New Study in *Science* Predicts Largescale Deforestation from Accounting Rules in Cap & Trade Bills

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There is a new study out in the journal *Science* (May 29, 2009), which highlights the likely consequences of the accounting system in cap and trade bills as now working through Congress, as reflected in the EU's system, and as used under the Kyoto Protocol. The study analyzed the land use changes and resulting emissions that would result from a world greenhouse gas program that taxed or otherwise controlled emissions of carbon from fossil fuels but exempted emissions from bioenergy and did not count emissions from land use change associated with the bioenergy. The study found that the resulting expansion of bioenergy crops would largely eliminate the world's natural forests by 2065, along with nearly all rangeland and savannah. Greenhouse gas emissions from the land use change alone would average 36 gigatons of CO2 per year, which compares to total world greenhouse gas emissions of 39 gigatons (CO2 equivalent) in 1990 and 49 gigatons (CO2 equivalent) in 2005. (The study is by nine researchers at the Joint Global Change Research Institute, using the Minicam model, which is one of the models used by the IPCC. Wise et al., Implications of Limiting CO2 Concentrations for Land use and Energy, Science 324:1183-86 (2009).

The Wise study contemplates ambitious CO2 targets, but its results seem proportionately similar to an MIT/Woods Hole Marine Laboratory study released last year which focused on a 50% cut in world greenhouse gases by 2050. It found that under the same kind of accounting system that exempted emissions from bioenergy without counting emissions from land use, and following strict economics, bioenergy expansion would eliminate roughly half of the world's natural forests, including two thirds of the natural forests and woodlands in Latin America and contribute 9 gigatons of CO2 per year from land use change by 2050. Melillo J.M. et al. 2008. Unintended Environmental Consequences of a Global Biofuel Program (2008).

To be clear, the cause of these changes is not a cap and trade bill per se, but accounting rules that exempt emissions from bioenergy without counting corresponding emissions from land use

change. This accounting rule is reflected in all the cap and trade bills moving through Congress. Since the U.S. consumes roughly 25% of the world's energy, it might be roughly responsible for the same percentage of world land use changes while also setting the model for other world regulatory systems.

The origins of these little discussed accounting rules seem to result from a misapplication of the IPCC accounting rules at the time of the Kyoto Protocol. The IPCC recognized that when bioenergy is burned, it causes emissions but the emissions only needed to be accounted for once: either as emissions from the burning of bioenergy or as emissions in the land use category. In other words, if you chop up a tree and burn it, you count it once. Under IPCC rules, emissions from the consumption of bioenergy are reported for information purposes only and not counted in country emissions levels. But the IPCC emphasized that bioenergy consumption could result in corresponding land use changes from biofuel production. "To avoid underreporting, therefore, any changes in biomass stocks on lands . . . resulting from the production of biofuels would need to be included in the accounts." IPCC. 2000. Land Use, Land-Use Change and Forestry, p. 355. See also 2006 IPPC Guidelines for National Greenhouse Gas Inventories, Vol 1, p. 2.33.

The problem arises when regulatory regimes control and count the emissions from energy but not land use – as is the case with all cap & trade systems to date (and also effectively the Kyoto Protocol). When the emissions from land use change associated with biofuel production are no longer counted, it is no longer appropriate to exempt emissions from the consumption of bioenergy. Failing to do so creates vast incentives for bioenergy, regardless of how produced, even to the point of simply harvesting trees from natural forests. This point appears to have gone unrecognized.

One solution might be to count emissions from burning of bioenergy, which are physically real, and award credits directly to landowners for the generation of biomass feedstocks in a way that takes account of the real emissions from land use and land use change.

The key graphic from the Wise study can be found in *Science*, with its legend presented below. I had no involvement in the study and was not aware of it until today.

Fig. 2 A comparison of global land use under different scenarios.

(A) Land use along the reference pathway.

(B) Land use under a UCT pathway defined to achieve a CO2 concentration target of 450 ppm, which limits fossil fuel, industrial, and terrestrial carbon emissions with a common carbon tax on emissions.

(C) Land use along the corresponding FFICT scenario in which only fossil fuel and industrial emissions are controlled to achieve the same 450-ppm CO2 concentration. In the FFICT scenario, the substantial increase in demand for purpose-grown biomass (four times as much as the reference scenario in Year 2095) intensifies its competition with food and fiber crops for the best cropland, pushing crops and biomass growth beyond traditional croplands and into lands that are inherently less productive. As a result, the relative increase in land required for biomass and other crops exceeds the relative increase in demand.