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Carbon Trading

ENTHUSIASM IS SPREADING FOR CAP-AND-TRADE SYSTEMS TO REGULATE THE AMOUNT of CO_2 emitted to Earth's atmosphere. In 1990, the U.S. Environmental Protection Agency set a limit on SO_2 emissions from obvious point sources and allowed those who emit less than their quota to trade excess allowances. As a result, regional acid deposition was dramatically reduced. Can the world do the same for CO_2?

Fundamental differences in the biogeochemistry of SO_2 and CO_2 suggest that establishing a comprehensive, market-based cap-and-trade system for CO_2 will be difficult. For SO_2, anthropogenic point sources (largely coal-fired power plants), which are relatively easy to control, dominate emissions to the atmosphere. Natural sources, such as volcanic emanations, are comparatively small, so reductions of the anthropogenic component can potentially have a great impact, and chemical reactions ensure a short lifetime of SO_2 in the atmosphere. CO_2, in contrast, comes from many distributed sources, some sensitive to climate, others sensitive to human disturbance such as cutting forests. It is thus impossible to control all of the potential sources.

Human-derived emissions from fossil fuel combustion are one of the smaller components of the atmospheric flux of CO_2, which is dominated by exchange between forests and the oceans. During most of the past 10,000 years, the uptake and loss of CO_2 from forests and the oceans must have been closely balanced, because atmospheric CO_2 showed little variation until the start of the Industrial Revolution. CO_2 from coal, oil, and natural gas combustion now comes from many segments of society, including electric power generation, industry, home heating, and transportation. Unbalanced by equivalent anthropogenic sinks for carbon, fossil fuel emissions account for the vast majority of the rise of CO_2 in Earth's atmosphere. Caps on emissions, like those instituted for SO_2, will be difficult to institute if the burden of reducing CO_2 is to be borne equally by all emitters.

Because land plants take up CO_2 in photosynthesis and store the carbon in biomass, forests and soils seem to be attractive venues to store CO_2. Market-based schemes propose substantial payments and credits to those who achieve net carbon storage in forestry and agriculture, but these projected gains are often small and dispersed over large areas. We will need to net any such carbon uptake against what might have occurred without climate-policy intervention. Conversely, will Canada and Russia be billed for incremental CO_2 releases that stem from the warming of cold northern soils as a result of global warming from the use of fossil fuels worldwide?

If credit is given to those who choose not to cut existing forests, the increasing total demand for forest products will shift deforestation to other areas. Frequent audits will be needed to determine current carbon uptake, insurance will be necessary to protect past carbon credits from destruction by fire or windstorms, and payments will be necessary if the forest is cut. All these efforts will be costly to administer, diminishing the value of the rather modest carbon credits expected from forestry and agriculture.

Many environmental economists recognize that a tax or fee on CO_2 emission from fossil fuel sources is the most efficient system to reduce emissions and spread the burden equitably across all sources: industrial and personal. A tax on emissions of fossil fuel carbon could replace the equivalent revenue from income taxes, so the total tax bill of consumers would be unchanged. A higher tax on gasoline would preserve the personal right to drive a larger car or drive long distances, but it would also motivate decisions to do otherwise. A tax on emissions from coal-fired power plants, manifest in monthly electric bills, would motivate the use of alternative energies and energy-use efficiencies at home and in industry.

The biogeochemistry of carbon suggests that both emissions taxes and cap-and-trade programs will work best if restricted to sources of fossil fuel carbon. Other net sources and sinks of carbon in its global biogeochemical cycle are simply too numerous and usually too small to include in an efficient trading system. Simple, fair, and effective must be the hallmarks of policies that will wean us from the carbon-rich diet of the Industrial Revolution, and we must begin soon if we are to have any hope of stabilizing our climate.

– William H. Schlesinger

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