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Forest carbon offsets and carbon emissions trading: Problems of contracting☆

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ABSTRACT

The process of monitoring and measuring the carbon fluxes associated with forestry is complex and costly, and the process is subject to asymmetric information, perverse incentives and inadequate institutions. The upshot is that any trade in forestry related carbon credits is likely to involve unwarranted acts of faith. This means that, since carbon credits are a de facto fiat currency, their exchange value is likely to be unstable. Contracting requires good governance, which is often lacking. Meanwhile, parties to a contract to provide offsets for sale in carbon markets have misaligned incentives in addition to asymmetric information. This leads to a principal-agent problem that delays successful contracting and quite often leads to incompatible claims regarding the creation of carbon offsets. At worse, it results in corruption.

The Kyoto process of the United Nations' Framework Convention on Climate Change (UN FCCC) permitted afforestation and deforestation as eligible means for developed countries (listed in Annex B of the Kyoto agreement) to attain their agreed upon emission reduction targets for the 2008–2012 commitment period. Since then, the UN FCCC process has continued to promote forestry activities that remove carbon dioxide (CO_2) from the atmosphere as a means of offsetting CO_2 emissions. Indeed, the conversation has gone even further to include conservation of forests – the emissions avoided by not harvesting trees. The inclusion of real-time CO_2 released to or removed from the atmosphere creates a particular challenge for auditors tracking compliance or non-compliance with greenhouse gas emission targets, which is only exacerbated when potential carbon fluxes are included.

When economists seek tools to reduce atmospheric carbon, most prefer price-based instruments, such as taxes and subsidies, and, in more recent times, cap-and-trade schemes. This is as true of forestry as it is of any other sector. The problem is that, in a world of asymmetric information, subsidies and carbon trading risk evolving into mere opportunities for rent seeking.

In forestry, taxes and subsidies should be levied at the time carbon is released or sequestered (van Kooten et al., 1995). Since forest conservation activities do not involve carbon flux (there are no emissions or removals of CO_2 from the atmosphere), the only incentive to conserve or protect forests comes because the forestland owner wants to avoid the tax when CO_2 is released at harvest. Yet, politicians have tended to shy away from taxes preferring emissions trading instead. This was reflected in the Kyoto process, where countries opted for a variety of instruments that they could use to meet their self-imposed targets, partly to prevent their costs of complying with Kyoto targets from rising inexorably. Thus, carbon terrestrial biological sinks and forestry activities were included as means to create carbon offsets, which countries could then use in lieu of emissions reduction to achieve targets. Because avoided emissions are also considered desirable, negotiations now consider how best to include forest conservation and protection as eligible means of creating carbon offsets.

The purpose in this paper is to examine the peculiar issues that arise when forest carbon offsets are included in an emissions trading scheme. In particular, a tax-subsidy scheme can straightforwardly be implemented, once concerns related to measurement and monitoring are addressed. The use of forest carbon offsets must, in addition to measurement and monitoring, consider contracting and governance, and these reflect the quality of a country's institutions. Weak institutions can result in governance failure relating to the accreditation of carbon offsets, which could lead to improper accounting and oversupply of credits. This in turn causes CO_2 emissions to trade for too low a price and thereby prevent desired reductions in atmospheric CO_2.

Buyers of forest carbon offsets must contract with sellers, who are often aggregators of carbon uptake services from various forestry activities, and sellers in turn must contract with landowners who might be considered the ultimate providers of carbon offsets. In addition, certifiers are needed to assure buyers and/or the authority that the carbon offsets are legitimate in the sense that they truly affect the concentration of CO_2 in the atmosphere, and to what extent. The business of creating forest carbon offsets to be used in lieu of emissions reduction becomes an intricate principal-agent dance, a dance that is investigated here.

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In the next section, forest carbon offsets are defined and located in terms of their contribution in mandatory and voluntary carbon markets. Contracts to provide carbon sequestration services result in a principal-agent problem, and this problem dominates the validity of forest carbon offset provision, because, in the creation of carbon offsets for sale in carbon markets, the incentives of principals and agents are misaligned and the institutions needed to resolve this misalignment are generally not up to the task. Governance and the principal-agent problem are considered in the main sections of the paper. The paper concludes with some suggestions.

1. Carbon offsets

For mitigating climate change, most governments and international negotiators consider emissions trading to be the main policy vehicle. Yet various jurisdictions have implemented renewable energy mandates, subsidies for non-fossil fuel energy and even carbon taxes, with carbon markets and taxes sometimes coexisting at the same time (van Kooten, 2013, pp.306–307). Emission trading occurs when there is a cap on greenhouse gas emissions; emitters that exceed their individual targets can purchase emission reduction permits in the compliance market from those who are below their emissions target. A carbon offset refers to an emissions reduction or equivalent removal of CO_2 from the atmosphere that is realized outside of the established compliance market, but can be used to counterbalance emissions from the capped entity.

The benefits of using forest-sector carbon offsets are illustrated in Fig. 1. Suppose emissions are to be abated by an amount $0E$, as indicated in the left panel of the figure; the marginal costs of abating emissions are indicated by the upward sloping curve. In the right panel, the derived demand for forest carbon offsets is simply given by the difference between the targeted level of abatement, E, and the amount provided by the (mandatory) emissions abatement sector as the shadow price of reducing emissions falls from P^0 towards zero. Then, the intersection of the derived demand for and marginal costs of carbon offsets determines the amount provided in the forest sector. In this example, C^* offsets are provided at a cost of P^*, thereby reducing actual emissions abatement by $EE^* = 0C^*$.

Forest carbon offset credits reduce large emitters' costs of complying with emission reduction targets, while buying time to enable them to develop and adopt emission-reducing technologies. On the negative side, however, offsets lower the cost of emitting CO_2, thus reducing incentives to invest in emission-reducing technologies. Further, carbon offsets are fraught with problems related to governance, especially uncertainty and corruption (Helm, 2010; van Kooten and de Vries, 2013).

The international community has identified four forestry activities that qualify as eligible means to create carbon offsets (IPCC, 2000, 2006): (i) afforestation, (ii) reforestation, (iii) forest management that enhances tree growth, and (iv) prevention of degradation and deforestation. The latter activity is controversial but has come to be an accepted means for generating carbon offset credits under the acronym REDD (Reduced Emissions from Deforestation and forest Degradation) (see Bosetti et al., 2011; Buttoud, 2012).

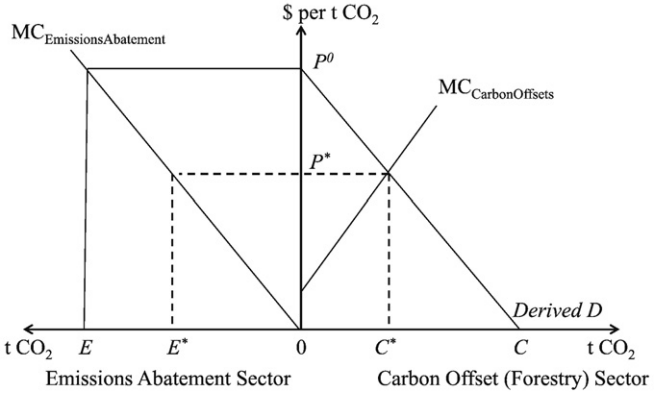

Fig. 1. Compliance markets and effect of forest carbon offsets.

Clearly, tree planting and activities that enhance tree growth remove carbon from the atmosphere and store it in the forest ecosystem; thus, afforestation and reforestation are eligible activities that create carbon offsets (IPCC, 2000). Afforestation is defined as the establishment of trees on land that has not in the recent past been forested and where trees would not otherwise be planted. In similar fashion, reforestation refers to tree planting on a site previously forested, but where it is unlikely that the forest will be re-established. Likewise, silvicultural activities such as fertilization that enhance tree growth or otherwise increase the carbon sequestered in a forest ecosystem would be eligible.

Forest conservation is to prevent deforestation and degradation, or simply to delay harvest, but to assign carbon offset credits to conservation activities is somewhat controversial. Although tropical deforestation releases significant amounts of CO_2 into the atmosphere (perhaps accounting for as much as one-fifth of emissions attributed to human activities), and should perhaps be prevented on grounds other than climate change, the use of land following deforestation cannot be ignored in any carbon accounting.

Measuring and monitoring are particularly pertinent for forestry where the greatest difficulty is that of tracking carbon fluxes. The problem of determining how many carbon offsets an activity generates is exacerbated when forest conservation is included as an option. This leads to troublesome transaction costs, governance issues and opaqueness regarding trade in forest carbon offsets and their economic value. Transaction costs refer to measuring, monitoring, verifying, enforcing and negotiating trades, while governance refers to the means by which trades are made. Both are affected by the institutional framework within a country and the nature of agreements among independent jurisdictions. This is discussed in more detail in the next sections, but it presumably would include such things as social capital, rule of law (independence of the judiciary) and freedom to engage in trade, which requires a degree of trust and the ability to make credible threats in the event of noncompliance.

2. Governance

In contrast to a global carbon tax (assuming such a global tax could be agreed upon and effectively implemented), emission trading and carbon offset credits are fraught with difficulties related to governance. This is particularly true of forest projects, which are associated with high transaction costs, a great deal of uncertainty (viz., natural disturbances), questions regarding additionality, high potential for leakage, and lengthy time horizons that make it difficult to ascertain how much carbon a project actually sequesters. This might explain why so few forestry projects have been certified under Kyoto's Clean Development Mechanism (CDM). As of April 1, 2016 and since November 2007, only 71 afforestation and reforestation projects had been certified, representing only 0.8% of the total 8512 registered CDM projects and 2477 Mt CO_2 credits; these projects are spread across 20 countries and account for 11.3 Mt CO_2 CER offset credits.[1] In addition, 117 projects representing some 9.4 Mt of CER credits had been created through CDM projects that used wood pellets or forest biomass as energy. The average life of reforestation/afforestation projects is 22 years compared to only eight years for biomass energy projects.

The purchase of carbon offsets might be considered similar to a payment for environmental services (PES), except that the aforementioned issues complicate drawing a direct analogy between the two. One problem that forestry projects have in common with PES systems is the need to create a baseline or counterfactual. For example, van Kooten et al. (2015) demonstrate that, for a private forest estate in southeastern British Columbia purchased by the Nature Conservancy of Canada, the baseline used to claim 750,000 t of CO_2 offset credits was difficult to justify.

[1] Another 36 projects had been rejected or withdrawn. See http://www.cdmpipeline.org/ [accessed August 3, 2016].