

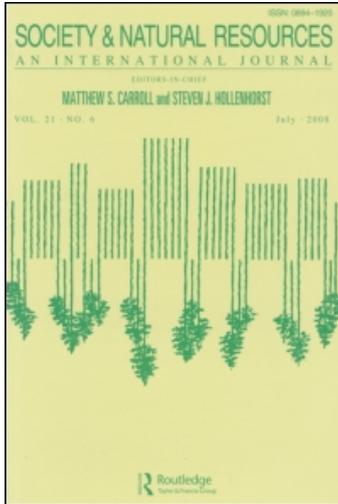
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## Tree-Based Carbon Storage in Developing Countries: Neglect of the Social Sciences

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## Policy Review

# Tree-Based Carbon Storage in Developing Countries: Neglect of the Social Sciences

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*While much is now known about the biophysical potential of carbon storage in the tropics, lacking is an equally vigorous examination of the sociopolitical potential. The result has been a profoundly uneven understanding by the policy community of the overall potential of carbon storage. This article argues that the neglected domains of governance, development, and benefits obfuscate a realistic estimation of the carbon that can be stored on tropical landscapes.*

**Keywords** avoided deforestation, benefits, carbon, development, global warming, governance, mitigation, sequestration, tropics

The prospect of storing atmospheric carbon through tropical tree planting and avoided deforestation (REDD)<sup>1</sup> (among other efforts) has become a significant aspect of research, policy, and treaty endeavors regarding mitigation of climate change. The biophysical aspects of tree-based carbon storage are clearly attractive<sup>2</sup> and the spatial and ecological requirements are well understood (e.g., Houghton et al. 2000; Kerr et al. 2001; Smith 2002; Brown 2002b), demonstrating that constraints to storing this carbon are not biophysical. The constraints are instead sociopolitical, particularly regarding the livelihoods of those that occupy, claim, and use the lands in question, the forms of governance under which these operate, and the opportunities for development. Yet this is where the scientific and policy literature on the prospects of storing carbon in the tropics is most lacking.

The calculation of the required land area, the characteristics of lands ecologically suited to storage, and the amount of carbon potentially stored have not been matched by the social science research (and assemblage of existing research) needed to assess how realistic carbon storage projects are on the ground, and hence the aggregate effect of sequestration as a mitigation option.

This article argues that the continued inattention regarding the human realities of putting and retaining trees on tropical landscapes has resulted in proposals that

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are neither feasible nor realistic. Malhi et al. (2002) point out that the proportional contribution that carbon storage in woody biomass could make to the total carbon offset would be sufficient to move to a “low-emissions”<sup>3</sup> scenario. However, as the magnitude of atmospheric carbon increases over time, the relative potential of carbon storage via tree growth declines. Thus, in order for tree-based storage to play a role, most of its carbon would need to be absorbed within the next few decades (Malhi et al. 2002). Within this short time frame, tropical ecosystems would be most effective at sequestration of carbon because they have the highest productivities (Malhi et al. 2002). This article accepts that this is biophysically correct, but argues that, sociopolitically, tropical ecosystems are the least effective for use as carbon sinks, due to the inability of current approaches to adequately link with human realities on the ground. This presents a particular policy dilemma. Given both the present gaps in knowledge and the neglect of what is known, it would require a significant amount of time to conduct the necessary research, policy, and implementation work so as to be able to pursue viable sociopolitical opportunities. As a result, will it be possible to realize carbon storage goals within the time frame whereby the impact will be meaningful?

While there does exist social science that addresses aspects of carbon storage in woody biomass (e.g., Saunders et al. 2002; Antle and Diagana 2003; Kauppi et al. 2001), this article argues that it does not exist as a cohesive body of literature able to engage the sociopolitical aspects of the problem. The policy domain, however, encouraged by the biophysical analyses, has moved forward with a range of policies including aspects of the Kyoto Protocol, the Intergovernmental Panel on Climate Change recommendations (IPCC 2007), and a range of other policy recommendations (e.g., Kauppi et al. 2001; Conference of the Parties 1997; Smith 2002). This article briefly describes the international development, governance, and benefit domains that currently comprise the areas both where insufficient research has been done, and where the research and practical experience that does exist (usually for purposes other than carbon storage) has been neglected.

## **International Development**

Forested lands have played a large role in international development. Saunders et al. (2002) point out that forest communities currently comprise most of the rural poor in the world (also Peluso 1992; World Bank 2002). Since its inception in the 1950s, the pursuit of “development” in tropical countries has constituted a large and costly effort. While there have been successes, ongoing problems, particularly in Africa and in forest regions of the world, reflect the profound complexity and difficulty of achieving meaningful pervasive progress.

However, a great deal of the carbon storage literature treats complex and vexing sociopolitical issues within international development as solvable simply with broad carbon project or policy recommendations, which are thought to be achievable in the near term (e.g., Niles et al. 2002; Brown 2002a; Toulmin et al. 2005). For example, this literature recommends that advances need to be made in tropical forestry, agriculture, range management, local community empowerment, consultation, and legal institutions because these are fundamental to achieving tree-based carbon storage objectives. However, these have all been priorities in international development for decades, at enormous cost. The reality is that the difficulties in achieving these advances over large areas are daunting (e.g., Bardhan 1997; Evenson and Gollin

2003; Jindal et al. 2008). Assuming that incentives and policies promoted by carbon projects will achieve success where decades of international development efforts have not reveals a disconnect between those who work on carbon storage and those who work in development. This is of particular concern given that many of the same development objectives will become more difficult to attain as climate change progresses and rural livelihoods are increasingly compromised (Toulmin et al. 2005). One example of the imbalance in social versus biophysical examinations of the problem is the question of aggregation in analyses. The carbon storage literature concerning tree-based approaches routinely disaggregates individual tree species by specific densities of wood and growth rates (e.g., Brown 2002b; Baral and Guha 2003; Thomson et al. 2007). Yet rural inhabitants are analyzed as a single group, as opposed to being disaggregated by, for example, categories of migrants; production systems; degree of market involvement; degrees of legal pluralism; or levels of impoverishment, state resistance, and grievance.

### **Governance in Developing Countries**

The primary problem related to governance is that the recommendations in the carbon-woody biomass literature assume that a developing country government is in full control of all lands within its country's borders, or has influence in those lands which results in local compliance rather than resistance. However, this is often not the case. There is a significant literature with regard to governance in rural areas of developing countries currently not included in the carbon storage discussion, which has effectively problematized such an assumption (e.g., Bruce and Migot-Adholla 1994; McAuslan 2003; Okoth-Ogendo 2000). Nevertheless, the broad conclusion that simply "better policies" or "greater political will" is needed in developing country governance in the context of implementing carbon forest projects is common (e.g., Antle and Diagana 2003; Saunders et al. 2002; Toulmin et al. 2005). This perspective assumes elements of capacity and political maturity, which in reality are not in place in many countries, nor are they realistically achievable in the short or medium term. In reality the derivation and implementation of improved policies, laws, and "will" in the developing world, particularly over large multicountry areas needed for carbon storage to be a mitigation option, are unrealistic within the needed time frame. The problems of enforcement, deep and long-lasting resistance to and suspicion of land-related policies, corruption, and discrimination severely compromise this time expectation. Climate change discussions do not adequately address the real nature of power, political will, policymaking, and project implementation in the developing world. This results in overly generalized, lofty and unrealistic statements—for example, "in a country with well-defined property rights and corresponding financial institutions, farmers could plausibly participate in a domestic or international market for tradable emissions reductions credits" (Antle and Diagana 2003, 1181). Also, carbon trading (including credit for carbon sequestered and retained) requires a sufficient operation of the rule of law, from local to international (e.g., Saunders et al. 2002; Jindal et al. 2008), which in reality is closer to the situation in developed countries.

The issue of land tenure policies alone is monumental. The incompatibility between customary and statutory land rights systems in the developing world has had major repercussions on governance, development, and the role of property in capital formation (e.g., Bruce and Migot-Adholla 1994; McAuslan 2003; de Soto

2000). Additionally, there are challenges regarding individual versus commonly held land (Unruh 2008). Recommendations in the carbon literature for increasing indigenous people's control over their lands so as to better manage forests (e.g., Saunders et al. 2002) fail to recognize that such control has been an ongoing struggle for some time and is very difficult to achieve (e.g., Meek 1949; De Moor and Rothermund 1994; Engerman and Metzger 2004). This difficulty is underscored by the reality that countries with significant violent conflict (governance failure) within their forests comprise over half of the world's tropical forest areas apart from Brazil (CIFOR 2003).

### Local Benefits of Carbon Projects

The problematic nature of benefits with regard to carbon storage projects has received little attention. Predicted carbon-related benefits to communities are not compared to preexisting benefits that would be changed or lost with the implementation of carbon storage schemes. An understanding about how the two sets of benefits compare in quantity, quality, type, functionality, and who within communities will gain and lose is fundamental to the adoption of benefits associated with carbon projects (including agroforestry as a benefit). However, the literature regarding benefits associated with such projects does not make such a comparison. Instead, generalized "benefits" for local communities are described, along with the implied assumption that such benefits will encourage adoption of changed practices (e.g., May et al. 2003; Jindal et al. 2008; Toulmin et al. 2005).

The lack of comparison between the two sets of benefits ignores the progress that has been made in understanding common property forest resource management, which focuses on benefits (and supporting institutions) currently held (e.g., Roncoli et al., 2007; Ostrom et al. 1999). It also ignores how the two sets of benefits are realized. Of the 1.2 billion people in the world who live in extreme poverty, 90% depend on forest resources (World Bank 2002). The benefits associated with the way that the impoverished interact with resources are largely short-term, attending to immediate needs, whereas benefits associated with carbon storage projects are almost exclusively long-term. The rural poor pursue livelihood systems that capitalize on flexibility in the short term, meaning frequent change in use, resource access, and dependence on multiple products (e.g., Bass et al. 2000; Unruh 2006). The impact of climate change on Africa, for example, will exacerbate conditions of poverty by reducing yields and disrupting water supplies (Black 2006), further reducing the time horizon for decision making, and lessening the prospect for tree planting and retention, which is done for long-term benefit.

Carbon storage-related benefits will only lead to tree planting (1) if existing benefits are of lesser near-term livelihood utility; (2) if the change from one set of benefits to another requires little risk, particularly given the risk-averse nature of impoverished forest-dependent communities; or (3) if carbon project benefits are only added to and do not replace, diminish, or subvert current benefits—which is unlikely. Even if payments are made to entice participation, such payments are made in exchange for *a change* in the way current benefits are realized, in other words, stopping forest degrading activities (and associated benefits) and changing to tree planting and conservation activities (with separate benefits). The purpose of promoting benefits associated with carbon storage projects, according to the literature (e.g., Jindal et al. 2008; Toulmin et al. 2005; Smith 2002), is to replace

existing practices thought to be unsustainable, extractive, change often, and cause resource degradation. Expecting local communities to abandon one set of practices and benefits for another is essentially expecting them to make a large gamble. A great many rural communities are generally not open to such a gamble, particularly those communities that are impoverished or marginalized (e.g., Unruh 2002). Transitioning from one set of practices and benefits to another takes time and results in a shift in who benefits within communities, often creating a “winners and losers” scenario that, while not always inevitable, can create resistance by potential losers. Such a shift is well known in the development literature (e.g., Lawson 2007; Tisch et al. 1994; Moyo and Yeros 2005).

The introduction of carbon-related practices would mean that their adoption (and realization of associated benefits) and the abandonment of others would occur over time as the two benefit sets are compared as to their short-term favorability. While an exclusive focus on the benefits from carbon storage projects (as in the sequestration literature) can make them seem attractive in an aggregate ecological or economic sense, in reality other issues, such as type of benefit, utility, time horizon, ownership of benefits, poverty, conflict, and local to global political and economic forces, can easily overwhelm what makes sense in a selected context. The examples are numerous. May et al. (2003) discuss general “environmental services” as proposed benefits. Silver et al. (2000, 401) note that “the reforestation of abandoned agricultural and pasture land offers many ecological and societal benefits.” And Brown et al. (2001, 1) propose that “well designed forestry projects for mitigating global carbon emissions can provide significant environmental and socio-economic benefits to host countries and local communities. A well-designed regulatory framework, including adherence to international agreements on biodiversity, desertification, and wetlands, would strengthen sustainable development while at the same time enhancing efforts to address climate change.” Brown et al. (2001, 1) also assert that “such uncertainties as remain are vastly out-weighted by the environmental and socio-economic benefits of forest conservation and restoration.” Such overly broad recommendations examining only the benefits presumed to be associated with carbon storage efforts and not benefits that would be replaced or changed, are common (e.g., Bass et al. 2000; Toulmin et al. 2005; Niles et al. 2002)

## Conclusion

Although efforts to initiate carbon storage projects in the tropics are laudable, the research and policy communities neglect important issues that may lead to very different conclusions. While individual community-based carbon storage projects can be “made” to work with enough individual attention, they are not replicable in the frequency and with the pervasiveness and degree of success needed to be a global carbon mitigation option.

The primary attractiveness of carbon storage in the tropics is biophysical. Sociopolitically, however, the tropics are where policy implementation is least feasible. In order to resolve this difficulty there needs to be (1) much more integration of the existing academic and applied social science in the carbon storage discussion and (2) a more integrated scientific and policy effort in the future with regard to the social and biophysical sciences. The depth and precision of the biophysical work needs to be matched by an equal understanding of the sociopolitical domain, so that

development, governance, and local benefits can be used to further and not hinder tree-based carbon storage as a mitigation option.

## Notes

1. Carbon storage here refers to reforestation, afforestation, agroforestry, and the avoidance of deforestation (known in the UN as REDD: Reducing Emissions from Deforestation and Forest Degradation in Developing Countries). Both REDD and carbon sequestration through tree planting face the same problems articulated in this article—neglect of the sociopolitical domain. Both efforts endeavor to change what people currently do, including stopping tree cutting (avoided deforestation), and planting trees on agricultural or other landscapes. How this change would be brought about is the problem, and the topic of this article.
2. Niles et al. (2002) showed that over 10 years, 48 tropical and subtropical countries could reduce atmospheric carbon by 2.3 billion tonnes. This would involve over 50 million hectares of land for implementation of carbon-friendly land uses.
3. As compared to medium or high carbon emission estimation over the coming decades.

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