Including CO₂ emissions from land use in mitigation policy

A comprehensive tax on carbon emissions would lower the cost of meeting environmental goals whilst discouraging deforestation, according to a recent study.

There is concern that climate change mitigation strategies may not always consider emissions from land use or their interaction with emissions from industrial and fossil fuel sources. For example, focusing on industrial and fossil fuel emissions could encourage a shift in land use from food crops and forests to biomass crops, which increases carbon emissions from the land.

The study analysed the effects of two types of mitigation strategies: a Universal Carbon Tax Regime (UCT) in which all carbon emissions in all sectors, including land use change, are taxed equally, and a Fossil Fuel and Industrial Emissions Carbon Tax regime (FFICT) in which carbon tax is applied only to fossil fuel and industrial emissions. It used an integrated assessment model to explore the effects of a UCT and FFICT in limiting CO₂ concentrations at levels of 450 parts per million (ppm) and 550 ppm.

In the FFICT regime, emissions caused by land use change peak at 10 billion tonnes of carbon per year as land is converted to grow bioenergy crops. This was shown by the model to push land requirements beyond traditional croplands and causes deforestation as well as a reduction in pasture.

The difference in cumulative land use change emissions between FFICT and UCT scenarios from 2005 to 2100 ranges from over 300 billion tonnes of carbon (at the 550 ppm limit) to over 400 billion tonnes of carbon (at the 450 ppm limit). According to the model, the UCT regime does result in a higher proportion of emissions from fossil fuel and industrial sources, and the difference in total anthropogenic emissions between the two regimes is relatively small.

Under UCT, the resulting carbon tax was less than half that of the FFICT approach at all atmospheric CO₂ concentration limits. The UCT also causes crop prices to rise and this is highest for the most carbon-intensive agricultural activities. The model suggests that this, in turn, drives changes in diet, reducing emphasis on beef and other carbon-intensive protein sources. Finally, the research demonstrated that improved crop productivity tends to cause a reduction in carbon emissions. This suggests that improvements in agricultural technology could be important in controlling carbon emissions.

The research indicates that a comprehensive mitigation approach to reducing CO₂ atmospheric concentrations (UCT) has large implications for forests, crop and livestock prices, diet, the global energy system and the cost of meeting environmental goals. However the authors point out that the study has not examined non-CO₂ emissions such as methane and nitrous oxide. Another limitation of the study is that it did not consider the impact on water.

1. See http://ec.europa.eu/environment/climat/climate_action.htm


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