Market ~~mechanisms~~ & Global climate change

An Analysis of Policy Instruments

Prepared for the Trans-Atlantic Dialogues on Market Mechanisms, *Bonn, 23 October 1998, and Paris, 27 October 1998*

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Foreword *Eileen Claussen, Executive Director, Pew Center on Global Climate Change*

There is growing evidence that providing businesses and consumers with market-based mechanisms for addressing environmental problems can achieve equal or better compliance while reducing costs and spurring technological innovation. In the context of climate change, countries have agreed to use several market-based mechanisms in implementing greenhouse gas emissions reductions—from emissions trading similar to that used in the United States to reduce sulfur dioxide emissions to more experimental measures such as joint implementation and the Clean Development Mechanism.

This report, which analyzes market-based environmental policy instruments, is the third in a series by the Pew Center on Global Climate Change. The Pew Center was established in 1998 by the Pew Charitable Trusts, one of the nation's largest philanthropies and an influential voice in efforts to improve the quality of America's environment. The Center brings a new cooperative approach and critical scientific, economic and technological expertise to the global climate change debate. The report was prepared as an input for the participants of two international conferences designed to promote a trans-Atlantic dialogue on market-based instruments and their use in mitigating global climate change. Recognizing the critical role of business in both shaping and applying market-based mechanisms, the Pew Center is working to bring businesses from both the United States and Europe together to discuss ways to do so.

The report reviews U.S. and European experience with market-based mechanisms and the ways the Kyoto Protocol on Climate Change utilizes these mechanisms. The report finds that properly designed rules for the operation of these mechanisms can provide economic and environmental integrity and signal to business and governments that any trades undertaken in accordance with the system will be valid and of value. Key elements to the success of such a system will be measurement, transparency, accountability, fungibility and consistency.

The Pew Center and its Business Environmental Leadership Council believe that climate change is serious business. Implementing emissions trading and other market-based mechanisms will be part of a serious response to the climate change problem.

Executive Summary

This paper has been developed with a view toward promoting trans-Atlantic dialogues on market mechanisms for environmental protection. While the overarching topic for dialogue is the full panoply of environmental problems for which market mechanisms may be considered, this paper is prepared in the context of increasing global attention to the problem of climate change. The November 1998 Buenos Aires Conference of the Parties to the United Nations Framework Convention on Climate Change provides an example of the international focus on market mechanisms among governments, the private sector, and non-governmental organizations around the world.

This paper reviews market mechanisms for environmental protection, with special focus on emissions trading. Emissions trading programs place an overall limit on the amount of emissions that sources may emit, and then allow sources a degree of flexibility to determine where, when, and how to meet their total limits. Emissions trading programs provide this flexibility by allocating to sources a fixed amount of emissions allowances; any source that reduces emissions below allowable levels may save the resulting allowance increment to offset future emissions, or sell the increment to another source who may add the increment to its allowances. Compliance is determined solely by comparing actual emissions to allowable amounts.

The paper notes that five elements are essential for providing environmental and economic integrity in such programs: **measurement, transparency, accountability, fungibility,** and **consistency.** In reviewing the experiences of the U.S., New Zealand, and Europe, the paper finds that harnessing the competitive forces of the market-place in favor of pollution reduction can enable governments, industries, and non-governmental organizations (NGOs) to reach political consensus about pollution limits. Experience also indicates that when these elements are firmly in place, emissions trading programs can deliver powerful incentives to sources to innovate to develop more environmentally effective and more cost-effective ways of reducing emissions. Trading programs premised on these elements can achieve faster, deeper cuts in pollution, at far less cost than other regulatory instruments.

The 1997 Kyoto Protocol on Climate Change seeks to use market mechanisms to limit the emissions of greenhouse gases (GHGs) that are contributing to changes in the global climate. The paper examines the Kyoto Protocol framework for an innovative international market in GHG emissions reductions. The Protocol places a legally binding limit on the allowable amount of GHG emissions from most industrialized countries for the period 2008-2012. It then affords these nations the opportunity to trade allowable amounts of emissions, either directly or in conjunction with joint emissions reduction projects. It further allows these nations to implement their obligations collectively, through shared arrangements known as “bubbles” or “umbrellas.” And the Protocol invites the participation of nations that have not adopted a legally binding GHG limit: it allows a limited form of trading between nations with limits and those without, where the trading involves emissions reductions obtained through cooperative projects in the latter group of nations.

The paper notes that the Kyoto Protocol respects the sovereignty of each participating nation to determine how best to implement its international obligations at the domestic level, and whether, in so doing, it should allow its private sector to participate in the international emissions trading market. The Protocol leaves open the development of internationally agreed rules to provide the **transparency**, the **accountability**, and—particularly in the case of trading with nations lacking limits on GHG emissions—the **measurability** that may be key to the Protocol's success. Further, the Protocol allows each nation that adopts emissions limits to decide whether to initiate programs prior to 2008 that will provide recognition and incentives for early actions to reduce emissions. The Protocol does not address the question of whether nations will, individually or collectively, place quantitative or qualitative restrictions on emissions trading.

After exploring the theory of market mechanisms, examining their implementation in selected cases, and analyzing the market elements of the Kyoto Protocol, the paper draws on lessons learned from practical experience in order to identify and evaluate options on the questions left open by the Protocol. The paper indicates that for environmental and economic effectiveness, experience weighs in favor of a limited set of rules—carefully drawn to foster **measurement, transparency, accountability, fungibility, and consistency**—and weighs against imposing further restrictions on the market mechanisms.

This paper includes a compilation and synthesis drawn from the sources and materials listed in Appendix I.

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This report was one input into two conferences on market-based mechanisms, which were held on 23 and 27 October, 1998, in Bonn and Paris. The conferences provided an important forum in which participants, including representatives of businesses, non-governmental organizations, and governments, shared practical experience about the use of market mechanisms, and provided valuable insights about the trans-Atlantic context for consideration of the report's findings. More information on the conferences is available through the Pew Center.

I. Market Mechanisms for Environmental Protection

A. General Theory of Market Mechanisms

Over the past three decades, policy makers in Europe and the United States have experimented with a wide range of different approaches to environmental regulation. They have done so in the context of greater European integration, expansion of the federal role in the U.S., and in both regions, increased preoccupation with improving environmental quality while at the same time promoting national economic self-interest through maintaining competitiveness. Their efforts to blend environmental quality and economic sustainability raise two questions: What kinds of goals should environmental regulation seek to achieve? And with what tools?

On both sides of the Atlantic, policy makers increasingly agree that successful environmental regulation is measured in terms of improvements in the quality of the environment. So, for example, while a company's emissions per unit of product provides a useful indicator of a company's eco-efficiency, it is the reduction in total emissions over time—with appropriate safeguards to avoid inadvertent shifts of pollution from one medium to another—that should be the measure of success of emissions regulations. Total emissions are what determine overall concentrations of emitted pollutants. Moreover, measuring a company's compliance in terms of total emissions links compliance directly to improved environmental quality.

What tools can achieve improvements in overall environmental quality? European and American environmental regulators have developed different tools in different contexts.[1] In the U.S., partly in response to concerns about the high cost of environmental protection, regulation has evolved from command-and-control, through technology mandates, to market-based approaches that provide emitters with incentives to undertake a continuous search for better, cheaper, faster ways of reducing emissions. In the European Union, concerns about harmonization have predominated, particularly for product standards. Pollution taxes and charges have been used in a number of European Union member states; in contrast, there is long-standing domestic opposition to taxes and charges in America. "Europe, in particular Germany, may be guided by a more Kantian perspective in which the solution to pollution is moral conduct (cease polluting) rather than a Benthamite perspective in which pollution is seen as a market failure to be corrected by market pragmatism."[2]

Environmental trading programs, used primarily in New Zealand and the U.S., limit total environmental allowances over specified time horizons, and allow sources of pollution (companies, factories, other regulated entities) to choose different pathways for meeting their limits, including purchasing "extra" allowances from sources that have reduced emissions below allowable levels. The "currency" of compliance in emissions trading programs is total emissions. Total emissions is also the measure of whether the environmental regulation has been successful in achieving its environmental protection goal. This identity between the measure of compliance and the measure of successful environmental performance distinguishes trading from nearly every other approach to environmental regulation. Technology mandates, technology standards, taxes, charges, and voluntary agreements to limit emissions to specific rates per unit of product output all require assumptions about the relationship between regulatory compliance and the overall environmental performance of sources (see Table 1).

Table 1 **Environmental Performance Goals, Regulations, and Measures of Compliance: Total Emissions Must Not Exceed Allowable Levels**

Regulatory Instrument	Measurement of Compliance	Information Needed To Determine Regulation's Environmental Success
Technology Mandate	Has the technology been installed at the facility?	Number of facilities at which technology has been installed; amount of time the technology is used in each; emissions at each facility; sum of all facilities' emissions
Automobile Fuel Economy Standards	What is vehicle's rated fuel use per distance traveled?	Emissions per fuel use per vehicle; total number of kilometers/miles traveled per vehicle; vehicle conditions of travel; total vehicles in use
Voluntary agreement on specific emissions per unit of product produced	Has each company or sector reduced emissions to specified levels?	Emissions per unit of product produced, multiplied by total amount of product of each company; sum of each firm's compliance reports multiplied by its productivity report
Tax on emitting activity	How much revenue is collected from the tax?	Base price of emitting activity; shape of marginal cost curve; responsiveness of demand to changes in price (price elasticity); emissions per unit of activity; amount of time in which activity is undertaken
Change in subsidy (reduction for polluting activity; increase for less polluting alternative)	How much money is devoted to the subsidy?	Base price of emitting activity and alternative; price elasticities; emissions per unit of activity; amount of time in which activity is undertaken; total emissions
Overall emissions limit, with trading	What is each firm's total emissions in comparison to its allowable amount?	Sum of all firms' compliance reports

Trading, in contrast, provides direct feedback to firms about their compliance with environmental performance targets at the same time that it requires sources to internalize pollution costs. Trading thus creates competitive demand for cost-effective compliance.

Properly designed emissions trading markets can capitalize on the common interests of nations, emissions sources, and the public to provide incentives to meet and exceed environmental and economic performance goals. Properly designed emissions trading programs can:

- increase environmental effectiveness,
- reduce compliance costs,
- create financial rewards for environmental performance,
- tap existing expertise in the search for new solutions, and
- create incentives for new technologies, processes, and environmental management.

A few straightforward steps can achieve these results. First, a limit must be placed on total emissions from each major source over a specified period of time. Second, sources must report their overall emissions. Third, any source that reduces its emissions below its limit may transfer or assign the unused increment of allowable emissions to another source; the other source may emit above its limit by that same amount, using the transferor's extra allowable emissions. The result is that the total emissions from the two sources remains constant.

By giving sources the flexibility, and the incentive, to produce emissions reductions cost-effectively, emissions trading harnesses entrepreneurial energy and deploys it to solve pollution problems. In most industrialized nations, the vast bulk of the money spent ameliorating environmental problems comes from the private sector, or from government corporations operating in market conditions. Emissions trading programs aim to ensure that when environmental expenditures are made, markets apply the forces of competition and innovation to grind down costs.

B. Five Essential Elements for Environmental and Economic Integrity

The key to the success of trading programs is defining and quantifying, in a transparent, consistent manner, what constitutes an extra, transactable reduction. Five elements are essential for emissions trading markets to operate with environmental and economic integrity.

THE FIVE KEY ELEMENTS FOR MARKET INSTRUMENTS

1. Measurement. Quantify emissions—including "extra" allowable emissions—accurately.
2. Transparency. Make reporting and program operation publicly available.
3. Accountability. Hold participants accountable for meeting their goals.
4. Fungibility. Minimize constraints on transactions.
5. Consistency. Apply fixed rules objectively and automatically.

Environmental and economic integrity are two aspects of the same set of features—credible commitments to compliance based on the accurate **measurement** of actual emissions performance, which, by definition, includes the accurate quantification of traded emissions reductions. **Transparency** is key: Government officials, the public, and investors must be assured that traded emissions reductions are in fact legitimately equivalent to the emissions they are offsetting. Mechanisms must be in place that render participants **accountable** for their performance in meeting or missing their environmental goals. That is, the system must ensure that participants will face consequences, known to them in advance, if they fail to meet their environmental obligations.

If creators of, and searchers for, cost-effective emissions reductions—that is, sellers and buyers—can transact freely, constrained only by requirements that ensure the environmental legitimacy of the traded reductions, then the emissions trading market will be able to perform its key function of providing real, cost-effective compliance with emissions limitations. Anything that restricts the **fungibility** or tradability of emissions reductions would diminish the incentives for entrepreneurs to develop new and innovative methods for reducing emissions. Diminishing these incentives would, in turn, impede the environmental effectiveness of the program. Those who invest in emissions-reducing activities want to be able to sell the reductions they earn and recoup their investments. Buyers of reductions want to use the purchased reductions to meet their legal compliance obligations. Large paperwork requirements, time lags, and arbitrary restrictions on trading would reduce incentives, discourage participation, diminish environmental benefits, and drive up costs.

Consistency is also key. The most important long-range result of any economic incentive program is to tap the creative energies of many differently situated buyers and sellers, enticing them to engage in an unending search for ever better ways to reduce emissions at lower cost. Rather than relying on the a priori decisions of a small group of experts, emissions trading invites stakeholders everywhere to test their emissions reduction ideas in the marketplace. These creative responses will not be elicited, however, without fixed rules fostering reasonably settled expectations that opportunities for pollution reduction can be turned into financial rewards.

C. The Importance of Flexibility in Time and Place

Because they provide sources with a degree of flexibility in choosing the time and place for reducing emissions, trading programs can achieve improved environmental quality at lower cost than other environmental regulatory programs. Temporal and geographic flexibility are particularly appropriate for controlling emissions of substances that have long environmental lifetimes and that mix uniformly over large areas. Many studies have documented the economic and environmental advantages of flexibility,[3] and practical experience validates these

conclusions. Flexibility is especially important for sources who must deal with turnover in long lived capital stock. Moreover, flexibility can maximize environmental benefits by enabling sources to make emissions control investments in those places and activities that provide the greatest environmental benefits per amount of funds invested.

1. Flexibility in Time

A close examination of temporal and geographic flexibility reveals how these can operate, whether in national, regional, or global trading programs, to deliver greater environmental benefits at less cost. Consider the relationship between the desired timetable for emissions reductions and the lifetime of the capital stock (plant and equipment) involved in emitting and emissions-abating activities. For emissions and reductions involving sectors with long-lived capital stock, a degree of temporal flexibility can increase the likelihood of compliance while yielding significant cost savings. Two mechanisms provide temporal flexibility: emissions "budgets" and emissions "savings."

Emissions "budget" programs place multi-year or cumulative limits on emissions. These give sources the flexibility to meet their overall budgets by reducing emissions uniformly during the budget period, early in the budget period, or late in the budget period. Budgets allow sources to manage emissions over time and to deal with emissions "spikes" that are beyond the control of any particular source. A well-known example is the relationship among Denmark, Sweden, and Norway regarding GHG emissions. The three nations participate in a shared electric power grid. Norway generates hydroelectric power into the grid. When Norway suffers drought, however, Denmark burns more coal to satisfy its obligations to provide power supply to meet demand in the other two nations. Accordingly, a dry spell in Norway—an event beyond the control of Denmark—can lead to a spike in Denmark's GHG emissions from coal-fired electric power. Multi-year emissions "budgets" allow each of the three nations to manage these fluctuations.

Emissions "savings" programs allow sources who reduce below target levels to use the resulting "savings" in current or future compliance periods. Because "savers" can either hold their savings for use in the future to offset their own emissions or sell the savings to other emitters, "savings" programs provide strong incentives for early investment in environmental protection. This is particularly important in the case of emissions that have long atmospheric lifetimes, such as GHGs.

The long atmospheric residence time means that even if emissions are held constant, *concentrations* of these gases will continue to increase in the atmosphere. Programs that spur early reductions—by incorporating "savings" opportunities into emissions trading programs—offer the possibility of encouraging extra compliance while tackling the otherwise very difficult environmental problem of increasing atmospheric concentrations.

2. Geographic Flexibility

Consider further the questions, "Where do the burdens of pollution fall?" and "Where do the burdens and benefits of emissions abatement occur?" If the benefits of emissions reduction occur independent of the location of the emissions reduction activity, and if the costs of emissions reduction vary at different locations, then allowing flexibility in the choice of locations where emissions reductions occur can achieve emission reduction goals at lower costs than if no such flexibility is allowed. The money saved can be used for other socially beneficial purposes—including further emissions reductions.

As noted above, GHGs mix uniformly in the atmosphere. For such gases, emissions trading systems enable nations and their private sectors to search for, or "demand," the lowest cost emissions reductions they can find anywhere in the world. Consequently, instruments such as emissions trading and joint implementation are particularly well suited to controlling GHG emissions cost-effectively.

D. Common Criticisms of Market Mechanisms

As will be seen more fully below, well-designed emissions trading programs can be powerful tools for delivering environmental benefits with significant cost savings. Yet these programs face criticism. Here we examine the most common concerns that have been raised.

It has been argued that emissions trading is immoral—that it is immoral to buy and sell allowances to emit pollutants. Nearly every other regulatory instrument, however, allows sources to emit for free. Emissions trading forces emitters to pay for the privilege of emitting in excess of government-identified levels, and to face consequences if they fail to purchase allowances sufficient to offset their excess emissions.

A second objection to global emissions trading is the fear that wealthier nations or firms could buy their way out of emissions reduction responsibilities and leave poorer nations and firms with fewer allowable emissions. This argument, however, overlooks the fact that in emissions trading programs, each participant retains the sovereign capacity to choose whether to save, use, or sell emissions allowances allocated to them. For sovereigns who choose to sell allowances, sales can provide them with a valuable source of capital for investment in sustainable development activities. The underlying
issue, accordingly, is not the possibility of inequitable market distribution of allowances, but rather the question of initial allocation of allowances. In domestic emissions trading programs, governments may allocate allowances; in the international context, initial allocations are done through negotiations among sovereigns.

A third concern raised about emissions trading is that using allowances to offset geographically concentrated emissions could result in isolated instances of high emissions and give rise to local pollution risks. This concern can arise when designing trading programs for pollutants whose local concentrations give rise to health and environmental risks. GHGs, however, mix uniformly in the atmosphere regardless of where they are emitted. So, concerns about local concentrations do not apply. In fact, emissions trading in this context can deliver health and environmental benefits to local communities that might not otherwise be able to afford pollution

reductions. Sales of GHG allowances can provide needed financing for projects that, by reducing emissions of GHGs and health-related pollutants together, deliver local as well as global environmental benefits. On the other hand, programs that do not take advantage of these features of emissions trading may miss opportunities to address local environmental concerns.

Finally, it has been argued that because emissions trading uses market mechanisms, it is not transparent. However, because emissions trading requires each source to make public its total actual emissions as well as its total allowable emissions, trading programs can provide an equal or greater degree of transparency than that afforded by virtually every other regulatory instrument.

II. Historical Experience with Market Mechanisms in Europe and the United States

National and regional experience reflects growing interest in the use of market mechanisms to address environmental problems. This section briefly discusses experience in various nations, focusing principally on the largest program to date, namely the U.S. trading program for reducing emissions of sulfur dioxide (a precursor of acid rain), and touching briefly on the European analogue to this system. After noting the New Zealand experience with fisheries policy, the section concludes with a summary of lessons learned from practical experience.

A. Limitations on Sulfur Dioxide Emissions

Both Europe and the United States have considerable experience with environmental policies aimed at limiting emissions of sulfur dioxide (SO_2), a precursor of acid rain emitted from coal-fired power plants. SO_2 regulation has involved experiments with time and place flexibility in both Europe and the United States, including a full-fledged trading program in the U.S.

1. The European Example: The Second Sulphur Protocol

Emissions trading programs are not widespread in Europe. This section does not seek to review all programs, but rather focuses on the flexibility elements of the 1994 Protocol on Sulphur Emissions (Second Sulphur Protocol or SSP) of the Long-Range Transboundary Air Pollution Convention (LRTAP).[4] Article 4 of the SSP obligates each Party to adopt national strategies, policies, and programs to control and reduce sulfur emissions. Article 2 and Annex II establish, for each Party, annual caps on total SO_2 emissions, measured in kilotonnes. Article 2 further establishes that, with the consent of the Parties and in accordance with rules established by the Parties, "two or more Parties may jointly implement" their SO_2 emissions obligations.

While the procedural hurdles in Article 2 (approval of all Parties; transaction-by-transaction limits according to rules that must be adopted) present some impediments to the use of the joint implementation flexibility mechanism in the SSP, some European nations and firms have already begun to seek and realize lower-cost opportunities to reduce sulfur emissions. For example, firms and governmental entities in the Netherlands and Sweden have invested in SO_2 removal in Poland, where the marginal costs of control are less, and where, consequently, the same amount of investment results in greater emissions reductions and larger environmental benefits.[5]

2. The U.S. Clean Air Act Amendments of 1990

The U.S. Clean Air Act Amendments of 1990 provide the single largest demonstration of the actual workings of emissions trading markets for reducing air pollution. Historically, Clean Air Act programs have imposed a variety of requirements on pollution sources, typically including technology mandates and emissions rate limits. These programs have tended to achieve fewer emissions reductions than intended. In contrast, the 1990 Amendments held each major thermal power plant in the U.S. legally accountable for meeting a specific *total annual allowable SO_2 emissions limit.* This feature, together with the inclusion of emissions trading, has made the SO2 program one of the most successful of U.S. environmental initiatives.

A. Mechanics of the Program

The 1990 Amendments were designed explicitly with the aim of incorporating the five essential elements for market mechanisms: **measurement, transparency, accountability, fungibility,** and **consistency.** The 1990 Amendments place a total limit on the overall emissions of sulfur dioxide from large electric power plants in the continental United States. The 1990 Amendments allocate that total limit among power plants. Each SO_2-emitting power plant is given an annual SO_2 emissions budget. Any plant whose emissions are below its budget either may transfer the incremental difference to another plant, or save the difference and add it to its emissions budget for a future year. In either event, the total amount of reductions achieved over time is the same.

To facilitate the operation of the program, the U.S. Congress provided for its implementation through the allocation of emissions allowances. Every year, each plant is allocated an allowable amount of emissions for each ton of SO_2 in its annual emission budget. The government essentially opens a checking account for each plant, and deposits the allowances in the account. These allowances—which are simply standardized, transactable, increments of allowable emissions, expressed in terms of tons of SO_2, and fully **fungible**—make trading and compliance easier.

Accountability is provided as part of the domestic compliance and enforcement system. Each plant is required to **measure** its own emissions, using continuous emissions monitoring equipment. At the end of each year, the U.S. Environmental Protection Agency compares the number of allowances a plant holds in its account with its actual, measured emissions. Sources that fail to hold allowances sufficient to cover total emissions face a staged set of automatic consequences. First, sources must pay monetary fines for each ton they emit in excess of allowable amounts. Second, if their actual emissions exceed their allowances, the difference is automatically deducted from their future years' allowance allocations. This automatic deduction assures environmental integrity or **accountability**, since monetary fines do not actually remove excess pollution from the atmosphere. Public access to reporting documents and clearly defined rules provide **transparency** and **consistency.**

The program explicitly allows power plants to "save" any increment of pollution reductions they achieve beyond the reductions required by the law itself. Power plants can then use these "saved" allowances in future years to offset emissions. Sources have responded conservatively to this "savings" feature of the program by over-

complying and saving the resulting increments of allowable emissions for use in the future. The result is that power plants have reduced their emissions of sulfur dioxide by 35 percent more than required by the law.

B. The Political Context

In 1980, the U.S. National Academy of Sciences issued a report suggesting that a total SO_2 emissions reduction of 50 percent would alleviate acidification of lakes. Political consensus to adopt this emissions limit, however, was lacking. In fact, there was strong political opposition to the 50 percent reduction target. Sharp and bitter differences erupted between states in the Eastern U.S., who bore the brunt of the impacts of acid rain, and the Midwest and Southeast regions, whose coal-burning electric utilities and higher sulfur coal-producing areas would bear the cost of the emissions reductions.

How did the 1990 Clean Air Act Amendments bring about the political consensus needed to enact a nearly 50 percent legally binding limit on SO_2 emissions? The key, in political and performance terms, was the development of the emissions trading concept. Four aspects of emissions trading were critical to engendering the political acceptance of a legally binding cap on emissions.

First, the program did not seek to dictate to sources the particular compliance technologies they would have to use. Rather, the program offered electric utilities the unconstrained flexibility to choose any path to compliance they wished.

Second, the program did not seek to dictate the terms of, or require governmental interference with, trading. Rather, the program provided a stable legal environment within which trading could occur with minimal transactions costs.

Third, the program distributed or allocated allowances to affected sources based on historical emissions, and did not seek to "auction" all the allowances. This distribution of allowances was key to reducing industry's opposition to the program and to ameliorating differential impacts among states.

Fourth, the program adopted a very simple and transparent measure of compliance: Whether a source is in compliance is determined solely by comparing its total actual emissions with the total allowances it holds. The program holds sources **accountable** for their emissions performance: failure to hold sufficient allowances (i.e., emitting in excess of allowances held) subjects a source to automatic and steep penalties of $2000/ton of excess emissions.

This simple, environmentally sensible approach to measuring compliance won the support of affected industry and states, and made possible the acceptance of a cap on SO_2 emissions that previously had been politically unacceptable. The trading program also eventually won the political support of a number of environmentalists who historically had opposed market mechanisms. Some environmentalists accepted trading in part because it made the imposition of a cap on total SO_2 emissions politically feasible for the first time.

C. Results

The SO_2 program has achieved broad environmental benefits from trading. Sources have met their targets faster, and at lower cost, than projected prior to the program. The "savings" feature of the program has spurred emitters to reduce emissions 35 percent below required levels, even though the program initially did not experience a large number of inter-utility trades. Analyses by the Massachusetts Institute of Technology's Energy Laboratory have concluded that most of the "dramatic drop" in SO_2 emissions is attributable to the emissions trading program.

Further, there has been a strong market response to this stimulus for finding better, cheaper pathways to compliance. The price of allowances has fallen from early estimates of $400-$1000/ton to $100-$200/ton. The price of scrubbers has also fallen, as scrubbers have faced competition from fuel switching and from allowances as alternative pathways to compliance. One electric utility has estimated that the market mechanisms, and the cost savings that emissions trading has enabled, have saved its customers over $100 million.[6]

B. Implementing the Montreal Protocol on the Ozone Layer

The 1987 Montreal Protocol on Substances That Deplete The Ozone Layer requires industrialized nations to phase out chlorofluorocarbons (CFCs) and a number of other ozone-depleting chemicals. The Montreal Protocol establishes binding timetables for phaseout of each nation's consumption of these substances, but does not mandate specific policies or measures by which Parties are to meet these obligations. In 1988, the U.S. Environmental Protection Agency (EPA) issued tradable allowances to producers and importers of ozone-depleting chemicals. These allowances permitted companies to produce or import specified quantities of the substances. Over time, as the Montreal Protocol mandated phaseout schedule accelerated, EPA reduced the amount of the allowances. EPA allowed companies to trade their allowances domestically and internationally, and EPA maintained a tracking system and required all transactions to be reported and tracked.

The available data suggest that this trading system greatly helped the United States to achieve—and do better than —its Montreal Protocol targets without major disruptions and with cost savings of up to 30 percent. The trading system gave government and industry the flexibility needed to adapt quickly to changing market conditions as well as to the acceleration of the Montreal Protocol phase out schedule.

Importantly, because the trading system did not mandate specific technologies, it actually spurred innovation in the development and testing of new, cost-competitive technologies and processes, hastening the shift to cheaper, environmentally friendlier alternatives. As a result of these innovations, demand for some chemicals fell, and companies found themselves with unused allowances for those chemicals. The system enabled companies to trade their unused allowances for other allowances for chemicals that were still in demand, and further enabled a smoother transition to alternatives to those latter chemicals. International trades between facilities in the U.S. and Canada enabled early closure of some facilities and more efficient operation of others.[7]

C. A Comparative Example: New Zealand's Fisheries Law 1996

New Zealand has one of the most extensive and sophisticated market-based environmental trading programs in the world, aimed at maintaining New Zealand fish stocks at sustainable levels. The Fisheries Act 1996 established a Quota Management System (QMS) as the primary mechanism for managing commercial fisheries in New Zealand. Under this law, quotas are tradable property rights held by the fisher to fish for a particular species.

As with SO_2 emissions trading under the U.S. Clean Air Act, the "currency" of compliance and the "currency" of the regulatory instrument are identical. The New Zealand government analyzes Monthly Balances, which are defined as the difference between the amount of each species of fish caught by the quota holder and the total quota by species available to that fisher during the fishing year. The Act carries tiered penalties, including forfeiture of future quotas and other property, for fishing in excess of quota amounts.

The 1996 Act implements the QMS in the context of existing treaty obligations, including both the Crown's Treaty of Waitangi obligations and New Zealand's international commitments in relation to fishing. It does so in the context of maintaining a sustainable fisheries management regime, with broad participation of stakeholders and a high degree of transparency.[8]

D. Lessons Learned in Program Design

The above-discussed programs, and other experiments, provide a valuable base of experience that can inform the design of emissions trading programs in the future. The principal lessons are:

1) Successful emissions trading programs adhere to the essential elements of program design: **measurement, transparency, accountability, fungibility,** and **consistency**. Adherence to these elements can help overcome political hurdles to the adoption of environmentally protective limits on emissions.

2) **Accountability** is best served by rules that provide clear and automatic consequences for cases in which measured actual emissions exceed allowable amounts.

3) It is not the amount of trading undertaken, but rather the unfettered availability of trading, that provides incentives for environmental innovation and cost-savings. Consequently, limitations on trading should be avoided, because they undermine the incentives of buyers and sellers of emissions reductions to undertake the search for innovative, ever-greater, cost-effective processes and technologies for reducing emissions.

III. The Market Mechanisms of the 1997 Kyoto Protocol on Climate Change

In 1992, over 160 nations adopted the United Nations Framework Convention on Climate Change (UNFCCC) as a mechanism for addressing the problem of human-induced changes in the global climate. The objective of the UNFCCC, and of any protocol to it, is to prevent dangerous anthropogenic interference with the global climate system. The UNFCCC requires each country to track its emissions of anthropogenic GHGs. The UNFCCC also asks industrialized countries—who have polluted the most—to take the first step in controlling the problem by voluntarily limiting their GHG emissions to 1990 levels by the year 2000. Industrialized nations undertaking this non-binding commitment to limit greenhouse gases to 1990 levels by the year 2000 are listed in Annex I of the UNFCCC, and are often referred to as "Annex I Parties."[9]

The UNFCCC has been fairly successful in terms of national development of emissions inventories and reports. But for a variety of reasons its emissions limitation commitment hasn't worked. Most Annex I Parties are emitting more GHGs now than before, and GHG emissions are increasing rapidly in many industrialized and developing countries. Consequently, in December 1997, nations regrouped in Kyoto, Japan, to try again to adopt an effective international instrument to control emissions of GHGs. The Kyoto Protocol on Climate Change, adopted by the Third Conference of the Parties to the UNFCCC, requires certain industrialized nations—i.e., members of the Organization for Economic Cooperation and Development (OECD), the Russian Federation, and certain other emerging market economies—to limit their GHG emissions to, on average, 5 percent below 1990 levels for the period from 2008 through 2012. Industrialized nations that adopted these legally binding commitments at Kyoto are listed in Annex B of the Protocol, and are often referred to as "Annex B Parties."[10]

The Kyoto Protocol implements these legally binding limits on emissions through the creation of an innovative trading market for GHG emissions. The Protocol's market mechanisms have the potential to foster sovereign compliance with legally binding emissions limits, while reducing significantly the costs of implementing those limits. Whether the market mechanisms will be able to achieve these goals, however, depends critically on steps the Parties to the UNFCCC may or may not take in the months and years ahead.

A. The Emissions Trading Framework in the Kyoto Protocol

At the heart of this mechanism lies a global GHG emissions reduction trading market that has the potential to deliver three important benefits. First, this market can enable nations and businesses to address the issues of environmental performance, cost, flexibility, and international economic competitiveness that likely will remain among their paramount concerns. Second, this market can deliver powerful incentives for compliance by industrialized countries with their GHG emissions obligations. Third, this market's incentives can invite developing countries to participate equitably in an international GHG regime.

The Kyoto Protocol establishes:

- a first budget period for emissions reduction commitments for industrialized nations (and any other nation that so chooses) from 2008 to the close of 2012;
- specific commitments by industrialized nations to reduce GHG emissions during this period 5 percent, on average, below 1990 emissions levels; and
- a framework for trading "assigned amounts" of emissions and "certified emissions reductions" as means of achieving emissions reduction commitments.

PROTOCOL EMISSIONS TRADING FRAMEWORK

- Parties' emissions limitation and reduction obligations are defined expressly in terms of five-year total cumulative legally binding limits on GHG emissions, expressed in terms of "assigned amounts" of emissions. (Article 3)
- Parties with such legally binding obligations may meet their obligations through four flexible mechanisms:
    - Emissions Trading Among Nations With Legally Binding GHG Limitations—Trading in Parts of Assigned Amounts (Article 17);
    - Joint Implementation Between Nations With Legally Binding GHG Limitations—Trading in Parts of Assigned Amounts Expressed As Project-Based Emissions Reduction Units (Article 6);
    - "Clean Development Mechanism" (CDM) Between Industrialized and Developing Nations - Trading in Certified Emissions Reductions (Article 12); and
    - Agreements Among Groups of Parties to Fulfill their Commitments Jointly (Article 4).
- These flexible mechanisms comprise two types of emissions trading:
    - Between and Among Nations With Legally Binding Limits on Emissions (Emissions Trading under Article 17; Joint Implementation under Article 6; Joint Fulfillment of Commitments under Article 4); and
    - Between Nations With Legally Binding Limits and Those Without (CDM of Article 12).
- All Annex I Parties must report their GHG emissions from sources and removals by sinks annually, in a transparent and verifiable manner (Articles 3, 7 and 8). The rigorous double-entry bookkeeping system established under Articles 3.10, 3.11 and 3.12 provides a solid foundation for transparent accounting for compliance as well as tracking of emissions trades.

B. The Two Types of Trading

The Kyoto Protocol provides for two principal types of trading: (1) trading among nations with legally binding emissions limits; and (2) trading between nations with such limits and those without. Table 2 summarizes the main characteristics of the trading regimes.

1. Trading Among Nations With Legally Binding Emissions Limits

Parties with legally binding limits on GHG emissions may participate in emissions trading in three ways.

Trading in Assigned Amounts. First, under the Kyoto Protocol, any Annex B Party may transfer or acquire increments or "parts" of its total "assigned amount" of GHG emissions. Such transfers are referred to in the Protocol as "emissions trading." Accounting provisions in the Protocol ensure the environmental integrity of emissions trading between Annex B Parties by explicitly requiring a transferring Party to deduct the transfer from its assigned amount before the acquiring Party can add the transfer to, and thus increase, its assigned amount.[11] In contrast to other emissions trading avenues described below, the Protocol does not limit such transfers to transactions where emissions reductions are "additional" to what would have occurred in the absence of the transactions.

Project-Based Trading of Assigned Amounts: Joint Implementation. Second, Parties may transfer, or authorize other legal entities to transfer, assigned amounts in connection with individual projects undertaken in other Annex I Parties where such projects yield emissions reductions.[12] The Kyoto Protocol limits the availability of this type of emissions trading, which is often referred to as "joint implementation," to Annex B Parties that are also members of Annex I of the UNFCCC.[13]

The Protocol also limits this type of trading to projects that provide emissions reductions that are "additional" to any that would otherwise occur. And the Protocol provides that the Parties "may" elaborate guidelines by which projects would demonstrate additionality.[14] The need for such guidelines is lessened, however, because of the integrity provided by the accounting rules for such transactions. The Protocol's accounting provisions require that these transfers receive identical accounting treatment as emissions trading; indeed, from an accounting perspective, there is no difference between these project-based transfers and non-project-based trading of assigned amounts. Specifically, if one Annex B nation or firm invests in an emissions reduction project in another Annex B nation, then the Party in which the project is located must deduct any transferred units from its assigned amount before the acquiring Party can add the transfer to, and thus increase, its assigned amount.

Collective Targets, Bubbles, and Umbrellas. Third, the Kyoto Protocol provides that Annex B Parties may enter into agreements to meet their emission caps jointly. That is, a group of Annex B Parties may enter into an agreement under which some of these Parties commit to meeting more stringent targets, and others, less stringent targets, than their individual legally binding commitments under Annex B of the Protocol, provided that the group as a whole meets the group's total Annex B commitments. The Kyoto Protocol accounting system preserves the integrity of legally binding limitations and rigorous double-entry bookkeeping for such agreements. The Protocol provides that in the event the group fails to achieve its total combined commitment level, each Party to the agreement shall be responsible for its own level of emissions under the agreement establishing the collective commitment. As with joint implementation, the Protocol limits this type of emissions trading to Parties who have joined Annex I of the UNFCCC.[15]

2. Trading Between Parties With Legally Binding Emissions Limits and Those Without.

The Kyoto Protocol provides that through the Clean Development Mechanism (CDM)—a new institution created by the Protocol—Annex B Parties may acquire certified emissions reductions resulting from cooperative projects undertaken in Parties that have not yet adopted legally binding targets. The Protocol further provides that Annex B Parties may use these certified emissions reductions to increase their total assigned amounts of emissions. However, precisely because the host countries of such projects have not adopted legally binding emissions limitation and reduction commitments, greater scrutiny is required in order to ensure that such project-based transactions involve actual reductions below what would have otherwise occurred in the host nations.[16]

Accordingly, CDM project-based transactions must pass a test of environmental "additionality."[17] Specifically, CDM transactions are limited to those "reductions ... that are additional to any that would occur in the absence of the certified project activity." Such reductions are necessarily project-based since the vast majority of non-Annex I nations are not subject to assigned amounts. This "additionality" test is therefore essential to the environmental integrity of the CDM, since it is only through such a test that any project's emissions reductions can be identified as truly "surplus" and therefore available for offsetting emissions elsewhere. Accordingly, trading under the CDM must rely on subsequent rulemaking to establish qualifications by which CDM projects may demonstrate environmental additionality.

Moreover, third-party verification of additionality may also be important, given the potential for conflict of interest in CDM transactions. Since CDM transactions result in additions to the acquiring Party's assigned amount, while the transferring Party has no assigned amount from which to make a corresponding deduction (as would be the case in joint implementation, described above), both Parties to a CDM transaction have an incentive to transfer more, rather than fewer, emissions reductions. Accordingly, third-party verification can provide transparency to assure the public that there has been no overstatement of emissions reductions.

Some emerging market economies that are not currently members of Annex I are weighing the relative advantages of CDM and full emissions trading. Any Party may participate in full emissions trading by adopting a legally binding limit on its emissions, and thus avoid the transactions costs associated with proving additionality on a project-by-project basis. The Protocol provides that the legally binding limit the Party adopts—which may be a limit that affords the Party a degree of emissions growth for its near-term sustainable development trajectory—must be approved by a three-fourths majority of the Parties to the Protocol.[18] Such emissions "growth budgets" can, if carefully developed, provide an incentive for broader participation in the Protocol in a manner consistent with the objective of the UNFCCC.

Table 2 The Types of Emissions Trading Under the Kyoto Protocol

	Project-Based?	**Additionality**	**Private Sector**	**Accounting**
1) Trading Among Annex B Parties				
a. Trading in Parts of Assigned Amounts	No	No proof necessary.	May participate if government agrees.	Transferor deducts transfer from assigned amount before acquirer may add to assigned amount.
b. Trading via Joint Implementation	Yes	Proof optional (accounting rules act as safeguard).	May participate if government agrees.	Transferor deducts transfer from assigned amount before acquirer may add to assigned amount.
c. Collective Targets	No	N/A	N/A	Each Party responsible for meeting own targets.
2) Trading Between Annex B and Non-Annex B Parties				
a) Clean Development Mechanism (CDM)	Yes	Additionality must be proved for each project; transparency important.	May participate if governments agree; all transactions must be certified; reductions must have already occurred.	Transferor must prove transferred reductions (a) are additional, and (b) have already occurred. Acquirer may then add reductions to its assigned amount.
b) "Growth Budget" (Three-Fourths Majority Vote of Parties Required to Approve Annex B Budget)	No, but can include projects.	No proof necessary.	May participate if government agrees.	Transferor deducts transfer from assigned amount before acquirer may add to assigned amount.

IV. Special Focus Topics

A. The Kyoto Protocol and the Five Essential Elements of Market Mechanisms

By defining compliance in terms of actual emissions, the Kyoto Protocol provides the single most important ingredient for satisfying the requirements of **measurement, transparency, accountability, fungibility,** and **consistency.** While the Protocol's structure thus provides the essential framework for structuring the international GHG emissions trading market, it is important to ensure that the Protocol hews to the essential elements of market mechanisms, and that it takes account of lessons learned from experience with emissions trading programs. The Protocol's environmental and economic effectiveness can be safeguarded by the adoption of rules that (a) define what is traded, and (b) provide automatic and transparent accountability based on actual emissions.

1. Defining What Is Traded

To ensure that the integrity of these elements is preserved, the Conference of the Parties to the UNFCCC (COP) may wish to elaborate rules that carefully define what is traded. These rules will need to identify the traded units by "vintage,"—i.e., by nation of origin, date of issuance/creation, and, for CDM units, project of origin.

MINIMUM ELEMENTS: DEFINING WHAT IS TRADED

* For Industrialized Nations (Emissions Trading and Joint Implementation)
- Parts of Assigned Amounts
- Measured in Carbon Equivalent Units
- Identified by Nation of Origin
- Identified by Date of Issuance/Creation

* For "CDM" Emissions Reductions Units:
- Carbon Equivalent Units
- Identified by Nation AND Project of Origin
- Identified by Date of Verified Reduction

Under the Kyoto Protocol, a Party's ultimate compliance is determined by comparing its actual emissions for the period 2008-2012 with its "assigned amount" as increased or decreased by trades. Because trades can add to or reduce a Party's compliance benchmark, the environmental integrity of the Protocol depends on the integrity of measures of actual emissions and on the integrity of the "currency" of assigned amounts. "Vintaging"—that is, identifying what is traded by nation, project, and year of origin—provides valuable information to Parties and the public about the integrity of the assigned amounts against which compliance is measured. It provides a way of tracking transactions and of delivering market incentives for buyers to procure assigned amounts (through emissions trading and joint implementation) and certified emissions reductions (through the CDM) from sellers whose compliance integrity is strong.

*2. Assigned Amounts and Actual Emissions Performance: Ensuring **Accountability***

Sovereign nations hold the key that can unlock market forces in favor of compliance with the Kyoto Protocol's legally binding limits on greenhouse gas emissions. That key is **accountability**—through trading rules, called for in the text of the Protocol itself, that build on the five essential elements of successful trading systems.[19] To ensure accountability, the COP may wish to adopt trading rules that: provide automatic, highly predictable consequences when nations' actual emissions exceed their assigned amounts, net of trades; and foster development of the robust, competitive GHG emissions trading market that can meet environmental targets while driving down costs.

One key to ensuring accountability will be resolving whether buyers or sellers are liable in the event that a Party's actual emissions exceed its assigned amounts. There is a trigger point beyond which placing responsibility solely on sellers can be an inadequate response to balancing the environmental account even with automatic deductions plus penalties from subsequent budgets. Accountability rules that place some responsibility on buyers, in contrast, can encourage buyers to take appropriate care to purchase from sellers whose actual emissions do not exceed assigned amounts. This care would be expressed as market preferences for quality. Exclusive seller responsibility would forgo the benefits of buyer caution, and would eliminate a significant market feedback. Exclusive or unlimited buyer responsibility, however, would hamper market development, since buyers would be reluctant to purchase under rules that hold them responsible for seller exceedances no matter how careful buyers are in their purchases.

One option to address this is a Blended System. Experience indicates that a tiered or staged system can be effective in ensuring accountability. When the emissions trading market opens, the rules hold sellers responsible for ensuring that their actual emissions do not exceed assigned amounts, and then, as more information about sellers' actual emissions becomes available, the rules provide that buyers purchase at their peril if they fail to consider the news that some sellers are emitting in excess of assigned amounts. The COP may wish to consider four rules, applied to all Annex B Parties regardless whether they engage in trading, that can achieve this blended result:

1. "True-Up." At the end of an emissions budget period, any Party whose actual emissions exceed its assigned amount could be required to "true-up" its emissions accounts by purchasing assigned amounts or Clean Development Mechanism emissions reduction units.

2. The Automatic Deduction. At the end of an emissions budget period, for any Party whose actual emissions exceed its assigned amount, the excess could be deducted automatically from its next-period assigned amount, with a penalty (e.g., 1.2:1.0) large enough to compensate the environment for the delay in achieving mandated levels and to operate as a deterrent rather than as a borrowing element.

3. The Automatic Discount. During an emissions budget period, if a Party's actual emissions exceed the total assigned amounts it holds for that period or another pre-specified trigger, then any assigned amounts it has sold, but which no buyer has tendered for compliance purposes, could be discounted automatically and immediately. The discount rate could be set equal to the Party's excess emissions divided by the total assigned amounts it holds. The discount could also apply to all future sales by that Party until it balances its emissions account.

4. The Prohibition on Sales. A Party whose cumulative emissions plus sales exceed its assigned amount for the budget period could be prohibited from selling assigned amounts until it balances its account.

Such an accountability system has the potential to create constituencies of buyers and sellers in favor of compliance.

B. The Clean Development Mechanism: Addressing Baselines and Additionality; Addressing Leakage and ***Accountability***

The Clean Development Mechanism (CDM) established by the Kyoto Protocol merits special focus for several reasons. First, it is a means by which nations that have not yet adopted legally binding emissions limits may participate in the climate protection activities of the Protocol. Second, as has been noted earlier, the absence of emissions limits for CDM host nations necessitates special attention when designing rules to assure the environmental integrity of CDM-origin emissions reductions. Third, a number of technical and legal hurdles must be overcome if CDM projects may begin earning tradable reductions prior to entry into force of the Protocol. [20]

A prompt start for the CDM cannot be realized without action by the COP. Without reliable guidance, continued uncertainty will mean that CDM investments are unlikely to occur. Providing CDM guidance may prove to be quite challenging. Interim rules that provide recommended approaches for future adoption by the Meeting of the Parties to the Kyoto Protocol, would need to address:

- the setting of project baselines for purposes of establishing additionality; and

- methodologies for quantifying, verifying, tracking, and reporting, on a project-by-project basis, emissions reductions relative to those baselines;[21]

- provisions to ensure **transparency** and **accountability** so that "leakage" effects do not undermine the integrity of the CDM.

Baselines and Environmental "Additionality." Two basic principles lie at the core of successful interim rules or guidelines for the CDM. First, as discussed above in connection with emissions trading between industrialized nations, the focus needs to be on actual emission performance and environmental integrity. Second, the guidelines need to take care to avoid imposing costs and burdens that do not enhance the environmental integrity of such trading.

The greatest and most critical challenge to the CDM is the formulation of guidelines for project baselines—that is, for determining what would have occurred in the absence of the project, and for measuring actual emissions performance against that baseline. Because this change in performance qualifies as a tradable reduction that can be used to justify increased emissions elsewhere, the determination must be made on a quantitative rather than strictly qualitative basis. At the same time, the criteria and general description of the kinds of projects encompassed by the CDM are broad enough to suggest that virtually every kind of activity that reduces, avoids, or sequesters GHG emissions can be a valid source of transactable emissions reductions. In fact, one of the major objectives of emissions trading generally is to stimulate as broad a search as possible for cost-saving opportunities and environmental innovation.

In keeping with the overall actual-emissions-performance paradigm of the Kyoto Protocol, the availability and calculation of certified emissions reductions will need to be based exclusively and in every case on verified actual emissions reductions—that is, reductions that have already occurred and have been verified relative to the annual emissions project baseline. Methodologies identified by the UNFCCC's Subsidiary Body for Scientific and Technical Advice and the Intergovernmental Panel on Climate Change should be used to provide quantification of project emissions and emissions reductions.

"Leakage" and Accountability. While, as explained above for emissions trading, specific Protocol provisions hold sellers accountable for ensuring that their actual emissions do not exceed their assigned amounts, the absence of analogous legally binding emissions limits for CDM host countries raises unique **accountability**

concerns. The principal accountability issue under the CDM is "leakage." Specifically, if CDM activities in one country in effect "cause" economic shifts to other emissions-increasing activities in that country or in another country lacking a legally binding emissions limit, the emissions reductions ostensibly gained by the investment or project could be extinguished. The threat to the environmental integrity of project-based trading arises if such emissions shifts occur without being detected or accounted for, and the emissions reductions purportedly achieved by the project are used in place of emissions reductions elsewhere.

The Kyoto Protocol requires that the CDM put in place a mechanism for identifying, and holding nations accountable for, such emissions shifts. Two alternative approaches are available. Under one, the rules could specify the kinds of projects for which such emissions shifting is a possible or likely effect. Proponents of such projects would have the burden of demonstrating that such leakage had not occurred or, in cases in which shifting did occur, quantifying the resulting emissions and deducting them from the quantity of emissions reductions claimed for the project. A second option would be to provide that a project may be challenged on the basis of unaccounted-for emissions shifts. The two approaches can be combined.

C. A Special Case of Temporal Flexibility: Credit for Early Action

The Kyoto Protocol requires Parties to demonstrate progress, by 2005, in reducing GHG emissions. Early action is important, because the cost of delay is significant:

> *"Steps taken now represent an investment that will pay environmental economic dividends into the future. Conversely, continued inaction will result in greater environmental impacts and increased costs down the line."*[22]

While various options could enable Parties to make such progress, this section profiles a special case of temporal flexibility—credit for voluntary early actions to reduce GHG emissions. These voluntary programs have the potential to advance efforts to meet the environmental challenge, while helping Parties soften what otherwise may be an abrupt change needed to meet emissions limits in the 2008-2012 period.

Credit for Early Action programs are not explicitly addressed in the Kyoto Protocol. However, they can be designed, consistent with the Protocol, to give sources the incentive and the flexibility to begin voluntary steps to reduce emissions early, when it may be less expensive for them to do so, rather than requiring sources to wait until 2008 to begin earning tradable assigned amount units. An economic incentive system premised on temporal flexibility can be put in place as a matter of domestic policy by Annex B nations—and put in place quickly—to stimulate businesses to begin making GHG reductions prior to 2008. Under this approach:

- companies that make voluntary early reductions could earn GHG emission reduction credits that they could save and either sell to others or use to meet any subsequent emissions reduction requirements.
- in the case of domestic reductions, the credits would be drawn from the Annex B Party's total assigned amount.
- In the case of reductions through investments in non-Annex B nations, the credits would be additional.

In either case, such a program would make voluntary GHG reductions achieved today or any time before 2008 financially valuable to the companies who made such reductions, in just the same way that extra reductions made after 2008 would be valuable in a GHG emissions trading market after 2008.

Credit for Early Action programs are thus premised on a degree of temporal flexibility. That is, they embody a decision by a sovereign nation to allocate a portion of its assigned amount early, to sources who voluntarily reduce emissions below an "early" emissions budget level. They therefore have the potential to slow, if not reverse, the climb of the upward curve of business-as-usual emissions, and create a smoother and more affordable transition. Companies that had "saved" early reduction credits would have a cost-effective compliance option already on hand for use after 2008, when they could face mandatory obligations. Moreover, by giving businesses a direct financial incentive for initiating emissions reduction investments sooner, an emissions-trading-based early reduction program would ensure that cost-savings innovations were put in place that much sooner. Consequently, in addition to addressing the short-term economic costs of an abrupt transition to compliance, such a program also would lay the foundation for cost-effective compliance over the long term as well. And, since the credits awarded to early reducers would be drawn from the assigned amount and otherwise allocated to industries not undertaking early actions, such a program would
create competitive advantages for companies that did move to make reductions before 2008. These early actors would also provide energetic constituencies favoring national compliance.

At the same time, the environment would benefit. Emissions prior to 2008 would be reduced, and the credit awarded for such reduction would spur faster discovery and use of environmental innovations. In addition, prompt initiation of domestic programs like this could accelerate government and business experience with emissions trading in Annex B nations—and, if those domestic programs recognized reductions achieved by overseas projects, in non-Annex B nations as well.

V. Unresolved Issues: Restrictions on the Use of Market Mechanisms

In this section, we explore proposals to place *quantitative* and *qualitative restrictions* on the use of the Kyoto Protocol's market mechanisms.

A. Quantitative Restrictions

The Kyoto Protocol specifies that trading "be supplemental to domestic actions for the purpose of meeting quantified emission limitation and reduction commitments..." The Protocol does not, however, specify any numerical target for this supplementarity.[23]

Notwithstanding the Protocol's silence on a numeric target, it has been suggested that Parties impose a fixed quantitative restriction (e.g., 49 percent) on the quantity of emissions reductions that a Party could achieve through international emissions trading, joint implementation, "bubbles" and "umbrellas" (collective targets), or CDM, as distinct from the quantity of reductions obtained through domestic policies and actions. Some advocates of this view believe that industrialized nations have a moral obligation to undertake most emissions reductions at home rather than abroad. Others support this view because they believe it could force more rapid development of GHG-reducing technologies. They reason that since industrialized nations already have a technological edge, forcing them to do most of their reductions at home would spur them to develop these technologies faster and more cost-effectively than if those nations were afforded unlimited access to less innovative but cheaper emissions reduction opportunities abroad.

Others, in contrast, note that GHG emissions reductions are environmentally equal no matter where, geographically, they occur. Opponents of such quantitative restrictions include a number of host nations and their investors and NGOs who are interested in obtaining foreign direct investment in technologies and processes for reducing or sequestering GHG emissions. In their view, these restrictions would discriminate among emissions reductions solely on the basis of national origin. Investors are concerned that such restrictions would increase compliance and transaction costs without achieving any environmental benefit. Moreover, in their view, restricting the market for environmental innovation drives up the cost of that innovation, and thus discourages the development and deployment of new technologies.

B. Qualitative Restrictions

The Kyoto Protocol provides that Parties that have adopted legally binding GHG limits are to be held accountable for ensuring that emissions do not exceed assigned amounts. The Protocol does not, however, place any restriction on the ways in which Parties may comply with these requirements. Nonetheless, it has been suggested that restrictions should be placed on the types of activities, technologies, processes, and events that can yield transactable "surplus" assigned amounts. For example, it has been proposed that joint implementation

projects between industrialized nations not be allowed to yield tradable assigned amount units if those projects involved the use of fossil fuels.

Similarly, it has been suggested that trading be restricted to transactions in assigned amount units that become surplus by operation of regulations explicitly aimed at reducing GHG emissions. Proponents of this view argue that it would be unfair to allow some nations to benefit from "windfalls"—that is, from emissions decreases that occur for reasons separate from Kyoto Protocol implementation—while other nations struggle to achieve the domestic consensus needed to adopt and enforce GHG emissions controls. Proponents of this view also contend that since some Annex B nations would have experienced emissions decreases or reduced emissions growth even in the absence of the Protocol, it would weaken the Protocol's overall targets to allow any resulting differences between actual emissions and assigned amounts to be treated as tradable, i.e., available to offset actual emissions elsewhere.

The Kyoto Protocol itself contains no such requirements. An examination of how these requirements might apply in practice reveals that they could be environmentally counterproductive, and could disrupt the participation of sovereigns in commitments to limit and reduce GHGs.

In the first instance, proposals for qualitative restrictions on market mechanisms based on the technology or process used to achieve emissions reductions would limit the number and scope of emissions reduction activities. In areas where alternative technologies and processes are not available or are not economically feasible, the emissions reductions simply might not occur. If, in contrast, the market is open to the full panoply of emissions-reducing technologies and processes—subject, of course, to the domestic laws of the host country—then competitive pressures will be more likely to reduce the cost of the range of activities, including alternatives, and consequently increase the number of reductions achieved. An illustrative example comes from the SO_2 trading market in the U.S., where, following the start-up of the trading program, the price of scrubber technology dropped, as scrubbers faced emissions reduction competition from allowance sales and fuel switching.

Furthermore, such qualitative restrictions on market mechanisms may risk driving away Parties whose participation is essential to the success of the Protocol. Each Annex B Party's emissions limit under the Kyoto Protocol for the period 2008-2012 is formulated as a multiple of its 1990 GHG emissions. Since 1990, a variety of political and economic circumstances have placed some Annex B Parties on trajectories that put their expected GHG emissions well below their assigned amounts under Annex B. Germany's overall GHG emissions have dropped in the wake of the absorption and economic integration of the former East Germany. The GHG emissions trajectory of the United Kingdom has been altered by dint of market-oriented reforms adopted in its energy economy. Emissions trajectories have changed since 1990 in the nations of Eastern Europe, the Russian Federation, and other economies in transition. And more such changes may occur in various Annex B nations, though the changes are at this juncture somewhat difficult to predict.

In the case of the United Kingdom and Germany, the European Union's burden-sharing agreement and collective GHG commitment appear to have taken account of these expected changes. The European Union's pre-

Kyoto proposal for a 15 percent reduction under its original burden-sharing agreement is, obviously, substantially below the 8 percent GHG emissions reduction for E.U. member states contained in Annex B. The 8 percent E.U. "bubble" target takes account of the changed emissions trajectories for the U.K. and Germany, and allows emission increases for some other member states. A similar approach is likely to be considered with regard to the expected emissions changes of East European nations that are seeking to be admitted to the European Union.[24]

The European Union's disposition of the emissions reductions expected from the U.K. and Germany has aroused little comment, while the treatment of reductions expected from Eastern Europe has attracted only slightly greater notice. In 1995, the aggregate GHG emissions from these nations exceeded that of the Russian Federation. In contrast, however, many have expressed the fear that if Russia's expected GHG emissions trajectory results in substantial transfers of parts of its assigned amount to other Annex B Parties, then the latter will be able to achieve compliance with their assigned amounts without having to make "investments" in substantial new emissions reductions, and that overall reductions will not be as great. Based upon those fears, it has been suggested that the Protocol text be re-opened, to negotiate a different commitment for Russia, a tighter limit on GHG emissions for all of Annex B, or a quantitative restriction on trading, as discussed above. On the other hand, some fear that efforts to renegotiate the Protocol would be unsuccessful and exclude some countries from the process. Given current global economic uncertainty, it is not clear which economies in the near term will enjoy the sustained growth historically associated with rising GHG emissions, and which will experience declines associated with lowered emissions trajectories.

When Parties seek to acquire assigned amounts from others whose emissions trajectories are below their assigned amounts, acquiring Parties could use their transfer agreements to ensure that the revenue transferred is targeted to GHG emissions control projects and to building the domestic regulatory infrastructure needed to ensure the transferring Parties' compliance. This approach underscores the need for transparency and accountability in both the use of funds and emissions accounting.

VI. Conclusion

Market mechanisms generally, and emissions trading in particular, have the potential to enable nations and economic actors to meet legally binding targets for greenhouse gas (GHG) limitation and reduction cost-effectively. As nations examine the 1997 Kyoto Protocol on Climate Change, the global GHG emissions trading market envisioned by the Protocol will be strengthened by maintaining sustained focus on the essential elements needed for market integrity—namely **measurement**, **transparency**, **accountability**, **fungibility**, and **consistency**—and by building on lessons learned from practical experience with program design and implementation. These elements and lessons weigh in favor of a streamlined approach that provides automatic accountability while avoiding other restrictions on market operation. Such an approach can enable businesses, NGOs, and governments to work together to tackle the problem of GHG emissions limitation in a way that is environmentally and economically effective.

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[2] "Designing Global Climate Policy: Efficient Markets Versus Political Markets," J.B. Wiener, Center for the Study of American Business Policy Study Number 143, December 1997, at 34.

[3] See "Designing Global Climate Policy," supra n. 2, at 18, citing studies.

[4] United Nations Economic Commission for Europe (UNECE), Protocol to the 1979 Convention on Long-Range Transboundary Air Pollution on Further Reduction of Sulphur Emissions, done at Oslo, 14 June 1994 (ECE/EB.AIR/40).

[5] See, e.g., "Environmental Policy for Eastern Europe: Technology-Based versus Market-Based Approaches," D. Dudek, R. Stewart, J.B. Wiener, 17 Colum. J. Envtl. L. 1 (1992), at 47.

[6] Estimates indicate that the market-based approach for phasing lead out of gasoline also resulted in savings on the order of hundreds of millions of dollars over the lifetime of the program, while the lead content of gasoline was reduced over ninety percent. "Environmental Policy for Eastern Europe," supra n. 5, at 24.

[7] Ozone Protection in the United States, E. Cook, ed., World Resources Institute (1996), at 34.

[8] See generally New Zealand Fisheries Act 1996. See also New Zealand Ministry of Fisheries Annual Report For The Year Ended 30 June 1997, available at http://www.fish.govt.nz/annrep_97.

[9] United Nations Framework Convention on Climate Change (UNFCCC) Articles 2, 4, and Annex I.

[10] The two annexes—Annex I of the UNFCCC, and Annex B of the Kyoto Protocol on Climate Change—are not identical, although there is considerable overlap among the Parties listed in each.

[11] Kyoto Protocol Articles 17, 3.10, 3.11, and Annex B.

[12] Kyoto Protocol Article 6.

[13] Kyoto Protocol Articles 6, 3.10, 3.11, Annex B, and UNFCCC Annex I.

[14] Kyoto Protocol Articles 6.1(b), 6.2.

[15] Kyoto Protocol Articles 4, 3.10, 3.11, Annex B, and UNFCCC Annex I.

[16] Kyoto Protocol Articles 12 and 3.12. As with joint implementation and collective targets, only Parties that have joined Annex I of the UNFCCC may acquire certified emissions reductions through the CDM.

[17] See Kyoto Protocol Article 12.5(c).

[18] Kyoto Protocol Articles 20 and 21.

[19] Kyoto Protocol, Articles 17 and 12.7.

[20] Article 12.10 of the Protocol specifies that it is the "Conference of the Parties serving as the meeting of the Parties to this Protocol" that is to "elaborate modalities and procedures" for "verification of project activities", "ensure the collection of administrative expenses" and "supervis[e] ... an executive board" for the CDM. Such a meeting of the Parties to the Protocol cannot take place until the Protocol enters into force pursuant to Article 25, i.e., until 55 nations representing 55 percent of global GHG emissions have ratified it. Article 12.10, however, strongly suggests that it is imperative for COP-4 and subsequent COPs to take at least some action to facilitate early trading activity between Annex I and non-Annex I nations. Specifically, it provides that "certified emission reductions obtained during the period from the year 2000 up to the beginning of the first commitment period can

be used to assist in achieving compliance in the first commitment period." Thus, Article 12.10 and the accompanying Decision of the Parties contemplate the adoption, sufficiently prior to the year 2000 to enable certified emissions reductions to begin in that year, of interim rules for the operation of the CDM.

[21] Presumably, reporting requirements pertinent to such trading will be encompassed in the general reporting structure established by the Protocol. See Kyoto Protocol Article 7.

[22] "Early Action and Global Climate Change: An Analysis of Early Action Crediting Proposals," The Pew Center on Global Climate Change (R. Nordhaus, S. Fotis, 1998), at ii.

[23] Kyoto Protocol, Article 17.

[24] The mechanism by which each member state operating within the "bubble" would be held accountable for meeting its individual target remains unclear.