Communities can monitor forest carbon ‘as well as experts’

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Introduction
Reducing Emissions from Deforestation and forest Degradation (REDD+) projects is seen as an important mechanism to curb greenhouse gas (GHG) emissions. Community-based monitoring has been suggested as a way to ensure continuous and cost-effective monitoring of forests included in REDD+ projects, and to enhance communities’ feeling of ownership as well as improve governance while building local capacity. Current United Nations Framework Convention on Climate Change (UNFCCC) documents outline explicit roles for indigenous peoples and local communities in implementing REDD+ to ensure their “full and effective participation”. However, it has been questioned whether these intentions are being translated into activities on the ground.

Typically, monitoring of forest carbon involves a combination of remote sensing and plot-based carbon measurements carried out by professional foresters. Little has been published on efforts to involve local stakeholders in REDD+ implementation or on how community-based REDD+ can be undertaken in practice.

The aim of the present research was to i) assess the ability of local communities to accurately estimate above ground biomass (AGB) compared to that of trained foresters; and ii) review current efforts to involve local communities in monitoring carbon, biodiversity, and livelihoods within forest carbon projects.

Methods
To compare the quality of carbon stock measurements by community monitors and professional foresters, both these groups were involved in the collection of plot measurement data from 289 permanent vegetation plots in nine forest sites in Indonesia, China, Laos, and Vietnam. Among site selection criteria were forest use by local communities and a potential for reduction of forest degradation.
Policy recommendations

• With modest training and support, local community members may be able to monitor forest biomass with a precision close to that of professional foresters

• Community-based monitoring appears cost-effective and may facilitate a more just implementation of REDD+

• In contrast to the intended full and effective participation as stated in the UNFCCC REDD+ text, the involvement of local stakeholders in REDD+ monitoring is limited

Based on available knowledge of forest history, the community members and researchers mapped the forest into homogenous strata which were treated as independent entities in the monitoring. Based on predetermined methods and under the supervision of the research team, a plot network was established and measured by community members and then re-measured by a team of professional foresters using the same manual. This enabled analysis of consistency in measurements by community members and professional foresters in terms of the number of trees per plot, tree girth, and biomass per hectare.

Costs of community-based and professionally-executed monitoring were estimated on the basis of actual expenses incurred for local transport, training and salaries for local communities and foresters.

To assess the extent to which community monitoring has been taken up in existing forest carbon programs, the project design documents for all projects validated by The Climate, Community & Biodiversity Alliance (CCBA) Standard by primo 2012 were analysed. The projects were divided into five categories in order to determine the degree of local stakeholder involvement in the monitoring, broadly following a monitoring typology established by Danielsen et al. (2009) (see Figure 2).

Results

Overall, the woody biomass estimated by community members differed only slightly from the estimates of professional foresters, even though the difference was significant in one-third of the forest strata (Strata a, b and c in Figure 1 below). To explore the precision of measurements by community members and professional foresters, the variance of biomass estimates was compared and a significant difference was found at only one stratum out of nine.

Analysis showed that community monitors and foresters had found exactly the same number of trees in the large majority of plots.

In terms of costs, the community measurements of woody biomass in the first year cost US$39–$82 per plot, whereas forester-executed biomass measurements cost US$22–$53 per plot. Community measurements required more funds for training but there were higher expenditures for travel, accommodation, and salaries for professional forester measurements. The costs of consecutive rounds of community monitoring are expected to decrease as the need for training diminishes and costs for trainers are reduced.

For the purpose of an analysis of uptake of community-based monitoring within existing REDD+ programs, local stakeholders have been defined as local forest users or local government staff. The results of the analysis are shown in Figure 2 below, which illustrates that, although community monitors are being involved in some CCBA certified projects, the vast majority of projects currently certified include none or very little community involvement in monitoring. However, looking into the temporal distribution of the project starts indicates that, between 2009 and 2012, projects increasingly involved local communities in monitoring schemes.

Discussion

The findings corroborate previous evidence that, with limited training, local community members can monitor forest biomass cost-effectively (see also previous policy briefs Nielsen et al. 2012 and Byg et al. 2012). Results reported here only cover the first year of measurements. Future measurements will show how learning curves and changes in commitment will affect long-term monitoring.

Our analysis of CCBA validated REDD+ schemes indicates a gap between policy and practice. In order to further engage local communities in monitoring related to REDD+, further
development of methodologies for involving indigenous peoples and local communities in REDD+ monitoring is needed. Local monitoring links to a number of the themes of forest justice. Through participation in monitoring, indigenous peoples and communities may strengthen their position to maintain or gain forest rights, feel empowered, be motivated to contribute to forest protection, and derive enhanced benefits.


**Figure 1.** Relationship between the aboveground woody biomass recorded by community members and foresters’ plot-based aboveground biomass measurement. Each point on the graphs represents one census of aboveground woody biomass in a permanent plot by community members (y-axes) and foresters (x-axes). Each of the nine graphs represent measurement in one stratum, strata being: lowland dipterocarp forest in Batu Majang, Indonesia (a), mountain rain forest in Manlin, China (b–c), evergreen monsoon forest in Sakok, Laos (d–e), and Diem (f) and Moi (g–i), Vietnam.

**Figure 2.** Involvement of local stakeholders in monitoring forest biomass (black), biodiversity (shaded), and livelihoods (white) in 50 forest carbon projects validated by the Climate, Community and Biodiversity Alliance (CCBA). The degree of involvement of local stakeholders increases from left to right along the x-axis: 1. no involvement of local stakeholders in monitoring; 2. local stakeholders assist in, or conduct parts of, monitoring but professional foresters are actively involved in on-the-ground monitoring activities; 3. local stakeholders conduct all on-the-ground monitoring themselves but reporting and analysis are done by professional foresters; 4. local stakeholders conduct all on-the-ground monitoring and report the data to a central unit independently, and/or actively participate in the design and implementation phase of the monitoring scheme, and professional foresters conduct the analysis of the monitoring data; 5. local stakeholders participate in the design and implementation phase of the monitoring scheme, conduct all on-the-ground monitoring, and report and analyze all on-the-ground data themselves.
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