AN ECOLOGIST'S THOUGHTS ON FORESTS AND FARMS IN A CAP-AND-TRADE SYSTEM

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Let's hope that 2008 marks the year of closure in scientific debate about rising carbon dioxide (CO_2) and climate change. All serious scientists believe that the recent rise in CO_2 in Earth's atmosphere is unprecedented in the recorded history of human civilization and derived from human-burning of fossil fuels.[1] The Intergovernmental Panel on Climate Change has concluded that rising concentrations of CO_2 will warm our planet, and there is widespread evidence from weather records, satellites, and various observations of nature that shows a strong warming trend is in progress.[2] From this point forward, we should move to the question of what to do about the climate change problem—a debate that will focus on the economics of action versus inaction and of costs today versus avoided costs tomorrow.

Science can inform this process by showing the accuracy of different approaches to quantifying carbon emissions and carbon sequestration in various components of the carbon cycle. Science can provide models of how ecosystems and the global carbon cycle will respond to changes in climate, with resulting changes in carbon storage. Science can tell us how climate change will impact agricultural production, the availability of fresh water, and the future epidemiology of disease. These large-scale models can be validated by careful field studies in selected areas.

Currently, there is widespread interest in a cap-and-trade system for controlling CO_2 emissions in the United States. Cap-and-trade systems worked well to control emissions of sulfur dioxide under the Clean Air Act. Cap-and-trade systems for carbon underlie the proposed legislation of the Lieberman-Warner Climate Security Act of 2007.[3] There is such a groundswell of

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[1] Jacqueline Flűckiger et al., *High-Resolution Holocene N_2O Ice Core Record and Its Relationship with CH_4 and CO_2*, 16 GLOBAL BIOGEOCHEMICAL CYCLES 1010 (2002).

[2] *See generally* WORKING GROUP I, INTERGOVERNMENTAL PANEL ON CLIMATE CHANGE, CLIMATE CHANGE 2007: THE PHYSICAL SCIENCE BASIS (Susan Solomon et al. eds., 2007), *available at* http://www.ipcc.ch/ipccreports/ar4-wg1.htm (describing the human and natural causes of climate change).

[3] S. 2191, 110th Cong. (2007).

enthusiasm to begin trading carbon credits on Wall Street that I fear we have lost track of what we are actually trying to do here—lower the concentration of CO_2 in the atmosphere.

Fundamental differences in the global cycles of carbon and sulfur complicate the implementation of cap-and-trade systems for carbon emissions.[4] The legal system will need to draw on scientists to help evaluate the efficacy, reality, and value of carbon credits in a cap-and-trade system. There is no point in establishing a complicated trading system, with potential loopholes for fraud, if it will have essentially no impact on the underlying problem.

Carbon credits could derive from several sources, for example, from a company that lessens its emissions of CO_2 below those granted (or sold) to it by a cap-and-trade authority. Credits could also stem from efforts to capture and sequester CO_2 that has already been emitted to the atmosphere, especially by changes in farming and forestry practices that would result in carbon storage. For instance, a farmer that plows his land less frequently, or not at all (i.e., no-till agriculture), may find that organic matter accumulates in his soils. The credit for this practice could be sold on an open market to a utility with emissions that remain above its legal allocation.

Cap-and-trade systems should grant credit only when the activity in question meets the test of "additionality." In other words, if converting to no-till agriculture is becoming the normative, regional practice and the farmer in question would have been likely to do so anyhow, then payment for carbon stored as a result of the shift in practice would not be justified. Arguments are sure to arise about what is regional practice, and even what constitutes the region itself, which will need to be adjudicated in the legal system.

Consider another example. If the owner of timberland does not harvest those lands for lumber, credit might derive from the continued storage of carbon in the forest. Indeed, many conservation groups are promoting the importance of such a system to preserve biodiversity in the remaining tropical rainforests. Credit for carbon storage in forests would need to pass the test of additionality—no credit should be granted if landowners of the region are mostly deciding to let their trees grow. But, here the credit must also pass another test—that of "leakage." With leakage, no credit would be given if the cessation of harvest in one region simply shifts an equivalent amount of harvest to another region, to replace the loss of lumber on the world market.

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[4] William H. Schlesinger, *Carbon Trading*, 314 SCIENCE 1217 (2006).

Leakage is another area of endless legal nuance, in this case extending globally, because the loss of timber to market in Georgia may simply cause further deforestation of Canada's boreal forest.

Real, audited credits that are of value in an open marketplace, such as the Chicago Board of Trade, will need to be insured against catastrophic loss to fires, windstorms, flood, and other calamities. Insurance companies will want to be informed of the risk of such fires. If fire is a commonplace component of the region in question, then the premiums to insure the carbon credit will be high or the carbon credit will be of lower value on the trading market.

These various problems are likely to be fatal flaws in cap-and-trade systems that include carbon credits for activities in forestry and agriculture. As long as world demand for timber products and paper increases each year, it will be difficult for any forestry practice that saves trees to pass the test of leakage.

With the mining of coal and the extraction of oil and gas, humans opened a large storehouse of carbon that had been held in Earth's crust for millions of years. Just as with the loss of marbles from a bag that develops a hole, it is much easier to mend the hole than to gather up the marbles that have escaped. Thus, I favor the more straightforward approach of capping industrial emissions and encouraging greater efficiencies and price-driven changes in customer use of energy that lower the emission of CO_2. Many environmental economists suggest that a tax on fossil carbon will produce such market-driven changes.[5] If the word tax is distasteful, call it a FEE—short for Fair, Efficient, and Effective. The revenues can be used to reduce the current income tax or to fund research to alternative sources of energy that are not based on fossil carbon.

[5] *See, e.g.*, NICHOLAS STERN, THE ECONOMICS OF CLIMATE CHANGE: THE STERN REVIEW (2007) (advocating aggressive carbon taxes).