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State and Trends of the Carbon Market 2003

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

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[1] The findings and opinions expressed in this paper are the sole responsibility of the authors. They do not necessarily reflect the views of the 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. And they do not necessarily represent the views and opinions of the three contributors: Natsource LLC, Evolution Markets LLC and PointCarbon.

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EXECUTIVE SUMMARY

The emerging carbon market encompasses both project-based emission reduction transactions, whereby a buyer participates in the financing of a project which reduces greenhouse gases (GHGs) emissions compared with what would have happened otherwise, and gets some of the emission reductions (ERs) thus generated in return; and trades of GHG emission allowances allocated under existing, or incoming, cap-and-trade GHG emissions control regimes.

Review of the state and trends of the carbon market as of November 2003, based on material provided by Evolution Markets LLC, Natsource LLC and PointCarbon, and on direct interviews with market participants, suggest that:

- Volume exchanged on the carbon market has more than doubled since 2002, with more than 70 million tCO_2e traded as of November 2003. The vast majority of this volume was exchanged through project-based transactions, most of which are intended for compliance under the Kyoto Protocol.
- Buyers are governments, public-private partnerships like the Prototype Carbon Fund, and increasingly private companies, especially from Japan. Private sector acting alone now represents more than 40% of all the volume of emission reductions purchased in developing countries.
- In 2003, nine out of ten tonnes of emission reductions originate from projects located in transition economies or developing countries. Latin America is the leading region in volume terms, followed by Asia and Transition Economies. Africa, as well as the poorest countries in Asia, is essentially bypassed, raising concerns about the long-term distribution of the benefits of the Clean Development Mechanism.
- Prices differ depending on the segment of the market, and on the structure of the transaction. For example, within transactions intended for Kyoto compliance, the risk that the emission reductions might ultimately not be registered under the Clean Development Mechanism or Joint Implementation commands a significant premium.
- Allowance markets dominate in number of transactions, but volume exchanged remains small compared with project-based transactions. Clarification of the rules, and entry into force of major trading schemes in Europe, Canada and possibly Japan might change this situation in the near future.
- Because of long lead time between project preparation and first “yield” of emission reductions, and absent clarification of the validity of project-based emission reductions beyond 2012, the window of opportunity for project-based transactions is rapidly closing. Under these conditions, prolonged uncertainty over the entry into force of the Kyoto Protocol might not only delay, but also lead to the cancellation of some project-based transactions.

1. INTRODUCTION

For voluntary reasons, or, increasingly, because of regulations–in force or expected–some governments, firms and individuals have started to take steps to reduce greenhouse gases (GHG) emissions. Since GHGs mix uniformly in the atmosphere, it is equivalent from an environmental standpoint to reduce emissions domestically or abroad. Most regulations take advantage of this substitutability property and allow for some form of outside purchase of emission credits, thereby laying the ground for the so-called "carbon market."

The carbon market is one of the few markets for environmental services currently in operation; and the only one, to our knowledge, with worldwide reach. It should therefore not only generate large efficiency gains, but could also contribute substantially to sustainable development by bringing new public and private investment in clean technologies to economies in transition and developing countries, where abatement costs are, in general, lower than in developed countries. However, we are far from having realized these goals, and many obstacles remain. The objective of this paper is to review where the carbon market stands as of the end of 2003, and to discuss some of the trends that we see emerging. It follows two previous annual reviews of the carbon market prepared by the World Bank PCF*plus* Research program in 2001 and 2002 respectively.[2]

As the reader will quickly appreciate, the "carbon market" covers in fact a wide range of disparate transactions, involving various underlying assets, contractual structures, and governing regulations. We thus start by providing an overview of the main segments of this market, and of their relationships (section 3). We then focus on project-based transactions, which constitute by far, in volume terms, the major part of the market at the moment (section 4). Section 5 touches on the various GHG emissions allowances markets, and section 6 discusses the major trends we see emerging. Section 6 concludes.

Since most of transactions on the carbon market are over the counter, with few details, if any, made public, we could not have undertaken this analysis without the help of major players in the market: namely Natsource LLC, Evolution Markets LLC, and PointCarbon. We must emphasize that, although based on their insights, the conclusions we draw in this document are solely those of the authors, and do not engage any of these organizations, or any of the other sources we have consulted. Section 2 details the methodology we have followed to build up our analysis.

[2] *Review and Analysis of the Emerging Greenhouse Gas Market*, PCF*plus* Research Report, July 2001; *State and Trends of the Carbon Market 2002*, PCF*plus* Research Report, October 2002. Available at http://www.prototypecarbonfund.org/router.cfm?Page=Research.

2. METHODOLOGY

As noted above, analysis of the carbon market is made difficult by the fact that, unlike in most mature commodities markets, there is currently neither a public registry of carbon transactions,[3] nor an internationally recognized, and publicly available, price index. In fact, most transactions so far are over the counter, with few details, if any, made public. Key elements of the deals such as prices or contract features often remain confidential.

To try to overcome this limitation, PCF*plus* Research has assembled a database of transactions by partnering with major players in the market. Data for this year's exercise come from two major brokers: Evolution Markets LLC and Natsource LLC, and a major market analyst, PointCarbon.[4] In addition, we have directly interviewed major market participants.

The resulting database–which is confidential–includes 288 project-based transactions completed between 1996 and the third quarter of 2003.[5] Activities Implemented Jointly projects are not included, unless clear attempt has been made to turn them into either Joint Implementation (JI) or Clean Development Mechanism (CDM) transactions under the Kyoto Protocol. Also, by convention, we have included both signed transactions, and deals at very advanced stage of negotiation (agreed term sheets or equivalent). On the other hand, projects at early phase of discussion, or pledges for carbon purchase by governments or firms are not accounted for.

For confidentiality reasons, some of the transactions that were reported to us by our partners contained only limited information. To the extent possible, we have tried to eliminate duplicates, and have adopted the conservative approach of deleting entries where some risk of duplication remained.

We are confident that our database captures most of the public sector activity on the carbon market, since it is in large part publicly available, and usually well documented. The comprehensiveness of our coverage of private sector deals, on the other hand, is more difficult to assess. We know that only part of these transactions go through brokers, and if the database has shortcomings, it is in the underreporting of private sector activity.[6] For this reason, and given the conservative approach adopted above, we can consider that the analysis reflects a rather conservative estimate of the carbon market.

In what follows, we discuss volumes of GHG Emission Reductions (ERs) up to 2012 only. This is to provide an idea of the volume that might be available for compliance, since 2012 is the end of the first commitment period of the Kyoto

[3] Except in the case of the UK Trading Scheme, where a transaction log for 2002 is now publicly available.
[4] www.natsource.com, www.evolutionmarkets.com, www.pointcarbon.com
[5] We also have aggregate information on the various allowance markets, but no transaction level data for these segments.
[6] Our coverage of the retail market is also less precise than our coverage of regular project-based transactions.

Protocol and a milestone in most regimes. For projects where vintages 2013 and beyond are purchased (in particular in forestry-related projects), we assumed an even annual accrual of ERs, unless we knew otherwise. Also, throughout the paper, we report volumes in metric tonnes of CO_2 equivalent (tCO_2e).

3. MARKET STRUCTURE

3.1 Segmentation by commodity

Two types of assets are traded on the carbon market:

- emission allowances allocated under a cap-and-trade regime, such as, for example, Assigned Amount Units (AAUs) defined by the Kyoto Protocol, emissions allowances under the domestic UK emissions trading regime, or emission allowances under the European GHG Trading Scheme (see below); and
- project-based emission reductions, i.e., ERs generated by an activity that reduces emissions compared with what would have happened otherwise.

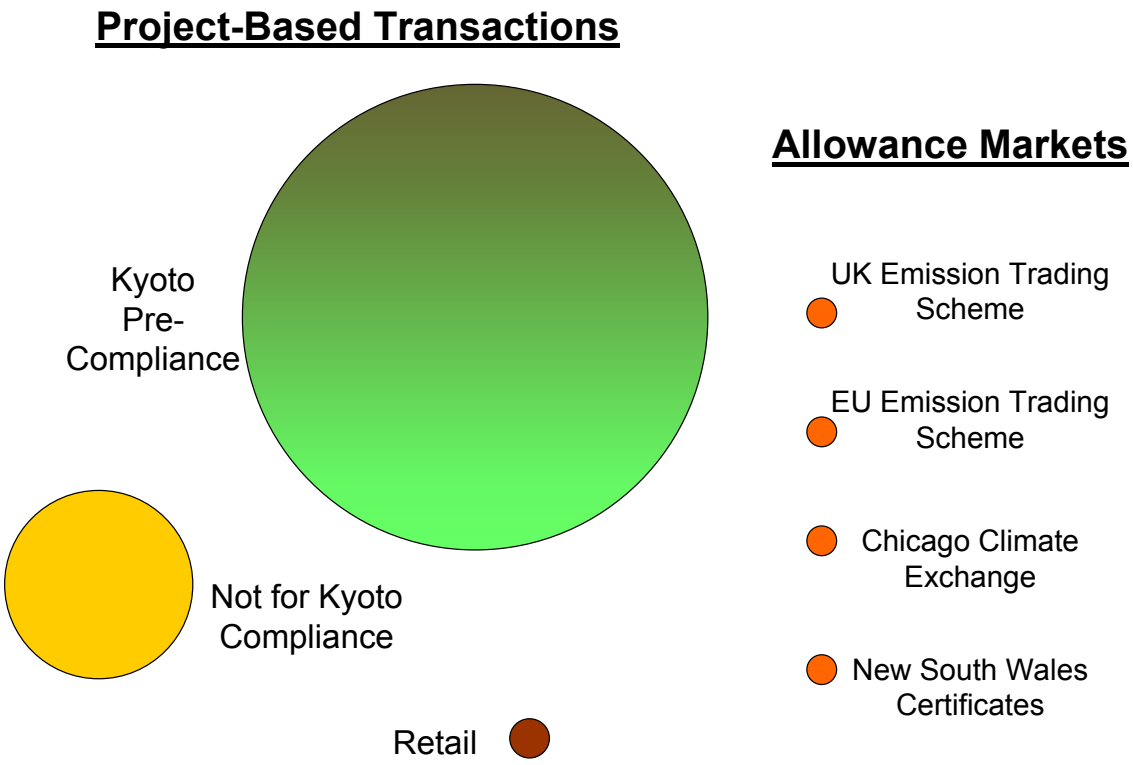


FIGURE 1: OVERVIEW OF THE CARBON MARKET

Emissions allowances account for only a small fraction of the total volume of assets exchanged on the carbon market (less than 4 percent in the first three quarters of 2003), although they represent the majority of transactions (more than

two-thirds over the same period).[7] The main reason for this situation 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 in the near future when details of allocation plans for the European and Canadian trading schemes are released.

Most of the transactions, in volume terms, thus remain project-based. Yet within this broad category, various assets are exchanged.

- *For projects intended for compliance under the Kyoto Protocol*—i.e., intended for registration under either JI or the CDM—contracts and commodities differ, in particular, depending on who takes the risk of non-registration. In some cases, the buyer purchases ERs after third-party verification, thus taking the registration risk, whereas in others, the buyer requires registration.
- *For projects not intended for compliance with the Kyoto Protocol*, a wide range of commodity is traded, depending on the regulatory regime under which the ERs are intended to be used, if any, or otherwise on the objectives of the buyer.

Figure 1 summarizes the main segments of the carbon market currently in operation.

3.2 Buyer Motivations

Another way of looking at the carbon market is to sort out by buyers' motivations. In addition to existing compliance obligations such as in the UK, corporate carbon risk management of expected compliance obligations appears to be the major motivating factor of most recent transactions. This risk may be either a compliance risk or a market risk, or both, in terms of growing consumer awareness of climate change and preferences for climate friendly goods and services. In either case, the varying approaches to management of the risk results in the following market differentiation:

- *Immediate compliance in national markets*—where buyers seek to comply with existing legislative obligations and constraints. Examples include the UK emissions trading regime and contributions to the Oregon Climate Trust;
- *"Kyoto pre-compliance"*—where buyers expect the project to be registered under either JI or the CDM, so that they might use ERs to meet their forecast Kyoto-related obligations. Examples include, *inter alia*, the transactions from Prototype Carbon Fund (PCF), the Dutch Certified Emission Reduction Units Procurement Tender (CERUPT) and the Dutch Emission Reduction Units Procurement Tender (ERUPT), and private or

[7] 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.

brokered transactions that are likely to meet Kyoto eligibility requirements and be eligible for use in offsetting those obligations;

- *Voluntary compliance*–where buyers aim to use the ERs to meet part of some form of voluntary target they have adopted either under national schemes (such as the now closed Pilot Emission Reduction Trading scheme in Canada), or voluntary schemes (such as the recently launched Chicago Climate Exchange);
- *Retail schemes*–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.

In addition to the above "direct" management of the corporate carbon risk, motivations for transactions also include learning by doing,[8] experimenting with diverse contract structures, strategic positioning, influencing policy, broadening the envelope of flexibility, public relations, goodwill generated in entry to market of strategic interest and management of corporate social responsibility obligations.

[8] This is important as engaging in a GHG transaction will require the involvement of the companies environmental, legal, tax, accounting and occasionally the risk management department.

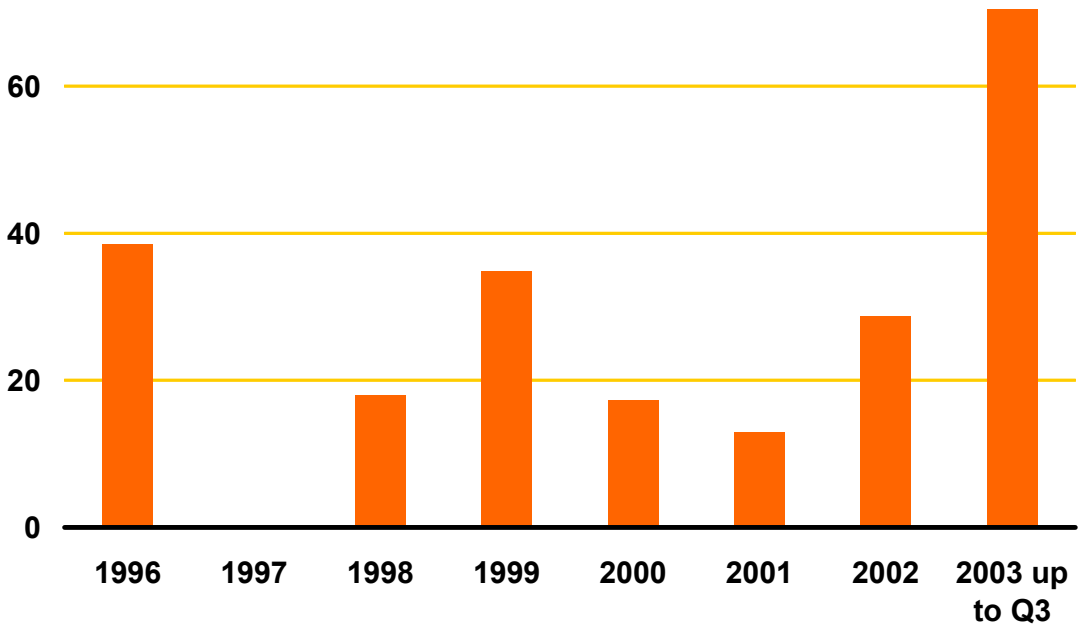
4. PROJECT-BASED TRANSACTIONS

We concentrate first on large project-based transactions, which represent the vast majority of the volume exchanged (from section 4.1 to 4.5). We then discuss the specifics of the retail market (section 4.6). Unless we have indication otherwise, we include all the project-based transactions with a total volume (up to 2012) inferior to 50,000 tCO_2e within the retail segment of the market.

4.1 Non-Retail Project-Based: A Growing Market, Mostly for Compliance

Figure 2 shows the annual volumes traded through project-based transactions, as per our database, from 1996 to the 3rd quarter of 2003 (for vintages up to 2012). We can see that the market has been growing steadily since 2001, more than doubling every year, from an approximate 13 million tCO_2e in 2001, to about 29 million tCO_2e in 2002 and more than 70 million tCO_2e in the first ten months of 2003. In all, we estimate that about 220 million tCO_2e have been contracted in the market since its inception (vintages up to 2012),[9] in projects which–overall–could generate up to 375 million tCO_2e of ERs over their lifetime.[10]

FIGURE 2: VOLUME OF PROJECT-BASED EMISSION REDUCTIONS TRADED PER YEAR (million tCO_2e)



[9] Our 2002 analysis, based on data up to July 2002, included a projection of 67 million tCO_2e for the year 2002. Although all the projects we had included in that projection materialized, most did not do so until the first or second quarter of 2003, hence the discrepancy between that projection and the realized volume for 2002.

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

Total volumes of recent non-retail project-based transactions are typically around 500,000 tonnes of CO_2e or above, up to about 5 million tCO_2e. Over the past two years, the average size of non-retail transactions has been roughly 1 million tCO_2e.

FIGURE 3: VOLUME OF PROJECT-BASED EMISSION REDUCTIONS PER SEGMENT (million tCO_2e)

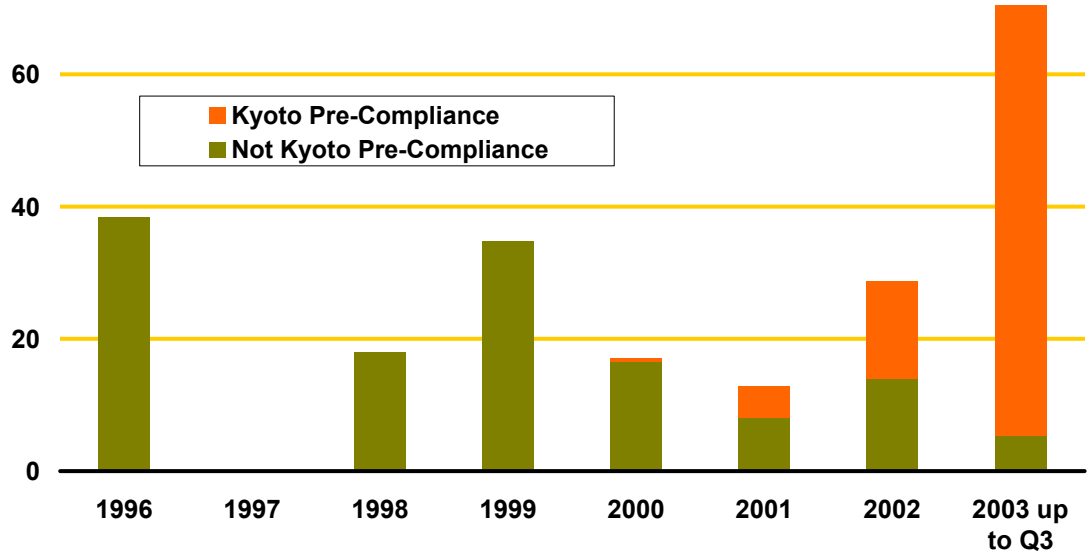


Figure 3 offers a breakdown of the annual volume by market segment. In green are "not for Kyoto" emission reductions, while in orange are pre-compliance ones, that is transactions intended for compliance with the Kyoto Protocol. Although it is not always easy to distinguish—at the margin—between voluntary and pre-compliance transactions, the analysis leaves little doubt that pre-compliance with the Kyoto Protocol now motivates the vast majority (93 percent in 2003) of the transactions in volume terms.

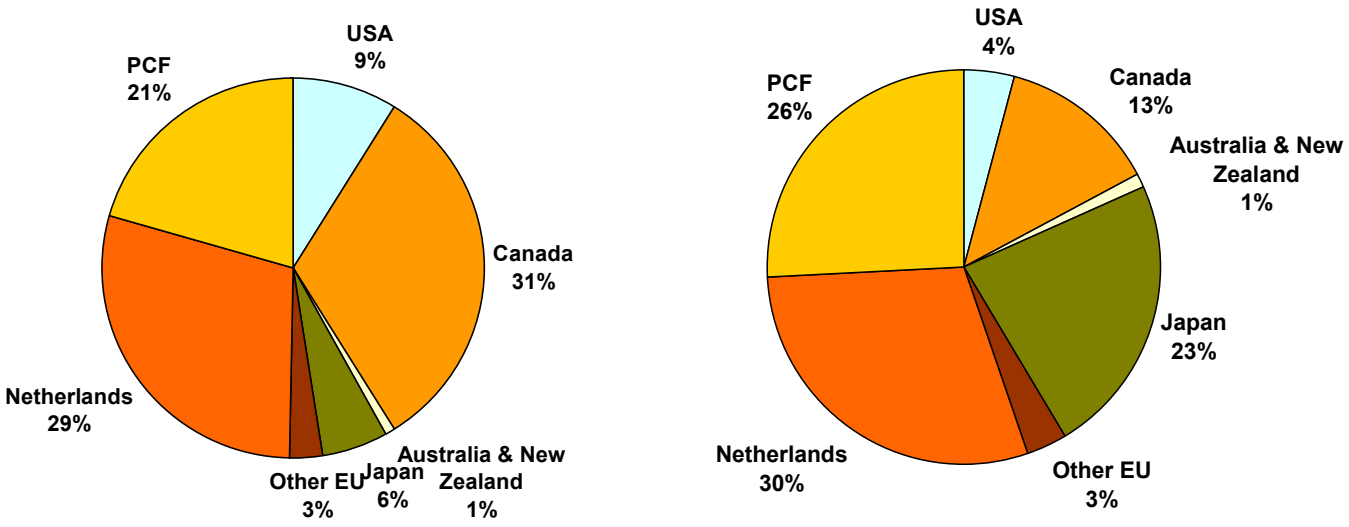
Figure 3 suggests that the predominance of deals intended for pre-compliance is a rather recent trend, which can be explained, *inter alia*, by the fact that the Marrakesh accords (adopted at the 7th Conference of the Parties to the UN Framework Convention on Climate Change in November 2001) provided some clarity on the rules of JI and the CDM especially, and by the fact that the compliance deadlines now loom nearer for market players.

4.2 Who's buying?

Currently, the main buyers of project-based transactions have been the Government of the Netherlands through various agencies and intermediaries (i.e. through 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 Prototype Carbon Fund (PCF). They represent respectively 30 percent and 26 percent of the market (in volume terms) in 2002-2003, although only, on aggregate, 26 percent of the transactions over the same period. Comparing data for 2001-2002 and 2002-2003 (Figure 4), we see that the share of the Government of the Netherlands and the PCF has remained more or less stable while the overall market was growing.

FIGURE 4: MARKET BUYERS (share of volume of ERs purchased)



2001-2002 2002-2003

The share of other buyers in the market, however, has changed substantially over the recent years. First, Japanese entities, and in fact mostly Japanese private firms (have emerged as major players in what was once a market dominated by North American buyers (from 5 percent to 23 percent, and it should be remembered here that private sector purchases are the ones we know less about.) This might demonstrate a growing sense of urgency in Japan, where abatement opportunities might be few and at high costs. Another indication of the activity of the Japanese private sector is given by the strong involvement of Japanese firms in the World Bank's Community Development Carbon Fund (CDCF), and in the preparation of the BioCarbon Fund.

Conversely, the decline of the share of U.S. buyers can be seen as directly related to the lack of a federal requirement to constrain GHG emissions. This is in spite of state initiatives that have begun to require modest levels of emissions reductions. The recent decline in activity from Canadian companies might look more surprising given the very high activity of major Canadian firms 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 has prevailed over most of the past year.

Beyond the Government of the Netherlands, the share of European private and public entities remains small. Yet EU actors—particularly public—are likely to be more active in the near future. In fact, Sweden and Finland 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 sheets" or equivalent stage. In addition, recent pledges by various European Governments, such as Austria, Italy or Denmark suggest that the share of non-Dutch EU might increase in the near future.

In fact, public sector purchases are expected to grow in most countries included in the Kyoto Protocol's Annex B, including Japan and Canada, in anticipation of entry into force of the Kyoto Protocol. Most governments concerned about meeting Kyoto Protocol targets have signaled their interest in entering the carbon market.[11] However, this interest is not reflected in 2003 data, where respective shares of public, private and public-private buyers are not that different (33, 42 and 25 percent respectively).

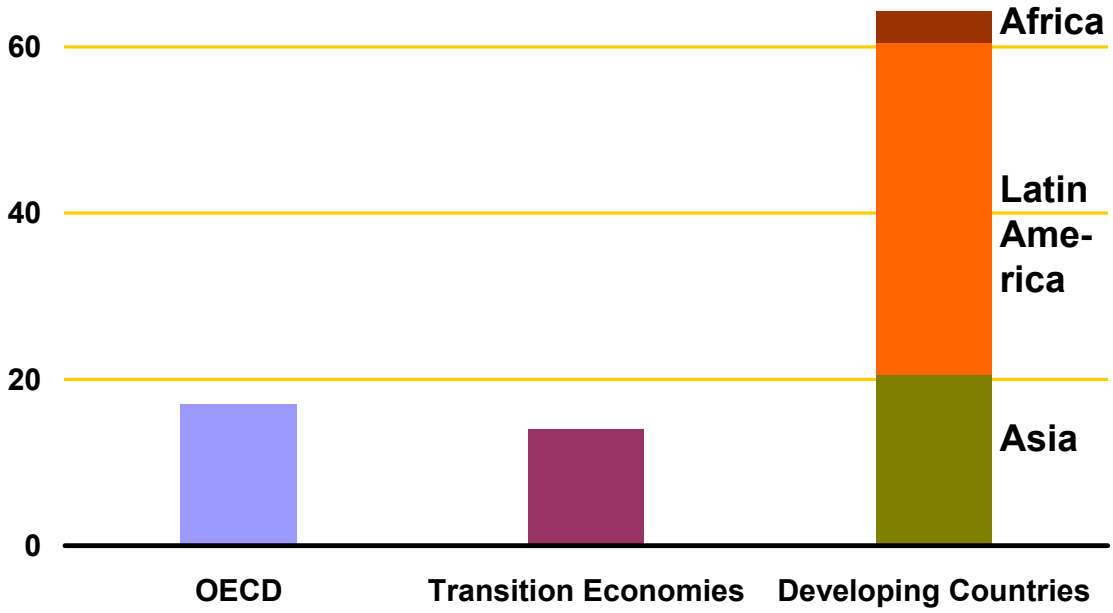
4.3 Who's selling?

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 from 38 percent in 2001 to 60 percent in 2002 and 91 percent over the first three quarters of 2003. This is consistent with the fact that most project-based transactions are now undertaken for pre-compliance purposes, and therefore follow the JI or CDM rules. Also, the Marrakech Accords appear to have provided more certainty to Emission Reductions purchases in developing countries. As more methodologies get approved, the regulatory uncertainty regarding CDM projects will further diminish.

Within transition economies and developing countries, the regional distribution of projects is also evolving rapidly. A majority of reductions still come from projects in Latin America but, in 2003, Asia joined the list of major sellers (Figure 5). In particular, about 10 agreements for project activities have been signed in India. This is with only one project in China, which is likely to become a major player in the coming years. Transition economies now rank third, although it must be noted that there has been to our knowledge no JI activity in two of the largest countries in this group, namely Russia and Ukraine.

[11] *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 Internationals, September 2003.

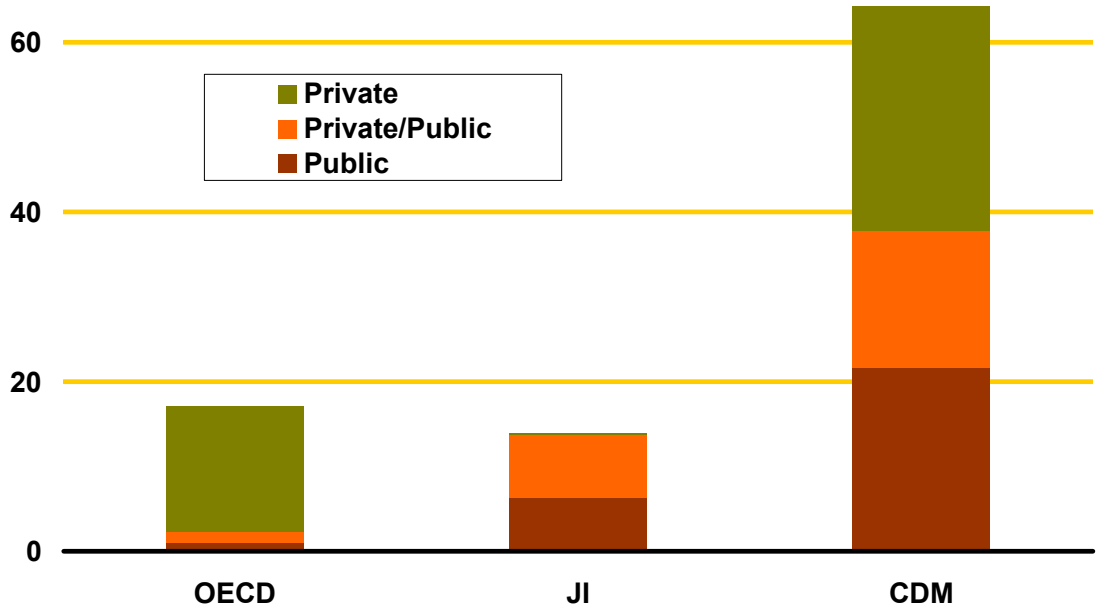
FIGURE 5: LOCATION OF EMISSION REDUCTION PROJECTS
2002 – Q3 2003 (in million tCO_2e)



On the other hand, very small volumes and a handful of transactions were associated with projects in the poorer countries of Asia and in the whole of Africa. The latter, in particular, is now 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 4.7 percent of carbon volumes transacted in 2002-2003.) 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–against, for example, 6 out of 12 countries with at least one project in South America.

Overall, the number of countries having hosted at least one non-retail project-based transaction in the past rose from 26 in 2002 to 36 in 2003. However, the large number of new deals in large countries or middle-income countries like India or Brazil suggests that the CDM are beginning to concentrate in these regions. And over the next several years, a much greater percentage of ERs is likely to come from projects in India and China–again bypassing the smaller and poorer countries within Asia and Africa.

FIGURE 6: LOCATION OF PROJECTS BY TYPE OF BUYER 2002 – Q3 2003 (in million tCO_2e)



The 2002 State and Trends of the Carbon Market report showed strong differences in project location depending on the private or public nature of the buyer, with the private sector acting alone—i.e., not through private public partnerships like the PCF—buying all but 13 percent of its tonnes within OECD, and none in transition economies. This year's analysis reveals a much different picture (Figure 6). In fact, the private sector has purchased 65 percent of its tonnes out of OECD in 2002-2003, nearly all from projects located in CDM countries. The private sector acting alone now accounts for 45 percent of the total volume of ERs purchased in the developing world (2003). The increased share of the private sector in CDM volume—double 2002—can be again interpreted as both increased confidence in the rules of the game since Marrakesh, and also as a more pressing need for compliance instruments.

4.4 Price Signals and Contractual Structures

Before discussing prices and contractual structures, we must make two introductory points. First, prices, and other key elements of the transaction, are often not publicly disclosed. This makes quantitative assessment of price data difficult. In addition, reporting practices are not uniform across buyers. In fact, most public buyers are required to disclose the prices they are paying (if not transaction by transaction, over the portfolio), whereas private buyers are under no such obligation. And in fact we have much more detailed price information on public deals than on private ones, hence creating an obvious bias in our price analysis.

Secondly, we must emphasize here that prices cannot be isolated from the other features of the contract, especially in a market where the asset traded is not

yet well defined, and thus depends strongly on the particularities of the contract. The samples assembled on the International Emissions Trading Association website,[12] for example, illustrate the wide diversity of contracts.

(a) Observed Prices for Non-Retail Project-Based Transactions

Given the above two points, we have decided 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 the transactions where the buyer takes the registration risk (i.e. purchases third-party Verified Emission Reductions or VERs), and the transactions where the seller takes most of the registration risk (i.e. the buyer purchases CERs or ERUs). 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 where the seller must actually find equivalent replacement units elsewhere if the project fails to deliver CERs or ERUs.

FIGURE 7: PRICES FOR NON-RETAIL PROJECT-BASED ERs 2003 (in U.S.$ per tCO_2e)

Figure 7 provides the range of prices we found for each of these categories in 2003, as well as the weighted averages (by volume). All prices are in expressed in nominal U.S. dollars per tonne of CO_2e. We include no differentiation for vintage, which seems–although we do not have full data–common practice in

[12] Available at www.ieta.org.

contracts where multiple vintages are traded. All prices were converted to U.S. dollars using average exchange rates over the first 10 months of 2003.

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 $1.95 and $3.00/t$CO_2$e (weighted average, by volume, $2.55).[13] Within the transactions intended for Kyoto compliance, we observe that with registration risk on the buyer, ERs sell at $3.00 to $4.20 (weighted average $3.51), while registration risk on the seller commands a higher value of $2.93 to $6.44 (weighted average $4.88). 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.[14] Within compliance grade, the weighted average is slightly higher in JI than in CDM, which might reflect a difference in perceived country risks.

(b) 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.

[13] Given the limited size of the sample of "not for Kyoto compliance" ER transactions for 2003 in which prices are available to us, this range might not be fully representative. In particular, data for previous years and insights from market players suggest that the lower price bound in this segment might in fact be in the range of $0.50 to $1.00.

[14] 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.

(c) Structure of Transactions

Prior to the Marrakesh Accords, a large number of contracts were written as call options. In fact, they represent 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.

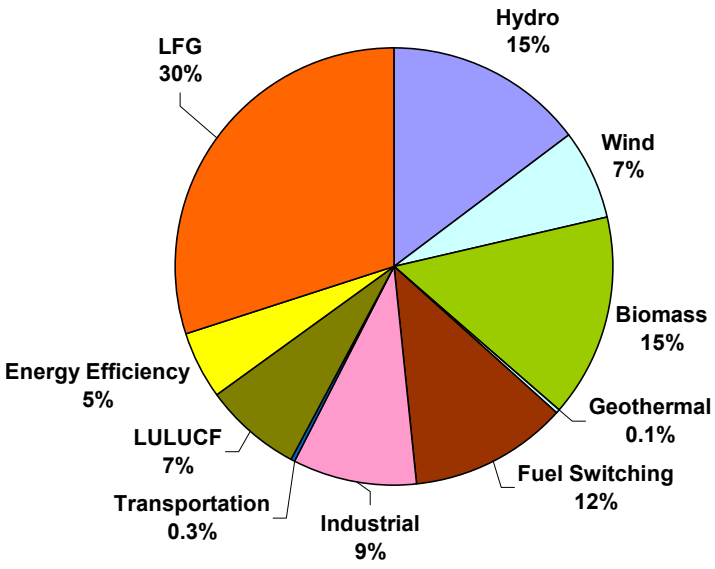
Since the adoption of the Marrakesh Accords, most of the activity takes the form of forward purchases–especially focusing on 2008-2012 vintages. Call option contracts represent less than 5% of the volume transacted in 2002-2003. Where options were written during that period, it was sometimes for vintages beyond 2012. We have very sketchy data on recent options prices.

A sign of increasing liquidity in the emissions trading markets is that companies are beginning to engage in secondary transactions, albeit on a small scale, selling parts 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.

4.5 Balance among Asset Classes

Whereas in the early years of the market, so-called land use, land use change, and forestry (LULUCF) projects largely dominated, transactions in 2002-2003 reveal a much more evenly distributed set of technologies (Figure 8), with landfill gas capture leading in volume terms with 30 percent, followed by hydro (15 percent), Biomass (15 percent) and Fuel Switching (12 percent). Taken together, renewables account for more than 37 percent of the total volume of project-based ERs transacted. LULUCF, on the other hand, is now a smaller part of the total volume (7 percent).

FIGURE 8: TECHNOLOGY SHARE OF EMISSION REDUCTION PROJECTS 2002-2003 (in percent of total volume contracted)



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 difference, and might actually, even at current carbon prices, render projects viable. (For example, carbon finance can increase the Internal Rate of Return of landfill-gas to energy project by more than five percentage points.)

This distribution, 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.

4.6 The Emerging Retail Market

An emerging 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. These transactions from what we call the "retail" market, in which we have included all the transactions where we had indication that the purpose of the deal was retirement as defined above, and by convention all other transactions below 50,000 tCO_2e.

Some companies may use these high quality reductions for compliance purposes as well as for green marketing and customer loyalty programs. Swiss Re, for example, recently announced that it would offset all its corporate emissions through in-house actions and its participation in the World Bank administered Community Development Carbon Fund.

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. One example is the Plan Vivo Forestry project in Karnataka, India, which is aided by an NGO, Women for Sustainable Development.[15]

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$5–12/$tCO_2e$. A range of brokers, NGOs, small companies, and retail associations are active in this market and the segment has been growing rapidly from 150,000 – 200,000 tonnes contracted in 2002 to at least 500,000 tonnes contracted in 2003 (estimated). Individual deals are often in volumes of 5,000 to 10,000 tCO_2e and contracts are usually either spot or 2–3 years forward. Retailers report a marked preference by customers for community-based agro-forestry and other forestry deals.

[15] http://www.futureforests.com/forestsandprojects/forest.asp?id=75

5. ALLOWANCE MARKETS

We know of transactions on four emissions allowance markets in 2003: the UK trading scheme, the EU Emissions trading scheme, the Chicago Climate Exchange (CCX) and the New South Wales (NSW) GHG Abatement Scheme.[16] We discuss each of them in turn.

5.1 The UK Emission Trading Scheme

The UK's voluntary emission trading scheme is currently still the world's largest national GHG trading program. 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 energy consumption or GHG emissions. 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 significant activity in the past years; with 434 inter company trades recorded in 2002, and an estimated 140 in the first three quarters of 2003, mostly for 2002 and 2003 vintages. Trades for 2.48 million tonnes CO_2e have been recorded in 2002, and an estimated 500,000 tonnes have been exchanged in the first three quarters of 2003. These figures mask large intra-annual variations, with a surge of transactions–and also of activity by speculators–in the last quarter of 2002 and the first of 2003, just before firms had to prove they were compliant with the 2002 requirements. Since then, the market has slowed down considerably; it is expected to pick up again when the deadline for proving compliance with 2003 requirements approaches.

Spot prices have spiked up from £4 in April 2002 to £12 in September 2002, and then fallen down to £2.50 in early 2003, where they have remained since. The September 2002 price spike can be explained by the combination of two factors. On the one hand, some companies with so-called Climate Change Agreements had to meet a first compliance deadline by October. On the other, supply was still very limited, for most of the companies that had bought allowances through the April 2002 reverse auctions had yet to receive them. The supply – demand tension, further fueled by some buyers' hedging strategy against further increase in allowance prices, drew the price up sharply. It decreased afterwards as more supply was becoming available. The spike is thus due to a contingent market timing issue, and does not seem to reflect the equilibrium between supply and demand on the UK market.

[16] To our knowledge, no transaction has occurred on the Danish trading system in 2003. In addition, apart from the exchange of AAUs against ERs generated before 2008 by some projects intended for registration under JI, which we have included in the project-based transaction section, a handful of transactions have involved direct trade of AAUs. To our knowledge, however, they remain still linked to a project, although not on a one to one basis.

5.2 The EU Trading Scheme

On October 13, 2003, European Directive 2003/87/EC on GHG emissions allowance trading was published in the *Official Journal of the European Union*, thus making the Directive EU law. According to that Directive, Member States must decide on the amount of GHG emissions allowances (EUAs) to be allocated for the period 2005-2007 to large fixed sources of CO_2 by March 2004 (a second phase is scheduled for 2008-2012.) More than 12,000 fixed sources, representing about 45 percent of the EU25[17] total GHG emissions will be covered. In addition, a linking directive will eventually govern the relationships between the European Trading Scheme (ETS) and the Kyoto Protocol. In its current form (it has yet to be approved by the European Council, and by the European Parliament at time of writing), it allows for the import of ERUs and CERs into the ETS (through conversion in EUA), though only after 2008.[18]

In preparation for the EU ETS, several companies have engaged in demonstration trades of 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 20 deals have occurred in the first three quarters of 2003, for a volume probably superior to 500,000 tonnes of CO2e. Most of these deals are small (below 50,000 tonnes), and they involve only vintages from 2005, 2006 and/or 2007.

Although price information is sketchy, prices in transactions have apparently increased from around €6/tCO_2e in May 2003 to €12/tCO_2e in November 2003. 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.

5.3 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.

So far, to our knowledge, there has been only initial auction of allowances, resulting in 28 transactions for a total of 136,200 tonnes of 2003 and 2005 vintages. Final price was $0.98 for the 2003 vintage, and $0.84 for 2005 vintage.

[17] EU25 refers to the current 15 EU member countries plus the 10 countries that will join Europe in 2004.

[18] Beyond designing National Allocation Plans, EU Member States also have to make decisions on other issues that will influence prices, including *inter alia* legal definition of EUAs (good, service, property right, license, etc.) and subsequent application of taxes, handling of Allowances in case of shut-downs and new entrants, and banking between periods (2005-2007 and 2008-2012).

The market is too thin to assume that these prices are representative of the voluntary market in the US.

5.4 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.

There have been several early transactions on this market. Volumes are low, and prices are assumed to be in the range of Aus$6 to Aus$7/tCO2e (U.S.$3 to U.S.$4).

6. MARKET OUTLOOK

The section discusses what we perceive as major drivers and issues for the carbon market in the next two to three years. We focus mostly on project-based transactions in transition economies and developing countries, but we cannot avoid discussing the global regulatory picture first, before turning to projects 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.

6.1 Kyoto, EU Trading and Other Regulatory Drivers

Two major regulatory developments will affect the carbon market in the coming years. The first is entry into force, or not, of the Kyoto Protocol. The second is the clarification of the rules, and implementation of major policies regulating GHG emissions in the EU, Canada, and in the longer run in Japan.

First, with the ratification of the Kyoto Protocol by the EU and Japan in mid-2002, and by Canada in late 2002, entry into force of the Protocol now hangs on Russia's decision to ratify. Mixed signals from Moscow in recent months, and two major elections scheduled in the country in the late 2003 and early 2004 suggest that Russia's decision might be delayed till at least to the second half of 2004.

Prolonged uncertainty over the fate of the Protocol has a major impact on the market. It indeed creates strong incentives for actors, and in particular for private ones, to adopt a "wait-and-see" attitude until the dust settles. They must balance the risk of non-compliance—or of high compliance costs—should the Kyoto Protocol enter into force, with the risk of disbursing significant amount of money for tonnes which might prove less valuable if the Protocol were not to enter into force.

The emergence of regional, national or subnational policies constraining GHG emissions counterbalances somewhat the impact of prolonged uncertainty on the market. First, they force some firms and governments to act, since they must comply with these obligations, usually rather soon (e.g. 2005 for the EU emissions trading scheme), and are therefore likely to result in some activity on the carbon market. Secondly, even for firms and governments out of these regimes, they provide some sense that at least high quality VERs will have value.

These policies include not only the "Kyoto-Compliance related" policies in the EU or Canada, but also regulations in Australia and the United States, both of which have publicly announced their intentions not to ratify the Kyoto Protocol,[19]

[19] In Australia, a number of federal or state-based initiatives creating environmental markets are being explored or have been developed, including in renewable energy certificates and other environmental commodities. The signing into law of a California bill to regulate greenhouse gas emissions from motor vehicles, a similar announcement by the state of New York, and other developments in U.S. states have also sent positive market signals.

as well as voluntary programs by firms. Most of these programs have emerged even without certainty over the entry into force of the Protocol, and the EU and Canada have even stated that they would go along with their climate mitigation policies even if the Kyoto Protocol were not to enter into force. As noted above, the EU has already adopted the Emission Trading Directive.

6.2 Uncertainty and Lead-Time: Implications for the Market

The key issue for the development of the market is, will the existence of these policies be sufficient to fuel growth in transactions even if the uncertainty over the Kyoto Protocol were to be prolonged over much of 2004, or even 2005?

The answer to this question boils down to two issues. Do these non-Kyoto policies create a constraint on GHG emissions sufficient to fuel growth in the carbon market? And do market players believe that these policies and measures will survive should the Kyoto Protocol not enter into force? The answer to the first question seems to be Yes. The answer to the second, on the other hand, is much less clear, and will very likely depend on the segment of the market we consider.

At one end of the spectrum, the development of the market for European Allowances appears rather impervious to the uncertainty over the Kyoto Protocol. Trade is likely to pick up as soon as allocation plans are completed, as the first phase of the EU trading scheme will materialize with or without Kyoto.

At the other end of the spectrum stands the market for (non-project-based) AAUs, which is obviously very dependent on the fate of the Kyoto Protocol. Unless AAU trades are somehow linked with projects, entities purchasing AAUs on a forward basis now would be left with nothing if the Protocol were not to enter into force; a strong counter incentive to any serious development of that segment of the market until the uncertainty is lifted.

Non-Retail project-based transactions lie somewhere in between. In the absence of the Protocol, Kyoto compliant VERs would obviously not become CERs or ERUs, but could still be used under various regimes, such as the second phase of the EU trading scheme, if the EU decides to make the linking of the regimes independent from the entry into force of the Kyoto Protocol,[20] or private voluntary markets. It is expected that Kyoto-compliant VERs might be used in a broad range of jurisdictions.

In this segment of the market, the problem is not so much for 2004 anyway, since existing pledges and projects in the pipelines appear already sufficient to at least keep the market at current level. The combination of existing commitments by European governments, continuation of various Dutch programs, as well as the last year of the funds allocation phase of the PCF and entry into operation of CDCF and possibly BioCarbon Fund could reasonably bring around 45 million tonnes of project-based ERs during that year from governments or the World Bank. It thus seems rather reasonable to think that the non-retail project-based market could at least remain at the same volume level in 2004 as in 2003,

[20] In its current draft the linking instrument does only allow the conversion from CERs and ERUs into EUA after the entry into force of the Kyoto Protocol.

irrespective of whether or not uncertainty over the fate of the Protocol is resolved. A third consecutive doubling of volumes, however, would require either new public participants that have not yet budgeted the money, or still higher involvement of the private sector. It is unclear whether this can be obtained without certainty on ratification.

Prolonged uncertainty, however, might have much more impact on the market for non-retail project-based ERs in 2005 and 2006, by delaying new commitments from governments and firms alike. The key issue is not so much the delay itself, but rather the cancellation of transactions due to the lead-time issue.

We know indeed that developing projects is a long process which, depending on the technology and business environment, requires 3-7 years from identification, through licensing, financing, and construction to the first certification of ERs after the first year of operations.[21] 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, and thus be contracted by at least 2006.

As a result, the firms and governments that have delayed investment in project-based ERs because of uncertainty might not have enough time to do so in 2005 or 2006, should the Kyoto Protocol only then enter into force; and they might then be forced to opt for the last remaining option, that is purchase of AAUs.

Apart from ratification, lead-time is probably the single most important issue JI and CDM faces in the medium-term. Absent some clarification of the validity of project-based ERs beyond 2012, volumes transacted under these mechanisms might diminish sharply before the beginning of the first commitment period.

6.3 What are constraints to increasing CDM and JI?

In addition to the fate of the Kyoto Protocol and other regulatory drivers, and to lead time, there are other constraints that could limit the potential of CDM and JI. While some of the uncertainties associated with acceptable methodologies are expected to be reduced in the coming months, substantial risks continue to constrain the CDM:

- *Methodology Risk*: Will the process for approving methodologies and projects not deter would-be project developers because of undue complexity?
- *Host Country Kyoto Risk*: The transfer of ERUs and CERs will depend on continuous host country support as well as the ability of the host country to comply with its Kyoto Protocol obligations including the establishment of registries, national communication, development of inventories. The issuance of CERs depends on the

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

establishment of a Designated National Authority that clears projects and issue letters of approvals.

- *Buyer Liability versus Seller Liability*: As sellers are pressed to take on more of this risk, this will depress their enthusiasm and ability to develop such emission reduction projects. Conversely, a firm carbon contract that is an irrevocable commitment to pay against delivery of emission reductions can provide comfort to lenders that an additional cash flow is available to the project, making it a more secure investment.
- *Underlying Finance Risk*: In an overall global financial market where Foreign Direct Investment flows have declined by 17percent between 2001 and 2002 achieving financial closure is difficult for projects. Many promising project ideas languish because of insufficient prospect of attracting underlying finance.
- *Volume and Quality of Cash Flows*: In a low carbon price environment, there is only a limited number of sectors where cash flows from carbon will make an appreciable difference to project developers. Hard currency, multi-year, and secure cash flows from strong contracts with credit-worthy buyers, on the other hand, can make contracts more attractive for financing institutions.

7. CONCLUSION

The above analysis paints the picture of a carbon market in rapid expansion fueled by clearer rules of the game for JI and the CDM, and by an heightened sense of urgency relative to the entry into force of policies constraining GHG emissions in Europe, Canada and possibly in Japan.

This dynamics has resulted in a record number of emission reduction projects in transition economies and developing countries, with a participation of the private sector approaching parity with public entities and private-public partnerships.

In other words, the once theoretical possibility that JI and the CDM might bring significant private investment to clean technologies and contribute to sustainable development is slowly materializing–at least in developing countries–despite a difficult global context for foreign direct investment. Booming activity in waste management fueled by carbon finance is a good example.

Yet this progress is fragile. Prolonged uncertainty regarding entry into force of the Kyoto Protocol might slow the market down. In addition, the flow of project-based transactions is very likely to decrease before 2008 because of the lead-time issue, unless the status of post-2012 project-based ERs is clarified.

On the other hand, there is still room for increase, since the total volume of CERs and ERUs up to 2012 that all the for compliance projects we know of could generate is no higher than 90 million tonnes of CO_2e, somewhere between 3 percent and 10 percent of the anticipated demand for emission reductions from countries in the Annex B of the Kyoto Protocol (excluding the U.S. and Australia), depending on the estimate.

The key challenge for the coming years is therefore to sustain the current momentum, and scale-up activity in JI and the CDM, while reaching out to countries which are currently bypassed by carbon finance.

A Carbon Finance Product of the World Bank