TRANSACTION COST AND OPERATION METHODOLOGY FOR THE CLEAN DEVELOPMENT MECHANISM (CDM)

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Abstract:
The "clean development mechanism" (CDM) is the most important outcome for implementing the Kyoto Protocol. It is expected to help the developed countries meet their obligations of greenhouse gases reduction while at the same time promoting sustainable" development in the developing countries for environmental protection and energy efficiency. This paper identifies two critical economic factors that will determine the effectiveness of CDM. The first is the associated transaction costs that will reduce the attractiveness of the CDM compared to other domestic options for energy investment, The second factor is the methodologies available for reducing the carbon emission and improving energy efficiency. We explain how these two factors affect the exchange of demand and supply through the CDM projects.

INTRODUCTION
Scientists generally agree that the global climate change poses a substantial threat, as many food-producing regions are vulnerable to drought and much of the world's human population is vulnerable to natural disasters involving extreme weather. Moreover the rate of change of temperature will be too fast for many species to adapt or migrate (Grace 2004). The greenhouse gases that are especially important are: carbon dioxide (CO2), methane (CH4) and nitrous oxide (N20), all of which have been rising fast over the last few decades. Carbon dioxide is the main product of fossil fuel burning. and is quantitatively the most important. The fundamental element for the success of the CDM is the participation of a broad cross-section of buyers, ultimately from developed countries, and sellers from developing countries, of CERs (Mendis and Openshaw 2004). The trading process in CDM starts with project formulation, through successful implementation and then certification (Kumbaroglua et al 2004, Brent 2005). Development projects that are eligible for CDM funding require final approval from the host countries where the projects are to be implementeded. The approval requires an evaluation of the positive contribution of the CDM project to sustainable development in the host country. An executive Board (EB) was appointed and this EB is in charge of proposing workable ground rules to promote the CDM. Three broad kinds of projects qualify for the CDM, these are: (1) renewable energy projects that will be alternatives to fossil fuel projects: (2) sequestration projects that offset green house gas emissions; (3) energy efficient projects that will decrease the emissions of green house gas. It is possible to have a combination of these initiatives.

This paper identifies two critical factors that will affect the demand and supply through the CDM, The first is the associated transaction costs that will reduce the attractiveness of the CDM compared to domestic green house gas abatement options. The CDM in particular is likely to entail considerable costs of baseline development, project registration, verification and certification. The second factor is the methodologies available for reducing the carbon emission and energy efficiency. Under the current system of the CDM, the Methodology Panel assesses submitted new methodologies and recommends and submits them to the EB to discuss. The transaction cost may decline over time as more approved baseline and monitoring methodologies become available, Those methodologies will reduce the fixed component for the transaction costs. To guarantee that applied projects ensure emission reductions, the CDM Executive Board (EB) and its Methodology Panel assess the baseline scenario, additionality of the projects, and monitoring plan.

Figure 1 lays out a market-based framework for promoting CDM transactions between private sector project developers and traders and public sector policy makers, with regulators, governed by CDM rules, overseeing the smooth running of the CDM. The remainder of the paper is organized as follows. First we briefly discuss the supply and demand can be coordinated through the market mechanism of CDM, Next we investigate the transaction costs that will reduce the attractiveness of the CDM compared to domestic green house gas abatement options. After that, we discuss the methodologies available for reducing the carbon emission and energy efficiency.

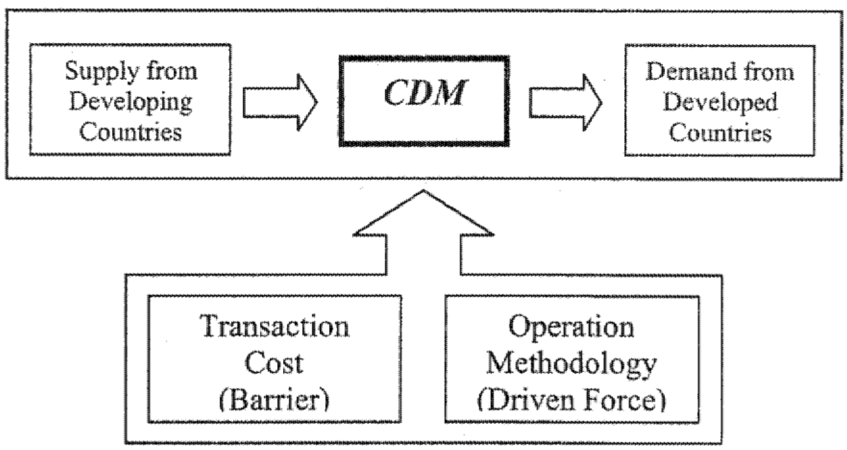

Figure 1. Transaction cost and Operation methodology for CDM supply and demand

SUPPLY AND DEMAND OF CDM

,The clean development mechanism (CDM) is often seen as providing the financial benefits and transfers of cutting-edge green technology that enable developing countries to reduce emissions and achieve their sustainable development goals. Market-based and emissions trading approaches can enable governments to put in place systems to encourage innovation in industry while at the same time providing environmental certainty, credibility and cost-efficiency in meeting reduction targets (PCFPlus 2004).

The last few years have seen the emergence of an entirely new market, one that creates value for greenhouse gas emission reductions. A robust and efficient carbon market can play a significant role in a future global climate regime by helping to minimize costs and mobilize worldwide investments in the low- carbon technologies needed to achieve deep long-term greenhouse gas reductions (Grace 2004). Rather than a single carbon market there is a mosaic of markets that differ in timing. location, relationship to the Protocol and their compliance-based versus voluntary nature. While the underlying commodity may seem the some (e.g. Mega-ton of CO2 equivalent or MtCO2e), the buyers, sellers and carbon prices can be quite different. The estimated potential for the CDM is disaggregated both by geographic region and project type that could affect the demand and supply of CERs from CDM projects.

The CDM demand mostly involves the governments of Annex B countries (as buyers) through the CDM. But there are gaps; for example, only a relatively small percentage of GHG emissions sources in industrialized countries are covered by a trading-based market mechanism linking them to a common international carbon market. Cumulated demand for Kyoto units in 2010, excluding Australia and the United States, is estimated at about 925 Mega-ton of CO2 equivalent (MtCO2e) that ranges between 600 and 1,150 MtCO2e at a price of $11.00 /tCO2e (range +1-50%). While some regional initiatives in the US and Australia are emerging, no US or Australian emissions are currently linked (PCFplus 2004).

To illustrate the results, in Figure 2 we compare the total emission reduction of different countries. Geographical distribution of the amount of emission reduction is expected to be biased to reflect the regional diversity of investment capability on capacity building. While Latin American countries are eager to build institutions necessary for approval of CDM projects, most of the credits will be generated from the Asian countries.

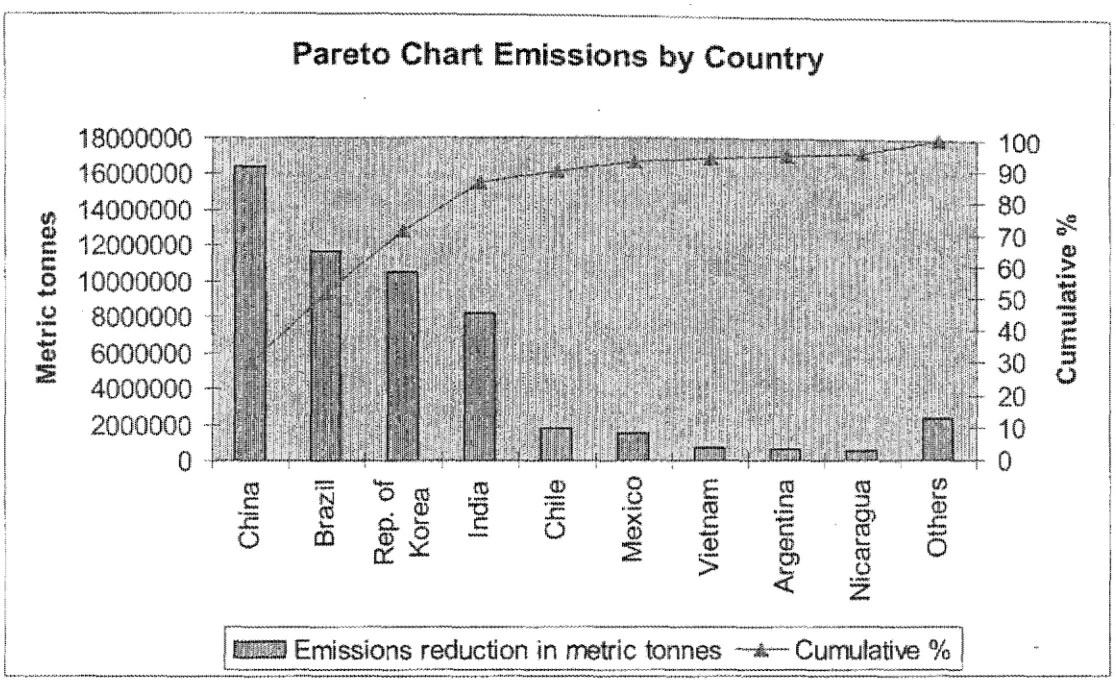

Figure 2. Total emission reduction of different countries

Finally, the market potential for the CDM depends critically upon preferences by buyer governments for CERs and ERUs, proposed regulations that allow only CERs and ERUs to be exchanged for EU allowances, and economic incentives for Russia and the Ukraine to limit the sale of their surplus Kyoto units. China represents 35 to 45% of the estimated total CDM potential in 2010, comparable to the estimated potential of Latin America, Africa and the Middle East combined. Thus the scale of CDM activity in China affects the total supply of CERs (PCFplus 2004).

TRANSACTION COST: THE BARRIER OF CDM

The CDM is a critical first step and is the only Kyoto flexibility mechanism that engages developing countries (Bell and Drexhage 2005). However, CDM pro incur relatively large fixed transaction costs prior to registration (Michaelowaa and Jotzo 2005). The process of implementing the mechanism is fraught with challenges. The absence of the United States in the carbon market has induced the low price of certified emissions reductions through the CDM, while host countries desire to ensure the sustainable development benefits of the CDM is likely to result in a complex approval process, which would further increase transaction costs. The CDM in particular is likely to entail consderable costs of baseline development, project registration, verification and certification. As a result, transaction costs and institutional rigidities will reduce the attractiveness as compared to domestic green house gas abatement options_ The activities implemented jointly pilot phase and the prototype carbon fund program give indications that projects with high implementation costs have high transaction costs as well (Michaelowaa and Jotzo 2005). Moreover, CDM projects have to be approved by host country institutions, and so far only a small share of host countries has been able to set up these institutions. Several of the larger host countries intend to only approve projects if the market price is above a certain threshold. Some governments will also levy fees to finance costs of approval bodies. Therefore, the opportunity of achieving the potential efficiency and effectiveness of project investment is significantly limited.

There has been sustainable development criterion developed by the Designated National Authorities (DNA) of each developing country that hosts the project, as of March 2006, DNAs are established in 72 countries, However, there is no standardized international CDM sustainable development criterion and few guidelines available on project design and the methodology for assessment. A common practice is to use an evaluation process, such as weighted values, that reflect economic, environmental, and social priorities. Many developed countries and international organizations provided assistance that ranges from training, project finding to development of Project Design Document (Kummbaroglua et 2004), Because CDM projects incur relatively large fixed transaction costs prior to registration, the economics of scale set threshold for projects to be financially viable. Analytical studies sugget a minimum project size of 50 000 tCO2e per year. Data from existing and identified projects suggest that the minimum size is about 100 000 tCO2e per year. The average size of existing and identified projects is over 150 000 tCO2e per year. The minimum size of an economically viable project may decline over time as more approved baseline and monitoring methodologies become available. Those methodologies will reduce the fixed component for the transaction costs. However, the minimum size is likely to remain above 50 000 tCO2e per year for regular CDM projects (PCFPlus 2004).

The transaction costs for CDM is estimated in Table 1. For a small project, the transaction costs tend to be prohibitively higher than the large project (Michaelowaa and Jotzo 2005).

Table1: Project size, types and total transaction costs

Size	Type	Reduction (tCO2/year)	Transaction cost (Euro/tCO2)
Very Large	Large hydro, gas power plants, large CHP, geothermal, landfill/pipeline methane capture, cement plant efficiency, large-scale afforestation	>200,000	0.1
Large	Wind power, solar thermal, energy efficiency in large industry	20,000-200,000	1
Small	Boiler conversion, DSM, small hydro	2000-20,000	1
Mini	Energy efficiency in housing and SME, mini hydro	200-2000	100
Micro	PV	<200	1000

Other challenges also arise from high transaction cost inherent to CDM. For example, evaluating project- based reductions requires assigning a baseline for the emissions that would occur in the absence of the project; that counterfactual cannot be measured, and considerable uncertainty surrounds it (Fischer 2004). Next, access to information will likely be asymmetric: the third-party monitor that will certify emissions reductions will know less about the project fundamentals than the investing and recipient parties, Asymmetry in access to information is a potentially serious problem for calculating CERs. Because participation in CDM projects is voluntary, certain baseline allocation methods run the risk of selection bias—attracting participants who would be predisposed to making such investments and having low emissions anyway. In addition, the certifying agent is limited in its ability to design a contract that would elicit truthful information from CDM participants regarding their investment intentions. Finally, the certification authority can only set the amount of abatement credits, while market forces determine the value of emissions reductions. This adds significant uncertainty to the CDM projects.

The combination of those factors means that rules for determining baseline emissions—the benchmark against which actual emissions will be measured and reductions will be certified—may be systematically biased. The costs of poor baseline determination range from under-allocation, which means forgoing some worthy projects, to over-allocation, which expands the global emissions cap and may encourage some unjustified investments.

OPERATION METHODOLOGY: THE DRIVEN FORCE OF CDM

CDM is governed by the CDM Executive Board (CDM-EB). In addition there was also established the Methodology, Small Scale CDM and Accreditation Panels. The Panels, with their technical capability, drafted a report regarding development of emission reduction estimation methodology to the CDM-EB for their consideration. Under the current system of the CDM, the Methodology Panel assesses submitted new methodologies and recommends and submits them to the EB to discuss. The CDM-EB of United Nation had approved 23 methodologies, out of 89 proposals, by March 2006. Also, two consolidated methodologies were approved for landfill methane recovery and renewable power generation connected to an existing power grid. Among the 23 approved methodologies, 4 address energy efficiency. 2 address industrial gases, 5 renewable energy and 9 fugitive methane emissions. Of 74 projects available for public comments in the validation process, 46 concern renewable electricity generation, 24 fugitive methane emissions and only 2 energy efficiency. The detailed information of approved CDM methodologies can be found in (UNFCCC 2006).

Table 2. The six leading methodologies in CDM projects

Methodology (% of total reduction)	*Description*
AM-1 (45%)	Incineration of HFC 23 Waste Streams
AM-21 (28%)	Baseline Methodology for decomposition of N2O from existing adipic acid production plants
ACM-1 (6%)	Consolidated methodology for landfill gas project activities
ACM-2 (3.8%)	Consolidated methodology for grid-connected electricity generation from renewable sources
AM-3 (3.7%)	Simplified financial analysis for landfill gas capture projects
AMS-ID (3%)	Grid connected renewable electricity generation

Although, the CDM has emerged as an entirely new market to create value for greenhouse gas emission reductions, in the longer term, the CDM is somewhat constrained by its project-based framework, In the future, a broader scope of complementary approaches is needed for the carbon market to be effective in influencing large-scale capital infrastructure investments in developing countries over the next 20 years. The effectiveness of the carbon market in mobilizing investments in long-lived capital stock also depends on polices that ensure long-term value for emission reductions.

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