

Carbon Markets

From draft of Chapter 10, Energy, Economics and the Environment (3d. ed. 2010) (Prof. Joel Eisen)

a. IMPLEMENTING KYOTO: CASE STUDY OF THE CDM

The Kyoto Protocol established three “flexibility mechanisms” for Annex B Parties to help them lower the overall costs of achieving their emissions targets:

- (1) *Joint Implementation* (Article 6): Annex B countries can undertake emissions reduction projects in other Annex B countries and receive a share of the emissions reductions (known as “Emissions Reduction Units” in Kyoto-speak) generated by the projects.
- (2) *Clean Development Mechanism* (CDM) (Article 12): Annex B countries undertake projects to reduce emissions or sequester carbon in developing countries without targets (non-Annex B), and claim credit for emissions reductions the projects achieve (in CDM parlance, “Certified Emission Reductions”). Under Article 12, the CDM has two objectives – achieving cost-effective emission reductions and achieving sustainable development in the host countries. Because the developing country has no limit on GHGs that they may emit under the Kyoto Protocol, this is not an emissions trading scheme.
- (3) *Emissions trading* (Article 17): Emissions trading allows countries that have excess emissions reduction units to sell them to countries that are over their emissions targets. This is not a typical cap-and-trade scheme, but instead a kick-start to a robust market of tradeable allowances and carbon credits generated by JI and CDM. See the discussion of emissions trading and the European Union’s Emission Trading Scheme, below.

In theory, an Annex B nation will use these mechanisms if they make it easier and cheaper to meet its GHG reduction target. At the same time, a CDM project could help a developing country host to benefit from new investment that increases economic productivity and may reduce local environmental problems. See Sophie Smyth, *The Prototype Carbon Fund: A New Departure in International Trusts and Securities Law, Sustainable Dev’t L. & Pol’y*, Spring 2005, at 28. The CDM overlaps with the European Union’s emissions trading scheme (discussed below). CO₂ emissions reduction projects undertaken outside the EU pursuant to JI and CDM may qualify for allowances that can be bought and sold within the ETS. However, one early report noted that over 800 CDM projects would be necessary to meet European reductions targets. Pew Center on Global Climate Change, *The European Union Emission Trading Scheme: Insights and Opportunities* (2005), <http://www.pewclimate.org>.

The Kyoto Protocol provided almost no guidance on what exactly the CDM would do or how it would operate. The 7th COP in Marrakech in 2001 agreed to final rules for the CDM, with the exception of rules on carbon sinks, which were completed at the 9th COP in 2003. Some details about CDM project approval were delegated to the newly formed CDM Executive Board

("CDM EB"). <http://unfccc.int>. Three bodies oversee the CDM: the representatives of the COP, the CDM EB, and independent auditors who verify project activities.

Since its inception, the CDM has become a multi-billion-dollar program, but it is not without its critics. Under the CDM's rules, project proponents provide the information used to assess what benefits the project will provide and thus how many CERs it will generate. As Professor Michael Wara notes in his study of CDM projects to date, this provides ample opportunities for project proponents and environmental regulators to "game" the CDM system by strategically exaggerating a project's potential to generate CERs.

Michael Wara
Measuring the Clean Development Mechanism's Performance and Potential
55 UCLA L. Rev. 1759 (2008)

The CDM is a project-based system. It accomplishes its objectives at the microlevel of individual emission reduction projects that are each validated by designated third party verifiers and then registered by the mechanism's governing body, the CDM Executive Board (CDM EB), as eligible for crediting. Each project wishing to participate in the CDM must prepare a Project Design Document (PDD) that explains in detail how its future emissions reductions will be voluntary, real, additional, and will not induce leakage. It must also either utilize a previously approved monitoring methodology that explains in detail how it will monitor emissions reductions made by the project or propose a new methodology. Voluntary emissions reductions are not compelled by national or provincial law or regulation. Real emissions reductions are monitored with sufficient care to ensure that they actually occur. Additional emissions reductions are those that are in addition to any that would have occurred absent the CDM subsidy. Leakage of emissions occurs when emissions reductions that would have occurred from a CDM project absent the CDM subsidy are displaced to another location because of the subsidy.

All four of these concepts require that a hypothetical baseline of emissions be defined for each project, and in the case of leakage, the world outside the project. This baseline represents the timeline of emissions that would have occurred absent the subsidy provided by the CDM (and thus absent the emission reduction project). It is an attempt to estimate the counterfactual of typical levels of emissions in a world without CDM. Several common variables can be seen in most PDDs. Project proponents often describe the regulatory baseline, that is, the emissions permitted by local law and regulation. They also often describe the financial baseline, which is the lack of an adequate return on investment without the benefit of the CDM subsidy. They often describe typical technologies applied by the type of project in the PDD and how the CDM-subsidized project exceeds these local standards. Finally, they sometimes must describe a sectoral or national baseline for installations of the project type. Ultimately, the CDM

project proponents must quantify, third party verifiers must check, and the CDM EB must certify the hypothetical emissions that would have occurred in the future without the CDM project subsidy.

The end product of the CDM process is the issuance by the CDM EB of an emission offset to the project participants. This offset can then be sold to an Annex B nation or a party within one that has obligations under the Protocol. The offset, called a certified emission reduction or CER may be used by Annex B countries in lieu of emissions reductions within their territories in order to meet their targets under the Protocol. Private parties that are assigned emissions allowances by their governments may also purchase CERs and use them as permits to emit in excess of their assigned allocations, or as an alternative to purchasing allocations from other participants in their domestic market. The European Union and Japan will likely be the major purchasers of CERs during the first commitment period.

The project must also receive approval from its host country's Designated National Authority (DNA), typically the host country's environmental ministry, before being submitted for registration to the CDM EB. Once registered, a project must submit monitoring reports providing data to show how many CERs have actually been generated during a particular period. These reports must be both consistent with the monitoring plan spelled out in the project's PDD and verified and certified by a DOE. At that point, the CDM EB will issue CERs into a project participant's account.

The CDM project pipeline began operation in December of 2003, when the first project was accepted for public comment and validation. Beginning in the second half of 2005, the registration process picked up significant steam so that by the end of 2007, there were 895 projects registered and able to produce CERs for sale in the carbon market.

By January 1, 2008, more than 1150 million tons (Mt) CO₂ equivalent had been registered for delivery via the CDM by the end of the first compliance period. A small number of very large projects dominate the supply of CERs from registered projects. The 45 largest projects (5 percent of the total number) represent 64 percent of the total supply to the end of the First Commitment Period.

The original intent of the CDM was to spur development of low-carbon energy infrastructure in the developing world both through achievement of sustainable development goals and substitution for early retirement of expensive, high-carbon energy infrastructure in the developed world. It comes as a surprise, then, to find then that the CDM pipeline bears only a partial relationship to this vision. The very large projects dominating the supply of CERs are confined primarily to two relatively obscure industries - adipic acid and chlorodifluoromethane (HCFC-22) production. Adipic acid is the feedstock for the production of nylon-66 and releases

abundant N₂O as a production byproduct. HCFC-22 is one of two major refrigerants that was phased in to replace the CFC's under the auspices of the Montreal Protocol to Protect on Substances that Deplete the Ozone Layer. HCFC-22 is also the primary feedstock in the production of PTFE, more commonly known by its Dupont brand name, Teflon. These two relatively small industries represent nearly 55 percent of the supply of issued CERs in the CDM to date.

HFC-23 is an extremely potent and long-lived greenhouse gas. 1 ton of HFC-23 abated is considered equivalent to 11700 tons of CO₂. In the developing world, prior to CDM, HCFC-22 manufacturers vented all HFC-23 produced to the atmosphere. Essentially all developing world HCFC-22 production, as of 2005, is currently participating in the CDM. This is a remarkable achievement for the CDM and begs the question of how a financial mechanism was able to achieve near total market penetration in an industry so quickly. An examination of the economics of HCFC-22 abatement and HFC-23 capture explains that the reasons may have as much to do with the perverse incentives created by the carbon market as with an ability to identify low cost emissions reduction opportunities. A developing world producer of HCFC-22 can earn more than twice as much from its CDM subsidy as it can gross from the sale of its primary product.

Recall that a key requirement of CERs is that they be "additional to any that would have occurred in the absence of the project activity." The economics of HFC-23 projects are a reductio ad absurdum of this requirement. It is quite likely that no capture of HFC-23 would occur without the CDM. On the other hand, with the CDM, HCFC-22 factories have very strong incentives to create extra HFC-23 specifically to capture and destroy it. To deal with the perverse incentives to overproduce HCFC-22 in order to capture and destroy HFC-23, the CDM EB decided to approve only those projects involving previously existing HCFC-22 production capacity. New plants or added capacity are not currently allowed into the CDM. Even with these relatively restrictive rules on eligibility, there is circumstantial evidence and very good reason to suspect that HCFC-22 manufacturers participating in the CDM have behaved strategically to direct a greater share of the subsidy to themselves by artificially inflating their base-year production. At least some of the HCFC-22 plants participating in the CDM appear to have ramped up production during the baseline period (2000-2004) far beyond expected growth in the sector (15 percent per annum).

To abate all developing-world HFC-23 emissions would cost approximately \$ 31 million per year. Instead, by means of a CDM subsidy, the Annex B nations will likely pay between <euro>250 and <euro>750 million to abate 2005 non-Annex B HFC-23 emissions. This is a remarkably inefficient path to an environmental goal. Also, recent press reports indicate incredibly high rates of growth in the HCFC-22 market, including the construction of new plants.

Until these plants are included in the CDM or some other climate regime, they will emit their HFC-23 byproducts into the atmosphere.

The most recent development in the CDM is the entry of important components of the Chinese electricity sector into the market, with the entry of significant numbers of large hydro and natural-gas-fired power projects into the project pipeline. These projects present extremely challenging regulatory decisions to the CDM EB because it must decide which projects would or would not have gone forward without the carbon finance funds. Answering the question of whether projects are additional or would have happened anyway is made particularly difficult by two factors: The energy sector in China is heavily regulated and primarily owned by the Government or state-owned entities, and participation rates by several elements of the sector is near 100 percent.

One currently available alternative to the large coal-fired generating station that is superior from a GHG emissions perspective is large power plants that utilize combined cycle gas turbines (CCGT) technology. These plants are superior from a climate perspective because they produce substantially less CO₂ per MW hour (MWh) of electricity than typical coal-fired power plants. In addition, CCGTs emit substantially lower quantities of particulate matter, soot, sulfur oxides, and nitrogen oxides per unit of power produced than do coal-fired power plants, because the fuel they burn is cleaner and combustion is more complete. This cleaner emission makes them extremely appealing for new baseload generation to developing countries that have severe local air pollution concerns. Even with these environmental advantages, natural-gas-fired power has struggled to gain a foothold in developing countries because of the different underlying prices of coal and natural gas. Overall, the higher fuel costs of gas swamp the higher capital costs of coal. This outcome is especially true in China where coal's capital costs are relatively lower, and CCGT's relatively higher, than global averages.

In China, these contrasting environmental and economic dynamics have played out via substantial state control of the power sector in ways that have encouraged construction of new CCGT power plants, and at the same time have created substantial uncertainties for their operation. China plans to build twenty-three CCGT power plants between 2005 and 2009, with a combined nameplate capacity of more than 18 GW. Construction of a CCGT instead of a coal-fired power plant arguably represents a reduction of GHG emissions. As described in the previous section, the economics in China do not favor the decision to build a CCGT rather than a subcritical coal power plant. Nevertheless, this choice would have clear climate benefits. If such a decision could be influenced by the potential supply of funds from the sale of carbon credits, equal to the difference in GHG emissions between the alternatives, crediting as a CDM project would be possible. Such thinking led to the submission and approval of just such a CDM

methodology in mid-2006, called the Baseline Methodology for Grid Connected Electricity Plants Using Natural Gas (AM0029).

By the end of 2007, twenty-four CCGT projects, representing essentially all power plants actually being built (as opposed to planned) in China between 2005 and 2010, had applied under the methodology to claim credit for the difference between their emissions and the baseline established by AM0029. All plants built or under construction since 2005 are arguing that they would not have been built but for the CDM. In its review of these projects, it is not at all clear that the CDM EB will be able to address the fact that, taken together, current applications for crediting under the CDM of natural-gas-fired power in China imply that no CCGT builds would occur in the absence of carbon finance. Because review is on a project-by-project basis and is limited to determination that the project documents are in compliance with the AM0029 methodology, this is likely beyond the scope of review. The AM0029 methodology determines a project's additionality by reference to a financial calculation comparing the costs of CCGT to alternative options, and by an analysis of whether the project is common practice. Thus, the review of CCGT projects is likely to find them to be additional to what otherwise would have occurred, not because this is in fact the case, but rather because the review is constrained by the procedures of the CDM from asking the right questions about the projects.

The AM0029 methodology and near 100 percent participation of CCGT power plants in China together have placed the CDM EB in an untenable position. On one hand, natural-gas-fired power is a climate friendly alternative to coal, whose development should be encouraged and fostered by the climate regime. Further, a program to encourage developing-country participation in the global climate change regime would strive to achieve 100 percent participation rates within developing country electricity sectors. On the other hand, it appears that the CDM, because it functions at a project rather than a sectoral level, is likely giving credit for activities that would have occurred without it. These "anyway" credits are especially important given that the CDM credit, "anyway" or not, can be sold to Annex B parties in order to reduce the extent to which they cut their own emissions.

The parties to both the Kyoto Protocol and the UNFCCC are now considering what to do to accomplish the goal of the UNFCCC after the first compliance period ends in 2012. Thus, consideration of how to improve the performance of the CDM is critical from both a domestic and an international perspective. The CDM is leading to widespread strategic behavior. In the case of the HFC-23 projects, the incentives created by the CDM are leading to undesirable behavior in the name of claiming credit. In the case of the CCGT projects, the incentives created by the CDM are likely leading to no change in behavior except for widespread claims for credits. The rules of the game in the CDM systematically create incentives for project proponents to manipulate the transfer of information to the CDM EB while providing it with essentially no

other information-gathering resources. Unlike in a natural market, buyers of CDM credits have no incentive to disclose information they have regarding projects. Their incentive, just like the generators of credits, is to facilitate the approval of projects and the issuance of credits. This informational problem is particularly acute because the CDM EB is called upon to make decisions requiring technical expertise across a wide array of both countries and industries.

The CDM set three goals: to produce sustainable development, to help developing countries accomplish the objective of the UNFCCC, and to reduce the costs of compliance for parties with quantitative targets. The evidence presented above points to the possibility that the CDM is accomplishing these goals, but only to a limited extent. Under the current regime, the third party verifiers charged with validating project applications face unavoidable conflicts of interest when it comes to substantive review of project proponents' claims. These DOEs are currently paid by the project proponents and face a competitive business environment. One potential reform measure might be to include the costs of third-party verification in CDM project application fees. Standardized accounting procedures might also be specified in order to limit the extent to which creative accounting is used to argue that projects would not have gone forward without the sale of carbon credits. Incremental reforms would likely reduce the extent to which project proponents can game the system, increase the incentives that DOEs have for monitoring strategic behavior, and help to simplify the extremely difficult regulatory choices with which the CDM EB is often faced. These procedures might, to a great extent, help to deal with the HFC-23 case.

Nevertheless, they do not resolve the issue of how to separate additional from nonadditional projects in regulated and state-owned industries like the Chinese energy sector. Ultimately, this issue looms larger than any other because of the emissions associated with the explosive growth in the Chinese and Indian economies. Fully addressing it will likely require transforming the CDM into a system that can deal directly with the actors that matter most in these industries - the government policy makers that set energy development priorities. Simply eliminating the CDM without replacing it with an alternative method for engaging developing countries is unwise. It would leave many low-cost reduction opportunities on the table, increase costs for developed-nation emitters in the short term, and both delay and increase the cost of eventual acceptance of caps by developing countries.

There is an alternative. The international community has significant experience in compensating developing countries for the reduction of dangerous atmospheric emissions in another context. The Multilateral Fund of the Montreal Protocol has been very successful at accomplishing the phase out of the most harmful ozone depleting substances (ODSs). This fund has operated on the principle that developed nations should pay any additional costs incurred by developing countries in transitioning away from ODSs to new, ozone-friendly chemicals.

Under a future climate change protocol, this model could be adopted for the purposes of engaging developing-country sectors that are state-controlled or particularly subject to gaming while still allowing for use of the CDM in some sectors. Alternatively, a climate fund could completely supplant the CDM as the major tool for engagement with developing countries.

A climate fund might have numerous advantages over the CDM. Agreed incremental costs or a reverse auction could generate a marginal cost-abatement curve for applicants to the fund. The climate fund could then invest in projects with the lowest marginal abatement cost until its resources were exhausted. Price setting via a reverse auction would encourage low-cost reduction opportunities to surface without having to pay them substantially more than the costs of abatement, as occurs in the current system. Inframarginal rents would thus be reduced. Another advantage of this approach is that state-managed sectors, like electric power in China, may be more effectively addressed by direct discussions with governments about priorities and costs rather than through the distorting filter of State Owned Entities. Further, low-cost emissions reduction opportunities such as building standards and avoiding deforestation, which require state intervention and regulation, can be accessed. Finally, transaction costs of emissions reductions would likely be reduced because project proponents would not have to prove that their project would not have gone forward without the sale of carbon credits.

Perhaps the biggest advantage of this type of fund would be that it reduces the incentives of firms and governments to misrepresent their business-as-usual emissions and costs to the regulator. Under the current system, the more a project proponent can inflate its baseline, the more money there is to be made. In a context in which emission reduction projects are competing for a limited pool of emissions reduction funds and where the odds of receiving payment for an activity increase as the costs of marginal abatement fall, sellers of credits have an incentive to report the lowest costs for emissions reductions that they can reasonably deliver.

NOTES AND COMMENTS

1. Professor Wara observes that because we “do not live in a world without the CDM,” it is perhaps inevitable that it would be subject to manipulative behavior. As he points out, “The fact that most industries involved in CDM projects are already highly regulated makes this strategy attractive and easy to implement. An environmental regulator faced with the choice of preventing an emission with a costly domestic regulation or by means of the CDM will have obvious political incentives for selecting the international program over new domestic regulation.” *Id.*

Do you think his proposed alternative – a “climate fund” – would reduce the strategic behavior associated with the CDM? If so, how?

2. For more on the challenges of measuring additionality, see Steven Ferrey, When 1 + 1 No Longer Equals 2: The New Math of Legal "Additionality" Controlling World and U.S. Global Warming Regulation, 10 Minn. J.L. Sci. & Tech. 591 (2009).

3. Carbon trading is big business. The Chicago Climate Exchange (CCX) operates an emissions trading system for all six GHGs, including trading of CERs since 2003. In 2005, the European Climate Exchange opened for business, and is now the leading exchange operating in the EU-ETS. The Montreal Climate Exchange started in 2008 and the Tianjin Climate Exchange in China began its efforts. The value of worldwide trading in carbon allowances increased 84% in 2008 to \$118 billion, and was predicted to reach as much as \$150 billion in 2009. What is Carbon Credit Trading?, <http://www.climateavenue.com>. Some 4 billion tons worth of credits were traded in 2008, a 42% increase over 2007, with most of these being allowances for use in the European trading scheme (discussed below). In 2008, national trading registries were linked to an international transaction log administered by the UNFCCC, allowing for improved trading of CERs for the CDM. CERs made up 13% of the carbon market in 2008, up from 8% the year before. According to one industry report, there was still work to be done to improve the market: “Limited UNFCCC capacity for processing verification requests delays the entry of projects to the CER market.” New Carbon Finance, Global Carbon Quarterly Q3 2009, Sept. 2009, <http://carbon.newenergyfinance.com/>.

From Fred Bosselman, Swamp Swaps, the Second Nature of Wetlands, 39 Env'tl L 577, 640-644 (2009)

To what extent are the recent market difficulties likely to weigh on the various markets for “swamp swaps” discussed in this article. Probably the closest existing American analogy to the kind of markets that might benefit wetlands is the so-called “voluntary carbon offset market” in which American companies can participate. Companies use this market to be able to say that they have offset their emissions of greenhouse gases and are therefore “carbon neutral.”

In 2007, members of Congress asked the General Accountability Office to describe the scope and analyze the credibility of the voluntary carbon offset market. It produced report in

August, 2008. The GAO found that over 600 organizations are developing, marketing or selling carbon offsets in the United States in a market with no significant government oversight:

Project developers implement individual projects and may sell offsets directly to consumers or to intermediaries. Intermediaries are further subdivided into retailers, aggregators, and brokers, among other categories. Retailers generally sell smaller quantities of offsets to individuals or organizations. Aggregators, also known as wholesalers, sell in bulk and often own a portfolio of offsets. Brokers facilitate transactions between sellers and buyers.

Consumers motivated by corporate responsibility or public relations may purchase offsets to compensate for emissions that result from a variety of activities including flying, driving, and purchasing consumer products. The GAO found that about half of the offsets came from projects that claimed to capture and destroy methane from coal mines, agricultural operations, or landfills – projects that were likely to be profitable without the offsets. An additional 19 percent was produced from projects that said they capture emissions from industrial and energy-related emissions sources and then store these emissions in geologic formations. Another 17 percent was produced from biological sequestration projects, including agricultural soil projects such as no-till farming and forestry projects.

The GAO purchased offsets anonymously from 33 retail providers. Few retailers identified specific projects associated with the transaction. Only 2 explained how their project met the test of “additionality.” The GAO found that general information provided on web sites “could not be linked to particular transactions. As a result, we found it difficult, in many cases, to determine exactly what we had purchased, and consumers in the offset market may face similar challenges.”

David Greising, the chief business correspondent for the Chicago Tribune, says that voluntary credits “exist in an unregulated and sometimes opaque netherworld, where the demands of ‘greenwashing’ and public relations can trump the need to protect the atmosphere and mitigate global warming.” Jeffrey Ball, writing in the Wall Street Journal, found many questionable examples of landfills getting credits for profitable things they were doing anyway. He reported that the “Federal Trade Commission also is examining whether the marketing is deceptive -- in particular, whether credits really represent emission cuts that wouldn't

otherwise have happened. With a tangible product, say, an apple, a buyer can easily judge a seller's claims that it's 'crisp and juicy and red,' says James Kohm, associate director of the FTC's enforcement division. Intangible products, such as pollution credits, 'have a greater potential for deception'." Offsets for no-till farming are frequently permitted although recent research suggests that this farming method does not necessarily increase carbon storage.

A recent study of both regulated and unregulated carbon markets noted that most markets "require third-part auditors to verify the emissions reductions. Yet auditors are chosen and paid by a project's developer. There is thus pressure on the auditors to approve projects in order to preserve their business relationships with the project developers. This compromises the auditors' independence and neutrality." The study found that no voluntary market had "specific procedures in place to review the approved auditors nor to allow for sanctions against or the discrediting of an underperforming auditor."

Much of the public has become more amused than impressed by the claims of carbon neutrality. But it is traders and dealers who continue to push market-based regulatory systems. The prospect of stacking credits for different benefits is particularly mouth watering. And energy traders are concerned that new regulations of derivatives may hamper the creation of securities based on carbon-related derivatives.

Integrity vs. innovation. Markets undeniably perform important functions. By providing liquidity they encourage investment. By offering a theoretically unlimited up-side they encourage creative risk-taking. By encouraging competition they discourage satisfaction with the status quo. But they perform these functions only as long as they are perceived as institutions with integrity.

It is possible to imagine systems of regulating markets for wetland functions that would provide a reasonable degree of confidence in the integrity of the process. But could this be done without limiting projects to a few well-accepted types for which demonstration of integrity was economically feasible? Such a limitation might be acceptable in a field that has been thoroughly studied over a long time, but wetlands research is at an early stage, and more applied research is needed.

The United States Congress actually recognized the need for this type of applied research, but hardly anyone seems to have noticed. Section 712 of the Environmental Innovation and Security Act of 2007 directs the Secretary of the Interior to develop a land use and management strategy that can be used to increase the sequestration capabilities of carbon dioxide, methane and nitrous oxide of any ecosystem; or to reduce the emissions of such gases from any ecosystem.

Under section 712, the Secretary is (1) to determine the processes that control the flux of greenhouse gases in and out of each ecosystem; (2) to estimate the potential for increasing carbon sequestration in natural and managed ecosystems through management activities or restoration activities in each ecosystem; (3) to develop near-term and long-term strategies to enhance the sequestration of carbon and reduce emissions of greenhouse gases from ecosystems; and (4) to estimate the annual carbon sequestration capacity of ecosystems under a range of management policies.

No funds were appropriated to carry out this work, nor have I found any subsequent reference to it. But someone obviously has thought enough about these issues to have recognized that the interplay of various greenhouse gases in systems such as wetlands deserves further study. Whether the current state of the science would allow the Secretary to reach such an assessment is a question that I cannot answer.