Emerging Carbon Markets and the Future of Climate Policy

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Until late October 2003, most observers had given up on the prospect of U.S. legislation addressing the emission of gases that contribute to climate change. Not only had President Bush summarily dismissed the Kyoto Protocol—the international community's first attempt to harmonize emissions reductions—as dead, but the last Senate vote on the issue unanimously demanded wider-ranging global participation than had been agreed to in U.N. negotiations. Thus, rather than attempt to engage either Congress or the Bush administration, attention to climate policy had focused elsewhere. Europe, Japan, developing countries, and even some U.S. states began their own initiatives to cut greenhouse gas (GHG) emissions. Despite the absence of the United States, the European Union pressed to save the Kyoto Protocol from irrelevance and, following the lead of the United Kingdom and Denmark, drafted its own legally binding program to reduce greenhouse gas emissions.

Against this backdrop, the Senate voted 55–43 against the McCain-Lieberman Climate Stewardship Act of 2003. This bill proposed a binding greenhouse gas emissions trading system in the United States, and for this reason it was expected to face a significant opposition—perhaps 65 votes against. While the bill was defeated, the surprisingly large number of "yes"

votes was met with excitement from environmental groups.

The last direct test of Congressional opinion on climate change policy was in 1997, and that resolution addressed international negotiations, not domestic policy. Indeed, the recent vote showed that, far from being a marginal and unlikely proposition, greenhouse gas regulation is a reasonable prospect even in the United States. For what it is worth, McCain and Lieberman have vowed to re-introduce their legislation until it passes. However, the bill covers domestic policy only, so if it does indeed pass, it will not be a ratification of the Kyoto Protocol.

Taken with independent initiatives in other countries, this vote could add weight to the argument that the Kyoto Protocol is becoming increasingly irrelevant. However, to interpret irrelevance as a license for "business as usual" would be wrong. On the contrary, Kyoto's relative unimportance stems from its demonstrable success in sending a signal to investors, firms, and countries that GHG regulation—specifically, regulation according to an interlinked system of tradable GHG emissions permits—will be a market reality for the foreseeable future. In other words, Kyoto is irrelevant *not* because the problem has gone away; rather, the regulation of GHG emissions by large groups of countries has created a functional market for GHG reductions and has consequently achieved Kyoto's primary goal: initiating the laborious process of pulling the global economy away from carbon-intensive energy sources. This emerging market for "carbon equivalent" emissions allowances therefore implies a future of altered approaches to climate governance.

Climate Change, the Greenhouse Effect, and Greenhouse Gases.

Although chemist Svante Arrhenius postulated the existence of the greenhouse effect in 1896, significant scientific inquiry did not reemerge until the early 1980s.[1] Public awareness about anthropogenic climate change was not widespread until the late 1980s, possibly as a result of a severe drought in the United States. Then, along with other simultaneously emerging global environmental problems like stratospheric ozone depletion and biodiversity loss, climate change moved quickly into the public consciousness.

Usually known by the more familiar, but less accurate term of "global warming," human-induced climate change results from activity that releases certain gases (carbon dioxide and methane, for example) into the atmosphere.[2] Once these gases are released, they mix quickly in the atmosphere and stay there for extended periods, usually between ten and one hundred years. While in the atmosphere, they let sunlight in but trap outgoing heat, thus leading to changes in Earth's radiation budget. Projected increases in atmospheric GHG levels are expected to affect temperature and will likely change precipitation and storm characteristics in less predictable ways. For example, the Intergovernmental Panel on Climate Change (IPCC) estimates a global warming of between 1.4–5.8 degrees Celsius before 2100.[3] A few degrees might not seem significant given the day-to-day temperature fluctuations that we experience, but it is significant given that the difference in global mean surface temperatures between the last ice age and today is only about 8 degrees Celsius.

The political controversy over climate change stems from a quandry: on

the one hand, greenhouse gas emissions, especially of carbon dioxide, are an unavoidable byproduct of a global economy that uses fossil fuels as its primary energy source. On the other hand, when added together year after year, these emissions will change the global climate. Moreover, in order to merely stabilize—not reverse—this change, the global *rate* of emission must drop to about one-third of its present level, regardless of population and economic growth. The good news is that the rate does not need to drop all at once and that new and existing energy technologies could provide much of the solution. Therefore, a sound policy on climate change will encourage innovation while initiating a modest constraint on emissions in the near term that gradually tightens over the long term.

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International Agreements on Climate Change. The international community immediately referred the scientific questions to the World Meteorological Organization and the United Nations Environment Program, which subsequently established the IPCC in 1988. The scientific body's procedures evolved moderately over the next ten years, but its 3,500 scientists and other experts have played a consistently important role in informing the international debate on climate change policy.[4] While the IPCC has not been free of controversy, its basic interpretation of climate change science was endorsed by a panel of the National Academy of Sciences convened by President Bush.[5]

The first international legal document to address climate change emerged from the 1992 UN Conference on Environment and Development in Rio de Janeiro. The UN Framework Convention on Climate Change (UNFCCC) set non-binding targets for developed countries to reduce their emissions to 1990 levels by 2000. Most countries did not meet these initial goals. More importantly, however, the UNFCCC established a system of national reporting and regular party meetings, with the goal of creating more significant commitments in the future.[6] Moreover, the United States has ratified this element of the UN climate change agreements and has therefore agreed to, among other principles, the idea that countries have "common but differentiated responsibilities" to prevent "dangerous anthropogenic interference with the climate."[7]

The international community debated this question of more significant commitments for the next five years. Emerging from the din in 1997 was the Kyoto Protocol, which includes an agreed limit on the emissions of developed countries and the ability of states whose emissions fall below their limit to sell these

"allowances" to states that miss their target. This kind of market-based program, called "cap-and-trade," was successfully pioneered in the United States and is still used for the reduction of regional air pollutants like sulfur dioxide. Importantly, the relative contributions of greenhouse gases to climate change can be estimated based on laboratory studies and knowledge of how each gas behaves in the earth's system. In this way, an amount of one greenhouse gas can be converted to the equivalent emission of CO_2 through basic conversion factors called global warming potentials. Accordingly, the basic unit of reduction has now become known as the "CO_2 equivalent," or CO_2e.

While the reductions inherent in the Kyoto targets are mild compared to long-term necessity, they are significant compared to the current "business-as-usual" trajectory. This factor and Kyoto's exemption of developing countries from any binding targets have led to political opposition in the United States.[8] Despite the *de facto* U.S. withdrawal from negotiations (or, perhaps, because of it), other countries solidified international emissions trading rules for implementing Kyoto and thereby removed the primary obstacles to a functioning market. Many private sector actors (e.g., broker-traders, insurers, verifiers, consultancies, exchanges, and credit generators) have already begun moving into this field and have outlined the new products they intend to bring into the market.

Trading Programs Outside the Kyoto Protocol. Despite U.S. criticism of the protocol, markets for greenhouse gas emissions have emerged, initiating a pattern that will continue in the coming years. For example, the UK introduced its voluntary multi-sector trading plan in early 2002, and Denmark has implemented a mandatory program that covers the electricity generation sector. More significantly, the European Commission has approved a proposal for mandatory, multi-sector, EU-wide emissions trading starting in 2005. This will form by far the largest GHG trading program in the world and will likely set the standard for subsequent programs in other countries.[9] These programs will, to varying degrees, be harmonized with the rules in the UN climate agreements.

Other actors have initiated trading programs in the absence of binding national legislation. British Petroleum was the earliest major corporate adopter of an internal, binding GHG trading system and subsequently has had a large consultative role in drafting both the Kyoto and UK emissions trading rules.[10] Although the United States has declared its intention to ignore Kyoto, many large

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U.S. corporations have also adopted internal targets.[11]

Moreover, one of the lead private sector contenders for an international carbon exchange was recently established in the Chicago Climate Exchange. The exchange has organized commitments of over thirty companies from multiple sectors and is providing a platform for their trades in the hope of establishing a dominant market position. Several quasi-governmental entities, most notably the World Bank's Prototype Carbon Fund and the Dutch Erupt program, have actively worked to reduce the early risks in carbon investment by catalyzing markets.[12]

Finally, many U.S. states have begun to regulate GHG emissions. California has sponsored a climate registry in which companies can voluntarily report emissions and reductions for possible credits in the future, and it has authorized its Air Resources Board to investigate upgrading automobile efficiency requirements. Massachusetts and New York have also passed legislation aimed at reducing carbon dioxide emissions.

Characterizing the Carbon Market. Although carbon markets have been disjointed, illiquid, and opaque, they do provide some concrete evidence of permit price ranges. Moreover, the increasing volume of trade in carbon assets indicates an expanding and maturing market. Most trades are currently handled through individual brokers on a transaction-by-transaction basis, and therefore the clearing prices are proprietary, or at least closely guarded. Until a transparent exchange handles and publishes a relatively large number of trades, carbon prices will remain somewhat uncertain and difficult to analyze. Nevertheless, research groups have compiled data on brokered trades through 2002.[13] In addition, data on recent prices and transactions are available in limited form through several carbon specialist websites.[14] These data collectively give a picture of the evolving market for carbon reductions.

Despite its lack of transparency, the carbon market has several noteworthy characteristics. Two types of tradable carbon assets exist. First, *allowances* are units that are allocated by a government agency in a cap-and-trade system. The sum of the allowances given out equals the cap, or maximum emission level by the country. Second, *credits* are units that are created by individual projects, often in other jurisdictions, that reduce emissions below an expected baseline. In other words, allowances are like pieces of a big atmospheric pie that are handed out to firms within a country, and credits are like additional pie pieces bought from somebody else.

Another distinction lies between the permits that firms acquire voluntarily and those that firms are required to hold by law. The first type, sometimes called pre-regulatory or pre-compliance reductions, are produced and bought because the firm would like to burnish its image, learn how to measure its GHG emissions, or perhaps even take a cheap option on the possibility that the pre-compliance credits can be converted to compliance credits upon the creation of a legal regime. Until allowance systems took shape in the UK and Denmark, pre-compliance credits made up most of the traded carbon and still are the primary form of tradable GHG asset for U.S. firms. Because of their ambiguous utility, they are fairly low-cost: usually between one and three dollars per ton of CO_2e.

In contrast, compliance or regulatory allowances are those that firms must hold in adherance to a domestic law such as the UK's. This distinction between regulatory and non-regulatory carbon allowances is part of a larger trend toward incorporating the perceived quality of the credit—a value based on regulatory status, degree of certification by an outside auditor, and reliability of the reductions—into the market price.[15] Currently, high-quality compliance allowances are approximately five dollars for the UK market and around eleven dollars for the EU market.

Market prices, while interesting to firms wondering how much carbon risk they are exposed to, are more a function of arbitrary emissions caps than any real measurement of the social value of carbon abatement. More important than the prices are the indications that the carbon market is becoming increasingly liquid and mature. The number of trades in 2002 was over 250 percent of the 2001 volume and should be higher still in 2003. Trade volumes showed a similar jump to approximately seventy million tons of CO_2e. The proportion of high-quality compliance units is also growing quickly, and financial firms are pioneering new types of risk-mitigating contract provisions including options and alternate payment structures. World Bank researchers estimate the market to be worth $350 to $500 million per year with market volume growing fast.[16]

Conclusion. The evidence points to three main phenomena: first, an increasing, albeit uneven, acceptance of greenhouse gas regulation; second, an increase in firm-level, national, and supra-national legislation using carbon permit trading as the means to regulate and reduce greenhouse gas emissions; and third, as a consequence, rapid growth in the number, volume, and quality of trades in the carbon market. Increasing liquidity and experience lowers the information and transaction costs in the market, thus lowering barriers to the creation of additional, linked markets, either within or outside the Kyoto framework.

The world is on a path that is consis tent with a gradual introduction and integration of connected, national carbon markets, the end result of which could look remarkably like the logical outcome of a Kyoto-based process. In this way, though the specific targets of Kyoto might be unpalatable enough to kill it, the signal that it sent to the world may in the end be enough to create a robust and widely accepted foundation for global greenhouse gas emissions reduction. Though this path is not a deterministic one and numerous inter mediate steps remain, firms that have not yet assessed their carbon risk will likely have to do so in the near future. As many firms have found, early action can reduce the risks of regulation where the specifics are unknown but the direction is, as in this case, predictable.

NOTES

1 H. Rodhe, R. Charlson, and E. Crawford, "Svante Arrhenius and the greenhouse effect," *Ambio* 26 (1997): 2–5.

2 Increased greenhouse gases and land use changes are likely to lead to an increase in global average surface temperatures, but this average may mask smaller scale temperature variations, including regional cooling. In addition, such changes are likely to lead to consequences in addition to temperature change, such as changes in precipitation. Therefore, climate change is a more encompassing and accurate term.

3 For a description of the IPCC and a complete set of its reports on the science of climate change, see http://www.ipcc.ch.

4 Paul N. Edwards and Stephen H. Schneider, "Self-Governance and Peer Review in Science-for-Policy: The case of the IPCC Second Assessment Report" in *Changing the Atmosphere: Expert Knowledge and Environmental Governance,* eds. C.A. Miller and P.N. Edwards (Cambridge: MIT Press, 2001), 219–246.

5 R.J. Cicerone, E.J. Barron, R. E. Dickinson, I. Fung, J.E. Hansen, T.R. Karl, R.S. Lindzen, F.S. Rowland, E.S. Sarachik, and J.M. Wallace, *Climate Change Science: An Analysis of Some Key Questions* (Washington, D.C.: National Research Council, 2001), 28.

6 S.H. Schneider, "Kyoto Protocol: The Unfinished Agenda—An Editorial Essay," *Climatic Change* 39 (1998): 1–21.

7 For full text of the Framework Convention on Climate Change or the Kyoto Protocol, see http://unfcc.int.

8 The exemption of developing countries from Kyoto targets has many justifications—based, for example, on equity, historical atmospheric debt, and on legal agreements—but these justifications were not enough to allay political opposition.

9 Details of the EU emissions trading program are available at http://europa.eu.int/comm/environment/climat/emission.htm.

10 Mark Akhurst, Jeff Morgheim, and Rachel Lewis, "Greenhouse gas emission trading in BP," *Energy Policy* 7 (3 June 2003): 657–663.

11 Michael Margolick, and Doug Russel, *Corporate Greenhouse Gas Reduction Targets* (Arlington, VA: Pew Center on Global Climate Change, 2001), 74. http://www.pewclimate.org.

12 Franck Lecocq, "Pioneering transactions, catalyzing markets, and building capacity: The prototype carbon fund contributions to climate policies," *Amer. Journal of Agricultural. Economics* 85, no 3 (2003): 703–707. For information on the Dutch program, see http://www.senter.nl/erupt.

13 Richard Rosenzweig, Matthew Varilek, and Josef Janssen, *The Emerging International Greenhouse Gas Market,* (Arlington, VA: Pew Center on Global Climate Change, 2002), 64. http://www.pewclimate.org; Franck Lecocq, and Karan Capoor, "State and Trends of the Carbon Market" (Washington, D.C.: World Bank PCF Plus Research Group, 2002).

14 For example, http://www.pointcarbon.com and http://www.co2e.com.

15 Michael Molitor, Laurent Segalen and Kristian Rajakaltio, "The Prices of Carbon," *Environmental Finance* (March 2003).

16 Franck Lecocq and Karan Capoor, "State and Trends of the Carbon Market" (Washington, D.C.: World Bank PCF Plus Research Group, 2002).