POLICY BRIEF

Community-based Forest Monitoring for REDD+: Lessons and reflections from the field

Key Messages

The involvement of local communities in forest monitoring is one meaningful way in which they can take on responsibilities for REDD+ and be rewarded for their inputs. The Community Carbon Accounting Project shows that through well-designed training and support programmes, the capacity of local people can be built to take forest measurements for accurate and precise estimates of forest carbon stock changes.

Community involvement in forest monitoring particularly makes good sense when the communities themselves are forest managers. Through the generation of scientifically verifiable data, communities can explore new management options, such as REDD+, and will be better informed in their dealings with outside professionals.

Governments preparing for REDD+ should begin exploring and testing options for incorporating community-based monitoring into national forest monitoring and safeguards information systems. Being locally based, communities can monitor some variables more effectively than outside professionals, and the involvement of communities in monitoring will enhance transparency.

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I Introduction

Deforestation presents one of the most significant and intractable global environmental challenges of our time. Without meeting this challenge, we are unlikely to avoid dangerous climate change by the end of this century.

REDD+ aims to address deforestation and forest degradation by delivering performance-based payments to forest managers who protect and/or increase forest carbon stocks. Millions of people live in and next to forests worldwide, and their participation in REDD+ is key to its success. Participation in forest monitoring is a meaningful way in which local people can be involved in REDD+. Without accurate and precise estimates of forest carbon stock changes, REDD+ payments will not be forthcoming.

There must of course be incentives for communities to participate in forest monitoring. When communities have forest carbon rights, then the incentive will be the payments they receive from a successful REDD+ project. Alternatively, governments could consider employing trained community teams as part of their national forest monitoring and safeguards information systems.

With any social intervention there are risks. For the integration of community-based forest monitoring into REDD+ activities, these risks could include inflated expectations about future payments. From a livelihoods perspective, at present REDD+ is an uncertain investment requiring long-term commitment that may or may not deliver performance-based payments at some time in the future. On the other hand, it is still early days for REDD+ and if successful models can be created, by providing incentives for forest conservation REDD+ could provide communities with new sustainable development options that better meet their needs and aspirations than current alternatives.

This policy brief focuses on the role that local communities can play in forest monitoring. It introduces lessons learned from the Community Carbon Accounting Project which trains local communities on forest measurement, and reflects on a number of observations that the Project has provided.

2 REDD+ as Part of the Solution to Global Deforestation

In the first decade of the 21st century, on average 13 million hectares of forest were lost every year, only slightly lower than the figure of 16 million hectares/year for the preceding decade (Food and Agriculture Organisation of the United Nations 2010, xiii). As forests disappear, we lose a wide array of ecosystems services critical to human well-being. Amongst these, international attention is now focused on the role that forests play in stabilising climate by acting as sinks and reservoirs of greenhouse gases (GHGs).

REDD+ is the concept of providing financial incentives to forest managers in developing countries to protect and enhance carbon stocks in standing forests to mitigate climate change. It seeks to at least partly correct the market failure underlying deforestation (i.e. the failure of markets to value most forest ecosystems services) by putting a value on the role that forests play in stabilising climate.

Parties to the United Nations Framework Convention on Climate Change (UNFCCC) have agreed that REDD+ will be part of the future global climate framework and are now shaping the global REDD+ mechanism. Like any proposed solution to global deforestation, the road ahead for REDD+ will not be easy. There are risks associated with REDD+, and already new actors – the "carbon cowboys" – have made moves in a number of forested developing countries to manipulate local people for personal profit through REDD+. REDD+ will not only have to tackle deeply entrenched underlying drivers of deforestation, such as weak governance and insecure tenure, it will also have to be scientifically rigorous, i.e. provide a robust accounting of the anticipated reduced emissions or enhanced sequestration from REDD+

activities. REDD+ could, on the other hand, succeed where other conservation initiatives have failed by tying payments to performance, and, through new investments in capacity building, provide significant co-benefits in the form of improved forest data and monitoring.

3   Participation as Key to REDD+

Participatory processes are important for forest management as they identify the values and needs of forest stakeholders, provide avenues for voices to be heard and acted on, provide checks and balances, and contribute to transparency and accountability. The history of forest management reveals the consequences of inadequate participation, including forest laws that privilege industrial interests over those of local communities, collusion between state actors and developers, weak forest law enforcement, and conflict between forest authorities and local people, all of which contribute to deforestation. Concern that REDD+ could inadvertently encourage governments and investors to seek greater control of forests, at the expense of about 1.3 billion (mostly poor) people in developing countries who live in and have customary rights to forests (Chao 2012, 7), explains why participation of local communities and indigenous peoples is one of the seven REDD+ safeguards agreed by negotiators. To succeed in reducing forest emissions, REDD+ needs to be socially acceptable, and to be socially acceptable, participation of local people is key. Further, the history of natural resource conservation and development suggests that outcomes for communities will be more sustainable when they have meaningful roles that rewards are tied to, rather than when they receive payments without taking on responsibilities.

4   Why Communities Should be Involved in Forest Measurement and Other Forms of Forest Monitoring

The COP recognises the need for "full and effective engagement of indigenous peoples and local communities in, and the potential contribution of their knowledge to, monitoring and reporting of [REDD+] activities" (Decision 4/CP.15). Forest measurement is one of many ways that local groups can participate in monitoring and reporting.

It is normally assumed that forest measurement for carbon stock estimation is the exclusive preserve of trained experts. Sampling is necessary as it is impractical to measure all trees in a forest, so knowledge on sampling design is required. Expertise is needed to determine efficient sample plot sizes, shapes and dimensions, how to locate plots to avoid bias, how to map and stratify a forest according to management types and carbon densities, which carbon pools to focus on, what measurement instruments can be used, and how to minimise and represent errors in results.

Given this complexity, it is easy to understand why little thought is usually given to involving local people in forest assessments, beyond the menial tasks of carrying equipment, cutting tracks, etc. However, some of the most important measurements for carbon stock assessment, such as tree diameter, are not technically difficult, though correct use of equipment, adherence to protocols to ensure consistency, and careful data recording are necessary. Moreover, in communities that traditionally manage and use forests, local people have intimate knowledge of forest resources, are skilled in identifying different tree species, and are aware of ecosystems boundaries, which can benefit carbon stock monitoring.

There are other good reasons for supporting community participation in forest carbon stock assessment. When communities themselves are forest owners and managers, it makes good sense for them to be involved in any efforts to generate scientifically verifiable data to monitor carbon stocks in their forests. With this capacity and knowledge, they will be in a much stronger position to understand the trade-

offs of alternative forest uses and to negotiate with outsiders, such as carbon professionals. By participating in forest monitoring, local people will also have a better understanding of how REDD+ payments are generated and what must be done to maintain the payments.

5 The Community Carbon Accounting (CCA) Project

Together with its partners, IGES launched the Community Carbon Accounting (CCA) Project with the intention of developing and testing approaches for engaging communities in forest carbon stock change estimation. With funding from the Ministry of Environment of Japan and the Asia-Pacific Network for Global Change Research, the CCA Project is being implemented at sites in Cambodia, Papua New Guinea (PNG), Indonesia, Laos and Vietnam according to local contexts, opportunities and needs (Fig. 1).

The CCA Project methodology is *action learning*, which is an interactive inquiry process that balances problem-solving actions with data-driven collaborative analysis or research. Action learning involves communities as co-researchers through a cyclical process of planning, action, observation and reflection. The general approach is outlined in Figure 2.

The action learning begins with the establishment of a local facilitation team. It is important that the team has expertise in both forest carbon accounting and community engagement, and is able to work with all stakeholders. A consultation is then organised with stakeholders to explain the objectives and agree on suitable project sites. The stakeholders will be communities in the locality, relevant local government offices, the national forest department, and non-governmental organisations, research institutes and others active in the area. The consultation is followed by a training of trainers, which typically takes several days and involves classroom training on concepts and practical
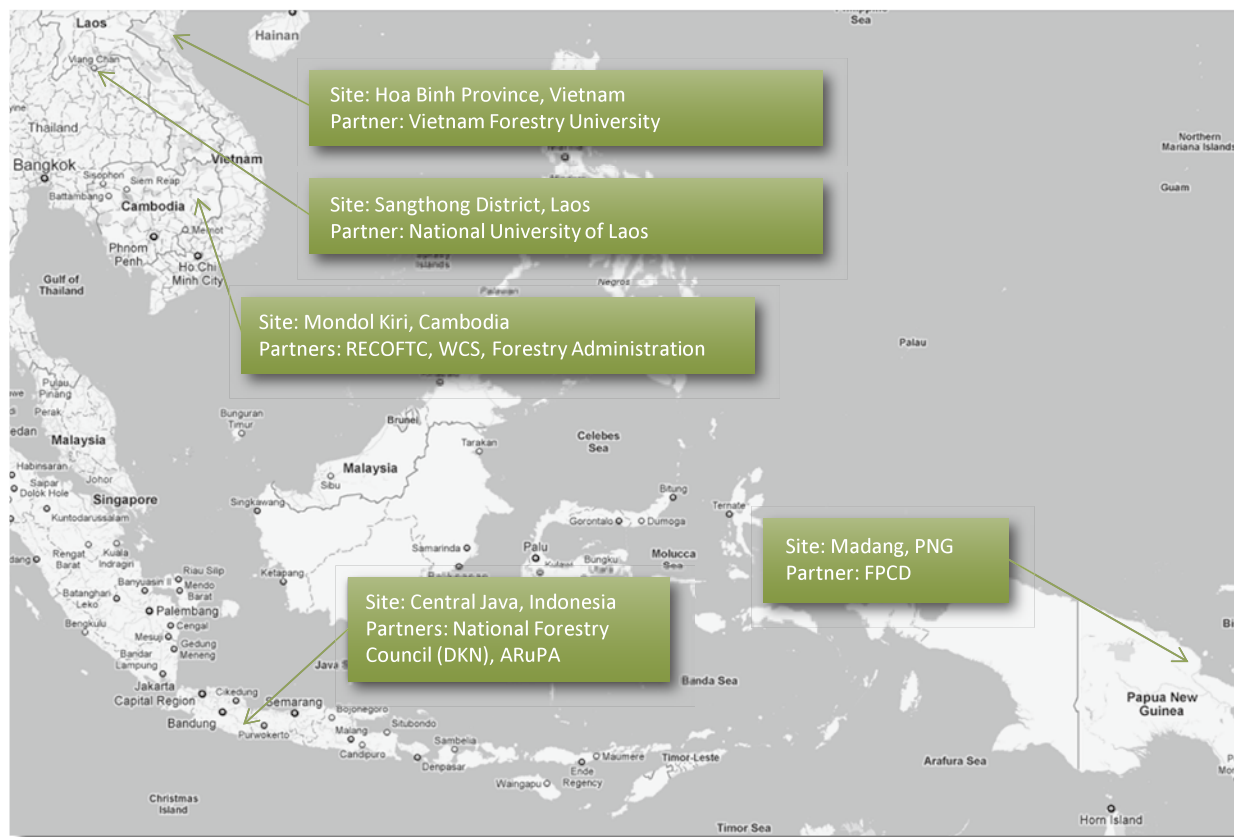

Site: Hoa Binh Province, Vietnam
Partner: Vietnam Forestry University

Site: Sangthong District, Laos
Partner: National University of Laos

Site: Mondol Kiri, Cambodia
Partners: RECOFTC, WCS, Forestry Administration

Site: Madang, PNG
Partner: FPCD

Site: Central Java, Indonesia
Partners: National Forestry Council (DKN), ARuPA

Figure 1 **CCA project partners and sites**

Figure 2 Process to develop and test approaches to engage communities in forest monitoring

field-based training. Reference materials, equipment and field sheets must be prepared for this training. The local facilitation team organises a meeting with the participating communities to further explain the measurement activities and their relationship with climate change. The communities select some of their members to participate in the training (they become the "community forest monitoring team"); the trainers encourage the inclusion of women to support their empowerment, and because in many rural societies women have unique knowledge about forests through their gender roles. Similar to the training of trainers, classroom and field-based training on plot establishment, measurement and data recording is conducted.

Forest boundary demarcation and stratification are conducted at this stage, or earlier in the process. Forest boundaries may already have been demarcated, especially when tenure arrangements have been formalised, but in other cases the facilitation team works with the community teams to delineate the boundaries using GPS.

After the training is conducted, the community team is organised to set up and measure the sample plots. They record the data using prepared field sheets, and the data is later transferred to a spreadsheet or database with inbuilt functionality to convert the measurements to timber and carbon stock estimates. The results are explained to the community, and next steps, e.g. a REDD+ feasibility study, are decided.

At sites in Papua New Guinea, Cambodia and Indonesia, the CCA Project has progressed through the stages of consultations, site selection, training of trainers and community teams, the establishment of sample plots, forest measurement and data recording, and data processing. Mapping has also been completed to varying degrees. In Laos, the CCA Project has progressed through the early stages of consultation, a training of trainers and the design of a baseline survey, while the Project was only recently launched in Vietnam.

Observations for REDD+ Project Developers and National Forest Monitoring Systems

The CCA Project provides the following observations for REDD+ project developers and for governments in the process of establishing their national forest monitoring systems (NFMS).

Communities can take accurate forest measurements

With proper training, community teams can take and record forest measurements to provide accurate and precise forest carbon stock estimates. Table 1 shows that the estimates from community measurements fall well within the range of uncertainty for estimates in similar forest types. The confidence intervals for the estimates from the community measurements and the professional surveys are similar, indicating measurement consistency by the community teams comparable with the professionals (the exception is PNG, where the community team used a much smaller plot size, hence the larger confidence interval than the professional surveyors). Other studies have also found that communities can take forest measurements as reliable as those of professionals (Larazzabal and Skutsch 2011).

Table 1 Carbon stock estimates from community measurements and those reported in the literature

Project sites	Forest type and condition	Estimates from community measurements	Estimates in published literature for similar forest types
Madang Province, PNG	Mostly lowland and montane primary moist tropical forest (Hm class)	129.5 ± 75.8 tC/ha	106.3 ± 22.7 tC/ha - *same province and forest type (Fox et al. 2010)*
Mondulkiri Province, Cambodia	Deciduous forest	Rectangular plots – 75.5 ± 19.6 Circular plots - 72.2 ± 23 tC/ha	73.8 ± 8.6 (std. error) - *same forest patch (Vathana 2010)*
Yogyakarta & Central Java Provinces, Indonesia	1. Dryland woodlots 2. Home gardens	1. 32.1 ± 22.5 tC/ha 2. 34.2 ± 20.6 tC/ha	1. No data 2. 35.3 ± 21.2 tC/ha - *Lampung province (Roshetko et al. 2002)*

Note: All figures are mean ± standard deviation, unless stated otherwise.

Community teams retain the skills they have learnt

In January 2012, Project partners observed a Bunong community forest monitoring team in Mondulkiri Province, Cambodia set up nested rectangular and variable radius circular sample plots, take measurements for estimating biomass in living trees and deadwood, and record the data (Image 1). The community team had received training one year earlier under the Project on forest sampling and measurement, and they demonstrated that they had retained the knowledge and skills from this training. Local people who participate in a well-designed training programme can be relied upon for future forest assessments. Short refresher trainings may be useful, especially when some of the initial team members are no longer available.

Image 1 **Project partners observing a Bunong community team in Cambodia demonstrating plot establishment**

The training of trainers is critical and well prepared training programmes are essential

The training of communities on forest measurement is not a simple task. Literacy rates may be low and communities may have received misinformation on issues such as carbon trading. In all Project countries, a structured training of trainers (ToT) was organised to ensure trainers possessed the necessary knowledge on forest carbon accounting and effective techniques for training communities on forest sampling.

Trainers must have knowledge of the "starting positions" of the communities they are working with and tailor their training accordingly. In Indonesia, partners found that communities participating in the Project in Java were more easily able to grasp the concepts of climate change and the value of forest monitoring than a community in Sumatra, reflecting, *inter alia*, a higher degree of literacy and several decades of community level forest management in the former.

Explaining concepts that are alien to local communities is another challenge. In Indonesia, community members of one village who were trained on forest monitoring, later assisted during the training of the community forest monitors in a neighbouring village. They were able to explain some of the concepts and practices using local metaphors and idioms familiar to the participants.

The Project found that local people respond best to practical exercises, and that sufficient time must be

allocated for participants to repeatedly practice setting up sample plots, measuring biomass and data recording. At least several days are required for the training. Thought must also be given to allowing community members to fulfil their regular tasks.

Communities can do more than is often assumed

Table 2 summarises the roles that key stakeholders took on in the design, training and implementation of the forest monitoring. Clearly, much of the technical work associated with the sampling design and data processing (e.g. construction or selection of allometric equations to estimate biomass from measurements) cannot be undertaken by communities, but projects engaging communities in REDD+ should not have rigid views on what communities can and cannot do. Some communities may have members who are competent with and own computers. In such cases, the responsibility for data entry could be given to the community. In participating villages in Jogjakarta Province, Indonesia, the communities were trained on MS Excel and have taken on the role of data entry using the spreadsheets created for them.

Table 2 **Stakeholder roles**

	Local Facilitation Team	Trainers	Community	Other stakeholders
Consultation	Leads process	May participate	Participates	Participate
Determination of research sites	Leads process	May participate	Participates	Some may participate
Training of trainers	Leads process	Participates	—	Can observe
Training of community members	Observes	Leads process	Participates	Can observe
Map & stratify the forest	Leads process	May participate	Participates	Can observe
Set up & measure sample plots	Observes	May provide continued guidance	Plays key role	Can observe
Additional technical work: destructive sampling, land use and land cover classification, etc. (optional)	Leads process	May participate	Participates (in field activities)	May participate
Spread sheet design	Leads process	—	—	—
Data input and carbon stock estimation	Leads process	May participate	May participate (in some cases, could do data entry)	
Decides monitoring frequency	Leads process	—	—	—
Decides next steps	Participates	May participate	Participates	May participate

The aim should be self-reliant community-based forest monitoring teams

Measurement equipment can be very expensive, but cheaper options may exist that provide accurate results and are better suited to community-based monitoring. Thought should be put into the design and use of low cost, easy-to-use instruments and methods. In Cambodia, Project partners introduced: a method to estimate tree diameter above buttressed sections that only requires a short length of bamboo and a plastic ruler or calliper (Image 2); the straightforward 3-4-5 method for making sure that the corners of rectangular sample plots are set at right angles[1]; and the use of large numbered coloured labels to simplify the identification of trees in the circular variable radius sample plots.

The aim should be self-reliant teams that can be depended upon for estimation of forest carbon stocks according to pre-determined monitoring intervals. The community forest monitoring teams should thus own the equipment necessary to set up and measure sample plots.

Image 2 **Partners innovating with a simple yet effective method for estimating bole diameter height above buttresses.**

Incorporating community-based forest monitoring into national forest monitoring and safeguards information systems

With technical and financial assistance from international agencies, developing countries are now reviewing their national forest monitoring systems to determine how these can be developed and strengthened for carbon stock inventory, and considering options for how they might take up the safeguards issue. In 2012, the Subsidiary Body for Scientific and Technological Advice (SBSTA) to the UNFCCC COP is working on modalities for national forest monitoring systems, and has also been tasked to consider (i) the timing and frequency of the provision of national summaries of information on how all of the safeguards are being addressed and respected, and (ii) further guidance to ensure transparency, consistency, comprehensiveness and effectiveness in the presentation of these summaries.

It is thus timely that both governments and REDD+ negotiators consider the possible roles of community-based forest monitoring teams in national forest monitoring systems and safeguards information systems. As the CCA Project and other similar initiatives have observed, community teams can be relied upon for accurate measurements to monitor carbon stock changes, and the potential advantages of engaging communities in forest monitoring include better local understanding and ownership of REDD+ activities, as well as providing new information for checking the quality of existing datasets.

In addition to forest measurement, there are many other ways that communities can contribute to monitoring for REDD+. Communities can assist with ground-truthing for the interpretation of remote-sensing data. They can provide information on local drivers of deforestation and degradation, such as accessibility to forests, biomass removals and disturbance, and their changes over time, which would help with spatial modelling of land use changes to develop emissions scenarios. Other possibilities also exist. In Cambodia, CCA Project Partners conducted participatory mapping with Project communities to better understand the local classification of different vegetation types. The communities sketched their spatial representation of the different vegetation types, and this information was useful for matching the main locally recognised classes to

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[1] Based on trigonometry, a right angle is established by measuring 3 metres along one side of the plot corner, 4 metres along the other, and 5 metres across the diagonal.

those used in a map adapted from national datasets.

Living close to or within forests, local communities can also provide useful information for monitoring safeguards on rights, governance, biodiversity, leakage and permanence. In PNG, Project communities living on forest fringes provided valuable information on biodiversity and forest use, and the fact that they visit the forest every day means they can readily provide updates on any observed changes. Engaging communities could enable more frequent monitoring on a wider array of safeguard variables and at the same time contribute to the transparency and accessibility of the information by having more groups involved in its collection.

Financial payments

Two scenarios for community-based forest monitoring teams can be envisioned. In the first scenario, the teams monitor community forests, i.e. forests over which the communities hold carbon rights. Under this scenario, the communities generate data which can be used to explore the feasibility of REDD+ for their forests, and they are then in a position to consider whether they will benefit from a REDD+ project. If they go ahead with a REDD+ project, they would receive payments for the carbon stocks they protect or enhance. If REDD+ proves not feasible, in cases where the communities are harvesting timber from

their forests, the data still has value as it can be used to improve forest planning.

The challenge here is to ensure that there is a clear process where the training and initial measurement is followed up with the necessary financial resources and technical inputs for the development of a community-level REDD+ project. The pilot Forest Carbon Trust Fund in Nepal suggests how such a process can be developed. The Fund is providing payments to communities for increases in carbon stocks in their forests, with the communities responsible for measuring and monitoring the carbon stocks[2].

The second scenario is where community forest monitoring teams are organised to provide data specifically for the NFMS, or for project-level REDD+ activities in forests that are not under community tenure. For this scenario, payment of the community teams for their labour is desirable. The costs incurred by Partners for implementing the CCA training and follow-up support for communities is still being evaluated, however, other studies suggest that the costs do not have to be prohibitive and, in the long run, may be lower than those for professionals. One study estimated that community carbon stock monitoring costs between USD 2.5 – USD 5 per hectare per year, which is 2 to 3 times less than the cost of expert monitoring (Larazzabal and Skutsch 2011).

6   Conclusions

The Community Carbon Accounting Project has demonstrated that through well-designed and implemented training programmes and ongoing back-up support, community-based forest monitoring teams can take and record measurements for accurate and precise estimates of forest carbon stock changes. From a climate change perspective, communities should be involved in forest monitoring, because not only will this enrich the data used for estimating carbon stock changes and increase transparency, it will also enhance the sustainability of REDD+ activities,

as communities will have a better understanding of what must be done to ensure future REDD+ payments. From a developmental perspective, community involvement in forest monitoring provides them with more forest management options and fits with the wider notion that sustainable communities can best be achieved by having them taking charge of their own development.

For further information on the CCA Project, see http://www.iges.or.jp/en/fc/activity_cca.html

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[2] See REDD+ for Green Communities: Lessons from a pilot project in Nepal, http://www.youtube.com/watch?feature=player_embedded&hl=en&v=Vj fTF9sVtxo&gl=US

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Printed on 70% recycled paper and 30% eco-pulp