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Community forest monitoring in REDD+: the 'M' in MRV?

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ABSTRACT

Transparent, accountable, and sustainable monitoring, reporting and verification (MRV) systems are essential for any REDD+ framework. With the prospect of a global agreement on forest preservation on the horizon, establishing functional MRV systems is one of the major goals of so called 'REDD Readiness'. However, due to the ambitious, worldwide scale of the prospective REDD+ framework, financial sustainability is a central issue. MRV of tropical forests has historically been an expensive, expert led process, carried out by external consultants in conjunction with the local population. This professional model of forest monitoring is not viable for a global scale programme, and so attention is turning to the potential of community/locally based monitoring to fulfil the 'M' in REDD+ MRV.

This desk-based study attempts to lend support to the above assertion by providing an up to date review of the still relatively limited literature on locally based natural resource monitoring, looking at the inherent advantages it has over professional monitoring. It then picks out key practical lessons from a variety of international case studies, before assessing how locally based monitoring could fit into a REDD+ MRV framework.

The investigation shows locally based monitoring to be advantageous in terms of lower costs, enhanced local ownership, greater cultural relevance and improved institutional strength at the community level, while not compromising on accuracy of information produced – there is a growing consensus amongst practitioners in the field that adequately trained local monitors can produce data comparable to that derived from professionals. As REDD+ requires ground-based monitoring to complement remote sensing of forest condition, locally based monitoring can fulfil this role while also creating employment. The author highlights the need to develop a community MRV protocol that maximises the involvement of local people in forest monitoring, while also corresponding to the forest monitoring requirements made by the UN for the prospective REDD+ framework.

1. Introduction

Monitoring the state of natural resources is important to almost all levels of human society: the international community need to know whether their national policy commitments are meeting global goals such as those outlined in the Convention for Biological Diversity; conservationists around the world need to assess the effectiveness of their actions; and resource-dependent local people need to calculate how much they can viably harvest each year. If there is external funding involved in natural resource management, monitoring provides essential feedback to the 'investors', creating accountable relationships. Monitoring therefore matters.

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Forest monitoring, like other natural resource monitoring, was historically mostly conducted by external professionals using strict scientific methods (Angelsen et al., 2009). However, recently in contrast, these monitoring responsibilities have been devolved to local communities, a practice that has become known as community-based/locally based monitoring which employs more participatory and locally appropriate techniques of measurement (Danielsen et al., 2005; Garcia and Lescuyer, 2008). The value of locally based monitoring is clear from examples in the developed world, using 'citizen science' to run projects such as the European bird atlas (Gibbons et al., 2007) and the new UK initiative, OPAL (the Open Air Laboratory, for monitoring environmental quality through measuring soil, air, water, biodiversity and climate, OPAL, 2010). Utilising the observations of resident populations is a way to continue natural resource monitoring despite funding shortages, while also gaining widespread community acceptance.

With approximately 1 billion people depending on tropical forests for their livelihoods (World Bank, 2004), monitoring the state of these valuable forests is becoming increasingly important. Furthermore, with REDD+ looking increasingly likely to become operational in the coming years, there is a significant demand for monitoring, reporting and verification (MRV) best practice, holistically including carbon, biodiversity, social, and ecosystem service monitoring (this four pronged monitoring approach is extrapolated from the current details in the UNFCCC REDD+ draft paper under the Ad Hoc Working Group on Long term Cooperative Action (AWG-LCA) (UNFCCC, 2009), an approach also being anticipated in UNREDD and World Bank 'REDD+ Readiness' work, such as in Tanzania (Burgess et al., 2010). It is becoming clear from looking at related fields that there are successful examples of the individual components (the 'M', the 'R' and the 'V') that might make up a REDD+ MRV system, such as the reporting system used by Birdlife International in the IBA network (e.g. Adhola et al., 2009). The unique and largely untested dimension of REDD+ is the combination of these parts to create a functional scheme.

The main objective of this paper is to assess whether locally based monitoring could be used in the future REDD+ framework. This is done by examining the central issues associated with the spread of locally based monitoring schemes: firstly comparing the integrity of professional and locally based monitoring; secondly teasing out the practical lessons and techniques from 20+ years of application in conservation management; and finally assessing how this approach could contribute to REDD+.

2. Professional vs. locally based monitoring

Garcia and Lescuyer (2008) make a strong assertion that that the devolution of forest monitoring responsibilities has mostly been unsuccessful in improving the condition of the forest or halting degradation. Perhaps this is true, but there are exceptions to this trend that are feeding an alternative view, notably two African examples of successful, long standing, locally based monitoring systems in Ghanaian and Tanzanian protected areas (Brashares and Sam, 2005; Blomley et al., 2008; Danielsen et al., 2010a, 2011). Similarly, recent studies in the Philippines (Uychiaoco et al., 2005; Danielsen et al., 2007a) indicate the potential success and feasibility of locally based monitoring. Regardless of the context, it seems like there are

Table 1 – A summary sample of studies showing which locally based monitoring schemes show evidence of accuracy, which show evidence of cost-effectiveness and sustainability, and which show evidence of particular cultural relevance. A more complete and up to date analysis of locally based monitoring schemes can be found in Danielsen et al. (2010b).

Case study	Details	Evidence		
		Accurate	Cost-effective/locally sustainable	Culturally relevant
Danielsen et al. (2011)	Assessing the results of community-based and professionally executed monitoring in India, Madagascar and Tanzania.	×	×	
Rist et al. (2009)	Monitoring biodiversity through hunter reporting of Bushmeat harvesting in Equatorial Guinea.	×	×	×
Skutsch et al. (2009)	Assessing the successes of the K:TGAL community carbon monitoring project	×	×	
Jones et al. (2008)	Monitoring biodiversity through interviewing crayfish fishermen in Madagascar.	×		
Danielsen et al. (2007a, 2007b)	Comparing locally based and professional methods across the protected area network in the Philippines.		×	×
Stuart-Hill et al. (2005)	Assessment of locally based wildlife monitoring conducted by the Namibian government.			×
Uychiaoco et al. (2005)	Comparing reef monitoring by marine biologists and local fishermen in the Philippines.		×	
Topp-Jorgensen et al. (2005)	Locally based monitoring of forest disturbance in Tanzania.		×	
Brashares and Sam (2005)	Assessing locally based wildlife monitoring in Ghana's nature reserves.		×	

three particular areas to address when comparing professional monitoring to locally based monitoring, the evidence for which is summarised in Table 1.

2.1. *Accuracy and variability*

There is a growing consensus that local people, using conventional scientific methods or participatory methods, can produce data sets that are just as accurate as those that are derived professionally (Yoccoz et al., 2003; Danielsen et al., 2005, 2008, 2011; Jones et al., 2008; Rist et al., 2009). A classic example that lends weight to the accuracy of locally based monitoring is that of the Sami reindeer herders, who's "observation of how snow depth has changed over the past 50 years aligns with long-term data collected by scientists" (Danielsen et al., 2007b). An additional part of locally based accuracy is the correct use and 'translation' of locally derived traditional measures into more 'scientific' data sets – a sort of conversion exercise that, for example, takes measures such as "consistently waist deep snow" and carefully translates that into broadly usable "50 cm depth with low variance ±5 cm". Nevertheless, the variability of locally produced information remains problematic, as exemplified by the international K:TGAL carbon monitoring project (Skutsch et al., 2009). While not glossing over this problem, Skutsch et al. insist that this high variability is a consequence of different communities employing slightly different techniques, rather than any lack of skill within the community. Thus the variability of locally based data can be reduced by standardising the techniques used, be them participatory or strictly scientific, and increasing the sampling frequency – something that is easily done by local communities living close to the forest resources (Danielsen et al., 2011)

2.2. *Cost and sustainability*

In general, locally based monitoring is cheaper than professional monitoring, even if the start-up costs for locally based systems can be high (Topp-Jorgensen et al., 2005; Rist et al., 2009; Danielsen et al., 2011). Professional monitoring has long been regarded as prohibitively costly (Balmford et al., 2003). Intuitively, if the costs of locally based natural resource monitoring are low, the monitoring programme will be more financially sustainable than a costly professional scheme. The locally based approach also involves the community in planning, data collection, analysis, and decision making, which in turn generates local support and ownership for the monitoring programme, enhancing its longevity. Chhatre and Agrawal (2009) suggest that this ownership is the primary advantage of locally based monitoring, as it leads to the local community regulating their own resource use (thus becoming a practice of internalising the costs of resource exploitation, in so combating the 'tragedy of the commons' which continues to create environmental problems worldwide). Additionally, this involvement increases capacity and environmental awareness amongst community members, and creates a local institutional framework that can link more remote rural communities into the sub-national and national institutional arrangements, encouraging relationship with the government.

2.3. *Cultural relevance*

Involving the local community in the planning and operation of monitoring programmes gives them the opportunity to significantly influence what specific resources are monitored. As these resources are more likely to be those on which they daily depend and interact, any threats are often quickly detected and thus can be addressed through local management actions (Danielsen et al., 2010b, 2011). This can be contrasted to professional biodiversity monitoring which may focus on rare, endemic, or charismatic species which may have been identified in a monitoring contract. Local communities are often more interested in the broader resource base of the forest than the status of particular floral/faunal populations. The task of the external expert is therefore to ensure, during the planning and contract writing phase, that the monitoring scheme covers elements that are both culturally relevant and scientifically useful (Garcia and Lescuyer, 2008; Rist et al., 2009), e.g. integrating non-timber forest products that are used for subsistence but are also suitable indicator species. Stuart-Hill et al. (2005) also speculate the role of the expert, highlighting the need for externally usable information as well as data that the community deems relevant to collect – the community might need an expert to enable them to see their immediate environment in a broader context, and may stimulate them to monitor something that they may not have planned to monitor.

Professional monitoring nonetheless has the advantage of potentially being conducted anywhere and at any time, with only a moment's notice, given the international pool of trained scientists with the appropriate skill sets to conduct such work. The quality of information can be largely guaranteed through the initial selection of the external team, and this information is frequently published in the international science and policy world, so may impact at a much larger scale. Although there are relative advantages to both professional and locally based monitoring, the best approach will often be an amalgamation of the two (as discussed by Gardner, 2010). There are in fact a range of different approaches that sit between these two polarised methodologies, which Danielsen et al. (2008) outline in a 'sliding scale' of local involvement, each tier of which is suited to different ground-level scenarios. For example, category 2 programmes use data collected by local community members but have all other aspects run by professionals (as in the creation of the European Bird Atlas, Gibbons et al., 2007), whereas category 4 programmes involve communities in all aspects of the monitoring, from planning to data analysis. External experts can assist communities to ensure that the planning phase covers elements that are scientifically useful as well as culturally relevant (Garcia and Lescuyer, 2008). An applied example of this is the use of butterfly counts as a biodiversity indicator during the butterfly harvest in the Iwokrama Forest, Guyana (Bovolo and Losos, 2010).

3. Locally based methodologies and best practice

With the benefits of locally based monitoring becoming clear, establishing and sharing appropriate practical techniques has

become important. As such, an international network was established in 2006 called Monitoring Matters (MOMA) and included governmental and non-governmental collaborators from Tanzania, Nicaragua, Bhutan, Ghana, Namibia and the Philippines, as well as research scientists from across the globe. MOMA conducted a 3-year project (Jensen, 2006), tracking 6 categories of natural resource indicators (e.g. vegetation types and bird populations) in all 6 countries, while utilising different monitoring techniques (both participatory and conventional 'science' techniques). Many specific practical lessons have been drawn from this, some of which are discussed here, and the approaches continue to be tested and analysed (Monitoring Matters, 2010). There appears to be consensus on a number of community-based monitoring issues:

- It is better to use appropriate, participatory methods of data collection, instead of training locals in conventional scientific methods which might interfere with local activities, e.g. using hunting diaries (hunters recording timings of bushmeat hunting trips and details of catches, Rist et al., 2009) instead of line transects for biodiversity, and using disturbance checklists (multiple-choice identification of destructive activities in specified areas, Holck, 2008) instead of fixed point photography for forest disturbance. Independent interviews conducted by local project workers are also capable of detecting meaningful changes in biodiversity (Jones et al., 2008). However, focus groups are seen as the most universally useful technique in that they draw information from a number of different sources simultaneously, while creating an institution in itself through which the local community can be empowered to solve their local problems and influence government.
- With a minimum of one day of training, local monitors are capable of producing habitat loss and forest disturbance data that is comparable to that collected professionally (Holck, 2008).
- Concerted input is typically needed to ensure continuity, starting with planning and continuing through data collection. This may come from a local NGO worker or a local government official (Uychiaoco et al., 2005).
- As communities will often have ways of monitoring their own resources, it is essential that any applicable elements of the indigenous system are integrated into the monitoring scheme (Read et al., 2010).
- The benefits that the monitoring participants receive must be clear, be them economic or social, in order for them to understand (if the programme is planned correctly) that the benefits outweigh the costs.

However, there is a specific subject where there is still disagreement – the use of advanced technology. Skutsch et al. (2009) consider GPS units, GIS systems and online tools as necessary components of community-based forest monitoring. Abrell et al. (2009), on behalf of UNEP, also promote the use of 'high' technologies in locally based monitoring. Although such an approach helps build technological proficiency and potentially allow locally derived data to reach higher institutional tiers, Rodriguez (2003), Danielsen et al. (2005), and Global Witness (2009b) state the need to avoid unsustainable use of hi-tech equipment in remote rural settings, despite the pressure to use it for local and governmental prestige.

These technical points are included to share knowledge and are important to regard when considering the design of REDD+ forest monitoring programmes, the subject of the next section.

4. Locally based monitoring in REDD+

It is clear that given: (1) the shortfall of funds available for environmental monitoring (that have stimulated the likes of the Open Air Laboratory project in the UK); (2) the potential for locally based monitoring to feed into a global system; and (3) its sustainable and transparent nature – locally based monitoring has the potential to shape the future of conservation management, a future that will include REDD+ in some shape or form. There are already encouraging signs internationally as national locally based monitoring programmes have been established in Ghana, the Philippines, Tanzania and Namibia.

Focussing on REDD+, locally based monitoring should provide the backbone for any MRV guidelines that are produced by the UNFCCC. This is important, firstly because remote-sensing alone cannot monitor the state of carbon stocks and the welfare of forested areas. Satellite imagery needs to be complemented by ground-based monitoring (Gibbs et al., 2009) as monitoring forest degradation (as opposed to forest clearance) is not possible using current satellite technologies. Secondly, it is the only way to holistically conduct a global forest preservation effort, as argued by Graham and Thorpe (2009), ''Community MRV should be included in a REDD mechanism in order to reduce the cost of REDD, engage communities, generate a direct income stream for them and improve equity and governance of REDD''. Lastly, as insinuated by the previous quote, it generates jobs and income. As the primary goals of REDD+ is to reduce deforestation (community or commercial) any programme should include alternative livelihood possibilities for those whose employment is affected by the introduction of the scheme (Topp-Jorgensen et al., 2005; Verplanke and Zahabu, 2009; Burgess et al., 2010; Danielsen et al., 2011). Chhatre and Agrawal (2009) and von Scheliha et al. (2009) both point towards the enhanced livelihood benefits of forests with greater autonomy and involvement of communities in ownership and management. Thus, tentatively, locally based approaches can provide monitoring jobs for 'displaced' workers, in so addressing two major concerns about REDD, namely the unacceptable social and biodiversity impacts. Social integrity could be preserved by minimising emigration of the jobless, and pressure on biodiversity could be reduced by preventing local lumberjacks turning from harvesting wood to harvesting flora and fauna. Sustained REDD+ monitoring jobs would be both more favourable than simple compensation payments (which do not require the beneficiaries to *do* anything and thus create an excess of inactive workers) and any logging operation (which will only last as long as there are trees to fell in the vicinity). Furthermore, the presence of the local monitoring personnel in the forest may well deter illegal loggers (Danielsen et al., 2011).

A brief paradigm of REDD+ forest monitoring might look like an above mentioned category 4 scheme: the community consents to the REDD+ project after extensive consultation; the community itself then plans the monitoring programme with the assistance of an external expert, and a REDD+ contract is created that fulfils local and high level policy demands; the forest monitors are elected by the community from a subgroup nominated by the expert, trained, and carry out the agreed monitoring activities that encompass carbon, biodiversity, social impacts and ecosystem services; payments are given out at a flat rate for providing the information (instead of linking them to carbon stocks as conflict may arise due to natural variance in forest carbon, and so payments (Skutsch et al., 2009)); and finally this data is collected and fed into the local management system as well as the higher level institutional framework on an annual basis, in so integrating the local information into regionally/nationally co-ordinated strategic forest cover monitoring. A final addition to this monitoring paradigm might be that suggested by Global Witness (2009a, 2009b) – an independent and expert monitoring body, assembled by a local partner, that primarily looks at implementation of policy and regulations, in so combating the commonplace ''weak governance, corruption, high levels of illegality and poor forest law enforcement'' in forest-rich developing nations. This would also be capable of verifying the information provided by the community and so eliminating the credibility issues associated with unregulated self-monitoring.

Zooming out from the local scale, the level of flexibility within the UN REDD+ MRV requirements are centrally important. The UNFCCC use the International Panel on Climate Change (IPCC) and national science research bodies as their primary source of information for the current policy movements on REDD+ and are therefore accustomed to receiving exhaustive quantitative data with rigorous statistical analyses. Locally based monitoring will not provide this type of data. As such it is essential that there is plasticity in the monitoring requirements. A systems-based indicator approach could be used (Bossel, 2001) for forest monitoring, which provides guidelines for selecting appropriate indicators from an official pool which are all indicative of the pressures, state or responsiveness of the forest (e.g. stream flow or avian diversity). Each indicator can be satisfied using a variety of different techniques, be them quantitative or qualitative, so the approach leaves room for site specific variation in what can be monitored, as well as variation in the type of data produced (e.g. complex biodiversity indices or simple bushmeat hunter counts). This approach contrasts with insufficiently vague procedural guidance, or the overly rigid standards-based approach. This latter approach, often favoured in high-level policy, requires information on very specific indicators, additionally setting particular performance standards for each indicator that must be met/exceeded in order for the project to qualify for payments or indeed continue. This approach has been used by the Clean Development Mechanism to monitor low-carbon projects, and as a result it is ''very difficult for community run projects to qualify for certification and carbon payments'' (Ecosecurities, 2009), as they are generally unable to ''handle issues of additionality, acceptability, externalities, certification, and community organisation'' (Minang et al., 2006).

Showing the growing popularity and momentum of this field, Danielsen (2009) published a leaflet on locally based monitoring and its potential to fulfil the MRV requirements of the REDD+ programme. It was launched during a side event at COP-15, the 15th conference of the parties to the UNFCCC in Copenhagen, and details the likely REDD+ documentation requirements for monitoring and what locally based monitoring can deliver in response.

5. Conclusions

Locally based monitoring has the potential to shape the future of conservation management, which includes REDD+. Depending on the monitoring requirements and the social/geographical dynamic of the site, local involvement can be included to varying degrees and appropriate techniques can be employed. This all relies on careful and participatory planning before any monitoring activity begins, and this planning is best informed by the study of comparable category 4/5 schemes (more autonomous local monitoring).

As REDD+ comes online, in order to make the programme function in the long-term, locally based monitoring should be seen as one of the critical elements of the operational MRV system. With this in place, REDD+, as an ambitious global framework, becomes more cost-effective, strengthens the local institutional setup, and crucially provides alternative livelihoods. The necessity for genuine local participation has been duly noted from bad experiences in Papua New Guinea last year, where there was a large and uncoordinated 'land grab' by private REDD developers. This has been attributed to there being no safeguards in place at the time to ensure local consent or involvement. Care Denmark (Blomley and Franks, 2009) make a further argument for the widespread use of locally based monitoring, drawing attention to the current need to integrate a ''pro-people'' approach to participatory forest management, but more poignantly, a future need for that to evolve into a ''pro-poor'' approach. This critically promotes equity in forest management programmes.

Locally based monitoring overcomes some of the big problems with REDD+ (such as it being a top-down mechanism) but still is not a silver bullet. Professional monitoring will continue to be required in areas where local people do not depend on the natural resources around them, where there are actually no residents at all, where resource threats are multiple and complex, and where the relationship between the communities and the local authorities is poor. These last two characteristics are unfortunately commonplace in many developing countries. Professional input may also be required during the verification process, where an independent 3rd party will periodically validate the information gathered.

There remain many areas where further work is required. Scepticism towards this style of monitoring is still found in the governmental, non-governmental and private sectors. This is attributed to the need for more quantitative studies that examine the quality of the locally produced data next to professionally derived data. There is also a need to explore the previously untapped potential of locally based monitoring to track social impacts (which will be a central MRV requirement in a REDD+ programme). Furthermore, there is still low

confidence that locally produced data can genuinely feed into a global system, there being two barriers to this information transfer: (1) the well mapped institutional deficiencies in many developing countries and (2) format differences between locally produced data and an international system that is accustomed to receiving scientific datasets from professionals. The task of strengthening the institutional arrangements in emerging forested countries is daunting but clear and is being addressed in 'REDD Readiness' work by the UNREDD program and the World Bank's Forest Carbon Partnership Facility. However adapting REDD+ policy to be flexible enough to allow the input of locally generated data has yet to be addressed, but could potentially be satisfied by using a systems-based indicator approach.

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