

## **Chapter 7**

# **IMPLEMENTING KYOTO THROUGH THE CARBON MARKETS**

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## **I. INTRODUCTION**

Central to the strategy underlying the Kyoto Protocol was the hope that a cap-and-trade system would catalyze a global carbon market that, in turn, would marshal substantial resources toward the reduction of greenhouse gas emissions at lower overall costs. The Kyoto Protocol's flexibility mechanisms, described in Chapter 5, were designed to create the institutions, principles and incentives that would form the basis of a global carbon market.

In some respects, the nature of climate change is ideal for establishing global trading markets in pollution; the reduction of one ton of carbon dioxide emissions anywhere in the world mitigates climate change as much as any other ton of reduction. In addition, disparities in regulatory systems also make carbon dioxide emissions trading potentially very cost effective. For example, most Western European countries have already implemented significant pollution control regimes and consequently further cuts in emissions in these countries will be relatively more expensive than in many developing countries where few if any pollution control

requirements currently exist. Although such investments in developing countries take advantage of cost-efficiencies, some observers question whether such emissions trading unfairly allow developed countries to avoid the politically difficult task of reducing emissions at home. As a result, many of the most difficult negotiations before and after Kyoto involved the parameters by which France or Germany, for example, would be allowed to meet their emissions limitations by investing in reforestation projects in Costa Rica or pollution control technology that reduces emissions in India or China.

By some measures at least, the Kyoto Protocol's embrace of carbon markets has been a success. Policymakers, polluters, investors and many environmentalists broadly support the development of a carbon market, and markets now exist in a growing number of jurisdictions. Today, active and vibrant carbon trading is happening around the world. Carbon trading increased ten-fold from about \$10.8 billion and 710 MtCO<sub>2</sub>e in 2005 to \$176 billion and 10.3 billion tCO<sub>2</sub>e in 2011. The European Emissions Trading System (ETS) is by far the largest market, with 7.9 billion tCO<sub>2</sub>e, valued at \$148 billion, traded in 2011. But the United States also has a functioning carbon market with the Regional Greenhouse Gas Initiative that was established by nine New England states, and in 2012 California launched its new state-wide carbon market. These U.S. subnational carbon markets are discussed further in Chapter 18. Carbon markets also already exist at the national or subnational level in Australia, Japan and New Zealand, and are being planned in Canada, China, South Korea and Switzerland.

Carbon markets are not without their critics, however, and the experience in Europe and elsewhere has left many questions unanswered. Market prices for carbon have fluctuated dramatically as uncertainties continue over the relative likelihood and strength of emissions caps globally and in the largest economies. Carbon markets are creatures of regulation and they rise and fall with changing perceptions over how tight emissions caps will be. Given the difficulties in the United States to develop a national cap-and-trade system and the weak result of the post-Kyoto negotiations, the price of carbon reductions in Europe and elsewhere has been much lower than what most observers believe is necessary for the market to contribute significantly to reducing emissions. This partly explains the continued skepticism among environmentalists about whether the emphasis on developing a carbon market will ever lead to meaningful reductions in emissions. Difficulties in enforcing the environmental integrity of the carbon market also lead to questions about how central the market should be to a future global climate regime, particularly if countries can participate without a cap on their own emissions or in sectors like forests or agriculture where significant uncertainty still exists in measuring the carbon impacts of various management practices.

The ultimate centrality of carbon markets to a future global climate regime is still not certain, but it does seem clear that carbon markets will be adopted frequently at the regional, national, and subnational level. This chapter is meant to provide an understanding of the way carbon markets work and their strengths and weaknesses as a policy framework for mitigating climate change. The rest of this section reviews the general case for emissions trading and associated design issues. Section II addresses the implementation challenges posed by the flexibility mechanisms under the Kyoto Protocol, with a particular focus on the Clean Development Mechanism. Section III presents the European ETS as a primary case study in understanding the opportunities and challenges in implementing a broad carbon market. Section IV introduces

some of the possibilities for future global carbon markets.

## **A. Economic Basis for Emissions Trading**

As described in more detail in Chapter 2, Section II.B.2, the underlying economic rationale for emissions trading is relatively straightforward. In contrast to command-and-control regulation, where a regulatory authority requires the use of specific technology (e.g., best available technology) or limits emissions of identified pollutants to specific amounts for a specific facility or class of facilities, emissions trading allows polluters greater flexibility. As long as total emissions or emissions reductions meet regulatory standards, facilities may either: (1) reduce emissions from any combination of sources within the plant or (2) acquire emissions reductions from another facility. The first approach allows companies to create “bubbles” in which the entire facility, regardless of the number of pollution sources, is considered a single pollution source. The facility is essentially trading emissions among its various pollution sources. The Kyoto Protocol has adopted the first approach at a country level. It allows Parties to aggregate their emissions. So long as those Parties reduce their combined emissions by the required amount, it does not matter in which country the emissions reductions take place.

The second approach to emissions trading takes two main forms, allowance-based trading and project-based trading. Under *allowance-based trading*, better known as cap-and-trade, polluters buy or receive free of charge, pollution allowances from a regulatory body. Regulators establish an overall pollution limit — a cap. Polluters may meet their cap by reducing their emissions or by buying allowances from other polluters who have allowances exceeding their emissions cap. These emissions trading programs are called “cap-and-trade” programs. The European Trading Scheme is an example of a cap-and-trade program. *Project-based programs* allow a buyer, typically a polluter, to purchase allowances from a project that can verify emissions reductions of the regulated pollutant compared to emissions in the absence of that project. Kyoto Protocol’s Clean Development mechanism, described in Section IV below, is an example of a project-based program.

The virtue of these emissions trading programs, according to its proponents, is that the reductions are made in the most cost-effective way because polluters will decide whether it is cheaper to reduce their own emissions or purchase allowances. Moreover, the market, not a person or agency, sets the price through competition among buyers and sellers, thereby reducing administrative costs of emissions reductions. Over time, these economic arguments for emissions trading have prevailed over moral arguments that emissions trading creates a right to pollute or allows polluters to buy their way out of making their own emissions reductions.

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## **B. Designing Appropriate Emissions Trading Programs**

As will be discussed later in this chapter, the future of carbon markets may include a variety of multilateral, national or subnational emissions trading programs. Each of the programs will face similar design issues—for example, how to allocate allowances or what categories of emissions are inside the trading system. The following excerpt highlights some of the fundamental decision issues for emissions trading programs.

## DENNY ELLERMAN, PAUL L. JOSKOW, AND DAVID HARRISON, EMISSIONS TRADING IN THE U.S.: EXPERIENCE, LESSONS, AND CONSIDERATIONS FOR GREENHOUSE GASES

5–6 (2003)

*Allocation of initial allowances.* This issue is only relevant in cap-and-trade programs. Some method is required to distribute the initial allowances. Basic methods include various formulas to distribute initial allowances to participants on the basis of historical information (“**grandfathering**”) or on the basis of updated information (“**updating**”) as well as auctioning of the initial allowances.

*Geographic or temporal flexibility or restrictions.* This includes the possibility of restricting trades among different parts of the geographic range of the program. It also includes the possibility of **banking** (i.e., reducing emissions more than required in a given year and “banking” the surplus for future internal use or sale) or **borrowing** (i.e., reducing less than required in a given year and thus “borrowing,” with the borrowed amount made up by reducing more than required in subsequent years).

*Emission sources that are required or allowed to participate.* This includes specification of the universe of sources that must participate in the trading program. It also includes the possibility of allowing additional sources to **opt-in** to the program.

*Institutions established to facilitate trading.* This includes the possibility of encouraging third parties (e.g., brokers) to participate in trading as well as the possibility of setting up an ongoing auction or other institutions to increase liquidity and establish market prices.

*Implementation Issues.* A number of decisions come into play as the program is implemented.

*Certification of permits.* This decision applies to reduction credit programs, which require that emission reductions be certified before they can be traded.

*Monitoring and reporting of emissions.* Methods must be designed to monitor and report emissions from each participating source.

*Determining compliance and enforcing the trading program.* These decisions relate to the means of determining whether sources are in compliance and enforcing the program if sources are out of compliance.

*Maintaining and encouraging participation.* This relates to decisions made to keep sources in the program and encourage participation of sources whose participation is optional (e.g., those given the opportunity to opt-in).

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## QUESTIONS AND DISCUSSION

1. A review of a large number of trading programs relating to fisheries, air pollution, and water pollution from many different countries concluded that:

In the presence of adequate enforcement, tradable permits do appear to increase the value of the resource (in the case of water and fisheries) or lower the cost of compliance (in the case of emissions reduction). Considerable savings in meeting air pollution control targets have been found. For water, the increase in value brought about by transferring the resources from lower valued to higher valued uses has typically been quite large. In fisheries, a substantial income increase not only results from more appropriately scaled capital investments (resulting from the reduction in overcapitalization), but also from the fact that [individual transferable quotas (ITQs)] frequently make it possible to sell a more valuable product at higher prices (fresh fish rather than frozen fish). One review of twenty-two fisheries found that the introduction of ITQs increased wealth in all twenty-two.

Tom Tietenberg, *Tradable Permits in Principle and Practice*, 14 PENN ST. ENVTL. L. REV. 251, 261 (2006). On the other hand, the survey concluded that the environmental impacts were not related solely to the aggregate limit imposed. Instead, the success of a trading program in meeting its environmental objectives was tied to a number of factors:

First, whether it is politically possible to set an aggregate limit at all may be a function of the intended policy. Second, both the magnitude of that limit and its evolution over time may be related to the policy. Third, the choice of policy regime may affect the level of monitoring and enforcement, and noncompliance can undermine the achievements of the limit. Fourth, the policy may trigger environmental effects that are not covered by the limit.

*Id.* at 255.

2. Consider the various environmental, economic, and political aspects of climate change. Is it best suited for allowance- or credit-based emissions trading? Which design features would you include in a national level system in the United States?

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## II. IMPLEMENTATION OF THE FLEXIBILITY MECHANISMS: THE CASE OF THE CLEAN DEVELOPMENT MECHANISM

As described in Chapter 5, Annex B of the Kyoto Protocol establishes targets — quantifiable emissions limitations and reduction commitments — for certain greenhouse gases that must be met by developed countries during the 2008 to 2012 commitment period. A second commitment period was subsequently negotiated to cover the period between 2013 to 2020. To help the Parties achieve their targets, the Kyoto Protocol includes a number of market instruments that allow the Parties to buy and sell portions of their assigned amounts. These “flexibility mechanisms”, which were described in Chapter 5, include bubbles (in practice limited to the

European Union), emissions trading, joint implementation, and the Clean Development Mechanism (CDM). This section takes a more in-depth look at the issues of implementation faced by the CDM. Many of the same issues, for example the challenges of supplementarity and additionality also arise in the context of the other flexibility mechanisms, particularly joint implementation.

## **A. Overview of the CDM**

Article 12 of the Kyoto Protocol established the CDM with the twin objectives of assisting developing countries in achieving sustainable development while also assisting Annex I Parties in meeting their emission reduction targets. The decision in 2012 to adopt a second commitment period of the Kyoto Protocol assured that the CDM would continue to operate under that regime at least until a new global agreement can be reached. From these negotiations it became clear that the CDM is important not only as part of the Kyoto Protocol, but also as a set of international procedures that can certify carbon offsets to be used in national or subnational carbon markets, regardless of whether there is a global cap on emissions.

By many measures, the CDM has been very successful and it enjoys substantial popularity among both developed and developing countries, as well as many in the private sector. As of February 2013, more than 6,500 CDM projects had been registered and more than 1.2 billion CERs had been issued. The CDM has been popular in part because it provides a large number of carbon offset opportunities at relatively low cost. On the other hand, critics are concerned that many CDM projects may not provide lasting climate benefits over what would be business-as-usual. This section explores some of the potential challenges facing the CDM.

Under the CDM, an Annex I Party may undertake qualifying projects that reduce GHG emissions in non-Annex I countries (i.e. developing countries) and use the resulting CERs to help meet their own targets. Non-Annex I Parties may also initiate their own projects and generate CERs (a “unilateral” CDM project). In both situations, CERs are tradable. Starting in 2000, reductions resulting from CDM projects could be counted towards satisfying an Annex I Party’s Kyoto target. Article 12(5) of the Kyoto Protocol states that participation in the CDM must be voluntary and any project must provide “real, measurable, and long-term benefits related to the mitigation of climate change” as well as reductions that are “additional to any that would occur in the absence of the certified project activity.”

Beyond these requirements, the Kyoto Protocol provided almost no guidance for operating the CDM. To develop the necessary institutional framework to operate the CDM, the Parties have adopted a substantial body of Decisions at Meetings of the Parties. In particular, ensuring that projects actually lead to “real, measurable, and long-term” climate change benefits and reductions that are “additional to any that would occur in the absence of the certified project activity” requires an institutional framework designed to review and approve project proposals and monitor project implementation. To that end, Article 12 of the Kyoto Protocol called for the establishment of an Executive Board to supervise implementation of the CDM. The Executive Board operates under the authority of the Kyoto Protocol Parties, but is provided substantial administrative support by the UNFCCC Secretariat. The ten members of the Executive Board consist of one representative from each of the five official UN regions (Africa, Asia, Latin

America and the Caribbean, Central and Eastern Europe and OECD), one representative from the small island developing countries, and two representatives each from developed and developing countries. The Executive Board, among many other things, maintains the CDM registry for issuance of CERs, approves methodologies for measuring baselines and additionality, and accredits entities that verify CERs for CDM projects. Decision 3/CMP.1, *Modalities for a Clean Development Mechanism as Defined in Article 12 of the Kyoto Protocol*, Annex, Parts C, D.

Article 12 of the Kyoto Protocol also requires that a CDM project have the approval of the Parties involved in the project. To ensure that such approval is granted, Parties must identify a Designated National Authority (DNA or National Authority) to serve as the focal point for consideration and approval of CDM project proposals. Decision 3/CMP.1, Annex, para. 29. Project proponents submit a Project Design Document (PDD) to the host country National Authority. The PDD should provide the technical and financial details of the proposed project, including the proposed baseline methodology for ascertaining emissions reductions, estimated operational life time of the project, description of how the additionality requirements are met through the project, documentation of environmental impacts, sources of funding, stakeholders' comments, and a monitoring plan. Decision 3/CMP.1, at Annex B. The National Authority evaluates the PDD and issues a letter of approval with the confirmation as to how the project will help the host country achieve sustainable development.

While the National Authority is responsible for ensuring that a project has been approved at the country level, a Designated Operational Entity (DOE) certifies the project proponent's proposed methodology for measuring emissions reductions, validates project proposals, and verifies the emission reductions resulting from the project that could be considered for issuance of CERs. Institutions or agencies with the requisite professional expertise to assess projects and that have no conflict of interest with the project participants may be accredited as DOEs by the Executive Board. To validate a project, the DOE reviews and assesses the PDD. The DOE is also responsible for publishing the PDD and for soliciting comments of stakeholders. Decision 3/CMP.1, at Annex, Part G. Based on the DOE's validation report, the CDM Executive Board registers the project.

As part of the PDD, participants in the CDM project must include a monitoring plan that allows for collecting data to estimate emissions reductions within the project boundary. Moreover, the DOE must verify and certify, based on the periodic review of the project, actual emissions reductions at the project. The DOE then submits a verification report to the project participants and the Executive Board and certifies the emissions reductions generated by the project. Based on the DOE's report, the Executive Board issues CERs for the project. Decision 3/CMP.1, at Annex, Part H-J.

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## QUESTIONS AND DISCUSSION

1. The role of the DOE in verifying emissions reductions is obviously critical. In practice, the project participants choose and often pay DOEs, who are private consultants and not governmental officials. Even though the CDM Executive Board accredits DOEs, is this accreditation process adequate to prevent conflicts of interest? To help answer this question, you

may wish to compare PDDs prepared by project proponents with the validations prepared by the DOEs. *See* CDM, Projects Registered, *at*: <http://cdm.unfccc.int/Projects/registered.html>.

2. The Executive Board yields significant power and makes decisions that have substantial financial implications. Can it be held liable for its decisions? The Argentinean utility company Capex, for example, threatened to sue the CDM's Executive Board because the Board rejected its CDM project — the conversion of a gas-fired power plant from open to combined cycle. Capex claimed that the project would have generated 2.65 million CERs over a six-year crediting period. The Executive Board rejected the project due to concerns about whether the project would reduce emissions beyond “business as usual” and because the project was started prior to January 1, 2000, the date such projects became eligible under the CDM. Capex, of course, disputed the Executive Board's conclusions. Carbon Finance, *Executive Board Faces Legal Threat over Rejected Project* (May 21, 2008). Where should Capex bring such a case and under what laws? Within the United States, a party upset by a US government agency decision would look to the statute authorizing the agency action as well as the Administrative Procedure Act, which allows lawsuits against agencies for agency action that is arbitrary, capricious or otherwise not in accordance with law. 5 U.S.C. § 706. However, international law has no equivalent to the Administrative Procedure Act. Moreover, the rules of the CDM do not provide any recourse to private parties to challenge the Board's decisions, although they do allow private parties to provide the Board with additional information. Instead, the Executive Board, as with other international institutions, has immunity to enable it to exercise its functions or fulfill its purposes without the threat of litigation. What type of recourse, if any, should private parties have? Should private parties be able to sue individual board members in their personal capacity in national courts? Are these the types of claims that should be raised in national courts or should these disputes be subject to some process within the UNFCCC? For a thorough treatment of these issues, see Ernestine E. Meijer, *The International Institutions of the Clean Development Mechanism Brought Before National Courts: Limiting Jurisdictional Immunity to Achieve Access to Justice*, 39 N.Y.U. J. INT'L L. & POL'Y 873 (2007).

At the request of the Kyoto Protocol Parties, the Executive Board developed and proposed a procedure for appeals of its rulings relating to requests for project registration and issuance of certified emission reductions. Executive Board, Report of the Fifty-seventh Meeting, Draft Recommendation to the CMP on the Procedure for Appeals against Adverse Rulings by the CDM Executive Board regarding Requests for Registration or Issuance, Annex 3 (Oct. 14, 2010). Like CDM project developers, environmental groups have joined the call for an appeals mechanism. They claim that such a mechanism will “promote enhanced accountability, legitimacy and public trust in and acceptance of the CDM as a valid tool for reaching its goals under the Kyoto Protocol – namely, mitigating global climate change while promoting sustainable development [and] introduce coherence and quality control into the EB decision-making process.” CDM Watch et al., *Views on Procedures for Appeals in accordance with the CMP Requests in Paragraphs 42-43 of Decision 2/CMP.51*, at 1 (undated). Despite near universal agreement on the need for an appeals mechanism, the Kyoto Protocol Parties remain split over certain aspects of the Executive Board's proposal. For example, some Parties question whether the Executive Board should be able to respond to the allegations made in the challenge and whether the Board should be allowed to gather additional information that responds to the

challenge. Australia, Submission under the Cancun Agreements, Procedures, Mechanisms, and Institutional Arrangements for a CDM Appeals Procedure (March 2011).

3. The problem of over-allocation has plagued CDM projects from the start. For the first 175 CDM projects that issued CERs, the validation procedure overestimated the number of CERs produced by an average of approximately 27 percent. Hart, *The Clean Development Mechanism*, 7 SUSTAINABLE DEV. L. & POL'Y 41, 45 (2007), citing UNEP Risø Centre, *Overview of CDM Pipeline as of May 1, 2007*. CDM participants identified the following factors as contributing to the recurrent overallocation:

### **CRAIG A. HART, THE CLEAN DEVELOPMENT MECHANISM**

7 SUSTAINABLE DEV. L. & POL'Y 41, 43 (Spring 2007)\*

The leading explanation of validation/verification error was inadequate technology or methodology to measure emissions reductions. For example, with respect to methane landfill projects, several respondents identified the primary cause of error to be the lack of adequate technology to measure low concentrations of gases over large areas. Survey respondents noted that measurements are typically not conducted under ideal conditions (as assumed in the standard methodologies), and very little is known about the quality of waste in landfill sites, which affects decomposition rates and the selection of appropriate methods for analyzing data. Further, models and assumptions used for estimation are often not reliable or appropriate for local conditions. With respect to environmental conditions, the performance of projects that depend upon wind, precipitation, river flow, or heat (as in the case of decomposition of waste) will be affected by fluctuations in weather conditions. These factors will significantly influence the outcome of verification results.

Supply and demand conditions also influence the verification results of projects whose performance is linked to market conditions. For example, electricity generation projects are verified based on the actual amount of electricity supplied to the grid. Furthermore, delay of project completion or operation can significantly affect the economic feasibility of a project and its verification results. In particular, hydroelectric plants are highly sensitive to construction delays.

Several firms identified the use of inappropriate assumptions in the validation stage and conservative assumptions in the verification stage as potential factors influencing validation/verification error. Several respondents noted that CDM methodologies often use generalized Intergovernmental Panel on Climate Change ("IPCC") estimates that do not take local conditions into account. For example, the use of IPCC estimates for methane projects fails to take into account local agricultural conditions. Several individuals noted that because the validation stage involves estimation, it is inherently subject to error, and one respondent noted that project sponsors are often optimistic in the validation stage. Others suggested that firms conducting the verification may use conservative assumptions in accordance with best practices recommended by the International Organization for Standardization and other organizations, thereby further increasing the difference between validation estimates and verification results.

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With respect to the adequacy of guidance or change in procedures, several respondents noted that the CDM Executive Board has not provided adequate guidance for validation and verification procedures. CDM methodologies have been frequently revised, which has greatly contributed to uncertainty. One respondent noted that some of these methodologies have been revised several times already since their inception and that CDM guidelines do not specify exactly what steps need to be taken to validate or verify emissions. Another person indicated that CDM rules which prohibit direct contact between project sponsors and reviewing personnel have slowed approvals and prevented project sponsors from receiving timely or detailed guidance.

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Do you think that the complexity of verifying emissions reductions outweighs the potential climate change mitigation gains from these projects? As you read the next section, consider whether the CDM has taken sufficient steps to address the issues raised by Hart.

**4. *The CDM and Removals by Sinks.*** Whereas Article 6 concerning JI refers to both “reduction in emissions by sources, or an enhancement of removals by sinks,” Article 12 concerning the CDM refers only to emissions reductions. Is this difference in language intended to exclude forestry and other land use projects that remove carbon dioxide from the atmosphere from the CDM? The Parties had many concerns about such projects, including whether it was possible to ensure removals from sinks over time because disease, natural disturbances, and other factors could eliminate any gains made from tree planting or other activities. As a consequence, they limited the use of the CDM to “afforestation” and “reforestation” projects, terms defined to exclude forest management practices. Decision 5/CMP.1, *Modalities and Procedures for Afforestation and Reforestation Project Activities under the Clean Development Mechanism in the First Commitment Period of the Kyoto Protocol* (2005). These and other forest-related issues are covered in greater detail in Chapter 8.

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## **B. Implementation Issues**

Many have heralded the CDM as a win-win-win situation: developed countries can reach their targets in a cost-effective way, global climate change is mitigated, and much needed infusions of cash and technology flow to developing countries. Whether the CDM actually does reflect a win-win-win situation depends on how it is implemented. Many of the most challenging and controversial implementation issues were left unresolved by the Kyoto Protocol negotiations, leaving the Parties to clarify the use of the CDM (as well as the other flexibility mechanisms) at subsequent meetings. For example, to what extent should countries be required to make domestic reductions to meet their targets before participating in the CDM market? CDM projects must provide climate change benefits that are “additional to any that would otherwise occur.” How should that be determined? Moreover, CDM projects are being developed in disproportionate amounts in just a few developing countries like India and China. Is that a problem? The remainder of this section explores these issues.

### **1. *Supplementarity***

While agreement was reached on the use of emissions trading by Annex I Parties to meet their commitments, no consensus could be reached on the extent to which those Parties could use emissions trading to meet their commitments. Could the United States meet its targets exclusively from emissions trading and JI and CDM projects? In the alternative, should Annex I Parties be required to make some emissions reductions at home?

Articles 6 and 17 of the Kyoto Protocol provide only that any ERUs generated from JI projects and any emissions trading “shall be supplemental to domestic actions” for the purpose of meeting a Party’s commitments. Article 12 allows an Annex I Party to use the CDM to meet “part” of its commitments. The Kyoto Protocol thus left for future negotiations the difficult decision of defining what constitutes “supplemental.” Hoping to take advantage of Russia’s expected excess credits and championing the economic efficiency of making reductions in developing countries, the United States advocated for unlimited trading. The European Union sought a cap on emissions trading of 50 percent of the total reductions required. The European Union’s position was shaped substantially by its regulatory advantage over other countries and regions. Because of the European Union’s existing institutional structures, it expected to implement a “bubble” pursuant to Article 4 and allocate emissions across the entire European Union. Importantly, the requirements for supplementarity do not apply to bubbles.

In choosing an approach to supplementarity, the Parties have faced a number of dilemmas. First, despite the express incorporation of the flexibility mechanisms into the Kyoto Protocol, the moral and legal argument for supplementarity is strong. Shouldn’t the developed countries that have contributed far more to climate change than the developing countries “take the lead” by reducing emissions at home? Doesn’t the principle of “common but differentiated responsibilities” require developed countries to do more? At the same time, the flexibility mechanisms are designed to encourage cost-effective GHG reductions, and without them, many Annex I Parties may not have adopted the Kyoto Protocol or, in the alternative, would have insisted on less ambitious targets.

Second, while recognizing the cost-effectiveness of reducing GHG emissions through the flexibility mechanisms, strict requirements for Annex I Parties to reduce greenhouse gas emissions domestically could provide a powerful incentive to develop climate-friendly technologies. By keeping the pressure on for reductions in the more technologically advanced countries, additional reductions are more likely to come from new technological innovations. These new climate-friendly technologies could become the first choice for use in both developed and developing countries.

On the other hand, rigid requirements for supplementarity may minimize economic benefits of the flexibility mechanisms, particularly for developing countries. By requiring substantial reductions in Annex I Parties, investors would have little incentive to develop CDM projects. Just how significant would be the lost economic opportunities for developing countries? How should the Parties balance cost-effectiveness with incentives for the development of climate-friendly technology?

Researchers evaluated the effects on developing countries of imposing limits on the number of CERs that Annex I Parties with commitments under the Kyoto Protocol (“Annex B Parties”)

could use to meet their commitments. They concluded that:

[T]he effects of the three levels of supplementarity restrictions are straightforward. By forcing Annex B Parties to reduce more internally, by definition importing less CERs, the demand for developing nations' CDM projects falls. As the limit on the use of CERs is tightened from 75% to 50% to 25%, the price of CERs falls, fewer CDM projects are financed, and the potential economic benefits to developing nations fall accordingly. The restriction severely reduces the potential for developing nations to contribute to the mitigation of climate change, constrains their ability to assist Annex B [Parties] in achieving their targets, and minimizes the economic benefits of CDM for sustainable development.

Thomas Black-Arbelaez, et al., *Contributions from the National Strategy Studies Program to COP6 Negotiations Regarding CDM and JI* (Sept. 2000); see also A. Denny Ellerman, et al, *The Effects on Developing Countries of the Kyoto Protocol and Carbon Dioxide Emissions Trading* 9–11 (MIT Policy Research Paper, 1998).

These studies have shown that the impacts on developing countries could be significant. For example, one study concluded that emissions trading would generate \$6.1 billion a year for five developing countries (Thailand, Pakistan, the Philippines, Korea, and Vietnam), but only \$1.4 billion if developed countries were required to make 75% of their reductions domestically. Thomas Black-Arbelaez, *Supplementarity at COP6: Fewer Benefits and Less Development for Asian Countries*, in AUSTRALIAN BUREAU OF AGRICULTURAL AND RESOURCE ECONOMICS, OUTLOOK 2001, at 35 (2001).

The European Union eventually relented and withdrew its proposal for establishing specific supplementarity limits on a Party's use of the flexibility mechanisms. Instead, the Parties established some general guidance on supplementarity for JI, CDM, and emissions trading.

**DECISION 2/CMP.1 PRINCIPLES, NATURE AND SCOPE OF THE  
MECHANISMS PURSUANT TO ARTICLES 6, 12 AND 17 OF THE KYOTO  
PROTOCOL**  
(2005)

*The Conference of the Parties serving as the meeting of the Parties to the Kyoto Protocol,*  
\* \* \*

*Emphasizing* that the Parties included in Annex I shall implement domestic action in accordance with national circumstances and with a view to reducing emissions in a manner conducive to narrowing per capita differences between developed and developing country Parties while working towards achievement of the ultimate objective of the Convention, \* \* \*

1. *Decides* that the use of the mechanisms shall be supplemental to domestic action and that domestic action shall thus constitute a significant element of the effort made by each Party included in Annex I to meet its quantified emission limitation and reduction commitments under

Article 3, paragraph 1;

2. *Requests* the Parties included in Annex I to provide relevant information in relation to paragraph 1 above, in accordance with Article 7 of the Kyoto Protocol, for review under its Article 8;

3. *Decides* that the provision of such information shall take into account reporting on demonstrable progress as contained in decision 15/CMP.1;

4. *Requests* the facilitative branch of the Compliance Committee to address questions of implementation with respect to paragraphs 2 and 3 above; . . .

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## QUESTIONS AND DISCUSSION

1. In what way is the supplementarity requirement enforceable? For example, can a Party be challenged for failing to take “significant” domestic action to achieve its commitment? The Compliance Committee under the Kyoto Protocol does not have the authority to penalize a Party for noncompliance with this supplementarity guidance. Instead, through its facilitative branch, the Compliance Committee provides advice and facilitates compliance with the Kyoto Protocol. If that is so, what is the value of referring the question of supplementarity to the facilitative branch? As you read about the EU ETS in the next section, consider whether supplementarity may be better enforced in the design of national carbon markets?

2. A stated purpose of the CDM is to promote sustainable development in developing countries and to allow developing countries to contribute to climate change mitigation. If supplementarity requirements would diminish economic opportunities that could spur sustainable development, should any restrictions be placed on emissions trading? *See Sangmin Shim, Korea’s Leading Role in Joining the Kyoto Protocol with the Flexibility Mechanisms as “Side-Payments”*, 15 GEO. INT’L ENVTL. L. REV. 203 (2003) (calling for the abolishment of supplementarity).

3. As described further below, the European Union has also struggled with how to reflect supplementarity principles within the ETS. Under the Phase III directive, credits from eligible CDM or JI projects, including credits purchased during the earlier Phase II, can be used to meet the Phase III allowance requirements. Credits are limited to approximately 1.6 billion credits for the combined Phase II-Phase III periods (2008–2020), which is intended to cap the use of these credits at no more than 50 percent of total emissions.

4. Related to the supplementarity question is what eligibility requirements would be placed on Parties before they could participate in the CDM or other trading mechanisms. The Kyoto Protocol itself is silent on whether a Party must meet certain requirements before it is eligible to use the flexibility mechanisms and when eligibility can be withdrawn. Yet, the majority of Parties wanted eligibility criteria; they wanted participation in the flexibility mechanisms to act as an inducement for compliance with other Kyoto Protocol objectives and requirements.

The issue came to a head during the negotiations at the seventh meeting of the UNFCCC Parties in Marrakech in 2001. These negotiations were contentious because some Parties wanted to tie use of the flexibility mechanisms to acceptance of a compliance agreement. In their view, such a requirement would have two major benefits. First, it would help ensure the integrity of the flexibility mechanisms by making them subject to the compliance regime. Second, because Annex I Parties wanted to use the flexibility mechanisms, an express link to the compliance regime would help ensure the adoption of the compliance regime. Although the final criteria do not condition eligibility on the adoption of a compliance regime, they do authorize the enforcement branch of the Compliance Committee to assess whether a Party has met its eligibility requirements. Decision 2/CMP.1, *Principles, Nature and Scope of the Mechanisms Pursuant to Articles 6, 12 and 17 of the Kyoto Protocol* (2005). In addition, separate decisions on JI, the CDM, and emissions trading require that, to participate in these mechanisms, an Annex I Party must:

- (a) be a Party to the Protocol;
- (b) have calculated its assigned amount pursuant to relevant decisions;
- (c) have established a national system for estimating emissions and removals;
- (d) have established its national registry;
- (e) have submitted its most recent required inventory; and
- (f) have submitted the “supplementary information” required to show that it is in compliance with its emissions commitments.

Decision 9/CMP.1, *Guidelines for the Implementation of Article 6 of the Kyoto Protocol*, Annex, para. 21 (2005); Decision 3/CMP.7, *Modalities and Procedures for a Clean Development Mechanism as Defined by Article 12 of the Kyoto Protocol*, Annex, para. 31 (2005); Decision 11/CMP.1, at Annex, para. 2 (2005). An Annex I Party may not participate in emissions trading or use CERs to meet its commitments if it fails to meet any of the six criteria. Decision 27/CMP.1, *Procedures and Mechanisms Relating to Compliance under the Kyoto Protocol*, Annex XV, para. 5(c) (2005); Decision 3/CMP.1, Annex, paras. 31–33. An Annex I Party may not participate in JI if it fails to meet criteria (a), (b) or (d) and it has to take special measures to verify emissions reductions if the Party fails to meet criteria (c), (e), or (f). *See also* Decision 9/CMP.1, Annex, para. 24. Of course, these requirements are for using credits for meeting Kyoto Protocol obligations; participants in the ETS or other carbon markets could still purchase CDM credits according to the rules of those markets.

**5.** Eligibility to use JI, CDM, and emissions trading was a major and divisive issue relating to the Kyoto Protocol’s second commitment period. With Japan, New Zealand, and Russia remaining Parties to the Kyoto Protocol but not undertaking commitments, would they be able to continue to participate in the flexibility mechanisms. In Doha in 2012, the Parties reached the following compromise:

13. *Clarifies also* that for the purposes of the second commitment period . . . a Party included in Annex I may continue to participate in ongoing project activities under Article 12 and in any project activities to be registered after 31 December 2012, but only a Party with a quantified emission limitation and reduction commitment inscribed in the third column of Annex B as contained in annex I to this decision shall be eligible to transfer and acquire certified emission reductions (CERs) in accordance with decision 3/CMP.1 and with paragraph 15 below.

14. *Decides* that a Party referred to in paragraphs 15 and 16 below shall be eligible to use CERs to contribute to compliance with part of its commitment under Article 3 of the Kyoto Protocol for the second commitment period upon the entry into force for that Party of the amendment contained in annex I to this decision and upon that Party meeting the requirements set out in paragraph 31 of the annex to decision 3/CMP.1;

15. *Decides*, with respect to joint implementation under Article 6 and emissions trading under Article 17 of the Kyoto Protocol, that:

(a) As of 1 January 2013, only a Party with a commitment inscribed in the third column of Annex B as contained in annex I to this decision whose eligibility has been established in accordance with the provisions of paragraph 3 of the annex to decision 11/CMP.1 in the first commitment period, shall be eligible to transfer and acquire CERs and assigned amount units (AAUs), emission reduction units (ERUs) and removal units (RMUs) valid for the second commitment period under Article 17 of the Kyoto Protocol, subject to the provisions of paragraph 3(b) of the annex to decision 11/CMP.1;

(b) Paragraph 2(b) of the annex to decision 11/CMP.1 shall apply to such Party only upon calculation and recording of its assigned amount for the second commitment period;

16. *Requests* the Subsidiary Body for Implementation to consider modalities for expediting the continued issuance, transfer and acquisition of ERUs under Article 6 for the second commitment period with respect to Parties referred to in paragraph 15 above and modalities for expediting the establishment of eligibility of Parties referred to in paragraph 15 above whose eligibility has not been established in the first commitment period. . . .

Decision 1/CMP.8, *Amendment to the Kyoto Protocol pursuant to its Article 3, paragraph 9 (the Doha Amendment)*, (2012). To what extent, if at all, are Parties who have not agreed to a target in the second commitment period allowed to participate in the flexibility mechanisms?

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## **2. *Additionality***

Articles 6(1)(b) and 12(5)(c) of the Kyoto Protocol require that JI and CDM projects provide

emissions reductions that are “additional” to any that would otherwise occur. A CDM or JI project is considered to meet the “additionality” requirement “if anthropogenic emissions of greenhouse gases by sources are reduced below those that would have occurred in the absence of the registered CDM project activity.” Decision 9/CMP.1, Appendix B (2005); Decision 3/CMP.1, Annex, para. 43. Implicit in this simple definition are difficult technical questions for determining the baselines as well as anticipated and actual reductions beyond the baseline. Given that additionality is central to the environmental impact of JI and CDM projects, it is perhaps not surprising that issues of additionality are among the most complex and controversial issues for implementing these regimes.

The initial question is how to conceptualize when a project might generate emissions reductions that would not otherwise occur, because emission reductions often occur as a result of natural economic progression. For example, U.S. carbon intensity — a measure of carbon emissions per unit of economic activity, such as gross domestic product — fell by 21 percent in the 1980s and 16 percent in the 1990s. Pew Center on Global Climate Change, “Analysis of President Bush’s Climate Change Plan” (Feb. 2002). Although overall emissions grew in the United States during these periods as a result of an expanding economy, emissions fell at the project or facility level due to technological and other improvements. Similarly, energy efficiency gains in China avoided 432 metric tons of carbon emissions from 1980 to 1997, again, in the absence of any CDM projects. Kevin A. Baumert, et al., *What Might a Developing Country Commitment Look Like?*, CLIMATE NOTES 4 (May 1999). Producers either became more energy efficient by purchasing more modern and efficient technologies or shifted to less carbon intensive fuels as China made policy choices, such as sharp reductions in coal and petroleum subsidies, that eliminated economic incentives to use large amounts of high carbon fuels. *See id.* at 9. In any event, project-level emissions reductions occurred in China and the United States without JI or CDM projects.

The challenge for the Parties is to sort out these “business-as-usual” factors from emissions reductions that simply would not have occurred absent the JI or CDM project. If the Parties do not establish credible rules for doing so, they will allow the issuance of CERs and ERUs for emissions reductions that would have occurred regardless of the existence of the JI or CDM project or the entire climate change regime. In other words, JI or CDM financing would yield no additional emissions reductions.

Assessing a project’s additionality is without question extremely complex. The Parties have established a two-step process to assess what is “business as usual.” First, the project participants must establish the project baseline, an assessment of what is actually happening and will happen without the JI or CDM project. Second, the project participants must assess the proposed project against this baseline. A third issue, leakage, further complicates the additionality inquiry. Leakage occurs when the reduction or sequestration of emissions in one place shifts emissions to another site. For example, energy efficiency investments may produce cost savings that encourage increased production — and emissions. An afforestation project may enhance removals of carbon dioxide but force subsistence farmers to cut forests elsewhere to meet their basic needs. Each of these aspects of additionality is explored below.

### **a. *Establishing Emissions Baselines***

The process for assessing additionality starts with establishing a project baseline. For both JI and CDM projects, baseline emissions should “reasonably represent[] the anthropogenic emissions by sources or anthropogenic removals by sinks of greenhouse gases that would occur in the absence of the proposed project.” In establishing the baseline, the project proponents must include all anthropogenic GHG emissions by sources and anthropogenic removals by sinks within the project boundary. Decision 9/CMP.1, *Guidelines for the Implementation of Article 6 of the Kyoto Protocol*, Appendix B (2005); Decision 3/CMP.1, *Modalities and Procedures for a Clean Development Mechanism as Defined by Article 12 of the Kyoto Protocol*, Annex, paras. 44–52. This baseline must also be established conservatively, in a transparent manner, and on a project-by-project basis. The Parties have established three basic approaches for establishing baselines, summarized by UNEP as follows:

**RAM M. SHRESTHA et al., BASELINE METHODOLOGIES FOR CLEAN DEVELOPMENT MECHANISM PROJECTS: A GUIDEBOOK**

21–22 (UNEP Risø Centre, Nov. 2005)

a) The first approach involves existing actual or historical emissions (hereafter “Approach A”). This is applicable to cases where the analysis of the baseline scenario indicates that the most likely activities implemented in absence of the proposed CDM project is the continuation of existing activities. To continue with the Landfill CDM project example, recall that the current practice in the host country is zero collection of methane generated from MSW [municipal solid waste] disposed at the landfills. The analysis of the situation indicates that though there are other options available for curtailing emissions from a landfill (e.g., treatment of organic waste before disposal in a landfill or systems for methane collection at the landfill), the most likely scenario is continuation of present practice. The baseline approach to be used in such a case is Approach A.

b) The second approach (hereafter, “Approach B”) is based on emissions from a technology that represents an economically attractive course of action, taking into account barriers to investment. This approach is applicable to situations, where economic analysis is undertaken to identify [the] most attractive option among various options, which includes the CDM project activity. The emissions from the economically most attractive alternative are the baseline. For the Landfill CDM project example, say the alternatives available are: continuation of the current practice, i.e., zero collection of methane generated from landfill; treatment of organic waste before disposal to landfill (methane emissions from landfill are from decay of organic matter); and, a collection system for landfill methane. Suppose the analysis of the situation indicates that treatment of organic waste before disposal at the landfill site is the economically most attractive alternative. Then, the baseline scenario is treatment of organic waste before its disposal to landfill and the baseline approach is Approach B. In this example, the baseline is in terms of emissions from the landfill under the condition that organic waste disposed at the site is pre-treated.

c) The third approach is based on the average emissions of similar project activities undertaken in the previous five years, in similar social, economic, environmental and technological circumstances, and whose performance is among the top 20 percent of their

category (hereafter “Approach C”). To continue with the Landfill CDM project, say there are four alternatives, other than the proposed CDM project alternative, available to curtail the methane emission from the landfill. None of the four alternatives can be clearly demonstrated as economically most attractive. The baseline scenario then is based on analysis of alternatives implemented during the last five years. The baseline approach in this case will be Approach C. The baseline is the average emission of the options most commonly used in the previous five years and whose performance is among the top 20 percent.

The three are akin to options available for implementing a project. Project proponents choose either to continue with an existing commonly used process/technology or to adopt a newer option available in the market that has come to be preferred over a more commonly used option in recent years. If more than one new option is available, the proponents choose the most economical option that meets all the regulatory requirements. But in absence of adequate information or differences among various new options, any of the options from the basket of new options could be chosen.

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### **b. *Additionality Assessments***

Identifying whether a specific project actually yields reductions “additional to” any that would otherwise occur is perhaps the most complex issue for both JI and CDM projects. Without an honest appraisal of additionality, the environmental integrity of the carbon market is jeopardized and efforts to mitigate climate change seriously undermined. As a consequence, the Parties have provided guidance on making additionality assessments to ensure climate change mitigation benefits are actually achieved.

As designed under the Kyoto Protocol, calculating additionality is not simply a measurement of the greenhouse gas emissions of a JI or CDM project. Instead, additionality is intended to assess whether the project avoids business-as-usual activities and emissions. To assist with this analysis, the CDM’s Executive Board has developed a voluntary “additionality tool” to clarify elements of additionality and guide assessment of additionality on a project-specific level. In this way, the questions help gauge whether the project’s emissions — to the extent that they are less than other options — provide reductions that would not otherwise occur. CDM Executive Board, *Methodological Tool for the Demonstration and Assessment of Additionality (Version 04)*. If project participants propose another methodology for assessing additionality, they must justify it.

The Executive Board’s tool establishes a four-step process for assessing additionality. First, the project participants must identify realistic or credible alternatives comparable to the proposed project. The second and third steps are combined: the project participants must prepare either an investment analysis or a barriers analysis, or both, to compare the proposed project with the alternatives. The project participants have the discretion to choose which analysis they want to use. The investment analysis is designed to determine whether the proposed project activity, without revenue from the sale of CERs, is economically or financially less attractive than at least one of the identified alternatives.

If the project is financially attractive, then step three requires the project participants to show

that other realistic and credible barriers would prevent the development of the proposed project but not prevent at least one of the alternatives. These barriers could include technological barriers, the lack of funding for innovative projects, and the inability to manage state-of-the-art technology.

If the investment analysis shows that the proposed CDM project is not financially attractive or not likely to be the most financially attractive, depending on which analytical tool is used to assess investment barriers, or the barriers analysis indicates that the project faces barriers that do not affect other alternatives, then the project participants need to complete step four, the common practice analysis.

The common practice analysis assesses the extent to which the proposed project type has already been deployed in the relevant sector and region. This analysis is designed as a credibility check on the investment and barriers analysis: if similar projects already exist in the area, it is difficult to claim that investment or other barriers prevent the development of the proposed project in the absence of the CDM. If similar activities cannot be observed or similar activities are observed, but essential distinctions between the project activity and similar activities can reasonably be explained, then the proposed project activity is additional. However, if similar projects exist and essential differences cannot be explained, then the project is not additional. For additional information on the additionality tool, see Ram M. Shrestha, et al., *Baseline Methodologies for Clean Development Mechanism Projects: A Guidebook* 35–45 (UNEP Risø Centre, Nov. 2005).

### **BOX 1 — ANATOMY OF A DEAL: THE LIAONING HUANREN NIUMAODASHAN WIND POWER PROJECT**

The Liaoning Huanren Niумаodashan Wind Power Project is a grid-connected renewable energy CDM project located in Liaoning Province, in Northeast China. The proposed project will reduce CO<sub>2</sub> emissions by replacing electricity produced from a fossil fuel fired power plant with electricity generated from 29 state-of-the-art wind turbines with a total generating capacity of 24.65 megawatts to the Northeast China Power Grid. The proposed project is expected to reduce emissions annually by 61,737 MtCO<sub>2</sub>eq per year. The project will be developed by EDF Trading Company of the United Kingdom and CASC Longyuan (Benxi) Wind Power Co., Ltd of China. Although neither China nor the United Kingdom is directly involved, both have given their approval to the project. The project proponents used methodologies for calculating additionality and monitoring approved by the CDM's Executive Board.

Consistent with CDM requirements, the project proponents solicited stakeholder comments. A total of six stakeholders, representatives from the local Government, local Environmental Protection Bureau, local Development and Reform Bureau, local Agricultural Power Bureau, and Wafangdian Village in Huanren County, participated in a meeting to discuss the project. These stakeholders provided no negative comments. The project proponents also concluded that the project would lead to no significant environmental impacts. Although the installation of the wind turbines would generate some solid waste and vegetation would be destroyed, the waste would be transported to landfills and the vegetation replanted. Noise from the project would be minimal as the turbines would be placed on top of a mountain. These findings were confirmed by the

DOE, Det Norske Veritas Certification AS. Details of the project can be found at:  
<http://cdm.unfccc.int/Projects/DB/DNV-CUK1199956532.2/view>.

To demonstrate that their project would be additional to those that would otherwise occur, the project proponents began Step 1 of their additionality analysis by suggesting alternatives to the proposed project:

- a) A thermal power plant with the same capacity or the same annual electricity output as the proposed project.
- b) The proposed project not undertaken as a CDM project activity but as a commercial project.
- c) Another renewable energy power plant with the same capacity or the same annual electricity output as the proposed project.
- d) The Northeast China Power Grid as the provider for the same capacity and electricity output as the proposed project.

Under Step 1, the project proponents concluded that building a thermal power plant with comparable output would not be reasonable because it would not be permitted under Chinese law. Similarly, building a different type of renewable energy project was also not reasonable. While wind energy, solar, geothermal, biomass, and other renewable energy sources could be used to supply the power to the Northeast China Power Grid, the Chinese partner in this venture, CASC Longyuan (Benxi) Wind Power Company, Ltd., did not have a license to produce power in Liaoning Province from sources other than wind.

Using the investment analysis of Step 2, the project proponents eliminated as an option undertaking the same project as a commercial project without CERs. According to the project proponents, such a project would produce a financial rate of return below that expected for electricity generating projects. The rate of return could exceed the benchmark rate of return only if operational and maintenance costs dropped significantly or if other factors, such as an 8 percent change in the tariff, applied to electricity. However, these changes were considered improbable. Applying the common practice analysis of Step 3, the proponents found that wind power was uncommon in Northeast China, with only 3 percent of energy deriving from wind power. While other wind power projects existed in the area, they were built with lower international interest rates than would apply to the proposed project or more generous Chinese policies supporting wind power projects. In addition, the owner of some of the other projects had applied for CERs to help ensure the profitability of its wind power projects. Thus, it could not be expected that the proposed project would be developed as a non-CDM project. As a consequence, the Designated Operational Entity concluded that “it is sufficiently demonstrated that the project is not a likely baseline scenario and that emission reductions occurring from this will hence be additional.” Det Norske Veritas, Validation Report: Liaoning Huanren Niumaodashan Wind Power Project, Report No. 2007–1256, 10 (Revision No. 01, Jan. 1, 2008).

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### ***c. Leakage***

As noted above, leakage occurs when reducing or sequestering emissions in one place shifts the pollution-causing activity to another place. The accurate accounting of leakage is obviously central for calculating the “additional” reductions from a project. If leakage is not accounted for or underreported, then too many CERs or ERUs will be issued and the overall goal of mitigating climate change undermined. Studies underscore the importance of accurate accounting of leakage to the credibility of the Kyoto Protocol regime: most estimates suggest leakage rates of GHG abatement policies in Annex I countries to non-Annex I countries are between 5 percent and 20 percent. See Frank Vöhringer, et al., *A Proposal for the Attribution of Market Leakage to CDM Projects* 13 (HWWA Discussion Paper, 2004) (summarizing research on leakage). As the following article describes, leakage can happen in a variety of ways, which explains why leakage is so prevalent and difficult to measure.

## **THE CDM GUIDEBOOK: A RESOURCE FOR CLEAN DEVELOPMENT MECHANISM DEVELOPERS IN SOUTHERN AFRICA**

¶ 3.1.3 (Randall Spalding-Fecher, ed. 2002)\*

Leakage is a measurable emissions increase that is caused by the project, but is outside of a CDM project boundary or timeframe. Leakage occurs when system boundaries are drawn in such a way as to ignore some emission changes caused by the project. In some cases there can be a positive leakage (known as spillover) if the CDM project leads to reduced emissions elsewhere, or after the project ends. Sources of leakage vary according to project type and according to which emission sources or effects are components of the project baseline. Leakage may be influenced by the type of baseline used. An example would be a physical displacement of the baseline technology to a location where a more modern and efficient technology was intended to be used, but where technology was chosen because it was readily available and possibly cheaper. A more common example would be a large CDM project lowering the price of its products or services, and so increasing the demand. For instance, a large energy-efficiency programme may decrease the price of electricity and increase the total demand for power. The fuel emissions offset by the project would then be reduced by the increase in emissions from the additional demand. Similarly, a large afforestation project may depress the market price for timber, thereby increasing demand for timber products and reducing net carbon reductions. Another example would be a project to reduce deforestation displacing the pressure on forest resources to somewhere else outside the project boundary.

Positive leakage or spillover could happen when CDM project technology is emulated by other projects in the same country or elsewhere, through a demonstration effect. If this replication of technology is planned, the spillover may be termed an intended consequence of the project, or market transformation. CDM project developers who adopt innovative technology may also patent it and market it to other producers. An example of a spillover in the [land management] sector would be if products from sustainably managed afforestation projects replaced products from unsustainably managed forests. If the reduction of deforestation outside the CDM project boundary reduces total emissions from the country, this should be considered as spillover. On the other hand, if the CDM project displaced subsistence farmers from the

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project area, and these farmers engaged in deforestation in other areas, the additional emissions would have to be counted against the project as leakage.

To measure the emissions impacts, it may be necessary to monitor changes in emissions outside the official project boundary, bearing in mind that widening the monitoring domain will entail greater costs. The secondary impacts of a project are likely to be modest in the beginning, and the monitoring of such impacts may not be a priority — for small-scale projects they may even be insignificant. In such circumstances, the project developer may be justified in disregarding these impacts and simply focussing on energy savings and direct emissions reduction. As the project becomes larger and more linked to market transformation, however, these impacts may become significant and may have to be evaluated.

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As can be imagined, measuring leakage is challenging. First, activities causing leakage by definition occur outside a project's boundary. Because it is not typical to monitor for such changes, they may not be noticed. With respect to an afforestation project, for example, how should project participants ascertain whether displaced subsistence farmers have engaged in deforestation? Second, even if such changes are detected, proving that they resulted from the CDM or JI project and not other economic or other factors will be challenging.

Despite these difficulties, project participants must account for and subtract any leakage from a project's on-site greenhouse gas reductions. For both JI and CDM projects, leakage is defined as "the net change of anthropogenic emissions by sources and/or removals by sinks of greenhouse gases which occurs outside the project boundary, and which is measurable and attributable to the CDM project activity." The project boundary encompasses all anthropogenic emissions by sources of greenhouse gases "under the control of the project participants that are significant and reasonably attributable to the CDM project activity." Decision 3/CMP.1, *Modalities and Procedures for a Clean Development Mechanism as Defined in Article 12 of the Kyoto Protocol*, paras. 50–52 (2005); Decision 9/CMP.1, *Guidelines for the Implementation of Article 6 of the Kyoto Protocol*, Appendix B, para. 4(f) (2005); Joint Implementation Supervisory Committee, *Guidance on Criteria for Baseline Setting and Monitoring*, Annex 2 (Version 01).

The discussion of leakage begins at the project design stage — the project design document must include a description of formulae used to calculate and to project leakage that is measurable and attributable to the project. To assist with the calculation of leakage, the CDM Executive Board has approved a number of methodological tools for particular types of projects. *See, e.g.*, CDM Executive Board, *Tool to Calculate Project or Leakage CO<sub>2</sub> Emissions from Fossil Fuel Combustion* (Version 01), available at <http://cdm.unfccc.int/Reference/Guidclarif/index.html>. In some cases, a highly pragmatic approach has been taken. For example, market leakage — leakage effects that are transmitted through changes in price, supply, or demand of goods — are considered to be unmeasurable or insignificant for some projects. Vöhringer, et al., *Market Leakage*, at 1. One can easily imagine the challenges of determining whether a particular CDM afforestation project has had an impact on the price or the manufacture and sale of wood-based products produced from wood harvested outside the project's boundary. The CDM Executive Board thus decided to exclude "market leakage" from consideration of afforestation/reforestation projects. CDM Executive Board, *Guidance Related to Market Leakage* (March 3, 2006).

## QUESTIONS AND DISCUSSION

**1. *Baselines.*** The three approaches for establishing baselines provide general guidance to project participants. The Parties have adopted highly technical guidance, including formulae and algorithms, for calculating actual baselines for specific types of projects. UNFCCC, *Approved Baseline and Monitoring Methodologies*. Despite this technical detail, the general approaches remain the starting point for establishing baselines. Consider the range of options under the three approaches. Why are three approaches necessary for ascertaining baseline emissions? In other words, why is it insufficient in some cases to establish baseline emissions using actual or historical emissions?

**2.** After reviewing the additionality analysis for the Liaoning Huanren Niumaodashan Wind Power Project, how confident are you that CDM investment in the project will result in additional climate benefits? In fact, CDM Watch reported the following:

Several scientific studies confirm that a large number of CDM projects are likely not additional — they would be implemented even without the incentives from the CDM. . . . Despite a request from CMP7, the CDM Executive Board did not take any action to significantly improve the assessment of additionality.

Research recently released under the CDM Policy Dialogue confirms that large-scale power supply and methane projects are unlikely to be additional. If such projects remain eligible in the CDM, they could increase cumulative global GHG emissions by up to 3.6 Giga tonnes CO<sub>2</sub>e through 2020. Non-additional credits also undermine the economic effectiveness of the CDM by artificially increasing the supply of credits that do not represent actual emission reductions. This is especially relevant, since the CDM is projected to be significantly oversupplied until 2020. Reducing the large number of non-additional projects therefore not only strengthens the CDM's environmental integrity, it is also a vital step in ensuring the continuation of the mechanism. A transition away from large-scale power supply CDM projects and other project types with low probability of additionality would address the over-supply CDM credits, enable projects that truly depend on the CDM, and improve the overall integrity and mitigation impact of the CDM.

The CDM methodology ACM0013 enables new coal power plants to receive credits for the claim that the project developers would otherwise build less efficient plants. In November 2011, the CDM Executive Board suspended the methodology because of serious flaws identified by the [CDM's] Methodologies Panel leading to significant over-crediting. In September 2012, the Board adopted a revision to the methodology. In an unprecedented move, the Board removed several safeguards recommended by the Methodologies Panel from the methodology. This could result in the identification of clearly outdated technologies as baseline and enable numerous clearly non-additional coal power

plants to receive CDM credits. Furthermore, in a study from 2011, the Stockholm Environment Institute (SEI) found that the additionality of this project type is highly unlikely and that the flaws that lead to the over-crediting are inherent to the project type.

CDM Market Watch, *Recommendations to the CMP8 on Further Guidance relating to the Clean Development Mechanism (CDM) 2–3* (2012).

3. A review by the CDM’s Panel on Methodologies revealed other deficiencies in assessing additionality:

**CDM EXECUTIVE BOARD, TWENTY-SEVENTH MEETING,  
PROPOSED AGENDA-ANNOTATIONS**  
(Oct. 29–Nov. 1, 2006)

(a) From review of available documentation it appears that current methodological guidance from the Board is either not applied or, if applied, is not always documented. For example, several project activities, which use the additionality tool have not assessed whether the proposed project carried out without the CDM is a realistic and credible alternative scenario. Most projects requesting a crediting period that started prior to registration have not provided evidence in the CDM-PDD to support the claim that CDM was considered in the decision to proceed with the project activity, while some have provided evidence that appeared inconsistent with the claim. For a majority of PDDs examined, the method for conducting the common practice analysis is not documented, as is requested by the additionality tool. In many of the PDDs considered, key underlying assumptions and rationales related to additionality are not substantiated. Documented evidence tends to be more complete and sufficient in cases where the project activity does not generate significant revenues other than those related to CERs.

(b) Paragraph 27(h) of the annex to decision 3/CMP.1 (“Information used to determine additionality . . . shall not be considered as proprietary or confidential”) is interpreted differently by various project participants. In approximately half the PDDs examined, key information used to demonstrate additionality was not included in the PDD. It is possible that such information was shared privately with the DOEs or the Board, or may be available elsewhere.

(c) Current assessment of additionality by DOEs is varied. While validation reports for some registered CDM projects indicate that efforts to corroborate additionality claims were undertaken, other cases with no such indications were found. Some validation reports acknowledge or restate claims made in PDDs, but do not explain whether or how such claims (and their underlying assumptions) have been validated. In cases where one or more alternatives are not under the control of project participants, a different procedure would be required to demonstrate additionality and identify the baseline scenario than provided in the draft. Such cases might include grid-connected power projects (where an alternative might be electricity produced by other facilities not under the control of project participants) or other projects that increase the delivery of a given product to a competitive local, regional or global market. In such cases, baseline scenarios might be rather complex (such as the combined margin scenario in ACM0002), and the methods for comparing alternatives may differ from those provided in the

draft (e.g., benchmark analysis or other methods that utilize information about the markets in which such projects might compete). \* \* \*

Among the project activities examined, there was no indication of a DOE requiring corrective action related to additionality. In summary, the available documentation reviewed by the consultants provides little evidence of external validation by DOEs of key assumptions and data used for additionality assessment, though such evidence may exist elsewhere. As noted above, such documentation (PDDs and validation reports) may not tell the full story; at the same time, such a gap in documentation should be rectified in the future.

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Why might compliance with the information requirements be so problematic? What does this assessment suggest about the effectiveness of the CDM for providing climate change benefits?

4. Commentators widely agree that additionality determinations are very subjective and flawed. *See, e.g.,* Axel Michaelowa, et al., *COP 10: Getting the CDM Started and Pondering the Future of the Climate Policy Regime* (Jan. 2005). As a consequence, interest has grown for simpler approaches for measuring project additionality and establishing project baselines. Simplified procedures for small-scale projects are one response (*see infra* Section III.D.1., note 4). Other approaches have also been proposed for simplifying the measurement of additionality. The “benchmark” approach involves establishing quantitative benchmarks expressed in terms of tons of carbon per unit of output and judged against “best practices” or some other agreed upon criteria that represents baseline emissions. A project would be deemed “additional” if its emissions were below the relevant benchmark. A second approach would establish lists of specific technologies that represent baseline technologies (and emissions) for different economic sectors. The baseline technologies could be universal or limited to specified countries or regions. Projects that use technologies with lower GHG emissions than the baseline technology would be deemed additional. While these approaches may be easier to measure, what additional challenges do they introduce? Does the language of Articles 6.1(b) and 12.5(c) of the Protocol pose any problems for these approaches?

5. The World Wildlife Fund established the Gold Standard in 2003, a set of expanded procedures and standards based on the CDM framework and rules of the CDM Executive Board. Endorsed by more than 80 civil society organization, the goal of the Gold Standard is to ensure that CDM and JI projects achieve additional reductions from business-as-usual activities and provide sustainable development benefits in the host country. The Gold Standard applies exclusively to projects employing renewable energy and energy efficiency technologies “to encourage the shift from a fossil fuel based economy to a renewable energy economy.” It also requires technology transfer and that project proponents use the Executive Board’s additionality tool. Project proponents must also invite local stakeholders to two consultation meetings (one in the initial stages of the project and one prior to validation) and ensure that the project responds to local concerns regarding the environmental, social, and economic impacts of the project. To ensure sustainable development benefits flow from the project, they must also calculate the environmental, social, and economic impacts of the project by scoring the project’s impacts (from -2 to +2) with respect to several specific questions (e.g., what is the impact on water quality and livelihoods of the poor?). Only projects with overall positive environmental, social,

and economic impacts are given the Gold Standard. *The Gold Standard: Manual for Project Developers (Version 3)* (May 2006). As of March 2013, more than 750 projects have completed the registration process or are in some stage of the Gold Standard pipeline. The Gold Standard adds evaluation costs for project developers. What are the benefits of seeking the Gold Standard? Do such private efforts provide an important supplementary means for ensuring that projects provide real benefits to climate mitigation and sustainable development? See <http://www.cdmgoldstandard.org/>.

6. Some business leaders and environmentalists worry that the development of additionality methodologies and actually ascertaining additionality have been too time-consuming and have resulted in high transactions costs. They argue that additionality may not even be “the most important factor at this stage in the development of offset-based emissions trading mechanisms.” Instead, they argue that it is more important to get “emissions trading frameworks into place for the future, noting that near-term emissions reduction targets and trading are only a first step toward long-term climate policy.” These observers are willing to trade “near-term environmental integrity in favor of getting a trading system into place.” Mark C. Trexler et al., *A Statistically-Driven Approach to Offset-Based GHG Additionality Determinations: What Can We Learn?*, 6 SUSTAINABLE DEV. L. & POL’Y 30, 34–35 (Winter 2006). Do you agree? What design elements would affect the importance of proper additionality assessments at the outset? For example, if a program allows significant banking — the use of excess allowances from an early commitment period to apply towards a Party’s commitment in the next commitment period — wouldn’t additionality matter more than in a program that prohibits or restricts banking? Even if banking is not a concern, would weak additionality assessments early on affect the expectations of Parties in the future?

7. Because leakage is defined as occurring outside the project’s boundaries, leakage will very likely be beyond the control of the project participants, unless the project participant is a government or governmental body. While a government may be able to control some leakage through extensive national planning, it will not be able to control “international leakage,” where companies or individuals move operations to another country. Consider potential leakage from a Bolivian afforestation CDM project. What kind of plan should project participants develop to measure leakage? Are there any steps they can take to avert leakage?

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### **3. *Diversity and Nature of CDM Projects***

At first glance, the statistics for CDM projects suggest a broad range of projects in a broad range of countries: as of the beginning of 2013, the CDM had registered more than 6,500 projects in most of the developing countries, totaling more than 1.2 billion CERs. A closer look at the data reveals both a skewing of projects toward big projects with big CER payoffs as well as an inequitable distribution of projects among a small number of developing countries. These issues have led some to question whether the CDM could be more effective in meeting its twin goals of helping developing countries contribute to climate change mitigation and promoting sustainable development.

During the Kyoto Protocol negotiations, some Parties sought to limit CDM eligibility to an

exclusive list of technologies relating to renewable energy and demand-side energy efficiency technologies. *See* Climate Action Network's Climate Negotiations Newsletter Eco 4, June 12, 2000. Ultimately, the "list" approach to CDM eligibility was rejected, and the Parties ultimately endorsed a technology neutral approach to the CDM (with nuclear being a rare exception). This allowed a broader range of projects to be eligible for CDM approval, but also required renewable energy and other projects to compete for CDM investment.

Not surprisingly, investors have gravitated towards those projects that give them the biggest CER bang for their buck. As a consequence, CDM projects have skewed towards particular sectors that, according to some, do not address climate change effectively or create perverse incentives for unsustainable development. The primary example was the CDM's treatment of projects designed to HFC-23. The elimination of HFC-23 is particularly illustrative. HFC-23 is a powerful greenhouse gas created as a by-product of the production of HCFC-22, an industrial coolant until recently promoted as an alternative to CFCs because it is a less potent ozone depleting substance. Although HCFC-22 is scheduled for phaseout under the Montreal Protocol on Substances that Deplete the Ozone Layer, its current production continues to produce HFC-23 with a global warming potential of 11,700. Regulation of HCFCs under the Montreal Protocol is addressed in Chapter 9. Consider the following description of a typical HFC destruction project in China

Among their targets is a large rusting chemical factory here in southeastern China. Its emissions of just one waste gas contribute as much to global warming each year as the emissions from a million American cars, each driven 12,000 miles.

Cleaning up this factory will require an incinerator that costs \$5 million — far less than the cost of cleaning up so many cars, or other sources of pollution in Europe and Japan.

Yet the foreign companies will pay roughly \$500 million for the incinerator — 100 times what it cost. . . . The huge profits from that will be divided by the chemical factory's owners, a Chinese government energy fund, and the consultants and bankers who put together the deal from a mansion in the wealthy Mayfair district of London.

With so much money flowing to a few particularly lucrative cleanup deals, the danger is that they will distract attention from the broader effort to curb global warming gases, and that the lure of quick profit will encourage short-term fixes at the expense of fundamental, long-run solutions, including developing renewable energy sources like solar power. \* \* \*

Another concern is that the program can have unintended results. . . . Handsome payments to clean up the waste gas have helped chemical companies to expand existing factories that make the old refrigerant and even build new factories, said Michael Wara, a carbon-trading lawyer at Holland & Knight in San Francisco. \* \* \*

[A recent] study . . . found that the profits are enormous in destroying trifluoromethane, or HFC-23, a very potent greenhouse gas that is produced at the factory here and several dozen other plants in developing countries. The study calculated that industrial nations could pay \$800 million a year to buy credits, even though the cost of building and operating incinerators will be only \$31 million a year.

Keith Bradsher, *Outside Profits, and Questions in Effort to Cut Warming Gases*, N.Y. TIMES, Dec. 21, 2006.

Many CDM projects have involved the destruction of HFC-23, which is relatively inexpensive to destroy and yields significant CERs per dollar invested. In fact, 99 percent of HFC-23 emissions can be destroyed by thermal oxidation at a cost of \$2 to \$8 million plus annual operating costs of \$189,000–\$350,000, depending on the facility’s capacity (less than \$0.20 per tonne of CO<sub>2</sub>eq). Technology and Economic Assessment Panel, *Response to Decision XVIII/12: Report of the Task Force on HCFC Issues (With Particular Focus on the Impact of the Clean Development Mechanism) and Emissions Reduction Benefits Arising from Earlier HCFC Phase-Out and Other Practical Matters* 51 (Aug. 2007). Consequently, HFC-23 destruction projects accounted for 67 percent of CDM CERs contracted in 2005 and 34 percent in 2006 (compared to just 16 percent for renewable energy projects in 2006). KARAN CAPOOR & PHILIPPE AMBROSI, *STATE AND TRENDS OF THE CARBON MARKET 2007* 27–28 (2007). Because of these concerns, the CDM in 2010 revised its methodology for HFC-23 destruction projects, which greatly reduced the number of these projects eligible for CERs.

Given the financial incentives, the rush to HFC-23 projects was easy to understand. In contrast, the following excerpt looks at the challenges facing CDM-project developers as they seek CERs through renewable energy projects.

**RENEWABLE ENERGY AND INTERNATIONAL LAW PROJECT, THE  
CLEAN DEVELOPMENT MECHANISM: SPECIAL CONSIDERATIONS  
FOR RENEWABLE ENERGY PROJECTS**

2–3 (Nov. 2006)\*

The first year after the Kyoto Protocol’s entry into force has revealed some hurdles in the operation of the CDM which renewable projects must overcome if the CDM is to be a meaningful driver for significant market growth of the renewable energy industry to meet the growing energy demand of developing countries in a sustainable manner. . . .

- Due to the differentiated global warming potentials of greenhouse gases (carbon dioxide, which is displaced by renewable energy, being the least “potent” in terms of its global warming effect), the volume of emission reductions from renewable energy projects is much smaller per unit of output than the volumes created by projects which abate other greenhouse gases such as nitrous oxide, HFC or methane.

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- Conversely, the equipment cost of most renewable energy projects is significantly higher per emission reduction than the cost of other types of potential CDM projects, such as agricultural methane flaring projects. The overall contribution of the revenue stream from Certified Emission Reductions (CERs) is therefore comparatively smaller for renewable energy projects than for other types of potential CDM projects. As the CDM is essentially a market, CDM project equity investors will tend to go to where “manufacturing costs” are cheapest and purchasers will tend to seek out a plentiful supply of CERs for minimum transaction costs. Renewable energy projects are therefore at a comparative disadvantage in the CDM compared to projects which reduce other types of greenhouse gases.
- In addition, renewable energy projects such as wind farms have a long operation life which (for projects being constructed today), will extend far beyond the Kyoto Protocol’s first commitment period. Until very recently, there was a significant amount of uncertainty as to whether the Kyoto Protocol would be continued beyond its first commitment period (i.e., 2012). CER purchasers have therefore been reluctant to make binding commitments to purchase CERs post-2012, such that the financial incentive created by CERs has in many cases been insufficient to support renewable energy projects for their entire operational life.
- As a result, many renewable energy projects which may be eligible under the CDM have had difficulty attracting project finance to support the projects. CER purchasers have tended to restrict their involvement in CDM projects to a commitment to pay for CERs upon delivery, rather than provide financial support for the underlying project. Registration as a CDM project does not necessarily mean that a renewable energy project will achieve project finance and become operational. Issues such as perceived regulatory and political risk in developing countries and the higher level of technology risk involved in renewable energy projects (as opposed, for example, to traditional fossil fuel projects) have meant that those renewable energy projects which have achieved external finance have tended to be smaller scale projects, rather than projects to create the optimum number of CERs. In addition, local host country regulations (such as grid connection, distribution or electricity tariff arrangements) may not provide renewable energy projects with the priority or support needed to make them feasible in the existing electricity market.
- Therefore, the transaction costs of developing these smaller scale projects as CDM projects (including the costs of external auditors, registration fees, consultants’ fees and legal fees for the negotiation of CER purchase agreements and power purchase agreements) may be prohibitively high compared to the volume of CERs expected to be generated by the projects.

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## QUESTIONS AND DISCUSSION

1. Both of the excerpts above suggest that the current market for CERs is biased against energy efficiency projects. Should we be concerned with that? Isn’t the market “bias” simply a

reflection that the lowest cost approach to mitigating climate change is the destruction of HFCs? Isn't the point of Kyoto's flexibility mechanisms to allow capital to flow to the lowest cost opportunities for abatement?

As you think about those questions, consider the discussion of HCFCs in Chapter 9. As noted there, concern over the climate impacts of HFCs led Parties to the Montreal Protocol to accelerate the phase out of HCFCs. This will mean that most HCFC production facilities even in developing countries will be phased out over the next few decades. How does this change the "additionality" of HFC destruction under the CDM? How will this regulatory change alter the market value of CERs from HFC destruction in the future?

**2.** Would the list-of-technologies approach rejected by the Kyoto negotiators be worth revisiting to help ensure that CDM investment is appropriately targeted towards sustainable development projects? What other approaches might encourage investment in more sustainable projects?

**3.** In a related issue, some projects that could reduce greenhouse gas emissions may have significant consequences for the environment. Thus, nuclear power or large hydroelectric dams have few carbon emissions and could be eligible for CDM credits to the extent that they replace coal or other fossil fuels, for example. Both nuclear power and hydroelectricity come with significant collateral environmental damage. Similarly, some forestry projects that could be eligible for CDM credits could also negatively impact biological diversity or forest-dwelling communities. Concerns such as these have been reflected in the design of the EU ETS, for example, which has disallowed credits for nuclear power, large hydropower and some forestry projects. Many EU Member States have also added additional limitations on what types of CDM credits will be available for their regulated industries.

**4. *Carbon Capture and Storage (CCS) Technologies and the CDM.*** Among the most controversial technology-related issues has been the extent to which the application of carbon capture and storage technologies will be available for CDM credits. In 2011, the Kyoto Protocol Parties endorsed CCS technology as eligible for the CDM. The Parties to the Protocol placed the following requirements on the use of CCS technologies (beyond that required by the general CDM rules and procedures):

8. A Party not included in Annex I to the Convention may only host a CCS project activity under the CDM if it has submitted an expression of its agreement to the UNFCCC secretariat to allow the implementation of CCS project activities in its territory and provided that it has established laws or regulations which:

(a) Set procedures that include provisions for the appropriate selection, characterization and development of geological storage sites, recognizing the project requirements for CCS project activities under the CDM . . . ;

(b) Define means by which rights to store carbon dioxide in, and gain access to, subsurface pore space can be conferred to project participants;

(c) Provide for timely and effective redress for affected entities, individuals and communities for any significant damages, such as environmental damage, including damage to ecosystems, other material damages or personal injury, caused by the project activity, including in the post-closure phase;

(d) Provide for timely and effective remedial measures to stop or control any unintended seepage of carbon dioxide, to restore the integrity of a geological storage site, and to restore long-term environmental quality significantly affected by a CCS project activity;

(e) Establish means for addressing liability arrangements for carbon dioxide geological storage sites . . . ;

(f) For a host Party that accepts the obligation to address a net reversal of storage in the situation referred to in paragraph 26 below, establish measures to fulfil such an obligation.

Decision 10/CMP.7, para. 8 (2011). How do these provisions attempt to address the potential for carbon to leak over time from a CCS facility? The CDM sets out a variety of more detailed requirements aimed at addressing the potential for seepage from carbon storage facilities. For example, the CDM requires that a CCS project be monitored for seepage twenty years after the last CER is issued, and there are procedures for cancelling CERs when there has been net reversal in carbon storage. Review Decision 10/CMP.7. Do you think these provisions are sufficient to address the potential challenges posed by the use of CCS technologies for climate-related credits? Do you think certifying CCS projects unreasonably slows the broader transformation to renewable technologies?

**5. Transaction Costs.** CDM projects have been criticized for having high transaction costs for CDM projects. According to one report:

EcoSecurities has estimated that the consultancy costs for project assessment and completion of the project documentation necessary to register a large scale (i.e., >15 MW) renewable energy project range between £23,000 and £122,000 [eds. note: \$46,000 to \$244,000 in January 2008], plus additional fees for the Designated Operational Entity's validation and verification. The Executive Board will also require payment of US\$21,000 upon registration of such a project to cover administrative expenses, plus US\$0.20 per CER issued (with a discount of US\$0.10 for the first 15,000 CERs issued each year). For a 50MW renewable energy plant expected to produce around 112,500 CERs per year, the transaction costs can eat away much of the first year's expected CER revenues from the project.

Renewable Energy and International Law Project, *The Clean Development Mechanism: Special Considerations for Renewable Energy Projects* 12 (Nov. 2006). At times, transaction costs actually exceeded the actual costs of GHG abatement. How should the Parties address this issue, if at all? Should governments find alternative ways to pay for such projects, as environmentalists

have suggested?

**6. Simplified Procedures for Small Projects.** The Parties recognized that many smaller projects could have cumulatively large climate benefits. However, each small project may not be profitable due to high transaction costs and modest CER value. Also, whereas the consulting fees must generally be paid upfront, the CERs tend to accumulate value only over a number of years. See Mindy G. Nigoff, *The Clean Development Mechanism: Does the Current Structure Facilitate Kyoto Protocol Compliance?*, 18 GEO. INT'L ENVTL. L. REV. 249 (2006) (finding the registration process "too cumbersome"). To reduce transaction costs and encourage smaller projects with climate benefits, the Parties developed simplified procedures for validation and verification of "small projects": renewable energy projects with a maximum output of 15 megawatts; energy efficiency projects that reduce consumption by at least 60 Gigawatts/hours per year, and "other projects," such as waste management, fuel switching, and agricultural projects, that reduce emissions by sources and directly emit fewer than 60 kilotons of CO<sub>2</sub>e annually. Decision 17/CP.7, *Modalities and Procedures for a Clean Development Mechanism as Defined in Article 12 of the Kyoto Protocol*, para. 6(c), (2001), as amended by Decision 1/CMP.2, para. 28 (2006). These thresholds also apply to JI projects. Decision 3/CMP.2, *Guidance on Implementation of Article 6 of the Kyoto Protocol*, para. 14 (2006)). With the simplified procedures, small-scale projects are intended to benefit countries that perhaps do not have the capacity to undertake larger CDM projects and thus enhance the sustainable development aspect of the CDM. At the same time, the rules developed by the Executive Board are intended to ensure that such projects do not undermine the climate benefits of the CDM. Under the simplified procedures, projects fitting these categories must follow less rigorous requirements for the different aspects of CDM projects: project design, selection of baseline methodologies, proof of additionality, and monitoring.

In addition, "small-scale afforestation and reforestation project activities under the CDM" are eligible for the simplified procedures. The original decision establishing a category of small-scale afforestation and reforestation projects limited such projects to removals by sinks of less than 8 kilotonnes of CO<sub>2</sub> per year. Decision 5/CMP.1, *Modalities and Procedures for Afforestation and Reforestation Project Activities under the Clean Development Mechanism in the First Commitment Period of the Kyoto Protocol*, para. 20(d) (2005). Projects of this size were widely considered unprofitable; Bolivia estimated that removals of 24 kilotonnes of CO<sub>2</sub> were needed to break even on a project and proposed increasing the limit to 48 kilotonnes of CO<sub>2</sub>. In the end, the Parties increased the limit to 16 kilotonnes, provided that the project is "developed or implemented by low-income communities and individuals as determined by the host Party." Decision 9/CMP.3, *Implications of Possible Changes to the Limit for Small-Scale Afforestation and Reforestation Clean Development Mechanism Project Activities* (2007); see also Decision 4/CMP.1, *Guidance Relating to the Clean Development Mechanism* (2005).

**7. Inequitable Distribution of CDM Benefits.** The distribution of CDM projects has been a source of complaint among NGOs as well as governments. As of February 2013, Asia and the Pacific hosted more than 85 percent of all projects, and Latin America and the Caribbean hosted 12 percent, while Africa hosted only 2 percent of all projects. Inside each region, one or two countries have attracted an overwhelming number of CDM projects. In fact China alone accounts for nearly 53 percent of *all* CDM projects (3,481 projects) through the beginning of 2013, and

India accounts for another 18.4 percent (1,198 projects). The next highest rated country is Brazil at 4.1 percent (269 projects), Vietnam 3.5 percent (231 projects) and Mexico 2.6 percent (171 projects). UNFCCC, *CDM Registration, available at* <http://cdm.unfccc.int>.

The inequitable distribution of projects means that the CDM is failing to assist the vast majority of developing countries to achieve sustainable development, one of the CDM's two principal goals. An important aspect of achieving sustainable development is the transfer of technology. Indeed, the CDM is designed to promote the transfer of environmentally-friendly technologies for sustainable development. In a study of all 644 CDM projects registered as of May 2007, however, researchers found that only certain types of projects lead to transfers of technology and that certain countries received technology more frequently than other countries. Some of the paper's key findings are:

Only 43 percent of CDM projects involved technology transfer.

- CDM projects in Malaysia (87 percent), Mexico (68 percent) and China (59 percent) involved much greater rates of technology transfer than Brazil (40 percent), Chile (35 percent), and India (12 percent).
- Some types of projects, such as biomass energy (19 percent) and supply side energy efficiency (14 percent) had relatively low levels of technology transfer compared to landfill gas recovery (80 percent) and N<sub>2</sub>O destruction projects (100 percent).
- 70 percent of agriculture, including reforestation, projects involved technology transfer, whereas energy (39 percent) and industrial (27 percent) projects had much lower rates of technology transfer.

Matthieu Glachant et al., *The Clean Development Mechanism and the International Diffusion of Technologies: An Empirical Study* (Fondazione Eni Enrico Mattei, Nota de Lavoro 105, 2007). Why? The researchers sought to answer whether technology transfer was more likely in countries with greater technological capabilities, due to the type of project involved, or other factors. Some answers were explained easily. For example, China has had a high rate of technology transfer because all HFC-23 destruction projects, many of which have occurred in China, involve technology transfer. Other explanations for the data were not as easily explained:

From a descriptive point of view, the data shows that technology transfers take place in more than 40% of the CDM projects. Very few projects involve the transfer of equipment only. Instead, projects often include the transfer of knowledge and operating skills, allowing project implementers to appropriate the technology.

Technology transfer mainly concern two areas. The first one is the end-of-pipe destruction of non-CO<sub>2</sub> greenhouse gas with high global warming potentials, such as HFCs, CH<sub>4</sub> and N<sub>2</sub>O. This concerns the chemicals industry, the agricultural sector and the waste management sector. The second one is wind power. Other projects, such as electricity production from biomass or energy efficiency

measures in the industry sector, mainly rely on local technologies. Moreover, Mexican and Chinese projects more frequently attract technology transfers while European countries are the main technology suppliers. We have also developed econometric models in order to characterize the factors underlying these patterns. They show that there are economies of scale in technology transfer: all other things being equal, transfers in large projects — in terms of emissions reductions — are more likely. Furthermore, the probability of transfer is 50% higher when the project is developed in a subsidiary of Annex 1 companies. Having an official credit buyer in the project also exerts a positive influence on transfer likeliness, albeit much smaller (+16%).

As regards the host countries' features, the most interesting econometric results deal with technological capabilities. In theory, this factor has ambiguous effects. On the one hand, high capabilities may be necessary to adopt a new technology. On the other hand, high capabilities imply that many technologies are already available locally, thereby reducing transfer likeliness. Our estimations show that the first effect strongly dominates in the energy sector and in the chemicals industry. By contrast, the second effect is stronger for agricultural projects. This suggests that the agricultural technologies transferred in these projects tend to be simple.

What are the policy implications? First, these results suggest policy lessons on CDM design. Encouraging large projects — or project bundling — allows . . . increasing returns in technology transfer. Promoting projects in subsidiaries of Annex 1 companies could also be of great use to foster technology transfer. In practice, one could imagine different ways of providing incentives for companies to do so (e.g., additional credits, simplified administrative procedures). To a lesser extent, credit buyers, which are generally not pure financial actors, can also play a positive role. Our analysis may also give lessons on general measures. In particular, the study suggests that programs of technological capacity building would be particularly profitable in the energy sector and in the chemicals industry.

*Id.*

**8. Sustainable Development Criteria.** The Parties have not established rules to ensure that CDM projects as a whole promote sustainable development. Instead, each Party hosting a CDM project determines on a case-by-case basis whether a project meets that country's sustainable development objectives. While the Parties have adopted various criteria, they have, on the whole, developed criteria that align with the three pillars of sustainable development: environmental, economic, and social development. A comprehensive review of national sustainable development criteria reports that environmental criteria include, for example, levels of CO<sub>2</sub> equivalent reduction in local areas or some other measurement of climate change mitigation, improvements to air quality, increased efficiency in resource use, or conservation of local resources. Economic criteria include job creation and improved working conditions, poverty reduction, technology transfer, and development in particular regions. Social criteria include training and technological

development, improved quality of life, better income distribution, poverty relief, or increased energy supply. Bruce P. Chadwick, *Sustainable Development Criteria and the Clean Development Mechanism* (2005). Regardless of the criteria, Designated National Authorities do not appear to be influencing decisions to approve or reject CDM projects: projects are approved because of the desire for investment. Is it true that any investment assists in some way with achieving sustainable development? Should the CDM Executive Board review projects against some minimum sustainable development criteria as part of the registration process? As an international institution, should the CDM at least ensure that all approved projects are consistent with norms found in other international environmental, human rights or labor agreements? Would it be acceptable to focus only on climate benefits, for example, if a project were shown to involve child labor or resulted in the dispossession of indigenous lands?

**9. The Buyers.** Given the presence of the European Union's mandatory emissions reduction scheme and an active emission trading program, it is not surprising that Europeans have bought the overwhelming majority of CERs from CDM projects and ERUs from JI projects — more than 85 percent. We now turn to a discussion of the EU Emissions Trading System.

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### III. THE EUROPEAN UNION EMISSIONS TRADING SYSTEM

Although carbon markets are emerging in many countries and regions, the European Union's carbon market has by far the longest and most robust track record. Even before the Kyoto Protocol entered into force, the European Union announced that it would implement an EU-wide cap-and-trade system for greenhouse gas emissions, called the EU Emissions Trading System (EU ETS). They planned to make the system compatible with the Kyoto Protocol, but it had an independent source of law as part of Europe's continent-wide approach to climate change. Whatever global commitments were in force, Europe believed having its own trading system would lower its overall costs of emissions reduction, give its private sector a jump-start on any global trading system, and further the political goals of European integration. Moreover, given the ultimate absence of the United States from the Kyoto Protocol, Europe became the dominant player in the Protocol's markets; the EU ETS accounts for well more than 70 percent of all carbon trades.

The 15 Member States that made up the EU at the time of the Kyoto Protocol negotiations committed to reducing their combined emissions of greenhouse gases by 8 percent from 1990 levels by the end of the Protocol's first commitment period (i.e. 2012). This overall target was translated into differentiated emission reduction or limitation targets for each Member State under a "burden sharing" agreement negotiated at the EU level. Newer EU Member States were not covered by the EU's aggregated first commitment period target, but in most cases had their own reduction targets of 6 percent or 8 percent under the Protocol. Thirty-one countries now participate in the EU ETS, which commenced in January 2005, with the 27 EU member States plus Croatia covered by the EU's aggregated second commitment period target, in accordance with Article 4 of the Kyoto Protocol. The EU ETS initially only covered CO<sub>2</sub> emissions from the energy sector but it has now been expanded to a limited number of other sectors and greenhouse gases.

Given Europe's early and consistent commitment to carbon markets, the EU ETS today offers the most important case study of the implementation of carbon markets. Lessons learned from the EU ETS are shaping the design and implementation of carbon markets around the world.

## **A. The Evolution of the ETS**

When the European Union launched the ETS in January 2005, it was the first emissions trading program to struggle with the many issues associated with linking different international and national emissions trading programs. In addition, the European Union had little experience with emissions trading and was, at the time, learning to integrate the less developed regulatory systems of the new EU members of Central and Eastern Europe. Thus, the European Union was building essentially from scratch a complex trading program with the need for well-developed institutional structure that covers thousands of installations. For that reason, the ETS included an early commitment period, which ended in December 2007 (Phase I), to allow EU regulators and businesses time to familiarize themselves with carbon trading and improve the program for the more important second commitment period (Phase II), which coincided with the 2008–2012 first commitment period of the Kyoto Protocol. A third commitment period now extends from 2013–2020 (Phase III). The cap on emissions from fixed installations will be reduced 1.74 percent each year during the third commitment period, resulting in a 21 percent reduction of emissions from these sectors by 2021 (when compared to 2005 emissions levels).

The first commitment period was explicitly intended to be a “learning-by-doing” experiment to prepare for the second commitment period that would coincide with the EU's international obligations under the Kyoto Protocol. During the first period, carbon dioxide emissions from covered facilities were capped at 6,600 MtCO<sub>2</sub>. The EU allocated Germany about 15 percent of the cap, while Italy, Poland, and the United Kingdom each received about 10 percent. STATE AND TRENDS OF THE CARBON MARKET 2007, at 15. In 2005, the ETS's first year, all but six member States met the caps established by the ETS. In addition, 8,980 installations representing more than 99 percent of allocated allowances in the 21 Member States with functioning electronic registries had fulfilled their obligations. European Commission, COM(2006)676 final, 3 (Nov. 13, 2006). Overall, total GHG emissions in 2006 for the 23 EU member States with Kyoto Protocol emissions targets were 5 percent below 1990 levels, but it is not at all clear that the ETS is responsible for any of those reductions.

In particular, Phase I of the ETS was marked by significant over-allocation of allowances due to the wide latitude left to the Member States to develop their own National Allocation Plans (NAPs). In fact, some suggest that annual average 2005–2007 allocations are actually 44.1 million metric tons higher than the reported 2005 emissions. How could this happen?

## **LARRY PARKER, CLIMATE CHANGE: THE EUROPEAN UNION'S EMISSIONS TRADING SYSTEM (EU-ETS) (CRS Report for Congress, July 31, 2006)**

[T]he primary problem the EC found with NAPs that resulted in revisions were excessive allocation of allowances and state efforts to permit “ex-post adjustments” to their allocations.

Excessive allocation problems resulted from states that left a gap in how they would achieve their target, to be filled with measures to be defined later; insufficiently delineated plans to purchase allowances; and unrealistic economic or emissions growth assumptions. Ex-post adjustments by states are not allowed; such adjustments are seen by the EC as potentially disruptive to the emissions market and creating uncertainty for companies. \* \* \*

For the first trading period, these 21 countries [with functioning registries] have allocated an annual average of 1.8295 billion allowances and set aside 73.4 million allowances for allocation to new sources or for auctions. Verified emissions in 2005 for covered sources is 1.7853 billion metric tons. . . . The 44.2 million allowances allocated in excess of actual 2005 emissions have been characterized by EU's Environment Commissioner as an "over-allocation" of allowances and is considered responsible for a significant drop in allowances prices in May, 2006. The 2005 emissions total reflects emissions from 8,980 sources representing more than 99% of the allowances allocated. As of April 30, 849 sources in the 21 countries had not surrendered sufficient allowances. The EC will determine whether the insufficiency is the result of technical difficulties in national registries, tardiness, or noncompliance.

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Despite the overallocation of allowances and doubts as to whether any environmental impact could be attributed to the ETS, Phase I successfully launched a viable carbon market. The volume of trade in allowances steadily increased since the ETS's inception. By 2006, more than one billion allowances were traded, a three-fold increase from 2005. At the same time, the price of allowances fluctuated dramatically, hitting a high of €30 in April 2006 from an earlier low of less than €1. *State and Trends of the Carbon Market 2007*, at 11–12. Consider the following:

**EUROPEAN COMMISSION, BUILDING A GLOBAL CARBON MARKET  
— REPORT PURSUANT TO ARTICLE 30 OF DIRECTIVE 2003/87/EC  
COM(2006)676 final, 3 (Nov. 13, 2006)**

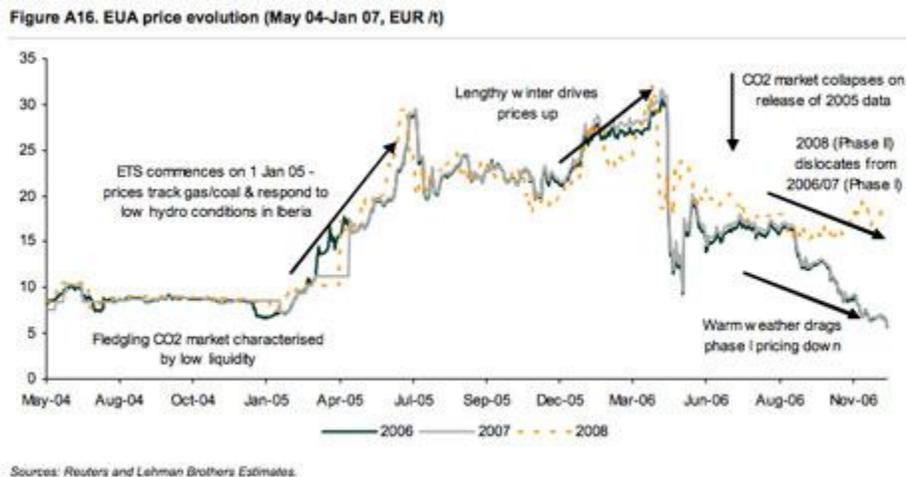
In 2005, more than 320 million allowances worth more than €6.5 billion were reported as having been traded over-the-counter, at exchanges or bilaterally. As regards 2006, by May a trading volume of over 300 million allowances had been reported and the monthly trading volume in May had approached 100 million allowances. Transactions under the EU ETS dominate the global carbon market, accounting for over 80% of the monetary value and over 60% of the total volume of carbon trades.

According to responses in a survey, power companies and refineries were among the most active in the market initially, while steel and aluminium companies had not traded at all by mid-2005. The reason for this is most likely that many power generators and refineries have access within their company structure to extensive experience of trading in related commodity markets. Once the first exchanges emerged around mid-2005, banks and investment funds started to offer services to inactive companies to trade allowances on their behalf.

Analysts cite various factors influencing the allowance price over time: reduction potential and costs to reduce emissions, allocations, reported actual emissions, access to and availability of JI and CDM credits, fossil fuel prices, weather patterns (temperature, precipitation) and degree of

participation across different sectors in the market. The allowance price has so far reacted also to political developments.

The most significant short term allowance price development so far took place in connection with the release of 2005 verified emissions data in May 2006. Both the timing of the release (unannounced pre-release by several Member States) and the actual level of the 2005 emissions data (lower in aggregate than expected by many market observers) caused a substantial decline in the market price within a few days. Several stakeholders have thus voiced concerns about the degree of volatility experienced so far. In this context it must be stressed that new markets need time to establish sufficient and reliable information sources and therefore tune its reaction to the fundamental price drivers. A higher degree of volatility has been observed in the initial phase of other successful environmental markets. Thereafter, volatility decreases, facilitated by stable political signals, legislative stability, and strong compliance enforcement.



At least as of 2012 large price fluctuations, frequently triggered by regulatory shifts, have continued to plague the EU ETS. This remains a major challenge for the future of the ETS.

## QUESTIONS AND DISCUSSION

**1. National Allocation Plans (NAPs).** During Phase I and Phase II of the ETS, each country would submit its own National Allocation Plan to the European Commission for approval. The NAPs reflected critical decisions, including how many allowances to issue to covered installations and how many to distribute to each of the covered sectors. The member States had some flexibility in making their choices, but they had to comply with criteria established by Annex III of the ETS Directive. *Id.* art. 9. These criteria included the following:

- Quantities of allocated allowances must be consistent with a member State's Kyoto Protocol and EU targets, and the potential, including the technological potential, of

activities covered by this scheme to reduce emissions.

- The NAP as a whole must “not discriminate between companies or sectors in such a way as to unduly favour certain undertakings or activities” and include information on the manner in which new entrants will be able to begin participating in the ETS.
- The NAP must establish a limit on the number of allowances from joint implementation and Clean Development Mechanism projects that may be used to achieve an installation’s target.
- The NAP must contain information about how many allowances will be reserved for new installations (“new entrants”) in the four sectors covered by the ETS.

The European Commission would then review each NAP to ensure compliance with EU legislation and the goals of the ETS. The Commission found itself in a position where it frequently had to reject the allocations proposed by the countries. For example, the Commission reduced proposed allocations of allowances by an average of 9.5 percent for 23 member States with approved NAPS as of August 2007. LARRY PARKER, CLIMATE CHANGE: THE EU EMISSIONS TRADING SCHEME (ETS) GETS READY FOR KYOTO, 4 (CRS Report, Aug. 27, 2007). The Commission’s decision with respect to Germany’s NAP further shows the tensions that allocating allowances creates between ETS and non-ETS sectors and between EU member States. For Phase II, Germany proposed to allocate 482 million metric tons of allowances, even though the actual emissions for the covered ETS sectors in 2005 were only 474 million metric tons. Moreover, the emissions covered by the ETS represented less than half of Germany’s overall Kyoto Protocol target.

The Commission concluded, among other things, that Germany’s NAP failed to demonstrate that it would meet its Kyoto and EU targets. Based on an assessment of Germany’s anticipated GDP growth, carbon-intensity improvements, and the effect of the increase in scope of the ETS, the Commission concluded that Germany’s proposed allocations exceeded emissions by 28.93 million tons.

Germany also proposed to allocate 11 million metric tons to new combustion facilities, i.e., coal-fired power plants. It also proposed that new power station built between 2008 and 2012 could opt out from CO<sub>2</sub> caps and the ETS for 14 years. Without commenting on the 14-year opt out provision, the Commission concluded that Germany’s allocation guarantees for new combustion facilities unduly discriminate against comparable existing facilities in contravention of the Treaty Establishing the European Community because the allocation guarantee constituted state aid that distorted or threatened to distort competition by favoring certain undertakings. European Commission, Decision concerning the National Allocation Plan for the Allocation of Greenhouse Gas Emission Allowances Notified by Germany in accordance with Directive 2003/87/EC of the European Parliament and of the Council (Nov. 29 2006).

Because of implementation challenges like these and the inevitable conflicts with Member States, Phase III of the ETS replaced the NAPs with an EU-wide cap and harmonized rules on allocation.

**2. Banking.** The designers of the ETS faced two questions related to banking: how easily allowances could be used within a commitment period and whether banked allowances would be available between reporting periods:

[A] notable feature of the EU ETS is that effectively there is no restriction on banking or borrowing of allowances within any given multi-year trading period. Allowances are issued annually but they are valid for covering emissions in any year within the trading period. Moreover, each year's issuance of allowances occurs at the end of February, two months before allowances must be surrendered for the preceding year. As a consequence, installations can cover shortages in any given year by allowances issued for the next year. This arrangement effectively allows year-ahead borrowing within the trading period.

The rules governing trading between trading periods are, however, more complicated. Most importantly, [essentially] no banking or borrowing was allowed between the first (2005–2007) and second (2008–2012) trading periods. This limitation effectively made the trial period self-contained and it is one of the major design flaws of the trial period. However, the reason it was adopted is understandable: to prevent any compliance failures during the trial period from spilling over into the second trading period and thereby complicating the attainment of the EU's commitments under the Kyoto Protocol. For the second and subsequent trading periods, unrestricted inter-period banking, but not borrowing, will be allowed.

A. DENNY ELLERMAN & PAUL L. JOSKOW, THE EUROPEAN UNION'S EMISSIONS TRADING SYSTEM IN PERSPECTIVE (Pew Center on Global Climate Change, May 2008). Under Article 13 of the ETS Directive, the ETS, Member States had the discretion to permit banking of allowances from the first to the second trading period, but only "if it did not lead to an allocation beyond the total allocation approved by the Commission for the second trading period. Therefore, for each allowance allowed to be banked, an allowance must be deducted from the total quantity issued for the second trading period." Press Release, *Emissions Trading: Commission Decides on First Set of National Allocation Plans for the 2008-2012 Trading Period* IP/06/1650 (Nov. 29, 2006), [http://ec.europa.eu/environment/climat/ip\\_1650.htm](http://ec.europa.eu/environment/climat/ip_1650.htm).

In addition, the Commission viewed discretionary banking from the first to the second trading period as impermissible State aid (i.e., an impermissible trade-distorting measure under Article 87 of the EC Treaty):

Discretionary banking from the first to the second trading period involves State aid,], "because the Member State would issue allowances for free where it could otherwise have sold them in the form of "Assigned Amount Units." At the same time banking by a Member State into the second trading period is only compatible with the criterion to reflect the reduction potential, if banked allowances are deducted from the cap found compatible with the Directive's allocation criteria.

The Commission takes the view that any national provisions related to the intended use of discretionary banking between the first and second trading periods must be notified to the Commission pursuant to Article 88(3) of the [EC] Treaty. The Commission at this stage considers that any issuance of banked allowances in the second trading period which is not based on an environmental counterpart by beneficiaries in terms of proven real emission reductions during the first trading period could constitute State aid which would likely be found incompatible with the internal market should it be assessed in accordance with Article 87 and 88 of the Treaty.

European Commission, COM(2006) 725 final, 11–12 (Nov. 29, 2006). These decisions of the Commission greatly limited the use of banking; only Poland and France — just 2 of 25 member States — allowed banking from the first to the second trading period. This led to a substantial devaluation of allowances in the last months of the first compliance period because excess allowances from the first compliance period became virtually worthless. Do you understand why?

**3. Consider the following reflection on the first phase of the ETS:**

Views about the EU ETS have been heavily influenced by a misunderstanding of what the 2005–2007 trial period was supposed to achieve and the limited goals for emissions reduction that were incorporated into the trial period caps. The primary goal of the trial period was to develop the infrastructure and to provide the experience to enable the successful use of a cap-and-trade system to limit European GHG emissions in 2008–2012 and beyond. The 2005–2007 trial period was never intended to achieve significant reductions in CO<sub>2</sub> emissions in only three years. In light of the speed with which the program was developed, the many sovereign countries involved, the unexpected increase in natural gas prices affecting a partially liberalized electricity sector, the need to develop the necessary data and compliance procedures, and the lack of extensive experience with emissions trading in Europe, we think that the system has evolved surprisingly well.

Although there have been plenty of rough edges, a transparent price on tradable CO<sub>2</sub> emission allowances emerged as of January 1, 2005, a functioning market in allowances has developed effortlessly without any prodding by the Commission or member state governments, the trading infrastructure of markets, registries and monitoring, reporting and verification is in place, and a significant segment of European industry is incorporating the price of CO<sub>2</sub> emissions into their daily production decisions.

A. DENNY ELLERMAN & PAUL L. JOSKOW, THE EUROPEAN UNION'S EMISSIONS TRADING SYSTEM IN PERSPECTIVE (Pew Center on Global Climate Change, May 2008).

## **B. Key Features of the Current ETS**

Phase III of the ETS from 2013 to 2020 reflects several important adjustments made in light of the lessons learned from the first two compliance periods. No longer will the ETS be an aggregation of 27 national caps; the EU has set the overall cap for the ETS, reducing emissions from fixed installations 1.74 percent each year, resulting in a 21 percent reduction of emissions from covered sectors by 2021 (when compared to 2005 emissions levels). The rules for allocating allowances have also been harmonized at the EU level, reducing the possibility of dramatically divergent implementation in different countries. The ETS has been expanded beyond carbon dioxide emissions to a limited extent and preparation is already being made for further expansion in the fourth compliance period.

### **1. *Scope of the ETS***

The EU ETS covers 31 countries — all 27 Member States of the EU as well as Iceland, Liechtenstein, Norway, and Croatia. The trading program covers more than 45 percent of the EU's greenhouse gas emissions, and applies to carbon dioxide emissions from more than 11,500 energy intensive installations in four sectors: production and processing of iron and steel, minerals (such as cement, glass, and ceramic production), energy (including electric power and emissions from oil refineries), and pulp and paper installations. It also now includes carbon dioxide emissions from airline flights to and from the covered countries. The EU ETS mostly covers emissions of carbon dioxide, but the third phase also covers nitrous oxide from the production of certain acids and perfluorocarbons from aluminum production. Emissions from these sources are considered relatively easy to measure and verify. See Directive 2003/87/EC of the European Parliament and of the Council of 13 October 2003 establishing a scheme for greenhouse gas emission allowance trading within the Community and amending Council Directive 96/61/EC, OJ 2003 L 275, art. 2, Annexes I, II; see also Directive 2009/29/EC of the European Parliament and of the Council of 23 April 2009, amending Directive 2003/87/EC so as to improve and extend the greenhouse gas emission allowance trading scheme of the Community.

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### **2. *Emission Allowances***

As in other carbon trading systems, emission allowances are the heart of the ETS, where one allowance equals the right to emit one metric ton of carbon dioxide or its global warming equivalent amount of nitrous oxide or perfluorocarbons. EU legislation provided that at least 95 percent of allowances during the first compliance period and 90 percent during the second compliance period had to be allocated free of charge. Directive 2003/87/EC, paras. 9, 10. This changed significantly for the third compliance period where the majority of allowances will be auctioned. The amount and method of distributing allowances have been continuing controversies for the design of the EU ETS. The third allowance period addressed these issues by putting an EU-wide cap on emission allowances and requiring a majority to be auctioned. The system is described further in the following summary from the EU.

## **EUROPEAN COMMISSION, THE EU EMISSIONS TRADING SYSTEM**

## **(EU ETS) FACTSHEET**

### 3–5 (2013)

#### **HOW ALLOWANCES ARE ALLOCATED**

##### *Auctioning*

Whereas the vast majority of emission allowances was previously given away for free by governments, from 2013 auctioning is the main method of allocating allowances. This means that businesses have to buy an increasing proportion of their allowances at auction. EU legislation sets the goal of phasing out free allocation completely by 2027. Auctioning is the most transparent method of allocating allowances and puts into practice the principle that the polluter should pay.

From 2013 power generators must buy all their allowances: experience shows that they have been able to pass on the notional cost of allowances to customers even when they received them for free. However, eight of the member states which have joined the EU since 2004 — Bulgaria, Cyprus, Czech Republic, Estonia, Hungary, Lithuania, Poland and Romania — have made use of a provision allowing them to continue granting limited numbers of free allowances to existing power plants until 2019. In return they will invest at least as much as the value of the free allowances in modernising their power sector.

Given the significant weight of power generation in the EU ETS, and even with partial free allocation in the eight member states, more than 40% of allowances in the system will be auctioned in 2013 and this share will rise progressively in the following years.

Eighty-eight per cent of the allowances to be auctioned are allocated to states on the basis of their share of verified emissions from EU ETS installations in 2005. Ten per cent are allocated to the least wealthy EU member states as an additional source of revenue to help them invest in reducing the carbon intensity of their economies and adapting to climate change.

The remaining 2% is given as a ‘Kyoto bonus’ to nine EU member states which by 2005 had reduced their greenhouse gas emissions by at least 20% of levels in their Kyoto Protocol base year or period. These are Bulgaria, Czech Republic, Estonia, Hungary, Latvia, Lithuania, Poland, Romania and Slovakia.

Auctions are held by companies appointed by national governments but are open to buyers from any country participating in the EU ETS. Most governments use a common ‘platform’ for their auctions, but Germany, Poland and the UK have opted to use their own platforms.

##### *Use of auctioning revenues*

Under the relevant EU legislation at least half of auctioning revenues, and all of the revenues from auctioning allowances to the aviation sector, should be used to combat climate change in Europe or other countries. Member states are obliged to inform the Commission of how they use the revenues. Germany, for instance, is spending a large part of its auctioning revenues on

climate change projects in developing countries and emerging economies.

### ***Free allocation***

In sectors other than power generation, the transition to auctioning is taking place progressively. Manufacturing industry will receive 80% of its allowances free of charge in 2013 but this will decrease annually to 30% in 2020. Allowances not allocated for free will be auctioned. In the **aviation sector**, however, only 15% of allowances will be auctioned over the whole 2013-2020 period.

The allowances given to manufacturing industry for free are distributed to companies on the basis of harmonised rules. This ensures that installations of a given type are treated equally across the EU. Underpinning these rules are ambitious benchmarks of emissions performance which have been drawn up in consultation with industry. By rewarding the most efficient installations, the benchmarks strengthen the incentive for businesses to reduce their emissions.

Installations in sectors and sub-sectors which are deemed to be exposed to a significant risk of ‘carbon leakage’ receive special treatment to support their competitiveness. Those reaching the benchmark level in principle receive for free all of the allowances they need, based on their historic emissions, for the whole 2013—2020 period. Installations falling short of the benchmark receive a proportionately lower allocation of free allowances compared to their emissions, and therefore need to reduce their emissions and/or buy more allowances.

In sectors not deemed to be at significant risk of carbon leakage, installations which attain the benchmark performance level in principle receive 80% of the allowances they need for free in 2013. This percentage is reduced annually to 30% in 2020. Again, installations falling short of the performance benchmark receive a proportionately lower allocation of allowances than those which reach it.

### **ENSURING COMPLIANCE**

Businesses must monitor and report their EU ETS emissions for each calendar year and have their emission reports checked by an accredited verifier. They must surrender enough allowances to cover their total emissions by 30 April of the following year. These allowances are then cancelled so they cannot be used again.

A business is penalised if it does not surrender enough allowances to cover its emissions. It has to buy allowances to make up the shortfall, is ‘named and shamed’ by having its name published, and must pay a dissuasive fine for each excess tonne of greenhouse gas emitted. The fine in 2013 is €100 per tonne of CO<sub>2</sub> (or the equivalent amount of N<sub>2</sub>O or PFCs). The penalty rises annually in line with the annual rate of inflation in the Eurozone (the group of EU countries using the euro as their currency).

The accurate accounting of all allowances issued is assured by a single EU registry with strong security measures. The registry keeps track of the ownership of allowances held in electronic accounts, in the same way as a bank holds a record of its customers and their money.

### ***3. Monitoring and Reporting***

The EU ETS is dependent on an elaborate monitoring, reporting and verifying system that reflects the generally strong environmental enforcement and compliance culture of the participating countries. Because the ETS covers only part of the greenhouse gas emission sources and substances regulated under the Kyoto Protocol, the permitting and reporting system for the ETS is nested inside a broader environmental permitting system for greenhouse gases.

#### **EUROPEAN COMMISSION, EU ACTION AGAINST CLIMATE CHANGE: EU EMISSIONS TRADING — AN OPEN SCHEME PROMOTING GLOBAL INNOVATION 12–14 (2005)**

Each installation in the ETS must have a permit from its competent authority for its emissions of all six greenhouse gases controlled by the Kyoto Protocol. A condition for granting the permit is that the operator is capable of monitoring and reporting the plant's emissions. A permit is different from the allowances: the permit sets out the emissions monitoring and reporting requirements for an installation, whereas allowances are the scheme's tradable unit.

Installations must report their CO<sub>2</sub> emissions after each calendar year. The European Commission has issued a set of monitoring and reporting guidelines [Commission Decision 2004/156/EC of 29 January 2004] to be followed. Installations' reports have to be checked by an independent verifier on the basis of criteria set out in the ETS legislation, and are made public. Operators whose emission reports for the previous year are not verified as satisfactory will not be allowed to sell allowances until a revised report is approved by a verifier.

Allowances are not printed but held in accounts in electronic registries set up by Member States. The European Commission has set out specific legislation for a standardised and secured system of registries based on UN data exchange standards to track the issue, holding, transfer and cancellation of allowances. Provisions on the tracking and use of credits from JI and CDM projects in the EU scheme are also included. The registries system is similar to a banking system which keeps track of the ownership of money in accounts but does not look into the deals that lead to money changing hands.

The system of registries is overseen by a central administrator at EU level who, through an independent transaction log, checks each transaction for any irregularities. Any irregularities detected prevent a transaction from being completed until they have been remedied. The EU registries system is being integrated with the international registries system used under the Kyoto Protocol.

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### ***4. Linkages to Other Emissions Trading Regimes***

The ETS is not a closed system. Just as the Kyoto Protocol allows Annex I Parties to buy credits from non-Annex I Parties (i.e., countries without emission limitation obligations), EU Member States may buy allowances from public and private entities outside the ETS. Beginning with the Phase II commitment period, the ETS “Linking Directive” allowed companies to use credits from JI and the CDM projects, up to a certain proportion of their allocation of emission allowances, to cover their emissions. Certain types of credits, for example those generated from nuclear facilities and land use, land-use change and forestry activities, were excluded from the Linking Directive. *See* Directive 2004/101/EC of the European Parliament and of the Council of 27 October 2004 amending Directive 2003/87/EC establishing a scheme for greenhouse gas emission allowance trading within the Community, in respect of the Kyoto Protocol’s project mechanisms.

The Linking Directive requires that the use of outside allowances be “supplemental” to domestic action. During Phase II, each member State determines the percentage of certified emission reductions (CERs) and emission reduction units (ERUs) that installations may use to meet their obligations. Member States are given the choice of applying the same limit on use of CERs and ERUs to all installations or on an installation-by-installation basis. Whatever approach is taken, the limit on use of CERs and ERUs does not restrict a company from generating and selling them in excess of the limit; excess CERs and ERUs may be sold to other installations, governments, or others outside the ETS regime. They may also bank them.

The EU also allows for linkages to other national domestic greenhouse gas trading schemes. The carbon markets in Lichtenstein, Norway, and Iceland have already been integrated into the ETS, allowing trading of emission credits from projects and installations in those countries. The EU Directive for Phase III states that “Arrangements should be provided to enable the mutual recognition of allowances between the Community scheme and other mandatory greenhouse gas emissions trading systems capping absolute emissions established in any third country or sub-federal or regional entity.” EU ETS III Directive, para.40. In the first intercontinental effort at linkage, the EU is planning to join the ETS with Australia’s carbon market. The plan is for an interim period beginning in 2015, during which Australian companies can purchase ETS allowances for credit within the Australian scheme, and then full linkage would occur in 2018 after the Australian carbon market has presumably stabilized. Theoretically, the EU is open to linking with any country that has a national cap on emissions, and in this way the linking procedure could be used to integrate a variety of national carbon markets into an integrated global market, even in the absence of a global cap on emissions.

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## QUESTIONS AND DISCUSSION

1. Greenpeace has opposed the Linking Directive for a number of reasons. Greenpeace has objected that the Linking Directive does not promote reductions in GHG emissions at home and has not established any concrete limits on the use of allowances from Joint Implementation and CDM projects. According to Greenpeace, even an eight percent limit (about 120 MtCO<sub>2</sub>) on trading with systems outside the ETS would be “unacceptably high.” Greenpeace, *Seven Reasons to Reject the Linking Directive* (Oct. 24, 2003). What reasons would you give to defend Greenpeace’s position?

2. The European Commission has used 10 percent of a country's allocation as an acceptable level of allowances from other emissions trading systems that may supplement domestic reductions because "[t]his reflects a reasonable balance between domestic reductions and giving operators of installations an incentive to invest in projects in developing countries." European Commission, COM(2006) 725 final 10 (Nov. 29, 2006). Nonetheless, it approved JI/CDM limits of as much as 20 percent for Lithuania and Spain. European Commission, *Emissions Trading: Commission Adopts Decision on Cyprus' National Allocation Plan for 2008–2012* (July 18, 2007). Despite the limits on trading, the EU has become one of the major drivers for a global carbon market with \$118.5 billion worth of allowances and derivatives exchanged in 2009 (before the European economic crisis).

3. ***The Banking Problem and Structural Reform.*** Phase II of the EU ETS ended in 2012, in the midst of the European fiscal crisis. Because of the economic slowdown, factory output and energy demand were depressed, emissions dropped, as did the demand for allowances. Not only did this mean a collapse in the price of allowances at the end of the second phase but it created a structural problem for Phase III. The expectation was that unused allowances from Phase II would be available relatively freely for Phase III, but the supply of so many unused allowances could disrupt Phase III's emission reduction goals. The Member States are undergoing negotiations to reduce the number of allowances that may be added to the market in the early years of Phase III and to agree on a long-term approach to handle banking.

4. The development of the EU ETS and the experience with the Phase I trial period provides a number of useful lessons for the United States and other countries.

- Suppliers quickly factor the price of emissions allowances into their pricing and output behavior.
- Liquid bilateral markets and public allowance exchanges emerge rapidly and the "law of one price" for allowances with the same attributes prevails.
- The development of efficient allowance markets is facilitated by the frequent dissemination of information about emissions and allowance utilization.
- Allowance price volatility can be dampened by including allowance banking and borrowing and by allocating allowances for longer trading periods.
- The redistributive aspects of the allocation process can be handled without distorting abatement efficiency or competition despite the significant political maneuvering over allowance allocations. However, allocations that are tied to future emissions through investment and closure decisions can distort behavior.
- The interaction between allowance allocation, allowance markets, and the unsettled state of electricity sector liberalization and regulation must be confronted as part of program design to avoid mistakes and unintended consequences. This will be especially important in the U.S. where 50 percent of the electricity is generated with coal.

A. DENNY ELLERMAN & PAUL L. JOSKOW, THE EUROPEAN UNION'S EMISSIONS TRADING SYSTEM IN PERSPECTIVE, PEW CENTER ON GLOBAL CLIMATE CHANGE (May 2008); *see also* David Hunter & Nuno Lacasta, *Lessons Learned from the European Union's Climate Policy*, 27 WIS. INT'L L. J. 575–606 (Fall 2009).

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## V. THE FUTURE OF THE GLOBAL CARBON MARKET

Although by far the most well developed carbon market is the European Union's, many other markets are emerging including those in the United States, Canada, Australia, Korea, and Mexico. The proliferation of national and subnational markets may in fact be the way carbon markets develop over the long-term. Rather than the coherent, unified trading system operating under a global cap that was contemplated in the Kyoto Protocol regime, the carbon market may instead evolve as a series of separate national and subnational markets operating under unrelated national and subnational caps — but linked internationally through globalized standards for certifying credits, an international registry of trades, and clear rules for trading credits between a relatively large number of otherwise separate regimes. This new evolution is still underway and, when coupled with the persistently wide price fluctuations of the existing markets, uncertainty could undermine the future stability of carbon markets. More importantly, it is still unclear whether carbon markets have the ability to contribute to real reduction in greenhouse gas emissions. Much of that uncertainty as well as the optimism of carbon markets is reflected in the World Bank's annual reviews of the carbon market; an excerpt from the latest one prior to publication of this book is provided below:

### **WORLD BANK, STATE AND TRENDS OF THE GLOBAL CARBON MARKET** (2012)

Carbon markets were not immune to the economic volatility. Compounded by increasing signs of long-term oversupply in the EU Emissions Trading Scheme (EU ETS), the backbone of the EU's climate policy and the engine of the global carbon market, carbon prices plummeted toward the end of the year. Yet even as prices declined, the value of the global carbon market climbed in 2011, driven predominantly by a robust increase in transaction volumes. The total value of the market grew by 11 percent (%) year on year (yoy) to US\$176 billion (€126 billion), and transaction volumes reached a new high of 10.3 billion tons of carbon dioxide equivalent (CO<sub>2</sub>e) (see Table 1).

Central to the rise in global transaction volumes, EU Allowance (EUA) trading volumes increased, reaching 7.9 billion tons of CO<sub>2</sub>e, valued at US\$148 billion (€106 billion). Supported by increased liquidity in the Certified Emission Reduction (CER) market and in nascent secondary Emission Reduction Unit (ERU) exchange-based activity, trading volumes for secondary Kyoto offsets also soared in 2011, increasing by 43% yoy to 1.8 billion tons of CO<sub>2</sub>e, valued at US\$23 billion (€17 billion). Largely driven by hedging and arbitrage, trading volumes for all assets increased as annual greenhouse gas (GHG) emissions in Europe declined for the second time in three years (primarily driven by weak industrial activity in the EU) and forecasts

of compliance demand were dwarfed by the oversupply of allowances. As compliance demand and prices deteriorated, the issue of whether current carbon prices can sufficiently spur long-term low-carbon investments emerged in the debate, surfacing a key challenge in this market: an oversupply created as a consequence of demand responding to the current macroeconomic scenario versus a pre-established supply determined under very different market conditions.

The value of the pre-2013 primary CER market declined once again in 2011 as a consequence of the imminent end of the first commitment period of the Kyoto Protocol. Market value fell by 32% yoy to US\$1.0 billion (€0.7 billion). The size of the ERU and Assigned Amount Unit (AAU) markets also decreased, by 36% and 49% respectively. In stark contrast to this, the post-2012 primary market increased by a robust 63% yoy to US\$2 billion (€1.4 billion) despite depressed prices. Although China remained the largest source of contracted CERs, African countries — largely bypassed in the pre-2013 market — emerged stronger in 2011 and accounted for 21% of post-2012 CERs contracted during the year. Despite the increase in post-2012 volumes, purchase agreements became less binding due to lingering uncertainties regarding residual compliance demand and the eligibility of international credits in existing frameworks and schemes under development.

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At a time when uncertainties surround the existing carbon markets, it becomes more important than ever to take stock of the cumulative impact of carbon market mechanisms. To date, US\$28 billion worth of pre-2013 CERs have been contracted forward (US\$30 billion, combined with ERUs); if all underlying projects are implemented, these contracts will have supported additional investments of more than US\$130 billion in developing countries and confirm that project-based mechanisms have the capacity to mobilize capital efficiently toward cost-effective low-carbon investments. More broadly, low-carbon initiatives, including market mechanisms, have broken the inertia and significantly raised awareness of the climate challenge.

In this context, several domestic and regional low carbon initiatives, including market mechanisms, gained increasing traction in both developed and developing economies in 2011 and early 2012. The global carbon market welcomed the news in late 2011 that the Australian Parliament had passed the ambitious Clean Energy Act, which will bring a nationwide cap-and-trade scheme to Australia by 2015. The scheme is expected to cover roughly 60% of the country's 600 million tons of CO<sub>2</sub>e per year. In 2011, California's cap-and-trade regulation was adopted by the California Air Resources Board. California's plan [went] . . . into effect in 2013; with a coverage expansion planned for 2015, the plan is expected to cover 85% of California's annual emissions. Québec, which emits 12% of Canada's annual GHG emissions, adopted its own cap-and-trade plan, and the province is now working toward linking it with California's (within the context of the Western Climate Initiative) starting in 2013. In addition, both Mexico and the Republic of Korea got their comprehensive climate bills passed a few days apart in April 2012. These initiatives combined mean five new jurisdictions are adopting economy-wide cap-and-trade schemes. These events are particularly noteworthy in contrast to 2010, when no such initiatives were launched. Now the world looks with particular attention to China, which is also among the frontrunners in the race to become a low-carbon economy. Its advanced plan to pilot

several regional cap-and-trade schemes is expected to provide the foundation for a nationwide scheme in the coming years.

Initiatives that attract competitive private sector participation are essential to identifying and implementing least-cost solutions for climate change mitigation and adaptation, and market-based mechanisms can catalyze such participation. However, the allocation of private capital toward the deployment of new low-carbon technologies at scale has been constrained by the low price prevailing in the short term and the absence of a price signal in the long term, and compounded by nervous financial markets that favor exposure to less risky assets and markets. More ambitious targets are needed from a larger number of countries to foster demand that can set the groundwork for a truly transformational carbon market — one that can emerge from fragmented but workable market initiatives. The challenge then will be to chart a course to further evolve these initiatives through linking and potentially reshaping the global carbon map.

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## QUESTIONS AND DISCUSSION

**1.** From this chapter, you can begin to understand how a global carbon market works. What exactly is being traded? Who is benefiting from the market? What role has government policy played in establishing and shaping the market? Is such a market an effective mechanism for responding to climate change? How does the purchase and sale of carbon emission credits affect energy pricing and markets for renewable energy?

**2. *United States Regional and State Carbon Trading.*** The failure of the U.S. Congress to enact an economy-wide cap-and-trade system for greenhouse gases has left states to act collectively and individually to fill the legislative void. Most notably, nine northeastern and Mid-Atlantic states participate in the Regional Greenhouse Gas Initiative (RGGI), which established a cap-and-trade program for carbon emissions from electric utilities that was launched in 2008. RGGI holds quarterly auctions of current and future pollution credits, but critics note that the cap is too lax for the market to really help reduce emissions. Indeed, the price of a ton of carbon reduction in RGGI has rarely exceeded \$2.00 per ton. RGGI has produced cumulative revenues of more than \$1 billion, but it has not created significant incentives to reduce emissions beyond business-as-usual.

The RGGI participants responded to their critics in 2012, announcing that the cap would be reduced from 165 million tons in 2012 to 91 million tons beginning in 2014. That 45 percent reduction in the cap would essentially match current emissions. The plan is to reduce the cap 2.5 percent every year from 2015 to 2020, thus perhaps tightening the cap enough to increase the price of a pollution credit sufficiently high to incentivize reductions in emissions beyond business-as-usual.

More recently, the State of California launched a carbon market as part of that State's comprehensive climate change legislation, known as the Global Warming Solutions Act of 2006 (or AB 32). In November, 2012, California held its first auction, selling 23 million carbon pollution credits at a closing price of \$10.09 per ton of carbon dioxide. California received more than three times as many bids as there were credits, suggesting significant demand. Those credits

had a compliance date of 2013, meaning that the credits would be available for entities to use toward meeting the emission requirements in 2013. The second auction sold its 12.9 million allowances at a higher average price of \$13.62.

California's initial auctions have been viewed as a success because there was sufficient demand to keep the price above the minimum floor of \$10.00 per ton. On the other hand, demand for future allowances (beyond 2013) has been weak. Because uncertainty still surrounds implementation of the California law (including legal challenges to the cap-and-trade scheme), regulated companies were less willing to bid on carbon credits for future years. Only five million of 39 million 2015 credits were sold at the \$10.00 minimum price. Only half of the 2016 vintage allowances sold at a subsequent auction in early 2013. The difference in demand between the 2013 and future pollution credits highlights how dependent the carbon markets are on perceptions of regulatory risk and the relative certainty present in the underlying legal regime.

**3.** Consider again the lessons learned from the trial-and-error approach of the EU ETS in the context of future carbon markets.

The deeper significance of the trial period of the EU ETS may be that its explicit status as a work in progress is emblematic of all climate change programs. Even when not enacted in haste, climate change programs will surely be changed over the long horizon during which they will remain effective. The trial period demonstrates that everything does not need to be perfect at the beginning. In fact, it provides a reminder that the best can be the enemy of the good. And this adage is likely to be especially applicable in an imperfect world where the income and wealth effects of proposed actions are significant and sovereign nations of widely varying economic circumstance and institutional development are involved. The initial challenge is simply to establish a system that will demonstrate the societal decision that GHG emissions shall have a price and to provide the signal of what constitutes appropriate short term and long-term measures to take in limiting GHG emissions to the desired amounts. In this, the EU has done more with the ETS, despite all its faults, than any other nation or set of nations.

A. DENNY ELLERMAN & PAUL L. JOSKOW, THE EUROPEAN UNION'S EMISSIONS TRADING SYSTEM IN PERSPECTIVE, PEW CENTER ON GLOBAL CLIMATE CHANGE (May 2008). Do you think the United States could ever agree to a system with so much uncertainty in the beginning? Will lessons learned elsewhere allow the United States to gain confidence in how to operate a carbon market to overcome political opposition?

**4.** What lessons can we learn from the European Union and the Clean Development Mechanism? If you were working in the US Congress to help design an economy-wide carbon trading system for the United States, how would you address:

- Initial allocations;
- Supplementarity;

- Additionality and leakage;
- Linkages;
- Monitoring, reporting and verification?