for compliance” group.) On the other hand, the limits of the retail market are more difficult to assess. As a proxy, we defined a category of “small projects” including all those below 50,000 tCO₂e of total volume purchased. This is because we infer from interviews with market participants that our coverage of small-scale transactions is less comprehensive than our coverage of larger ones. Also, small-scale transactions (for instance those in the retail markets), tend to have very different economics than larger ones, with higher prices per tonne to compensate for transaction costs. The threshold of 50,000 tCO₂e is somewhat arbitrary, but setting the bar between 10,000 tCO₂e and 100,000 tCO₂e does not significantly alter our results.¹⁵

How comprehensive is our database? We are confident that it captures most of the public sector activity on the carbon market, since Governments tend to disclose their activities in this domain. On the other hand, the comprehensiveness of our coverage of private sector deals is more difficult to assess. We know that only part of the private

¹⁴ From an economic and a financial point of view, obviously, the schedule of payment also matters. Detailed information, however, was rarely available.

¹⁵ It is important to note that projects reducing emissions by more than 50,000 tCO₂e can still fall within the “small-scale” definition of the Marrakech Accords (below 15 MW of power generation, below , energy efficiency reducing consumption by less than 15 gWh per year, or projects emitting less than 15,000tCO₂e per year). For example, the Uganda West Nile project of the PCF, which consists in installing two small hydro generators to replace diesel generators, will reduce emissions by 2.7 MtCO₂e over its lifetime (PCF, 2003).

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transactions go through brokers. Although our database also includes some over the counter transactions, it is possible that others occurred which we have no record of. For this reason, and given the conservative approach adopted above, we consider that our analysis reflects a rather conservative estimate of the carbon market.

In addition to the database of project-based transactions, we have compiled aggregate information on the allowance markets currently in operation to serve as a comparison point with market for project-based transactions.

4. PROJECT-BASED TRANSACTIONS: VOLUMES AND FLOWS

Table 2 summarizes the volumes exchanged and number of projects for both allowance trading and project-based transactions. As the Table shows, project-based transactions account for 98 percent of the total volume of assets exchanged since 1996. (and for still 95 percent in 2004). This imbalance (in volumes terms) is due to the fact that allowance markets are still emerging.¹⁶

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

	Volume (vintages up to 2012, in tCO ₂ e)		Nb of Transactions		Average size of transactions 1998-2004 (tCO ₂ e)
	1998-2004	2004	1998- 2004	2004	
Project-Based Total, including:	293,611,881	64,870,588	360	44	848,589
Kyoto compliance	151,890,882	61,394,093	126	27	1,234,885
Voluntary	139,148,129	2,299,050	124	9	1,209,984
Retail	1,493,870	98,445	108	6	14,093
Allowance Trading (estimated)	7,218,183	2,088,408	765	97	9,436
TOTAL	300,830,064	66,958,996	1,125	141	267,405

This is why, in this chapter and the next, we concentrate on project-based transactions. This chapter discusses volumes, the directions of trade and the type of project technologies employed. The following chapter addresses contractual structures, prices and total market value. We come back to allowance markets in chapter 6.

4.1 Project-Based Transactions: A Market in Rapid Growth

Figure 1 shows the annual volumes traded through project-based transactions from 1996 to May 2004. As noted in the previous chapter, this figure includes only the amount of carbon contracted (projects often produce a larger amount of ERs than are actually contracted), and only up to 2012.

Volumes have oscillated between less than one and 30 MtCO₂e from 1996 to 2002, before going up to 78 MtCO₂e in 2003, a 2.5 times increase compared with the previous year. Since the number of projects in 2003 has also more than doubled compared with the past years, it is clear that this increase reflects genuine growth in the market. Interviews with market players confirm that this growth is reflected in their transaction pipeline

As can be judged from the first four and a half months of activity, rapid growth in the market is continuing in 2004. A total volume of nearly 65 million tCO₂e has been exchanged over that period, which is nearly as much in five months as the whole year 2003, and the market is on track for another doubling.

¹⁶ On the other hand, allowance trading represents the majority of transactions (two-thirds in 2003). The reason is that once an allowance trading system is set up, low transaction costs relative to project-based transactions and large numbers of market players create suitable conditions for a large number of transactions.

In all, we estimate that about 300 million tCO₂e have been contracted in the market through project-based transactions since its inception (vintages up to 2012), in projects which—overall—could generate up to 525 million tCO₂e of ERs over their lifetime.¹⁷

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

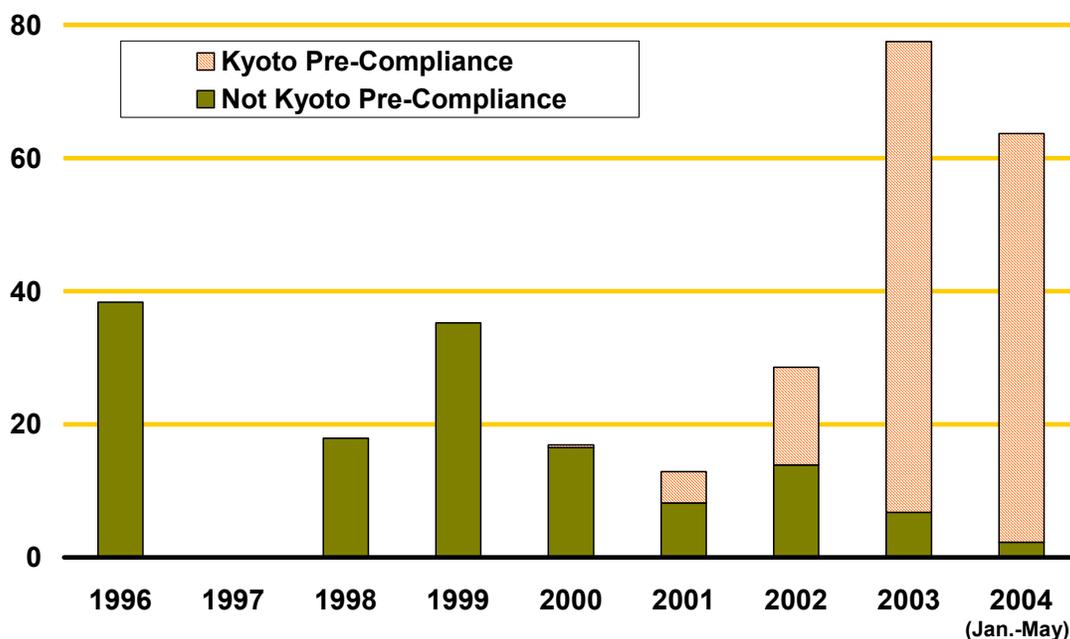


Figure 3 also offers a breakdown of the annual volume by market segment. The green bars represent “not-for-Kyoto” emission reductions, while those in orange are pre-compliance ones, that is transactions intended for compliance with the Kyoto Protocol. Although it is not always easy to distinguish—at the margin—between voluntary and pre-compliance transactions, the analysis leaves little doubt that pre-compliance with the Kyoto Protocol now motivates the vast majority (96% in 2004) of the transactions in volume terms.

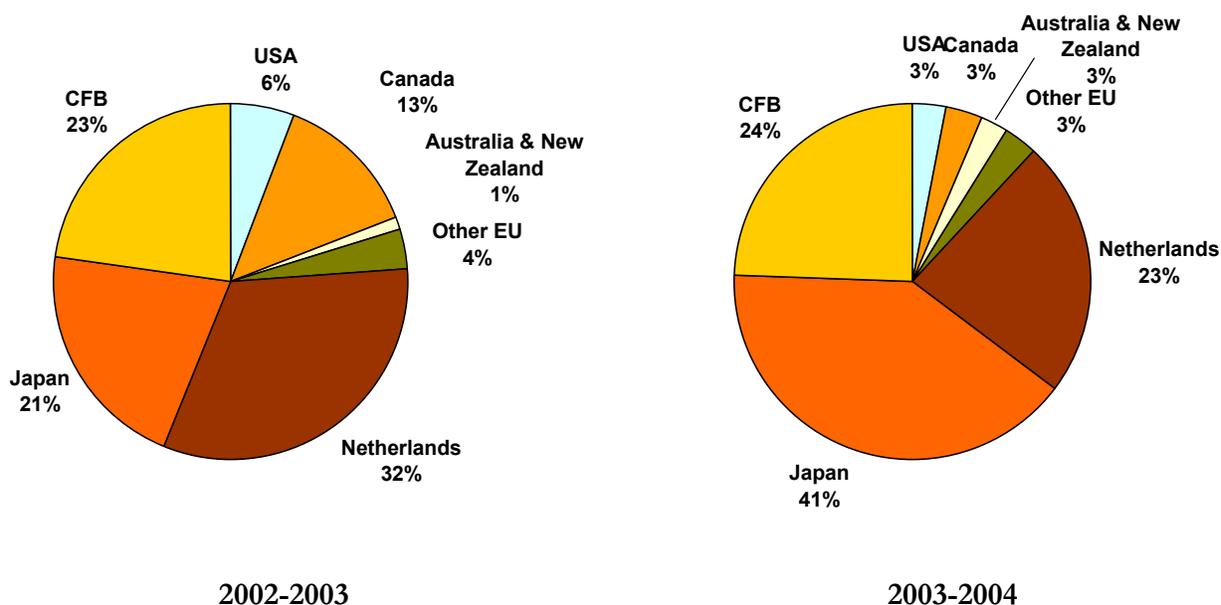
4.2 Who’s buying?

Pursuing a trend that we had already noted last year, the data confirms the emergence of Japanese entities, mostly Japanese private firms, as the largest buyer of emission reductions. Japanese entities represented 41% of the volume purchased in 2003-2004, against 21% in 2002-2003 (Figure 2). This might demonstrate a growing sense of urgency in Japan, where abatement opportunities might be few and at high costs. It might also, reflect the persistent regulatory uncertainty in Japan, which might lead firms to invest more in emission reduction projects while they are still uncertain about how the Kyoto burden will ultimately be shared between the public and the private sector.

¹⁷ Project-based emission reductions are typically contracted up to 2012. However, most underlying projects are likely to generate ERs well beyond this point.

The second and third largest buyers are still the Government of the Netherlands—through various agencies and intermediaries (Senter, and programs established within Rabobank, the International Finance Corporation, the International Bank for Reconstruction and Development, and the Corporación Andina de Fomento)—, and the Carbon Finance Business (CFB, through the Prototype Carbon Fund and the Community Development Carbon Fund), each with nearly a quarter of the purchases in 2003-2004. These three sets of buyers represent the vast majority (88%) of the total volume purchased.

FIGURE 2: MARKET BUYERS (share of volume of ERs purchased)



The decline of the share of U.S. buyers has been continuing, and can be seen as directly related to the lack of a federal requirement to constrain GHG emissions. This is in spite of initiatives in various U.S. states that have begun to require modest levels of emissions reductions. The decline in activity from Canadian companies might look more surprising given their very high involvement in the carbon market in previous years, but it can likely be attributed to the uncertainty regarding the final form of the Canadian domestic emissions trading program that is still prevailing.

The share of (non-Dutch) European private and public entities might appear very small. However, one must recall that the Carbon Finance Business represents many buyers from Europe (which, excluding the Government of the Netherlands, represent 48% of the shares in the PCF). When their participations is accounted for, non-Dutch European entities (private or public) represent 15% of the volume purchased in 2003-2004.

EU actors—particularly those in the public sector—are likely to be more active in the near future. Sweden, Finland, Denmark and Austria already have active CDM and JI programs, of which only a few transactions are recorded in our database since we understand that most of them were not, at time of writing, at “agreed term sheet” or equivalent stage. In

addition, recent pledges by other European Governments, such as Italy, suggests that the share of non-Dutch EU buyers might increase in the near future.

4.3 Who's selling?

In early years (mostly 1996 to 2000), the majority of project-based transactions took place in industrialized countries, i.e., both buyers and sellers were located in industrialized countries. The situation, however, has evolved rapidly. The share of ERs contracted in transition economies and developing countries rose steadily from 38 percent in 2001 to 60 percent in 2002, 88 percent in 2003, and 93% in the first months of 2004. Most of the remaining projects are in fact still related to the Kyoto Protocol, as one JI project has been undertaken in New Zealand, and as the Government of New Zealand has granted Kyoto credits to firms in exchange for their implementing emission reduction projects.¹⁸

The majority of ERs in 2003-2004 now come from projects in Asia (51% of the total supply). This is a major shift compared with the 2002-2003 period, when Latin America was still dominant. Latin America is second with 27% of the volume supplied (Figure 3). Transition economies rank third among non-OECD regions at 8% of the volume supplied. Interestingly, however, they have supplied nearly as many projects as Latin America in 2003-2004 (20 against 26). But the average project size is only 500,000 tCO₂e in Eastern Europe, against over a million in Latin America. Also, it must be noted that there has been to our knowledge no JI activity in two of the largest countries in this region, namely Russia and Ukraine. Once projects start being undertaken in these large economies, the volumes out of Eastern Europe are likely to increase.

As already noted last year, very small volumes and a handful of transactions were associated with projects in the whole of Africa (including the Middle East). Africa is still lagging far behind in the CDM market. This is unfortunately consistent with the overall distribution of Foreign Direct Investment (FDI) flows. (Sub-Saharan Africa represented 5.6 percent of FDI flows to developing countries and transition economies over 2000-2002, and 4 percent of carbon volumes transacted in 2003-2004.) This under representation of Africa raises deep concerns about the overall equity of the distribution of the CDM market, as the vast majority of African countries have not, for the moment, been able to pick up even one first deal.

In our database, 32 countries in the developing world or among transition economies have hosted an emission reduction project since 2001. (Projects are being developed in more, but we take into account only signed contracts, or projects at advanced stage of negotiation.) However, the three largest suppliers (India, Brazil and Chile) account for 56% of the total volume delivered over that period, and the top five (which include also Romania and Indonesia) account for two-thirds.

In addition, a disproportional share of the new volume is going to these countries. In fact, two-thirds of the volume supplied so far in 2004 have gone to the countries in the top three above, and 80% of the new volume have gone to the top five. In other words, the market appears to be in the process of concentrating towards a handful of large suppliers.

¹⁸ A form of project-based domestic implementation of Kyoto targets.

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

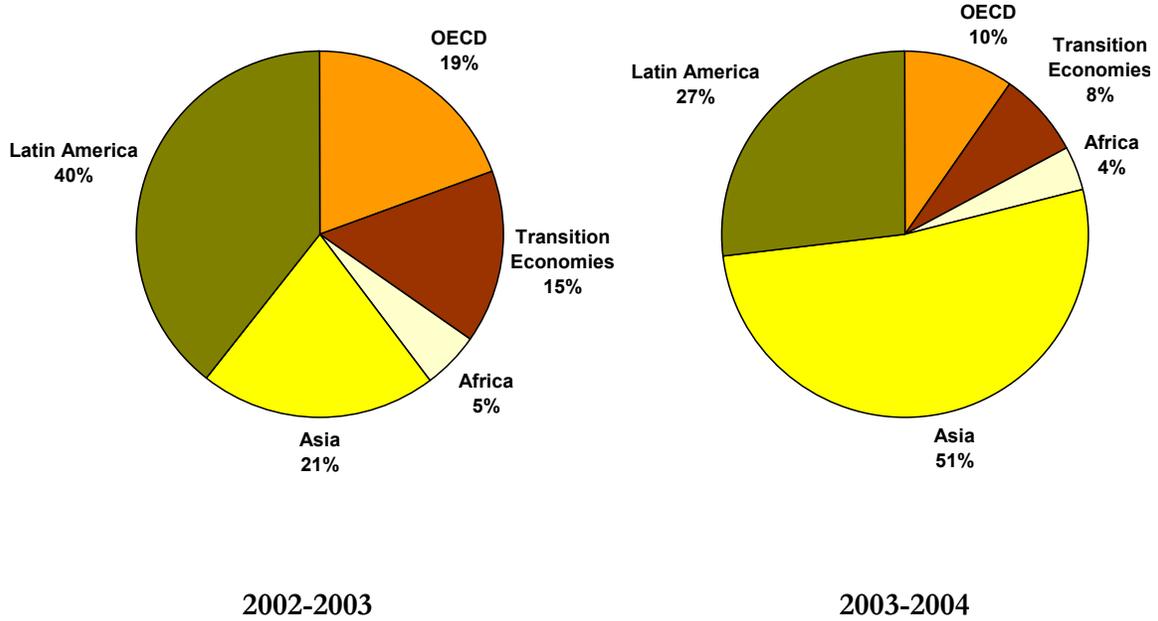
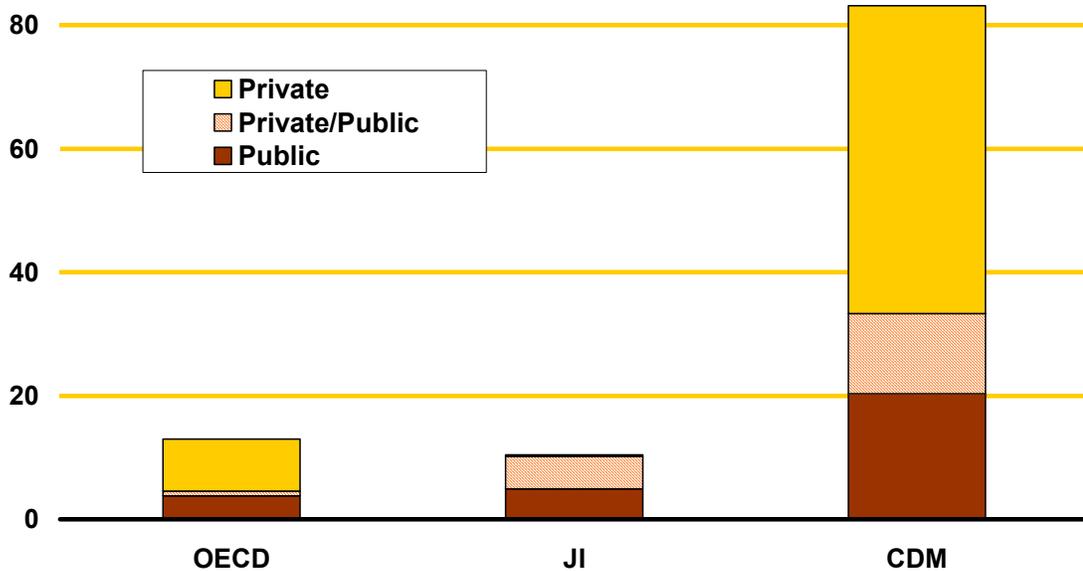


FIGURE 4: LOCATION OF PROJECTS BY TYPE OF BUYER January 2003 – May 2004 (in million tCO₂e)



As shown in Figure 4, our data confirm last year's trend of higher involvement of the private sector in emission reduction projects in developing countries. In fact, the private sector acting alone (i.e., not through a fund such as the PCF) represents 60 percent of the volume purchased in the developing world since January 2003. The vast majority of that demand, however, is from the Japanese private sector.

The fact that limited private sector purchases take place in transition economies remains puzzling, especially since country risks are low in those economies. This might reflect higher perceived barrier to project-based activity compared with other regions of the World. It might also translate the fact that the relationships between JI and the EU-ETS have just been clarified, and that EU accession countries in Eastern Europe have to implement a substantial amount of emission reduction activities as part of the EU *acquis communautaire*—the existing body of EU legislation, that accession countries must translate in their national laws—hence limiting the potential for JI projects.

4.4 Balance among Asset Classes

While landfill gas to energy projects dominated in 2002-2003, HFC₂₃ destruction projects now account for the largest share of the emission reductions produced in 2003-2004, with 35% of the total volume supplied.¹⁹ This is a major shift compared with last year, and

The result is consistent with the fact that mitigating HFC₂₃ emissions is comparatively cheap per tonne of CO₂e mitigated because of the extremely high global warming potential of HFC₂₃, and with the fact that the first methodology approved by the Executive Board was related to this technology combine to make this type of projects very profitable. It is also important to note that it takes only two HFC projects to reach this volume.

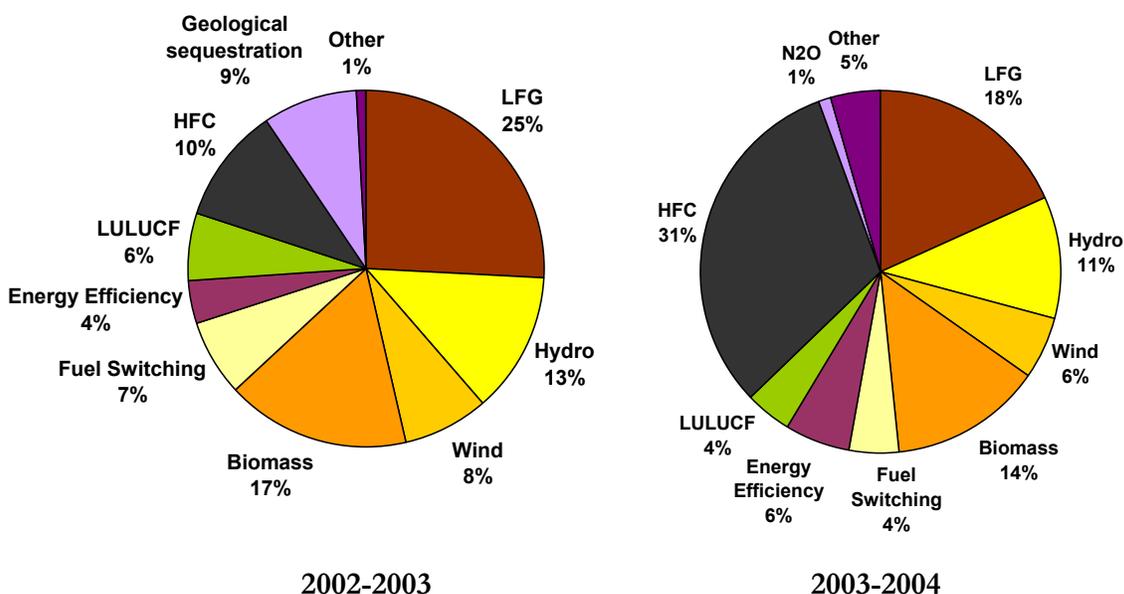
Beyond HFCs, the distribution of technology is consistent with last year's (Figure 5). Landfill gas capture leading represents 20 percent of the volume, followed by biomass (12 percent) and hydro (12 percent). Taken together, renewables account for 29 percent of the total volume of project-based ERs transacted; and the small majority of projects (53 percent) are related to power generation.

This distribution is consistent with findings from PCF experience that projects involving methane capture, such as landfill gas to energy or biomass waste recovery, are the ones where carbon finance make the most significant contribution to, and might, even at current carbon prices, render projects viable. For example, PCF experience suggests that carbon finance can increase the Internal Rate of Return of landfill-gas to energy project by more than five percentage points.

This distribution of project technologies, however, may not be a reflection of future trends—especially given the absence of large scale purchases from modern fuel shifts, such as coal to gas generated power, which would only be possible with much larger investment than present in the CDM market.

¹⁹ It is interesting to note that both landfill gas to energy and HFC₂₃ were not among the type of projects that were anticipated *ex ante*. The market has proven its ability to surprise observers, and find unanticipated solutions to meet the mitigation's objectives.

FIGURE 5: TECHNOLOGY SHARE OF EMISSION REDUCTION PROJECTS 2003 - 2004 (in percent of total volume contracted)



The size of transactions of recent project-based transactions (excluding retail segment) range from around 500,000 tonnes of CO₂e and to about 5 million tCO₂e, with one exception at more than 20 million. Over the past two years, and excluding that particular transaction, the average size of non-retail transactions has been roughly 1 million tCO₂e. This marks an increase compared with the previous years, reflecting an increased frequency of projects over 1.5 million tonnes.

4.5 The Retail Market

A persistent trend is for individuals, corporations and events to purchase from carbon “retailers” small volumes of emission reductions from projects that have consumer appeal. These ERs are not usually intended for compliance, although they may have been generated in compliance with CDM or JI procedures. Instead, their purpose is to demonstrate concern about climate change and to take some responsibility for the impact of corporations and businesses on climate in a transparent and responsible way.

In many cases, the ERs in this class are “retired” or withdrawn from secondary resale markets for tax benefits. For the ERs in this market segment, development institutions and Non Governmental Organizations (NGOs) are often used in the project design or as verifiers, providing a “seal of approval” formally or informally to projects that satisfy pre-defined environmental and social criteria.

The retail market is growing rapidly and often pays a premium for ERs that will be achieved within a year or so of purchase. Prices for reductions from small projects with a strong sustainable development contribution command premiums in the marketplace, with prices ranging from US\$5–12/tCO₂e. A range of brokers, NGOs, small companies, and

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retail associations are active in this market and the segment has been growing rapidly. We do not have good data for the retail market in 2004.

5. PROJECT-BASED TRANSACTIONS: CONTRACTS AND PRICES

5.1 Structure of Transactions

Most project-based transactions to date (about 95% in 2003-2004) follow a commodity model, whereby the buyer of carbon purchases the emission reductions generated by the project as it would purchase any other good or service. Only a few transactions, to our knowledge, follow an investment model whereby the buyer invests either equity or debt in a project and get the emission reductions as part of its returns.^{20,21}

This has important implications for the financial structure of CDM and JI projects. Indeed, carbon buyers under a commodity model tend to pay for the carbon on delivery, thereby reducing their exposure to project risks. Although this future cash-flow adds to the Internal Rate of Return, the projects often need upfront financing to cover, *inter alia*, construction costs. Most carbon contracts thus do not directly respond to that problem, but because they are payable in strong currencies (typically, dollars, euros or yens) and originate from buyers with high credit ratings, they can be used as a tool to increase financiers' confidence in the project, and leverage additional capital.²²

Prior to the Marrakesh Accords, a large number of contracts were written as call options. In fact, they represented 25 percent of the volume recorded in our database on the period 1996 to 2001. Such deals provided the buyer with the option of purchasing ERs at a future date for a pre-determined (usually fixed) price. Many of the options purchased lapsed as their strike dates passed. A small number of transactions were executed as "spot contracts", for example in purchases by North American companies for voluntary commitments.

Since the adoption of the Marrakesh Accords, most of the activity takes the form of forward purchases where the buyer acquires several future vintages that the project is expected to produce—especially focusing on 2008–2012 vintages. Call option contracts represent less than 5% of the volume transacted in 2003-2004. Where options were written during that period, it was sometimes for vintages beyond 2012. We have, however, very limited data on recent options prices to draw any conclusion.

Contractual arrangements still vary greatly depending on how various risks are allocated between buyer and seller: namely project risk, that is whether or not the project will adequately perform and produce the expected amount of ERs; country risk, and Kyoto-

²⁰ This preference for the commodity model might stem from the fact that buying carbon requires very specific skills (e.g., in setting up the baseline, or interpreting the Kyoto Protocol requirements) which firms, even large utilities, are not automatically ready to invest in. Secondly, even for firms investing in JI or CDM countries, the projects they are interested in might not all be realistic in terms of CDM or JI at current carbon prices. Conversely, the types of projects where carbon finance appears to have the most impact at current prices—notably landfill gas to energy projects—might not fall within the core business of the firms looking for carbon, which are for a large part utilities.

²¹ As noted in section 3, we do not include in our database projects undertaken within the existing boundaries of a firm (e.g., a firm investing in an offshore subsidiary to reduce emissions there), or a developing country firm investing in clean technologies with view to selling ERs under the CDM ("unilateral CDM").

²² Bishop V., *Catalyzing Climate-Friendly Investment through Structured Financing of Carbon Finance Transactions*, CFC Note, Washington DC, 2004.

related risks, such as the risk that the project might ultimately not be registered under the Kyoto Protocol (because, for example, the project is not deemed additional by the CDM Executive Board) or the risk that the Kyoto Protocol does not enter into force at all. Various contractual features are used to allocate these risks between the buyer and the seller. They include, *inter alia*, monitoring plans, guarantee structures, penalties, default clauses or the disbursement schedule.

To the extent we can tell given our limited data on project transactions, the treatment of Kyoto-related risks is especially variable across contracts. For example, some buyers are content with high quality verified emission reductions (that is ERs after validation by an independent third party), while others want actual credits and will stop payment if the project is not registered by the UNFCCC.

5.2 Observed Prices

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

Secondly, prices are often not publicly disclosed. As noted in Table 1, our database includes price information in only 60 percent of the transactions, which represent 55 percent of the total volume exchanged. In addition, reporting practices are not uniform across buyers: while most public buyers are required to disclose the prices they are paying (if not transaction by transaction, at least portfolio-wide), most private buyers are under no such obligation. This creates an obvious bias in our price analysis.

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

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

Each category encompasses a rather wide range of transactions. For example, the compliance grade category includes both contracts where payment stops if the ERs are not issued as CERs or ERUs, and stricter transactions structures where the seller must actually find equivalent replacement units elsewhere in the market at prevailing prices if the project fails to deliver CERs or ERUs.

FIGURE 6: PRICES FOR NON-RETAIL PROJECT-BASED ERs 2003-2004 (in U.S.\$ per tCO₂e)

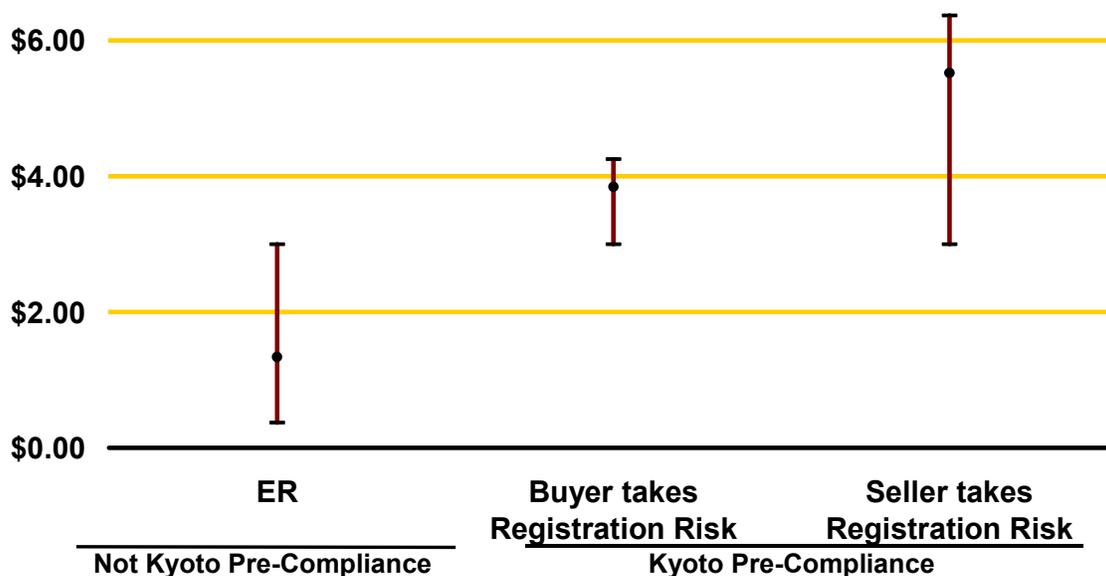


Figure 7 provides the range of prices we found for each of these categories in 2003 and 2004, as well as the weighted averages (by volume). All prices are expressed in nominal U.S. dollars per tonne of CO₂e. We include no differentiation for vintages until 2012, which appears to be common practice in contracts where multiple vintages are traded. All prices are nominal. Prices in euros have been translated in dollar terms using average exchange rate over the period January 2003 to April 2004.²³

Figure 7 shows that prices vary greatly depending on the nature of the commodity traded. First, not for Kyoto compliance ERs command a price between \$0.37 and \$3.00/tCO₂e (weighted average, by volume, \$1.34). Within the transactions intended for Kyoto compliance, we observe that with registration risk on the buyer, VERs sell at \$3.00 to \$4.25 (weighted average \$3.85), while registration risk on the seller commands a higher value of \$3.00 to \$6.37 (weighted average \$5.52). Although the latter is very sensitive to the exchange rate between euros and U.S. dollars (as a majority of the deals in the compliance category come from the Dutch ERUPT and CERUPT programs), it suggests that the risk of non-registration commands a large premium.²⁴

The prices of JI and CDM transactions do not appear to have evolved significantly compared with the previous analysis in 2003, except when the buyer requires delivery of compliance-grade credits. The weighted average price of credits in these transactions has increased from \$4.88 (as reported at the end of 2003) to \$5.52.

²³ 1 Euro = 1.15762 U.S. Dollar.

²⁴ It is difficult to put a dollar value on that premium since the projects are different, and since other contractual features not known to us might also contribute to the price difference.

5.3 Other Determinants of Prices

As the previous discussion suggests, the greater the guarantee the seller can provide regarding the robustness of the ERs purchased, the higher the price is likely to be. The other key determinants of price, identified via information from market players, and from the World Bank Carbon Finance Business experience, are as follows:

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

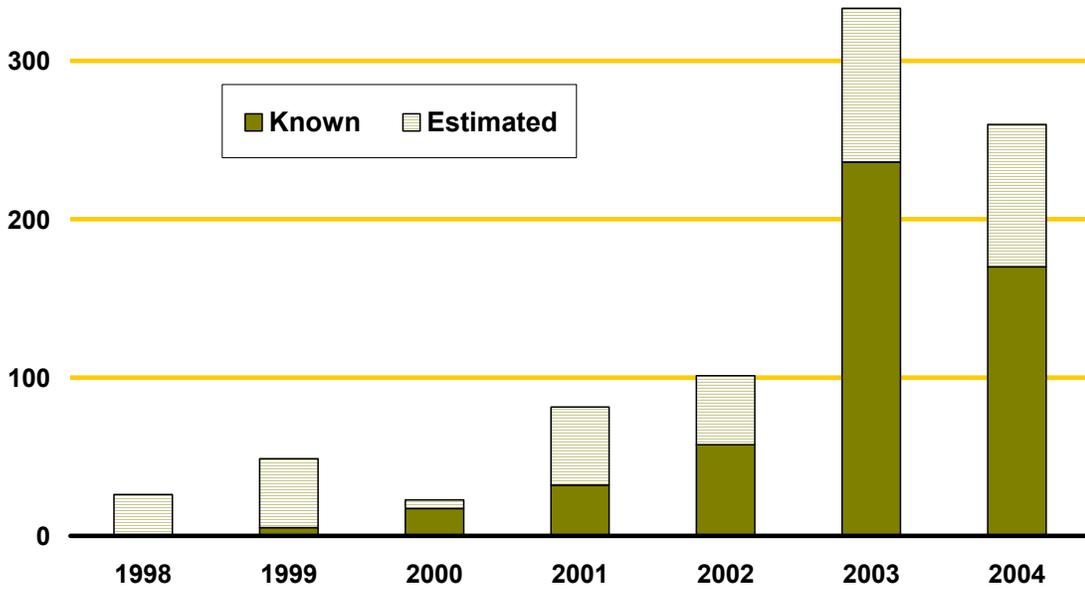
5.4 Total Value of Project-Based Transactions

Given prices and quantities, it is possible to estimate the total value of project-based transactions to date. Again, the result must be taken with caution, as data on prices is scarce. In Figure 7 below, the solid bars represent the product of prices contracted times quantities for the projects where the price is known. The shaded area represents the value of the remaining volumes contracted, multiplied by the weighted average price of ERs for that particular year.

Under these assumptions, the total value of contracts for the purchase of project-based transactions can be estimated at about \$330m in 2003, and at about \$260m from January to May 2004. Since its inception, the total value of project-based transactions has been of at least \$500m (\$800m using average prices for transactions where prices are not known).

A sign of increasing liquidity in the market is that companies are beginning to engage in secondary transactions, selling part of their portfolios to other buyers. Not only does this development attest to increased demand, but it is also an indication that some early movers are beginning to see rewards.

FIGURE 7: TOTAL MARKET VALUE (ESTIMATE) PER YEAR in million U.S. dollars (nominal)



We know of transactions on four emissions allowance markets in 2003-2004: the UK trading scheme, the EU Emissions trading scheme, the Chicago Climate Exchange (CCX) and the New South Wales (NSW) GHG Abatement Scheme.²⁵ We discuss each of them in turn.

6.1 The UK Emission Trading Scheme

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

The UK market has seen significantly less activity in 2003 than in 2002, with an estimated 500,000 tCO₂e exchanged against 2.48 in 2002. Activity in the first five months of 2004 has been of about 300,000 tCO₂e, for immediate delivery of 2003 vintage allowances. The high activity in 2002 was associated with the fact that companies with so-called Climate Change Agreements (CCA) had to meet their first commitment. Since 2004 is the second target year for CCA participants, it is possible that activity picks up again in 2004. Prices have remained stable between £2 and £4 per tonne.

6.2 The EU Trading Scheme

The so-called EU Trading Directive (European Directive 2003/87/EC) will create in January 2005 the single largest market for GHG emissions allowances. The Directive indeed directs Member States to allocate GHG emissions allowances (EUAs) for the period 2005-2007 to large fixed sources of CO₂. (A second phase will cover 2008 to 2012.) More than 12,000 fixed sources, representing about 45 percent of the EU25 total CO₂ emissions will be covered. In addition, a linking directive, approved April 20, 2004 by the European Parliament, will govern the relationships between the European Trading Scheme (ETS) and the Kyoto Protocol. The linking Directive allows for the import of ERUs and CERs into the ETS under certain conditions.

In preparation for the EU ETS, several companies have engaged in demonstration trades of spot and forward EUAs. Because EUAs have not yet been allocated to any private entities, all transactions at time of writing have been forward trades in which EUAs will be transferred from the seller to the buyer at a future date. To our knowledge, some 30 deals have occurred in 2003, for an overall volume probably greater than 650,000 tonnes of CO₂e,

²⁵ Some transactions have involved AAUs. In most cases, it was to allow for the crediting of emission reductions generated before 2008 by some projects intended for registration under JI. In a handful of cases, the AAU trade was not linked to a JI project. To our knowledge, however, even the latter have remained linked to a project, although not on a one to one basis. They have been included in the project-based transaction database.

and another 40 have occurred so far in 2004, with at least 200,000 tCO₂e exchanged.²⁶ Most of these deals are small (5,000 to 10,000 tonnes each), and have involved only vintages from 2005, 2006 and/or 2007.

Although price information is sketchy, prices in transactions have apparently increased from around €6/tCO₂e in May 2003 to €12/tCO₂e in November 2003, down to about €7-8 in May 2004. The two main reasons cited for this decrease are the fact that the early National Allocation Plans were less stringent than anticipated, and the fact that the linking directive allows for the importation of CERs as early as 2005. However, these prices do not necessarily reflect what the long term equilibrium between supply and demand might be, since the market is still so thin, and since there is still so much uncertainty about the final allowance allocations. Current price development is believed to be more driven by companies early trading strategies than by their natural position on the market.

6.3 The Chicago Climate Exchange

The Chicago Climate Exchange (CCX) is a pilot GHG cap-and-trade system in which a group of North American companies have voluntarily agreed to limit their GHG emissions during 2003-2006. These companies can comply through internal reductions, purchase of allowances from other companies facing emission limitations, or purchase of credits from ER projects that meet specific criteria. In 2004, an estimated 850,000 tCO₂e have been exchanged on the CCX, at prices between \$0.75 and \$1.00 per tCO₂e.

6.4 The New South Wales GHG Abatement Scheme

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

This market has substantially picked up compared with the last report. A total of 1.5 million tonnes have been exchanged in 2004 alone, in about 25 trades. Nearly 750,000 tCO₂e had been exchanged in the last quarter of 2003. We do not have price data for this market.

²⁶ These figures are conservative. Our coverage of the EU ETS is limited.

The last section discusses what we perceive as major drivers and issues for the carbon market over the next year or two. We begin by discussing the global regulatory picture and its impact on the market, before turning to project-based transactions and the combined impact of regulatory uncertainty and lead-time issues. We conclude by listing other issues, which, if unchecked, might hamper the development of the CDM and, to a lesser degree, JI.

7.1 Regulatory Drivers

Since the last analysis, the major regulatory development related to the carbon market is the welcome clarification of the rules and allocations governing the EU-ETS. The linking directive adopted by the European Parliament April 20, 2004, clarifies the relationships between the EU-ETS and the Kyoto Protocol. Notably, entities under the ETS are allowed to use CERs for compliance purposes starting in 2005, and ERUs starting in 2008, albeit with certain restrictions.²⁷ (AAUs, on the other hand, are excluded.) The Directive also addresses double-counting issues, and explicitly states that the *acquis communautaire*—the existing body of EU legislation that accession countries must translate in their national laws—should be taken into account when setting baselines for JI projects.

In addition, as of May 21, 2004, thirteen EU Member States had submitted their National Allocation Plans (NAPs) for 2005-2007 to the European Commission, and four had issued draft plans.²⁸ As they currently stand, prior to review and approval by the EU Commission, the NAPs are more generous than expected, and could generate a demand for credits of 20 to 50 million tCO₂e annually between 2005 and 2007 relative to business-as-usual (depending on the NAPs of the remaining States).²⁹ The generosity of NAPs and the approval of the Linking Directive are the two primary reasons cited for the dramatic fall in EU allowance prices from 12 to 13 euros in February 2004 to 7 to 8 euros in April and May 2004. Should the NAPs be accepted by the Commission, it is possible that the price of EUAs could remain at that level or even decrease further, which will generate a lower-than-expected demand for JI and CDM projects.³⁰

²⁷ In particular, the amount of CERs that each installation can use is capped, and Member States have to make sure that, overall, domestic action remains a “significant element” of their mitigation strategy. Also, large hydro (>20 MW) and LULUCF projects are banned, although, for the latter, a review is scheduled in 2006.

²⁸ The 13 States that had submitted final NAPs as of May 21, 2004 are Germany, Finland, Italy, Denmark, Austria, the Netherlands, Sweden, Slovenia, Slovakia, Lithuania, the United Kingdom, and Luxembourg. The four States that had issued draft NAPs are Estonia, Italy, Portugal and Belgium. The States that had not yet published any NAP are Poland, France, Spain, the Czech Republic, Greece and Hungary.

²⁹ Chris Rowland of Dresdner Kleinwort Wasserstein (DRKW) presented an estimate of 50 Mt at the 6th EURELECTRIC Trading Day conference on April 2, 2004. Christopher Grobbel of McKinsey and Company

presented an estimate of ~20 Mt at the Second Brussels Climate Change Conference on May 12, 2004, <http://www.ceps.be/files/CCGrobbel120504.pdf>.

³⁰ Since the NAPs address only the pilot phase of the ETS (although it is our understanding that the agreement in Germany also includes a figure for the first commitment period), it is not possible to draw conclusions on the longer term prices. Everything will depend on the NAP for the 2008-2012 phase of the EU ETS.

The second major regulatory development of the past six months is the adoption of new methodologies by the CDM Executive Board. As of June 1, 2004, the EB has published five approved methodologies, and the Methodology Panel has proposed consolidated methodologies for renewable energy and waste management which, if adopted, would considerably expand the range of projects that can be validated under the Protocol. The EB is also expected to register the first project before the end of the year.

These developments are likely to have a significant impact on the carbon market, since regulatory uncertainty was considered a key bottleneck in the development of the CDM. Approved methodologies are already being used for new projects, and it can be expected that, as the number and scope of approved methodologies widen, transaction costs for CDM projects should decline, encouraging future transactions.

On the other hand, other regulatory developments are still missing. First and foremost, Russia is yet to ratify the Kyoto Protocol. Although there has been positive signs recently, it is still not clear when the decision will be made and implemented. Second, climate change policies in Canada and in Japan are still not fully established. This is of great importance because these two countries face significant shortfalls of emission reductions to meet their Kyoto targets and have, at least in Japan, high domestic abatement costs. The Canadian Climate Plan is the most advanced, but it appears probable that it won't be finalized before the upcoming elections. Japan is scheduled to review progress towards its Kyoto targets in late 2004, and will establish mandatory targets if voluntary targets are deemed insufficient.

7.2 Market Outlook

We anticipate that the market for JI and CDM transactions is likely to grow steadily in the coming 12 to 18 months. This confidence is mirrored in the buy orders from Japanese and European companies, and in the healthy pipelines that brokers and other market players report. Another major reason is that European governments, at least, have signaled their willingness to enter the market, and pledged significant resources to buy emission reductions, either directly or through outside intermediaries.³¹ Given the time necessary to book deals, it is likely that this demand alone could fuel the market in the coming 12 to 18 months.

Beyond this, the picture becomes more difficult to read. The signal coming from the NAP (and the resulting expectations on demand for EUAs between 2008 and 2012), and the nature of the policies adopted in Canada and in Japan will play a significant role. Two major challenges for the future of the market for JI and CDM transactions must be noted here.

First, the market is currently given little indication from regulators that CERs or ERUs generated by CDM or JI projects beyond 2012 will have value under the post-2012 climate regimes.³² In this context, because of project lead time the window of opportunity for the CDM and JI will essentially close in 2006. Developing infrastructure projects is a long process which, depending on the technology and business environment, requires 3–7 years from identification, through licensing, financing, and construction to the first certification of

³¹ *Governments as Participants in International Markets for Greenhouse Gas Commodities*. Draft prepared by Natsource LLC for the Electric Power Research Institute, the International Energy Agency, the International Emissions Trading Association and Institut du Développement Durable et des Relations Internationales, September 2003.

³² That baselines for CDM can be established for a period up to 21 years implies that the ERs generated by these projects are intended to have value beyond 2012.

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ERs after the first year of operations.³³ Therefore, for projects to deliver a significant proportion of their achievable ERs by 2012, they need to become operational by 2006 or 2007 at the latest.³⁴

The second hurdle is project financing. As noted above, most of the transactions tend to be based on a commodity model, thereby adding to cash-flow, but do nothing to solve the problem of upfront financing directly. Given the downward trend in FDI flows in recent years, finding upfront finance can prove very challenging, especially in projects where carbon finance does not, at current prices, make a very large difference in the Internal Rate of Returns (e.g., traditional renewable energy). To bridge the financial gap, the involvement of financial institutions, including development finance institutions, is required. This faces significant barriers notably that most commercial project finance institutions have a minimum \$100 to \$200 million threshold before they will consider traditional project financing, a tall order for the smaller project currently in the carbon market.

³³ Experience of the Prototype Carbon Fund, as well as energy and infrastructure projects developed by the World Bank.

³⁴ Some types of mitigation projects, however, involve lower project lead time. LULUCF is often one example, HFC23 destruction another.

This analysis paints the picture of a rapidly growing carbon market that is fast approaching maturity. With the clarification of rules governing the EU-ETS, a potentially strong driver for the demand of allowances and project-based transactions has emerged. Similar clarifications in Japan and Canada should drive additional demand into the market. On the supply side, thanks to the work of pioneers, the opportunities attached to the CDM and JI are now well understood, and the pipelines of projects are growing steadily. As more methodologies are published by the CDM Executive Board, the transaction costs of CDM and JI should decrease, and the supply increase accordingly. It is interesting to see several unilateral CDM projects emerging, a clear vote of confidence in the market.

This momentum is already reflected, albeit only partially, in the volumes exchanged. The first months of 2004 have seen an activity nearly as high as the whole of 2003, and the market appears on track for another consecutive doubling. However, unless governments give a clear signal to the market that emission reductions beyond 2012 will have some value, the window of opportunity for the CDM and JI all but closes in 2006 – 2007. It is remarkable to note that in a recent survey of firms' intentions conducted by IETA, EURELECTRIC and the World Bank, only one in five respondents declared it was interested in buying post-2012 CERs.

The market might find unexpected ways to provide CERs and ERUs even without such guarantee by regulators. HFC₂₃ destruction projects, for example, have a lower lead time than most traditional emission reduction projects as only a small amount of time is required to build and attach a HFC₂₃ incinerator. This is also true for some industrial N₂O projects, and some LULUCF projects. If such projects were to dominate the market, however, they would further aggravate already serious distributional concerns, as most of the CDM revenues already flow towards only a limited number of large suppliers. Although sensible from an efficiency point of view, this may raise questions about the negotiations over future commitment periods.

