

Carbon Sequestration in the Terrestrial Biosphere

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As a strategy for offsetting carbon emissions to the atmosphere, carbon sequestration in the terrestrial biosphere has emerged with both advocates and detractors. It appears to offer low-cost options in the short run but raises questions about alternative uses of the land and about the permanence of carbon sequestration in the long run. Carbon could be sequestered by increasing either the area or the carbon per unit area of above-ground vegetation or the carbon concentration of soils. If the biosphere is to be managed for minimizing greenhouse gas emissions, however, we need to determine whether it is preferable to store carbon in the long-term biosphere or to harvest and use biomass to displace fossil fuels and other energy-intensive products. We need to understand the impact of management strategies on net emissions of greenhouse gases. We need to understand the interaction between carbon management and other human objectives in land management. And we need to understand how changing the Earth's surface cover affects the climate system through its impact on not just the carbon balance, but also through its impact on the fluxes of reflected radiation and latent and sensible heat. Negotiation of the Kyoto Protocol has revealed that management of carbon requires some care to insure that short term objectives, and differences in the obligations and interests among parties, do not lead to outcomes that are counter to long-term, global objectives. Although the opportunities for carbon sequestration in the terrestrial biosphere are finite, there appear to be strategies that could be implemented quickly, at low cost, with current technology, and that are consistent with other social and environmental objectives.