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April 2004

Online at https://mpra.ub.uni-muenchen.de/13222/
MPRA Paper No. 13222, posted 07 Feb 2009 05:30 UTC

First version: April 2004
This version: December 2005

The World Bank's Prototype Carbon Fund and China

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Abstract

As the first global carbon fund, the World Bank's Prototype Carbon Fund (PCF) aims to catalyze the market for project-based greenhouse gas emission reductions while promoting sustainable development and offering a learning-by-doing opportunity to its stakeholders. Since the inception in 1999, the PCF has engaged in a dialogue with China to get it to sign up as a host country, because the World Bank and other international and bilateral donors expect great potential of the clean development mechanism (CDM) in China and feel the significant need for building CDM capacity in China to enable it to gain more insight into the CDM and increase its capacity to initiate and undertake CDM projects. This paper first discusses why China had hesitated to sign up as a host country of PCF projects until September 2003. Then the paper explains what has led China to endorse the PCF projects. The paper ends with discussions on the implications of the PCF's offering prices for the emerging global carbon market.

JEL classification: Q54; Q58; Q52; Q48

Keywords: Carbon prices; Carbon market; China; Prototype Carbon Fund; The World Bank

1. Introduction

In recognition of the potential impacts of climate change on its borrowing client countries, the World Bank has been participating in the climate change process since its beginning. This, combined with the limited existing capacity in developing countries and in economies in transition in originating CDM and joint implementation (JI) projects, led the World Bank to undertake a pioneering role in developing the market for greenhouse gas emission reductions through the establishment of the Prototype Carbon Fund (PCF, 2003).[2] As the first global carbon fund, the PCF aimed to:

- demonstrate how project-based transactions in greenhouse gas emission reductions can contribute to the sustainable development of developing countries and countries with economies in transition;
- share the knowledge gained in the course of the PCF's operations with all interested parties; and
- demonstrate how the World Bank can work in partnership with the public and private sectors to mobilize new resources for its borrowing member countries while addressing global environmental concerns.[3]

[2] The World Bank's engagement in carbon finance started with the establishment of the US$180 million Prototype Carbon Fund in 1999. Since then the Bank has also agreed to administer country carbon funds for the Netherlands, Italy, Spain and Denmark. In addition the Bank established the Community Development Carbon Fund and the BioCarbon Fund in 2003. The Bank administered carbon funds grew from US$413.6 million in July 2004 to about US$914.7 million in July 2005 ("New Carbon Finance Strategy Increases Opportunities For Developing Countries", Press Release, 6 December 2005, The World Bank (the carbon finance business web site at: http://carbonfinance.org)).

[3] See the PCF web site at http://carbonfinance.org.

The PCF operates like a mutual fund, pooling the collective resources from 23 investors (6 governments and 17 companies) and investing these funds in projects that reduce greenhouse gas emissions or remove these emissions from the atmosphere and that would in many cases not be financially viable without financial support from the PCF. The PCF is not legally able to own these carbon credits generated from the PCF projects. These credits have to go back to those investors pro rata according to their level of investment in the Fund. Participants in the Fund agreed on a set of project selection and portfolio development criteria designed to serve the "learning-by-doing" objective of the PCF while reducing project risk through portfolio diversity. In practice, these objectives are achieved by balancing the Fund's portfolio between: CDM and JI;[4] geographic regions; and eligible sectors and technologies and/or fuel switching in projects that create emissions reductions additional to a credible baseline of what would have happened without the CDM/JI project.

The World Bank and other international and bilateral donors are keen to support CDM capacity building in China because they expect great potential of the CDM in China and feel the significant need for China to gain more insight into the CDM and increase its capacity to initiate and undertake CDM projects. Thus, since the inception, the PCF has engaged in a dialogue with China to get it to sign up as a host country. This paper first discusses why China had hesitated to sign up as a host country of PCF projects until September 2003. Then the paper explains what has led China to endorse the PCF projects

[4] In February 2001, the PCF decided that it would seek a ratio of 3 to 2 between CDM and JI projects in the portfolio (PCF, 2003).

in the end. The paper ends with discussions on the implications of the PCF's offering prices for the emerging global carbon market.

2. Why had China hesitated to sign up as a host country?

With the already huge and growing amount of greenhouse gas emissions and a great deal of low-cost abatement options available, many economic modelling studies indicate that China is widely regarded as the world's number one host country of CDM projects. For instance, the studies of Zhang (1999, 2000, 2001, 2004) show that about 60% of the total CDM flows in 2010 go to China. The similar findings are also founded in the World Bank-led study on the CDM market potential, the results of which suggest that China will capture about 50% of the world's CDM market in 2010 (World Bank, 2004). But, making this potential a reality represents a significant challenge for China, because there has been a general lack of awareness by both the Chinese government and business communities, institutional structure, and implementation strategy. This has raised great concern about China's ability to compete internationally for CDM projects and exploit fully the potential. The World Bank and other international and bilateral donors feel the significant need for CDM capacity building in China to enable it to gain more insight into the CDM and increase its capacity to initiate and undertake CDM projects. For this, since the inception, the PCF has engaged in a dialogue with China to get it to sign up as a host country. The PCF experience suggests that completing the first carbon deal in a host country is a powerful capacity building tool, with tremendous impact on supply on its own (Lecocq, 2003). But China had hesitated to sign up the PCF until late 2003. There are several reasons. First, rules governing the CDM are not agreed on among parties to

the Kyoto Protocol until the seventh Conference of the Parties to the United Nations Framework Convention on Climate Change (UNFCCC), and as a very important player, China does not want to see that its involvement in the PCF leads the rules operating the PCF to have any impacts on overall rule-setting for the Kyoto mechanisms. Second, China considers the PCF's targeted price levels of about US$ 3.3 per ton of CO_2-equivalent too low,[5] relative to its expectation of US$ 10 per ton of CO_2-equivalent or more.[6] Understandably, the investors in the PCF exert pressure to keep the purchasing prices low. Other host countries of the PCF projects are not in a strong position to negotiate with investors to increase the PCF's price levels. China is the only country that seriously regards the PCF's price levels as too low, and views that the low price levels will affect the sustainability and expansion of the PCF over the long run.[7] Third, the PCF establishes a practice where the host country takes the risk in case a project does not perform as planned (In general, PCF transactions are structured so that the project sponsors and their creditors assume most project risks, while the PCF bears most of the Kyoto Protocol-related risks (PCF, 2003). So the PCF takes the registration risk and

[5] Minimum requirements for PCF projects specify that estimated cost of emission reductions should preferably be less than US$ 10 per ton of carbon, which is equivalent to about US$ 3 per ton of CO_2-equivalent (see the PCF web site at http://carbonfinance.org).

[6] Author' interviews in Beijing, January 2004. A study coordinated by Stanford University's Energy Modeling Form examined the cost of meeting the Kyoto commitments according to a dozen different global energy-economy models. The results from these models show the world carbon price of double-digit number (Weyant and Hill, 1999). This may be the basis of China's expectation for high price of carbon credit. However, these estimates are made when the U.S. is part of the Protocol. The point is that, the U.S. being the biggest single buyer on the international market of tradable permits, its withdrawal from the Kyoto Protocol breaks the balance of the buyers and sellers on the international permit market. The studies focusing on the implications of the U.S. withdrawal from the Protocol (e.g., Löschel and Zhang, 2002) show that the U.S. non-ratification leads to a sharp drop in the price of permits on the international market.

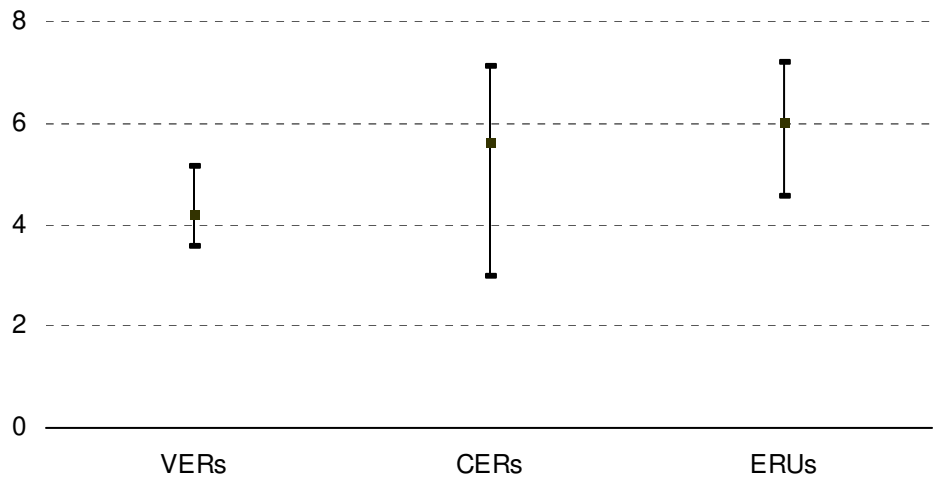
[7] Author' interviews in Beijing, January 2004.

continues to purchase VERs even if the project itself eventually fails to get registered under the Kyoto Protocol. By contrast, most buyers purchase certified emission reductions (CERs), thus passing on the registration risk to the seller. In this case, because the seller is more exposed to project risk, it thus comes as no surprise that CERs, on average, have been traded at a higher price than VERs. The carbon market study by Lecocq and Capoor (2005) found that, CERs have been traded between US$ 3.00 and US$ 7.15 per ton of CO_2-equivalent between January 2004 and April 2005, with a weighted average of US$ 5.63, in comparison with the VERs' price that ranges from US$ 3.60 to US$ 5.15 over the same period and has a weighted average of US$ 4.23 (see Figure 1). Because JI projects in the Eastern European countries pose a comparably less risk for the buyer than CDM projects in developing countries, the corresponding emission reduction units (ERUs) are sold at slightly higher prices, ranging from US$ 4.57 to US$ 7.20 and with a weighted average of US$ 6.04.), and China does not accept that the PCF projects do not bear some risks in implementation and crediting, although the PCF guarantees payment on delivery of the verified emission reductions (VERs).[8] Fourth, there are some concerns about the formal status of PCF projects regarding whether they can eventually be recognized as CDM projects. To be recognized as CDM projects, the baseline methodologies of the PCF projects have to be approved by the CDM Executive Board (EB). At the time of the PCF dialoguing with China to get it to sign up as a host country, the CDM EB approved a total of nine baseline methodologies. The PCF

[8] The risk of non-delivery for the PCF, a carbon buyer, is mitigated by purchasing VERs on delivery rather than upfront. Although a project developer is able to use this carbon purchase agreement as a collateral to leverage financing that would otherwise not have been available, the host country and business's risks associated with the underlying project remain, unless the carbon buyer is able to share these risks with the project developer (Lecocq, 2003).

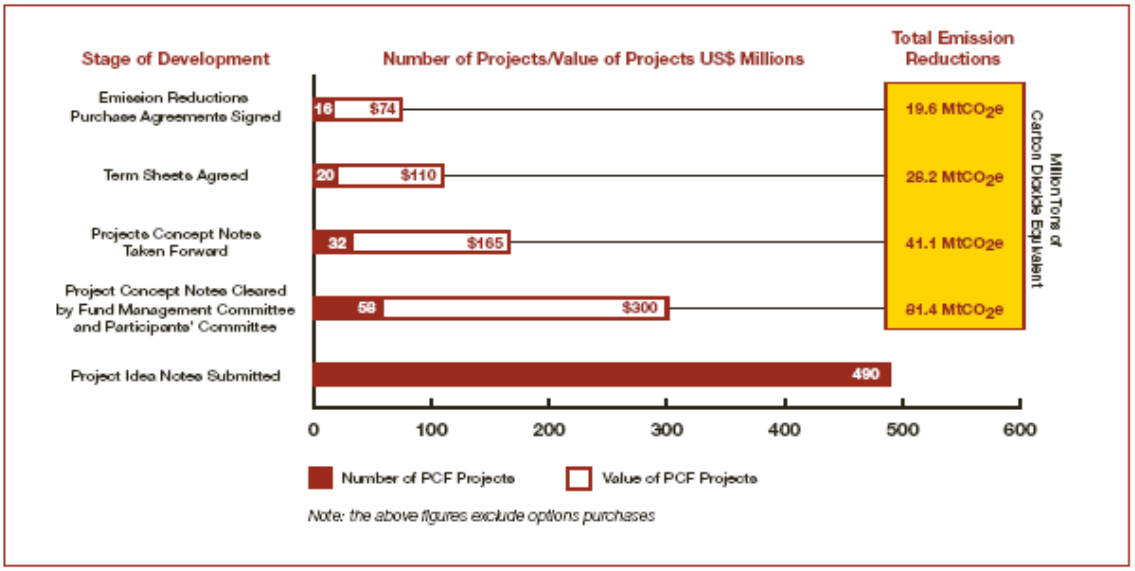
submitted the eight methodologies for its own projects, but only got the two methodologies approved (JIQ, 2004). At that time, it was difficult to predict which portion of the PCF portfolio would eventually be covered by approved methodologies. But the bottom line is that as more methodologies get approved, the regulatory uncertainty regarding the status of the PCF projects will further diminish. By December 2004, approximately 60% of the PCF portfolio was covered by approved or nearly approved methodologies (Ringius, 2005).[9]

Figure 1 Prices of project-based carbon credits
Source: Drawn based on data from Lecocq and Capoor (2005).



[9] The CDM EB has to date approved the 23 baseline methodologies (JIQ, 2005). However, it should be pointed out that not every project developer needs to propose a new methodology to the EB for consideration and approval. A project developer is free to opt for using a methodology previously approved by the EB, if appropriate.

Figure 2 Status of project development in the PCF
Source: PCF (2004).



3. What led China to endorse the PCF projects?

Despite the difference in opinion, negotiations between the PCF and China have never stopped. On 16 September 2003, two sides made important progress in negotiations in Beijing, and China decided to be a host country of the PCF.[10] At this moment, there are several PCF projects in China under preparation, and the PCF has signed the Emission Reductions Purchase Agreement (ERPA)[11] with the local project developers of the two projects: one on coal bed methane capture and power generation in Shanxi Province, and another on run-of-river hydropower to displace coal-fired power in Gansu Province.[12]

[10] Personal communication with Lu Xuedu, The Chinese Ministry of Science and Technology, 3 July 2004.
[11] This agreement governs the purchases and sales of emission reductions (PCF, 2003). As indicated in Figure 2, four years into the placement phase, the PCF has reviewed over 490 project idea notes, but only signed 16 ERPAs with a total value of US$ 74.3 million (PCF, 2004).
[12] The information cited below on the PCF funding contributions and the received amounts of emissions reductions for these two PCF projects is taken from the PCF web site at: http://carbonfinance.org (accessed on 27 July 2005).

The coal bed methane project is the first World Bank-supported CDM project in China. As one of the investors, the PCF contributes US$ 17 million in return of 4 million tons of CO_2-equivalent of the total project's emissions reduction of 49 million tons of CO_2-equivalent. This is the first project in China that the PCF has signed the ERPA with the local project developer. For the Xiaogushan hydropower project, the PCF invests US$ 9.22 million and receives the emissions reduction of 2.17 million tons of CO_2-equivalent of the total project's emissions reduction of 2.93 million tons of CO_2-equivalent during the crediting period of 10 years. Signed on July 14, 2005 in Beijing, the ERPA for the Xiaogushan project is the first carbon finance hydropower project in East Asia, and the second agreement of this kind in China.[13] Based on the PCF funding contributions and the received amounts of emissions reduction of CO_2-equivalent, the purchasing prices of emissions reductions for these two PCF projects are set through negotiation at US$ 4.25 per ton of CO_2-equivalent.[14] As indicated in Table 1, this is the highest purchasing price that the PCF paid for the VERs until the end of the year 2004.

[13] "China to Reduce Three Million Tons of Greenhouse Gases with Renewable Energy Project", Press Release No. 2006/027/ESSD, 14 July 2005, The World Bank (the PCF web site at: http://carbonfinance.org).

[14] The PCF has signed an umbrella agreement with the Chinese government on the purchases of 20 millions of CO_2-equivalent at the price of US$ 4.25 per ton of CO_2-equivalent. But for each PCF project, a fixed price needs to be agreed through the negotiations between the PCF and the specific project developers. This way to share the price risk provides incentives for both parties to perform. Some PCF contracts provide the project developers the opportunity to sell a fixed volume of the annual emissions reductions, which are generated above the amount due to the PCF, to a third party (PCF, 2003). Alternatively, under the Dutch CERUPT (Certified Emission Reduction Unit Procurement Tender) program, the contractor must offer the surplus of generated CERs to Senter (the tendering authority for the CERUPT) at the market price of the CERs at the time of delivery before it can do so to any other party, although Senter is in no way obligated to purchase more CERs than are agreed upon in the contract (Senter Internationaal, 2001).

Table 1 Changing contract prices for the World Bank-managed funds (US$ per ton of CO_2-equivalent)

Year	Maximum price paid by the PCF/other large project funds	Maximum price paid by the Community Development Carbon Fund
2003	3.75	
2004	4.25	5.00
2005 to date	5.00	5.50

Source: Newcombe (2005).

What led the PCF to reach a watershed agreement with China that leads it to endorse the PCF projects? First, it is related to the time table set for the funds reserved for projects in China. The Fund's maximum size is capped at US$ 180 million. At the creation of the PCF, its Participants Committee has requested to reserve US$ 18 million, 10% of the Fund's capital base, for potential projects in China.[15] But these funds are only able to be reserved by the end of 2003. While China still views that the PCF projects do bear some risks in implementation and crediting, such perceived risks are not at unreasonable levels because the PCF guarantees payment on delivery of the VERs.

Another reason is related to weak demand for CERs, which makes it much hard for China to negotiate with the PCF on the price. It is conceivable that China's side is keen to ensure that the carbon credits from China have a high value. However, as shown in Table 2 indicating the prevailing price levels for CDM projects at less than US$ 6 per ton of CO_2-equivalent at the time of the PCF dialoguing with China to get it to sign up as a host

[15] The spending ceiling set for China is not fixed. In case the World Bank were unable to use the amount of the funds originally allocated to other regions, it could invest the remaining in China (Personal communication with Lu Xuedu, The Chinese Ministry of Science and Technology, 23 September 2005). Indeed, investing US$ 26.22 million in the aforementioned two projects in China, the PCF already shots that ceiling.

country, the development of the carbon market just turns the price of carbon credits the other way around, and leaves China a very little space to influence the market.[16]

Table 2 Prices of carbon credits under the selected programs

Programs	Price of carbon credits (US$ per ton of CO_2-equivalent)
World Bank's Prototype Carbon Fund	3 - 4
Dutch CERUPT program	4.4 - 5.5*
Dutch-IFC CDM Facility	~ 4
Dutch-IBRD CDM Facility	~ 4

* € 4-5 per ton of CO_2-equivalent.
Source: Zhang (2004).

Third, China hopes to use those projects on the margin to gain much-needed, real learning. Recongnising that it is hard to change the situation in weak demand in the short run, China thought that it is whorthwhile undertaking some PCF projects, in particular those PCF projects that fall into the priority area under the CDM in China (The Chinese government has prioritized the areas of the CDM investment. The priority areas for CDM projects in China are energy efficiency improvement, development and utilization of new and renewable energy, and methane recovery and utilization.) and whose local developers are determined to undertake these projects and need the funding on the margin. In this case, the funding from the PCF is considered additional. Undertaking these projects will provide much-needed, real learning and practice about baseline setting, project boundaries, monitoring and verification at project levels, these aspects that are most relevant to all prospective projects under the CDM but in which China has gained little

[16] On the other hand, China is fully aware of its role as a dominated suppler of CERs. Whatever prices are set for China projects will have impacts on the world prices. Thus, China is not to give up the price issue so easily.

experience in the AIJ (Activities Implemented Jointly) pilot phase. The different attitudes towards the AIJ pilot phase among the Chinese ministries concerned at the beginning put China at the slow starter of AIJ projects. As a result, China has only hosted 5 AIJ projects, with 4 projects registered with the UNFCCC Secretariat (see Table 3). For all these projects, there have been quite tough bilateral negotiations between China and the investor countries. The estimated unit costs of abatement for these registered projects are very high.

Table 3 The registered AIJ projects in China

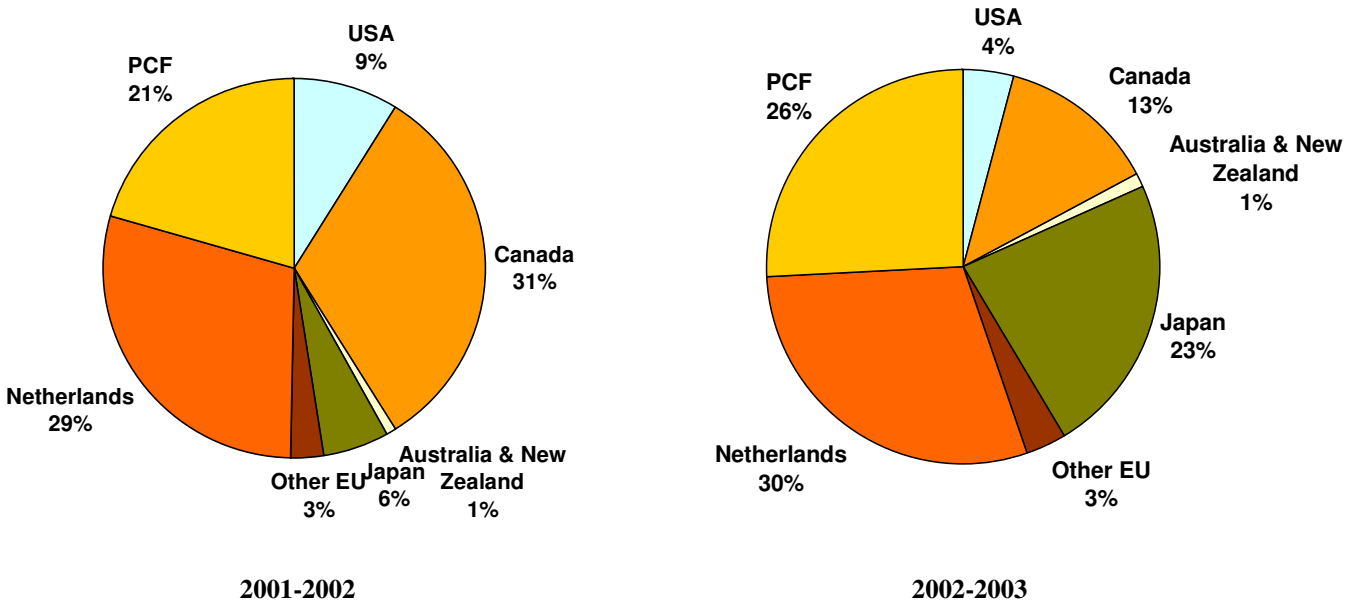
Project	Type[a]	Parties involved (host/investor)	Lifetime (years)	Emissions reductions per year (tons of CO_2-equivalent)	Estimated unit abatement cost (US$ per avoided ton of CO_2-equivalent)
A. Installation of a coke dry-quenching facility	Energy efficiency	China/Japan	20	68265	19.6
B. Model project for energy conservation in electric furnace used for ferro-alloy refining	Energy efficiency	China/Japan	20	29050	22.6
C. CFBC & CHP project in Shangqiu thermal power plant in Henan Province of China	Energy efficiency	China/Norway	20	87480	15.0
D. Model project for utilization of waste heat from incineration of refuse in Harbin of China	Fugitive gas capture	China/Japan	20	62896	31.1

[a] The Intergovernmental Panel on Climate Change has classified type of AIJ project as energy efficiency; renewable energy; fuel switching; forest preservation, restoration or reforestation; afforestation; fugitive gas capture; industrial process; solvents; agriculture; waste disposal; or bunker fuels.
Source: Zhang (2004).

4. The implications of the PCF's offering prices

When applauding this positive development in the PCF, we have to realize that host countries like China are very concerned about the price issue. In the early stage of the carbon market, the World Bank and the Dutch government are the two most active players on the buyer side in project-based transactions. In volume terms, they represent 30% and 26% of the carbon market in 2002-2003, respectively, as shown in Figure 3. This Figure also shows that the share of Japan in the carbon market increased from 6% in 2001-2002 to 23% in 2002-2003. But unlike the Netherlands, Japan's purchases are mainly from private entities.

Figure 3 Market buyers (share of volume of emissions reductions purchased)
Source: Lecocq and Capoor (2003).



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At the time of the PCF dialoguing with China to get it to sign up as a host country, the maximum purchasing price that the PCF paid for the VERs was US$ 3.75 per ton of CO_2-equivalent (see Table 1). This is very much in the price range of US$ 3.5-4.0 per ton of CO_2-equivalent, which was set in 1999 at the creation of the PCF.[17] The Dutch CERUPT program is aiming at price levels of about US$ 5 per ton of CO_2-equivalent. The offering price of the PCF is not intended to serve as the market price. Given its dominated role on the buyer side in the early stage of the carbon market, however, it will largely in practice set the standard for the carbon market. Private investors are unlikely to accept projects with a higher cost. To avoid harming their negotiation positions either in subsequent deals or in negotiating with the government on the emissions target and policy, private players often keep key elements of their deals such as prices or contract features confidential. However, given the fact that the publicly disclosed offering prices of PCF projects provide information on abatement costs in both economies in transition and in developing countries, it is conceivable that private players are unwilling to go beyond this price bound. This raises a very important question of striking the balance between encouraging investors to engage CDM projects (thus increasing the volume of CERs of CDM projects) and ensuring the quality of CERs. If the unit cost of abatement is so high, potential investors are scared away. Without CDM investment, there is no delivery of CERs. On the other hand, government and multinational actors had totally dominated on the demand side for CDM projects before the Kyoto Protocol entered into force. They continue to be the major buyers in the Kyoto market, at least so far, in the face of

[17] Cited in the *Report of the Asia Meeting on Efficient Clean Development Mechanism Operations*, organised by the UNDP and the World Bank, 1-3 April 2003, Kuala Lumpur, Malaysia.

continuous regulatory uncertainties. Moreover, they have greater flexibility than the private sector in determining the types of CERs that they are willing to purchase. Thus, if they are just interested in getting cheap CERs, there will be no strong incentives to encourage potential investors to develop CDM projects, in particular those sustainable projects like renewable energy projects. No doubt, the additional cash flow from CDM credits can boost the internal rate of return. But, the aforementioned World Bank-led study on the CDM market potential found that this added value from the current low price of CERs is insufficient to cover the incremental costs of implementing many CDM projects in China (World Bank, 2004). Put another way, the corresponding stream of CERs will be rarely the decisive factor that makes the most significant difference and renders these projects viable. This, combined with the lead times required for CDM projects and the current highly debatable process to review and approve CDM projects by the CDM Executive Board, raises both the concerns about China's ability to fully capitalize on its CDM potential and the uncertainty over whether there will be sufficient amount of CDM credits available for meeting the demand from the EU and other Kyoto-constrained parties before 2012. At the current low prices, a clear and understandable preference is to highly potent source of emissions, such as HFC23.[18] This has been confirmed by the World Bank study. As shown in Figure 4, HFC23 decomposition project dominates among all project types, providing about 25% of the worldwide emission reductions supplied from January 2004 to April 2005. This will simply exclude

[18] HFC23 is a by-product of the production of HFC22, which is used as a refrigerant and a raw material for the production of fluorinated resins. HFC23 is a very potent greenhouse gas. Its 100-year global warming potential is 12, 000 times that of CO_2, implying that releasing one ton of HFC23 in the atmosphere is equivalent to 12, 000 tons of CO_2 emissions.

a whole range of other CDM projects. All this clearly suggests that having the appropriate price level of CERs is critical for the development of CDM market, because, in the long run, the price of CERs, either too high or too low, would severely hamper the development of the market.

Figure 4 Technology share of emission reduction projects 2003 – April 2005 (in percentage of total volume contracted)
Source: Lecocq and Capoor (2005).

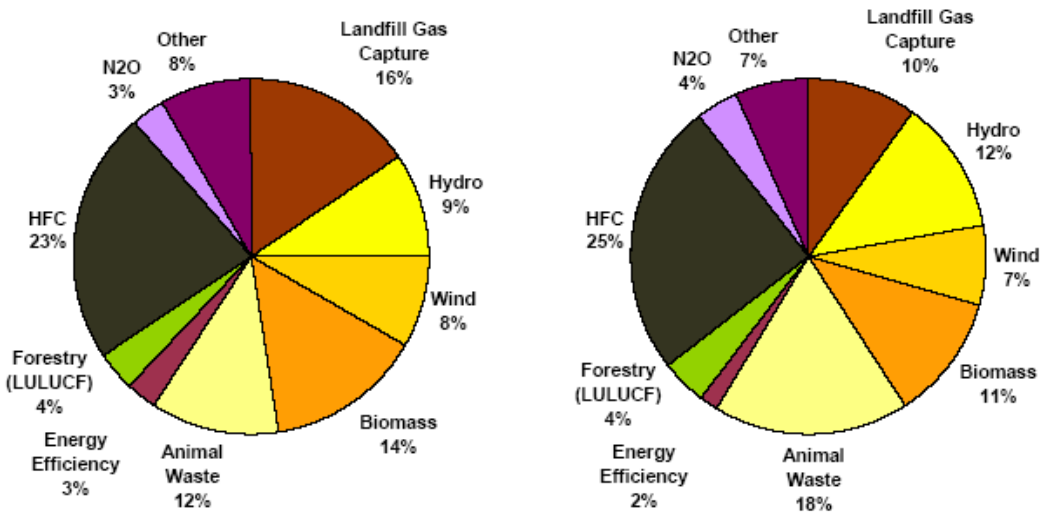

Table 4 The maximum offering prices of CERs under the Dutch CERUPT program

CDM project type	Maximum offering prices of CERs under the Dutch CERUPT program (€ per ton of CO_2-equivalent)
Renewable energy (excluding biomass)	5.5
Biomass energy (excluding waste)	4.4
Energy efficiency improvement	4.4
Fossil fuel switch and methane recovery	3.3

Source: Senter Internationaal (2001).

From the preceding discussion, it thus follows that, to promote the sustainability and expansion of the World Bank's carbon finance initiatives (including the PCF) as an integral part of the Bank's mission to reduce poverty, mobilize resources for carbon financing, and to build the global carbon market over the long run, China and the World Bank should work together on the price issue. It is in their interests. The World Bank is there to promote and demonstrate how the market can work and to help catalyze the carbon market. However, the current, low price levels of CERs would have led its borrowing clients either to spend too much time on negotiations on this or to approve few CDM project proposals than what would otherwise have been the case. Thus, the Bank has an obligation to react to this concern of its borrowing clients as well as that of its lending clients. In the meantime, chairing the Host Country Committee of the World Bank's Carbon Finance Business (CFB),[19] China is now able to play an even more proactive role in either pushing for the various carbon funds managed by the CFB to pay

[19] A host country of the PCF projects is entitled to be a member of the Host Country Committee if it has signed a memorandum of understanding or a letter of endorsement (or at least a letter of no objection) with the World Bank. Membership of the Host Country Committee has grown from less than 15 in the first year of PCF operations (PCF, 2003) to over 50 now.

a more favourable price[20] or demanding that the offering prices are differentiated according to technology types. Indeed, as shown in Table 4, the offering prices of CERs under the Dutch CERUPT program are differentiated according to technology types, with renewable energy projects in general assigned with a premium price. This will broaden project types that carbon finance renders viable (Indeed, this has increased the number of renewable energy projects in the Dutch CERUPT portfolio to 75%). After all, the transactions of the PCF and other carbon funds managed by the CFB, although they are significant in comparison with the current carbon market, account for only a small portion of the total projected emissions reductions required for Annex I countries to meet their Kyoto targets. Much work remains ahead to stimulate both demand and supply so as to progressively scale up project-based carbon transactions and create the necessary liquidity in the global carbon market.

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[20] A clear reflection is that, at its recent Plenary Conference of the Host Country Committee of the World Bank's Carbon Finance Business in February 2005, Washington, DC, it was decided to set up the Price Committee to pay due attention to the price of VERs.

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