Multiple private and social benefits of Reduced Impact Logging in the Heart of Borneo Green Economy

Brendan Fisher, World Wildlife Fund - United States; Anna van Paddenburg, WWF - Heart of Borneo Initiative; Andy Dean, Hatfield Group; Doni Prihatna, WWF-Indonesia; Thomas Barano, WWF - Indonesia

In most land use decisions there are tradeoffs between exploiting natural resources for private returns and protecting them in order to preserve their social value. However, there are cases where the magnitude of such tradeoffs can be mitigated. Improved forestry management techniques have been shown to help minimize the social costs of logging - such as carbon liberation and worker safety (Putz et al. 2008a). In the Green Economy, improved forestry management techniques become commonplace. It is important to understand how employing such techniques compares to the Business as Usual scenario. We compared the two scenarios in timber concessions located entirely within in the Heart of Borneo (HOB). We analyzed additional carbon stored, the potential social and market value of carbon, the associated costs to deliver it, and the potential for increased sediment retention in concessions.

In the Green Economy, across 158 timber concessions, ~19 (± 5) more tonnes of carbon (tC) per hectare were stored when compared to the Business as Usual approach to concession management. The total additional carbon stored across all concessions is shown in Figure 1, and amounts to ~115M tC.

There is evidence that improved management techniques (Holmes et al. 2002) do not result in net additional costs, since costly activities like vine cutting and road planning are offset by much less wood wasted and improved skidding productivity. Other assessments have suggested that improved management activities can increase costs up to 50% (Rahim et al. 2009). In order to understand the potential costs of the Green Economy approach, we tested the net social and market value of the potential additional carbon stored across the HOB timber concessions under two cost assumptions 1) no *net* cost to improved management activities and 2) and a cost increase of 30%.

Figures 2a,b show results of the potential value that improved techniques add to the social and financial bottom line of forestry concessions. Of course if there are no costs to improved management techniques in the Green Economy then there can be financial gains for a concession given a functioning carbon market that credits carbon gained by improved forestry techniques. Under such an assumption the Green Economy could potentially improve the financial bottom line. Across all concessions, the theoretical market value of the stored carbon would be greater than $3.8B, with the largest individual concessions having additional carbon values over $100M (Figure 2a). If we look at the potential *social* value of the carbon the returns to the Green Economy are close to $9B, and the largest concession alone returning a social value of over $500M (Figure 2a).

With the assumption of an additional mean cost of $790 per hectare (in order to operationalize improved management techniques (FRIM 2001)) the results are somewhat

altered. Most concessions return positive gains when using the social value of carbon, and the total returns to the Green Economy under this assumption are over $4B. However, under the market value, the additional costs of management outweigh the potential financial returns for the majority of concessions (Figure 2b). However, the total cost is only $900M under the assumption of a payment of $9.20 per tCO_2 (the current European Trading Scheme price point for carbon). What is clear from this is that the improved management techniques (at least in terms of carbon) are favorable from a social cost-benefit perspective. Here they return a cost-benefit ratio >4, meaning that value of social benefits are over four times greater than the private costs of improved management.

Additionally, the mean breakeven price across the 158 concessions is only slightly higher than the current market price for carbon at ~$12 (±4.50). Therefore, under the assumption where a Green Economy with improved forestry practices entails a financial cost, a carbon value of ~$12 would be enough to offset it. Here the suggestion is that as long as the market or social value of carbon is greater than ~$12 (±4.50) per tCO_2, then improved timber management techniques simultaneously deliver net benefits.

Of course there are other benefits to moving from practices in the BAU scenario to the type of management practices envisioned in the Green Economy. Worker safety, potentially improved biodiversity outcomes, and improved sediment retention are a few. We analyzed the gains in sediment retention from moving from the BAU to the Green Economy. We were able to do this for the Mahakam basin by using InVEST (Integrated Valuation of Ecosystem Services and Tradeoffs; see Tallis et al. 2008, http://invest.ecoinformatics.org/) to model sediment retention in the two scenarios. Improved timber management under our assumptions greatly improves sediment retention across the 49 timber concessions in the basin with a mean additional retention of 37 (±12) tons of soil per hectare (Figure 3a), and close to 900,000 tons across the whole basin (Figure 3b).

We can look at both the carbon and sediment retention benefits together for a move from a BAU to a Green Economy. In Figure 4, along the x-axis is the mean additional carbon stored for the 49 concessions in the Mahakam basin (range 0-32 tC/ha). Along the y-axis is the mean sediment retained for the same concession (range: 3-133 t/ha). One way to look at this analysis is that the origin of the graph represents the 2020 future under a BAU scenario and each point represents additional gains of moving from BAU to the Green Economy for the 49 concessions in the basin.

The ultimate result here is that by looking at multiple benefits of the Green Economy compared with the BAU there are not only net biophysical benefits with respect to additional carbon stored and sediment retained, but that such a move within a social cost-benefit framework suggests that the benefits outweigh the costs 4 times over. It is likely that this analysis represents a lower bound estimate because we were not able to put a social value on the close to 900,000 tons of sediment retained under the Green Economy assumption [but see section main HOB report for the suite of benefits that would result from less sediment being exported into the waterways of HOB]. Within the context of

improved forestry management, the Green economy is a net benefit and delivers these benefits across a suite of stakeholders from the global stakeholders who benefit from effects of reduced carbon emissions, to the local users who benefits from waterways with less sediment export.

Methods

We used modeled above ground biomass values from SARVISION (2008) to derive aboveground carbon stock of all active and inactive concessions on the Indonesian side of the HOB study area. The latter were included because the intent here is to highlight the potential carbon gains from managing past or future concessions with the best management practices that can improve carbon retention of a working concession by up to 20-30% (Pinard and Putz 1996, Putz et al. 2008b). To calculate the potential additional carbon we used the management rating scores from the Global Forest and Trade Network assessment carried out in the regions. We assumed that on the 4-category scale, concessions with the highest possible score were performing at their maximal carbon retention. For the 78 concessions where we have management performance scores the additional carbon that could be stored was a function of the existing above ground biomass and the score. Such that concession with a "very good" score were performing at their maximal and concessions with *poor* rating could improve stores by 30%. *Fair* and *good* concessions were assumed to be operating at 20% and 10% below their full potential, respectively. For the 80 concessions where we did not have performance scores were given the mean score of the concessions with scores.

For the market values, we used the European Trading Scheme price point for carbon (accessed 19 Jan 2012). For the social value of carbon we used \$21 per tCO_2 as used by the United States Social Cost of Carbon Regulatory Impact Analysis (2010). Our two cost assumptions were 1) no net additional cost of management and 2) an additional cost of \$790/ha as calculated for moving from conventional practices to improved forestry management techniques in lowland dipterocarp forests in Malayasia (FRIM 2001).

For the sediment retention analysis we used InVEST sediment retention model. We made management assumptions that compared to BAU the sediment retention parameters improved under the Green Economy. Specifically, the cover and management factor, management practice factor, and sediment retention efficiency were changed from (10%, 50%, 80%) to (50%, 50%, and 80%) for primary forest cover and from (10%, 50%, 70%) to (50%, 50%, 70%,) for secondary forests.

References

ETS (European Trading Scheme). 2012 Carbon Price Point, accessed 19 January 2012. *www.pointcarbon.com*

FRIM & ITTO. 2001. A Model Project for Cost Analysis to Achieve Sustainable Forest Management: Volume 1 Synthesis Report. Kepong, Malaysia: Forest Research Institute Malaysia; International Tropical Timber Organization.

Holmes, T. P., F. Boltz & D. R. Carter. 2002. Financial Indicators of Reduced Impact Logging Performance in Brazil: Case Study Comparisons. . In *Applying Reduced*

Impact Logging to Advance Sustainable Forest Management. Bangkok: : Food and Agriculture Organization of the United Nations, Regional Office for Asia and the Pacific.

Pinard, M. A. & F. E. Putz (1996) Retaining forest biomass by reducing logging damage. *Biotropica,* 28**,** 278-295.

Putz, F. E., P. Sist, T. Fredericksen & D. Dykstra (2008a) Reduced-impact logging: Challenges and opportunities. *Forest Ecology and Management,* 256**,** 1427-1433.

Putz, F. E., P. A. Zuidema, M. A. Pinard, R. G. A. Boot, J. A. Sayer, D. Sheil, P. Sist, Elias & J. K. Vanclay (2008b) Improved Tropical Forest Management for Carbon Retention. *Plos Biology,* 6**,** e166-e167.

Rahim, A., M. Shahwahid & M. A. Zariyawati (2009) A comparison analysis of logging cost between conventional and reduced impact logging practices. *International Journal of Economics and Management,* 3, 354-366.

SarVision (2011). Above Ground Biomass map Kalimantan 2008. Agro Business Park 10 6708 PW Wageningen, The Netherlands.

Social Cost of Carbon for Regulatory Impact Analysis In *Under Executive Order 12866* Washington DC: Interagency Working Group on Social Cost of Carbon, United States Government (2010).

Tallis, HT., Ricketts T., Ennaanay D., Nelson E., Vigerstol K, Mendoza G, Wolny S, Olwero N, Aukema J,Foster J, Forrest J, Cameron D (2008) InVEST 1.003 beta User's Guide. The Natural Capital Project, Stanford

Figure 1. Potential additional carbon stored across forestry concessions in Indonesian HOB

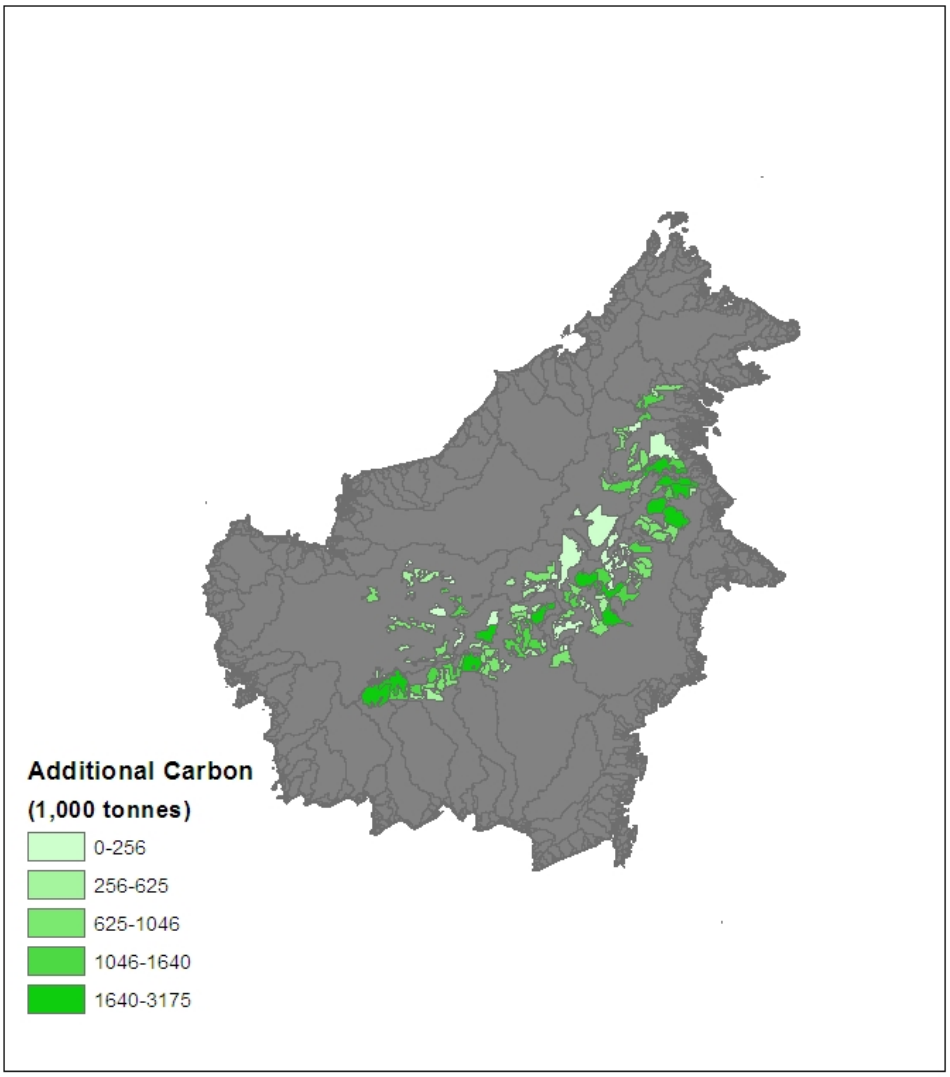
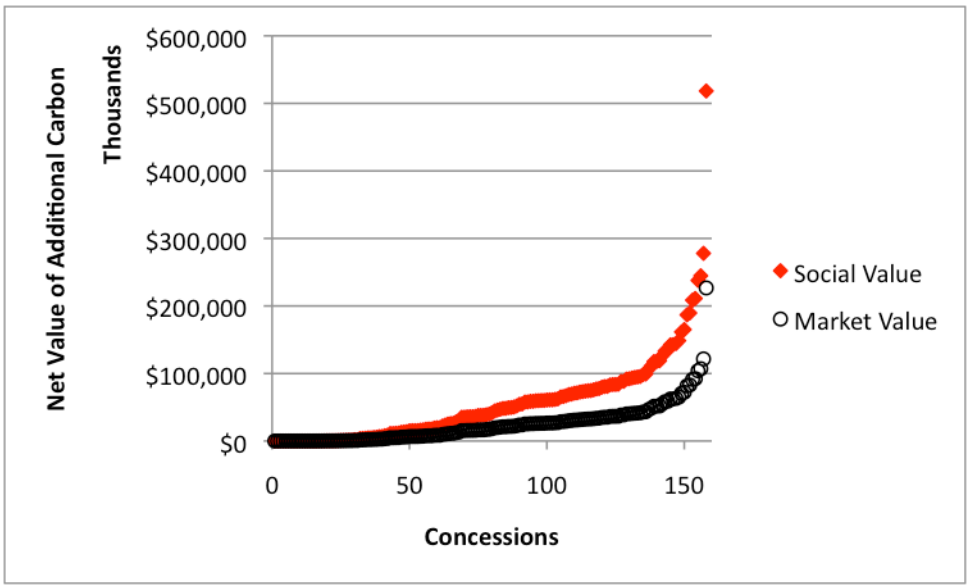


Figure 2. Net value social and market value of the potential additional carbon stored in HOB forestry concessions under a Green Economy compared to BAU. Figure 2a assumes that GE techniques have no net cost and Figure 2b assumes an additional 30% onto management costs.



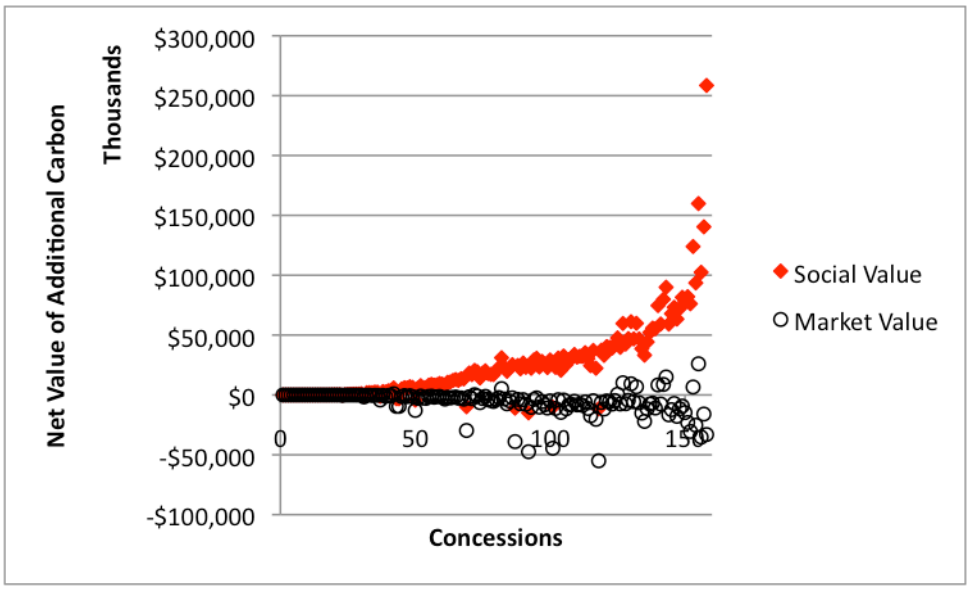
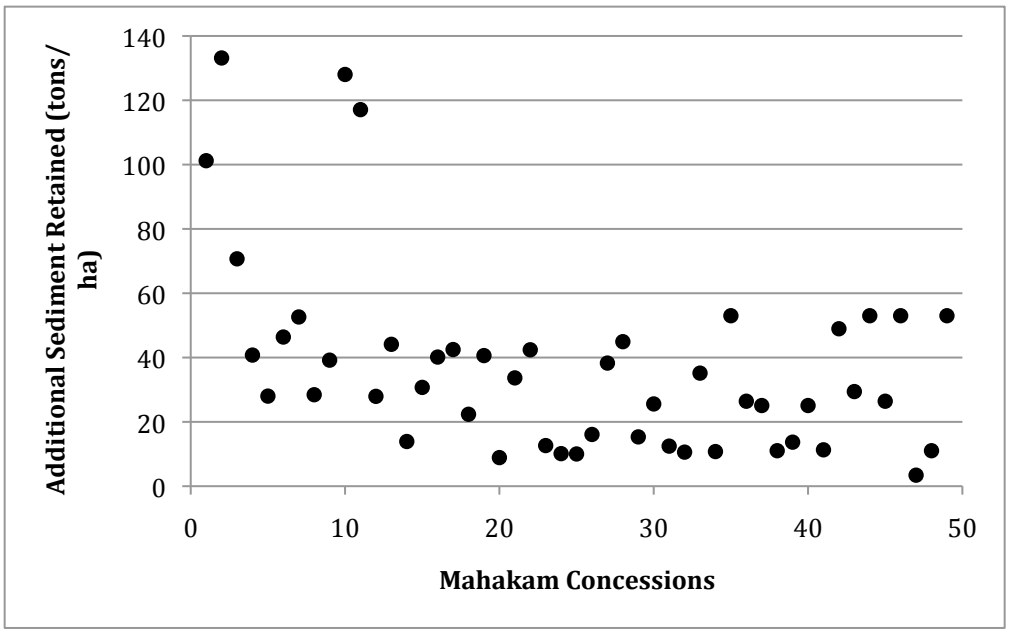


Figure 3. a) Additional sediment retained in the GE compared to BAU for the 49 timber concessions in the Mahakam basin b) cumulative additional sediment retained in the GE for the 49 timber concessions in the Mahakam basin



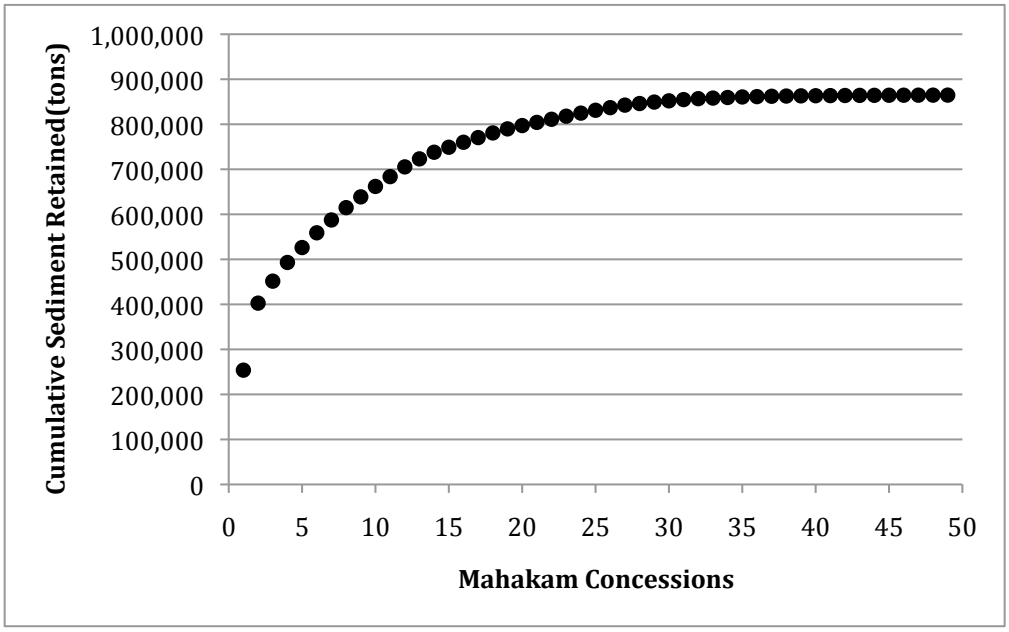


Figure 4. Mean additional sediment retained (per ha) versus the mean additional carbon stored (per ha) under the Green Economy for the 49 timber concession in the Mahakam basin