Institutional effectiveness of REDD+ MRV: Countries progress in implementing technical guidelines and good governance requirements

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A B S T R A C T

The UNFCCC requires REDD+ countries wishing to receive results-based payments to measure, report and verify (MRV) REDD+ impacts; and outlines technical guidelines and good governance requirements for MRV. This article examines *institutional effectiveness* of REDD+ MRV by assessing countries' progress in implementing these technical guidelines and good governance requirements, from three dimensions. *Ownership of technical methods* examines whether countries own technical methods for forest area and area change measuring, and for estimating forest carbon stocks; and whether national MRV systems cover all forests, land uses and carbon pools. *Administrative capacity* examines development of administrative competence to implement MRV. *Good governance* examines whether countries espouses norms of good governance in their MRV systems. We apply these dimensions to assess and compare progress in 13 REDD+ countries, based on a review of national and international documents. Findings show that REDD+ countries have high to very high ownership of technical methods. However, majority ranks only low to moderate on administrative capacity and good governance. This means that although countries have started developing technical methods for MRV, they are yet to develop the competence necessary to administer MRV and to inculcate good governance in MRV. The article explain the scores and suggest ways of improving implementation of REDD+ MRV.

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1. Introduction

At the 19th Conference of the Parties (COP) to the United Nations Framework Convention on Climate Change (UNFCCC) in 2013, Parties agreed on a set of decisions to advance implementation of Reducing Emissions from Deforestation and forest Degradation in Developing countries; and the role of conservation, sustainable management of forests and enhancement of forest carbon stocks in developing countries (REDD+). The agreements encompassed decisions on methodologies for setting forest reference emission levels and modalities for measuring, reporting and verification (MRV) (UNFCCC, 2014), which have been major contentious issues in REDD+ negotiations. On MRV, the agreements re-affirmed past COP decisions, namely that REDD+ countries wishing to receive results-based payments should

measure, report and verify REDD+ carbon impacts and establish National Forest Monitoring Systems (NFMS) to perform MRV (UNFCCC, 2009, 2010).

Earlier at COP 16, the UNFCCC had outlined a three-phased approach to implementing REDD+ (UNFCCC, 2010): A readiness phase that involves development of national strategies, policies, accounting frameworks and capacity building; an implementation phase that involves implementation of national strategies and policies, technology development and results-based demonstration activities; and a results-based payment phase that involves payments for measured, reported and verified REDD+ carbon impacts. Since 2008, several REDD+ countries have been implementing REDD+ readiness and demonstration activities (Angelsen et al., 2012). Developing a robust and transparent NFMS to conduct MRV is a major activity in the readiness and implementation phases (Meridian Institute, 2009). As REDD+ was concluded at COP21 and features prominently in many of the submitted INDCs from tropical countries, it is very timely to assess countries' progress in implementing the UNFCCC decisions on REDD+ MRV.

Although several studies have examined the capacity of REDD+ countries to measure, report and verify REDD+ impacts (Grainger

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and Obersteiner, 2011; Herold, 2009; Herold and Johns, 2007; Herold and Skutsch, 2011; Palmer Fry, 2011; Pratihast et al., 2013; Romijn et al., 2012; Skutsch and McCall, 2010), these studies are limited with regard to the actual institutional effectiveness of REDD+ MRV in three ways. First, these studies examine whether REDD+ countries have the technologies in place to implement MRV but are silent on whether REDD+ countries actually own these technologies and whether they have the administrative capacity to implement MRV. Second, studies that examined REDD+ countries' technical capacity for MRV used global datasets such as the Food and Agricultural Organization's Forestry Resource Assessment Country Reports. Since it takes two-to-three years between data collection and publication of these datasets (Romijn et al., 2012), the information they contain do not reflect capacity building in MRV that countries have undertaken since 2008. Third, besides outlining technical methods for MRV, the UNFCCC has also outlined 'good' governance requirements for REDD+ MRV. However, as Korhonen-Kurki et al. (2013a) rightly observe, studies on good governance aspects of MRV remain scanty. This article addresses these gaps by examining the 'institutional effectiveness' of REDD+ MRV decisions by assessing and comparing REDD+ countries' progress in implementing technical guidelines and good governance requirements for MRV. It does this by examining countries' progress regarding (1) 'ownership of technical methods' for MRV, (2) developing 'administrative capacity' to implement MRV, and (3) exercising 'good governance' in MRV.

The article proceeds as follows. Section two briefly outlines the UNFCCC decisions on modalities for REDD+ MRV. Section three introduces the concept of 'institutions' and serves to conceptualize the UNFCCC and its decisions on guidelines for REDD+ MRV as 'institutions'. Building on the concept of 'effectiveness' of international institutions (Helm and Sprinz, 2000; Underdal, 1992; Young and Levy, 1999), this section also develops a framework for assessing the extent to which REDD+ countries have adjusted their national forest monitoring practices and rules to align with the UNFCCC technical guidelines and good governance requirements for MRV. Section four presents the results of our analysis. Section five discusses the results and makes some recommendations. Section six concludes the article and highlights its methodological limitations. The article is based on a literature review and document analysis of national and international reports. These include Readiness Preparation Proposals, UN REDD+ National Program Documents, National REDD+ Strategies, MRV Framework Documents, CIFOR Country Profiles, Norwegian International Climate and Forest Initiative Evaluation Reports, among others (Appendix A). The research was performed in 2014. The study is part of the CIFOR-led Global Comparative Study on REDD+ (GCS) and thus focuses on thirteen countries under study within the GCS: Bolivia, Brazil, Peru, Burkina Faso, Cameroon, Democratic Republic of Congo (DRC), Mozambique, Tanzania, Indonesia, Laos, Nepal, Papua New Guinea (PNG) and Vietnam.

2. UNFCCC decisions on REDD+ MRV

The UNFCCC explicitly states that REDD+ countries wishing to receive results-based payments should measure, report and verify (MRV) REDD+ impacts (UNFCCC, 2014); and outlines guidelines on how REDD+ MRV should be conducted. Firstly, the UNFCCC requires REDD+ countries to ' . . . establish robust and transparent national forest monitoring systems . . . ' (UNFCCC, 2009; p. 12) to perform MRV. Secondly, the established NFMS should follow the Intergovernmental Panel on Climate Change's (IPCC) methodological guidance and guidelines for estimating anthropogenic forest-related greenhouse gas emissions by sources, and removals by sinks, forest carbon stocks, and forest carbon stock and forest-area

changes (UNFCCC, 2009, 2014). Thirdly, in performing MRV, the NFMS should:

1) 'Use a combination of remote sensing and ground-based forest carbon inventory approaches . . . ' (UNFCCC, 2009; p. 12)
2) Provide estimates that are as far as possible accurate and that reduce uncertainties (UNFCCC, 2009).
3) 'Enable the assessment of different types of forest in the country, including natural forests' (UNFCCC, 2014; p. 31)
4) Provide estimates that 'are transparent and their results are available and suitable for review' (UNFCCC 2009; p. 12).
5) ' . . . the need for full and effective engagement of indigenous peoples and local communities in [. . .] monitoring and reporting . . . ' (UNFCCC, 2009; p. 11).

The first guideline outlines technical methods for REDD+ MRV while the second requires that these methods be accurate. The third guideline outlines the scope of REDD+ MRV, namely that it should cover all forests in a country. The fourth and fifth can be interpreted, respectively, as the need for transparency and accountability, and participation in MRV. Since transparency, accountability and participation are key principles of good governance (Secco et al., 2014; Woods, 2000), these guidelines can also be interpreted as the need for 'good' governance in MRV. While these guidelines are determined and agreed upon in an international negotiation process, they need to be translated and implemented in highly diverse country-specific contexts, with country-specific distinct actors, ideas, interests, information and knowledge and existing institutions.

3. 'Institutions' and UNFCCC guidelines on REDD+ MRV

Institutional theory explains order, stability and change in society by locating 'institutions' at the centre of human action and behaviour. The key assumption is that human agencies, in making their decisions and choosing their action trajectories, follow institutionalized values, norms and rules of societies and organizations they are part of, rather than economic incentives per se, such as expected costs and benefits (March and Olsen, 1998). However, such institution-driven behaviour should not be interpreted too mechanistic or functionalist, since agencies have certain degrees of autonomy, the capacity to improvise and, sometimes, the will do things otherwise than expected, although most will remain within the range of appropriate, socially defined boundaries (Bourdieu, 1990; Giddens, 1984). 'Institutions' can be conceptualized from different perspectives (Hall and Taylor, 1996; North, 1991; Schmidt, 2005; Young, 1993), but here we refer to the phrasing that they comprise of the 'rules of the game' ordering social fields, including politics, economics and international relations (March and Olsen, 1998; North, 1991). From an International Relations perspective, however, 'institutions', or 'regimes', are the internationally agreed-upon principles, norms, rules and decision-making procedures around which actors' expectations converge in a given issue area of international cooperation (Krasner, 1982; Rittberger, 1993). From this perspective, the UNFCCC and its various provisions such as technical guidelines and good governance requirements for REDD+ MRV constitute an 'institution' that shapes and converges the expectations of state Parties on international cooperation on the issue area of climate change, and especially the sub issue-area of REDD+.

A major question addressed by scholars of international institutions centres around 'effectiveness' of such institutions. A number of authors have developed conceptual approaches for examining effectiveness of international regimes (Helm and Sprinz, 2000; Underdal, 1992; Young and Levy, 1999). Here, we follow the approach proposed by Young and Levy (1999). The

Table 1
Framework for assessing REDD+ countries progress in implementing technical guidelines and good governance requirements for MRV.

Approach	Variable	Operationalization
Legal/Political	Acquiring and owning technical methods of MRV	Ownership of methods for area change measuring
		Ownership of methods for estimating forest carbon stocks
		Scope of MRV: whether it covers all forests, land uses and carbon pools
Legal/Political	Developing administrative capacity	Clarity of MRV procedures
		Linkage of REDD+ MRV with other GHG MRV systems
		Recruitment and development of expertise
		Development of strategic partnerships
Normative	Exercising good governance in MRV	Participation
		Transparency
		Accountability
		Coordination

authors identify five approaches from which effectiveness of international institutions can be conceptualized and evaluated. The (1) problem-solving approach examines the degree to which the institution has alleviated the problem that led to its creation. The (2) legal approach examines the degree to which the contractual obligations of the institution are met: rules are complied with, policies changed, programs initiated, et cetera, by the Parties. The (3) economic approach incorporates elements of the legal approach but add economic efficiency criteria. The (4) normative approach examines effectiveness in terms of normative principles such as fairness, stewardship, and participation. The (5) political approach, lastly, examines changes in the behaviour and interests of the actors, or in the policies and performance of the institution in ways that may contribute to the positive management of the targeted problem (Young and Levy, 1999, p. 4–7). The first and third approaches will be less useful here because it is still too early to assess the extent to which UNFCCC guidelines have contributed to resolving problems with forest measurements in REDD+ countries, and data on costs/benefits of MRV is lacking. The fifth approach will also be less useful for our purpose, especially the perspective on change in behaviour and interests of actors, since it is too early to examine such behavioural and interest changes.

The framework that follows therefore blends aspects of the legal and normative approaches as well as the political approach. The framework (Table 1) specifically examines the extent to which the UNFCCC technical guidelines for REDD+ MRV, i.e. the technical methods for estimating forest area, area changes and carbon emissions/removals, are being complied with, and whether the scope of MRV covers all forests, land uses and carbon pools in a country. In addition, it examines REDD+ countries' progress in developing the administrative capacity to implement MRV, for example through hiring skilled experts, formulating new forest measurements protocols, et cetera. Development of such administrative capacity constitute part of implementing technical guidelines for MRV. Lastly, the framework examines the extent to which REDD+ countries complies with norms of 'good' governance – participation, transparency, accountability and coordination – as introduced and further elaborated below. Overall, the framework allows for an assessment of countries' performance with regard to the UNFCCC decisions on REDD+ MRV at the national level. In developing the framework, we follow Keohane et al. (1993) advise to 'focus on observable political effects of institutions rather than directly on environmental impacts' when examining effectiveness of international institutions. The framework also aligns with Helm and Sprinz (2000) observation that such an evaluation of an international institution along its outputs may take place either at the level of the regime itself, analysing its norms, principles and rules, or at the national level in

terms of the regulations, decisions and measures implemented by state Parties to implement the provisions of the institution in question (see also Underdal, 1992).

Below, we delve into the IPCC methodological guidelines for Land Use, Land Use Change and Forestry (LULUCF), and good governance literature to develop criterial and indicators for assessing progress in implementing UNFCCC REDD+ MRV decisions at the national level along the three dimensions, and summarized in Table 2.

3.1. Ownership of technical methods

The IPCC provides two factors for estimating GHG emissions/removals: Activity Data and Emission Factors; and identifies six land use categories: forestland, cropland, grassland, wetland, settlement and other land (IPCC 2006). While the concept of land use categories applies to GHG inventories in the Agriculture, Forestry and Other Land Uses sector in general, for REDD+, interest is in 'estimating anthropogenic forest-related greenhouse gas emissions by sources and removals by sinks, forest carbon stocks and forest area changes' (UNFCCC, 2009). REDD+ encompasses five activities: (i) reducing emissions from deforestation, (ii) reducing emissions from forest degradation, (iii) conservation of forest carbon stocks, (iv) sustainable management of forests and (v) enhancement of forest carbon stocks (UNFCCC, 2010). Activities i and v not only causes changes in forest carbon stocks, but also changes in forest areas. The rest causes changes in forest carbon stocks but not necessarily in forest areas (see also GOFC-GOLD (2013)). Activity Data refers to area changes between forest and other land use categories, and is needed to precisely estimate forest-related GHG emissions/removals, hence the need to measure all forest types in a country. The different forest types have various carbon pools: above-ground biomass, below-ground biomass, dead wood, litter and soil organic matter (IPCC, 2006). These pools have varying carbon emission/removal potentials per unit area. For the LULUCF sector, Emission Factors refers to emission/removal potentials of the various carbon pools.

In estimating their forest-related GHG emissions/removals, REDD+ countries therefore need Activity Data (AD) and Emission Factors (EF). The technical methods for estimating AD correspond with the methods for measuring forest areas and area changes while those for estimating EF correspond to methods for estimating carbon stocks. Traditionally, forest area and area changes (AD) has been estimated using ground-based field inventories (Mohren et al., 2012). However, since the 1980s, ground-based methods have been complimented by Remote Sensing (RS), since RS offers a more cost-efficient method for measuring large tracks of forests. To estimate AD, the UNFCCC therefore requires REDD+ countries to use RS. Nonetheless, RS

Table 2
Framework for assessing REDD+ countries' progress in implementing UNFCCC technical guidelines and good governance requirements for MRV.

Criteria	Indicator	Progress level	Score
Owning technical methods for measuring forest area and area changes (AD), and estimating Emission Factors. Scope of MRV	Acquisition of RS data	RS data (images, aerial photos, etc.) acquisition not planned	Low
		RS data acquisition planned	Moderate
		Acquisition of RS data started	High
		RS data regularly acquired	Very high
	Implementation of National Forest Inventories (NFI)	NFI not planned	Low
		NFI planned	Moderate
		NFI (including establishment of PSP/TSP) started	High
		NFI regularly conducted	Very high
	Developing higher-order EF	EF development not planned	Low
		EF development planned	Moderate
		EF development (forest stratification, measurements, etc.) started	High
		(Higher-order) EF developed	Very high
	Extent to which REDD+ MRV covers all forests, land uses and carbon pools	Plans to measure only a few forests (and no other land use)	Low
		Plans to measure only a few forest, land uses and carbon pools	Moderate
		Plans to measure only key forests, land uses and carbon pools	High
		Plans to measure all forests, land uses and carbon pools	Very high
Developing administrative capacity to implement MRV	Development of MRV procedures (methods, tools, etc.)	Development of MRV procedures not planned	Low
		Development of MRV procedures planned	Moderate
		Development of MRV procedures started	High
		MRV procedures developed	Very high
	Linking REDD+ MRV with other GHG measuring systems	Linkage of REDD+ MRV with other GHG measuring systems not planned	Low
		Linkage of REDD+ MRV with other GHG measuring systems planned	Moderate
		Mechanism for linking REDD+ MRV with other GHG MRV systems under development	High
		Mechanisms for linking REDD+ MRV with other GHG MRV systems developed	Very high
	Recruiting and building expertise	Recruitment and building of expertise not planned	Low
		Recruitment and building of expertise planned	Moderate
		Recruitment and building of expertise started	High
		Expertise regularly recruited and built	Very high
	Development of strategic partnerships	Linkage with pilots, national/international research institutes, etc. not planned	Low
		Linkage with pilots, national/international research institutes, etc. planned	Moderate
		Linkages started (pilots, institutes identified; MoU signed, etc.)	High
		Linkages with pilots, national/international institutes regularly conducted	Very high
Participation	Involvement of different societal actors	Only forestry agencies involved	Low
		Only forestry and non-forestry state agencies involved	Moderate
		Only state agencies and a few CSOs are involved	High
		All societal actors (state, CSO, private sector, local communities) involved	Very high
	Development of participation mechanisms	Platform for stakeholders engagement not planned	Low
		Platform for stakeholder engagement is planned	Moderate
		Platform for stakeholder engagement under development	High
		Platform for stakeholder participation developed	Very high
	Development of conflict resolution mechanisms	Conflict resolution mechanism not planned	Low
		Conflict resolution mechanism planned	Moderate
		Conflict resolution mechanism under development	High
		Conflict resolution mechanism developed	Very high
Transparency	Results made public at the national level	No plan to make MRV results public	Low
		Making results public is planned	Moderate
		Mechanism for making results public under development	High
		Public information provision mechanism (web-portals, forest information systems, etc.) established	Very high
	Datasets, methodologies, etc. described publicly	Public disclosure of datasets, methodologies not planned	Low
		Public disclosure of datasets, methodologies planned	Moderate
		Mechanism for public disclosure of datasets, methods, etc. under development	High
		Mechanism for public disclosure of datasets, methods, etc. developed	Very high

Table 2 (*Continued*)

Criteria	Indicator	Progress level	Score
	MRV results provided in a timely manner	After months of MRV Data Acquisition	Low
		Within a month after MRV Data Acquisition	Moderate
		Within two weeks of MRV Data Acquisition	High
		Real-time (i.e. within a week of MRV Data Acquisition)	Very high
Accountability	Clarifying roles	Roles of stakeholders not clarified	Low
		Roles of different stakeholders elaborated	Moderate
		Roles and responsibilities communicated to the different stakeholders	High
		Stakeholders have started implementing their roles in MRV	Very high
	Clarifying reporting channels	Reporting channels not clarified	Low
		Reporting channels to be clarified	Moderate
		Clarification reporting and communication channels started	High
		Reporting and communication channels developed and in effect	Very high
Coordination	Developing inter-agency/multi-level coordination mechanism	Coordination of MRV between levels/agencies of government not planned	Low
		Coordination of MRV between levels/agencies of government planned	Moderate
		Development of coordination mechanism started	High
		Inter-agency/multi-level coordination mechanism developed	Very high

needs to be complimented by ground-based methods – so-called 'ground-truth' data – because of challenges associated with RS (haze, cloud cover, etc., see Joseph et al. (2013)). While there are RS methods for estimating Emission Factors, in most developing countries EFs are estimated using ground-based methods. The accuracy (second guideline) of methods for estimating AD and EF is indicated by the 'Tier' used. The IPCC identifies three Tiers. Tier 1 refers to default AD and EF values as provided by the IPCC. Tier 2 involves use of country-/region-specific methods for EF and AD. Tier 3 involves use of higher-order, country-specific methods including models and repeated inventory measurements, and provides estimates of greater accuracy (IPCC, 2006).

In this article, we make a distinction between technical methods for estimating AD and those for estimating EFs. Since in most REDD+ countries EFs are estimated using ground-based methods, we further distinguish between ground-based methods for ground-truthing RS data and those for estimating EF. In line with these distinctions, we examine REDD+ countries' progress in: (1) acquiring and owning technical methods for estimating AD, i.e. RS data and ground-based methods for verifying RS data; and (2) developing higher-tier EFs. The former is indicated by acquisition of RS data (satellite images, aerial photos, etc.) and implementation of National Forest Inventories (NFI), including establishment of Permanent and or Temporary Sample Plots (PSP/TSP). The latter is used to access accuracy of the technical methods. Where a REDD+ country has acquired RS data, implemented NFI and developed higher-tier EF, for example, 'ownership of technical methods' is rated 'very high'.

The MRV system should cover all types of forests (third guideline). This is necessary to minimize double counting and leakage. MRVying all forests is also necessary to address political issues associated with measuring deforestation/degradation. As Gupta et al. (2012) and Visseren-Hamakers et al. (2012) convincingly argue, measuring deforestation/degradation is not an apolitical, neutral, scientific activity. Questions such as what is measured and reported are largely political (Lövbrand and Stripple, 2011; Wertz-Kanounnikoff and McNeill, 2012). This political nature of MRV means that while a country may own RS data,

implement NFI and develop higher-tier EFs, it may have little political will to measure certain forests, land uses and carbon pools. To address this political nature of MRV, we examine whether countries intend to MRV all forests, land uses and carbon pools.

3.2. Administrative capacity to implement MRV

Young and Levy (1999) identify developing administrative capacity of national authorities to implement international institutions as one of the conditions essential for effective action on environmental problems. Therefore, development of administrative capacity of national authorities to implement the provisions of an international institution in itself constitute a measure of effectiveness of such institutions. Cornell (2002) conceptualizes developing administrative capacity to include developing clear procedures, hiring skilled labour and developing expertise, and building cooperative partnerships. Accordingly, we examine REDD+ countries' progress in: (1) clarifying MRV procedures, which encompass methods, guidelines and best practices to follow while conducting MRV; (2) linking REDD+ MRV with other GHG measuring systems. The UNFCCC encourages developing countries to implement Nationally Appropriate Mitigation Actions (NAMAS) and to report on GHG emission reductions resulting from implementation of these actions (UNFCCC, 2010). This implies that REDD+ MRV should fit within a broader national GHG accounting framework for NAMAS; (3) recruiting and developing expertise to conduct MRV. This is necessary especially given the often low technical expertise to measure forests in REDD+ countries (Korhonen-Kurki et al., 2013b; Romijn et al., 2012); and (4) developing strategic partnerships with national and international academic, research and development partners to support MRV and capacity building activities.

3.3. Exercising 'good' governance in MRV

As argued in section 2, the fourth and fifth guidelines call for transparency, accountability, and participation in MRV, which are key principles of "good" governance (see Secco et al., 2013).

Table 3
Progress in owning technical methods for MRV.

	Owning methods for estimating AD		Owning methods for estimating EF	Scope of MRV	Aggregate score on ownership
	Acquiring RS data	Implementing NFI	Developing higher-order EFs		
Bolivia	Very high	Very high	High	Very high	Very high
Brazil	Very high	Very high	High	Very high	Very high
Peru	Very high	High	Moderate	Very high	Moderate
Burkina Faso	Very high	Very high	Moderate	Very high	High
Cameroon	Very high	Very high	Moderate	Very high	High
DRC	Very high	Very high	High	Moderate	Moderate
Tanzania	High	High	High	High	Low
Mozambique	High	Very high	Moderate	Very high	Moderate
Indonesia	Very high	Very high	High	Very high	Very high
Laos	Very high	Very high	Moderate	Very high	High
Nepal	Very high	Very high	Moderate	Moderate	Low
PNG	High	High	Moderate	Very high	Low
Vietnam	Very high	Very high	High	Very high	Very high

Although good governance is itself a contested concept and include many principles (Cashore and Visseren-Hamakers, Forthcoming; Nthiga, 2014), we focus on participation, transparency and accountability as these are the ones that UNFCCC has explicitly called for in MRV. However, we add a fourth – coordination – for reasons explained below. Participation implies that all actors have an opportunity to be heard and influence decisions (Kishor and Rosenbaum, 2012; Secco et al., 2013). This requires that the institutional arrangements expressly provide for their participation in decision-making on, implementation and evaluation of relevant policies. Developing mechanisms for actor participation is a necessary condition for effective participation. Here, we examine participation based on whether countries aim to: (a) involve different actors – state (both forestry and non-forestry), civil society, private and local communities – in MRV, (b) develop mechanisms for actor participation in MRV, and (c) conflict resolution mechanisms.

The UNFCCC also requires NFMS to be transparent and accountable (fourth guideline). Transparency implies that information about a resource and its governance be available to all actors (Gupta and Mason, 2014; Kishor and Rosenbaum, 2012). Transparency is indicated by the extent to which institutional arrangements allow access to and use of information by all actors. This entails availability of documentation procedures, timely provision of information and in a form understandable by all actors and availability of feedback mechanisms (Kishor and Rosenbaum, 2012; Secco et al., 2013). Here, we examine transparency in MRV based on: (a) developing mechanisms for making MRV results public, and for (b) making datasets, methods, approaches etc. public, and (c) provision of MRV results in a timely manner.

Accountability means that those in authority can be held accountable for their actions and decisions (Biermann and Gupta, 2011; Kishor and Rosenbaum, 2012). Indicators of accountability include clarity of roles, clear reporting, frequent monitoring and clear rationales for decision making (Secco et al., 2013). Here, we assess accountability based on clarity of (a) roles of the different actors involved in MRV, and (b) reporting channels. Availability of external evaluation mechanisms, and periodic reporting are not considered since it is assumed that the reported emission reductions/removals will be independently verified under the UNFCCC (see UNFCCC (2014)).

While the UNFCCC does not explicitly call for coordination, we add it for four reasons. First, deforestation and degradation stem from several causes, many of which arise outside the forestry sector. Second, in most REDD+ countries, forests fall under multiple jurisdictional levels or non-forestry state agencies. Third, in many countries, several REDD+ pilot projects have been initiated. Fourth, the UNFCCC has called on REDD+ countries to nominate National Entities to serve as liaisons between them and the UNFCCC (UNFCCC, 2014) on REDD+-related issues (e.g. receiving results-based payments). A coordination mechanism is therefore necessary to coordinate MRV between different levels and agencies of government, the forest agency and REDD+ pilots, and among

Table 4
Countries' progress in developing administrative capacity for MRV.

	Developing MRV procedures	Linking REDD+ MRV with other GHG measuring systems	Recruiting & building expertise	Developing strategic partnerships	Aggregate score on administrative capacity
Bolivia	High	Moderate	Very high	Very high	High
Brazil	Very high	Very high	Very high	Very high	Very high
Peru	High	Moderate	Very high	Very high	High
Burkina Faso	High	Moderate	High	High	Moderate
Cameroon	Moderate	Moderate	High	Very high	Moderate
DRC	Very high	Moderate	Very high	Very high	Very high
Tanzania	High	Moderate	High	High	Moderate
Mozambique	Very high	Low	Very high	High	Low
Indonesia	Very high	Very high	Very high	Very high	Very high
Laos	Moderate	Moderate	Very high	Very high	Low
Nepal	Very high	Low	Moderate	Moderate	Low
PNG	High	Moderate	High	High	Low
Vietnam	Very high	Moderate	High	Very high	High

Table 5
Exercising good governance in MRV.

	Participation			Transparency			Accountability		Coordination	Aggregate score on 'good' governance
	Involvement of different societal actors	Development of Participation Mechanisms	Development of conflict resolution mechanisms	Making MRV results public	Making datasets, approaches, etc. public	Timely provision of MRV data	Clarification of roles	Clarification of reporting channels	Development of coordination mechanism	
Bolivia	Very high	High	Low	Moderate	Moderate	High	Moderate	Low	Moderate	Moderate
Brazil	Very high	Very high	Low	Very high	Very high	Very high	Very high	Very high	Very high	Very high
Peru	Very high	Moderate	Low	High	Moderate	Very high	Moderate	Moderate	High	High
Burkina Faso	Very high	Moderate	Low	Moderate	Low	Low	High	Low	Low	Low
Cameroon	Very high	High	Low	Moderate	Low	Low	High	Moderate	Moderate	Moderate
DRC	Very high	Very high	Low	Very high	Very high	Very high	Moderate	Moderate	Low	High
Tanzania	Very high	Very high	Low	Low	Low	Low	High	High	High	Moderate
Mozambique	Very high	Low	Low	Very high	Moderate	Low	Moderate	Moderate	Moderate	Moderate
Indonesia	Very high	Moderate	Low	Very high	Moderate	High	Moderate	High	High	High
Laos	Very high	Low	Low	Moderate	Low	Low	Low	Low	Low	Low
Nepal	Very high	Very high	Low	High	Moderate	Low	High	Moderate	Moderate	Moderate
PNG	Very high	High	Low	High	Moderate	Low	High	Moderate	Moderate	Moderate
Vietnam	Very high	Very high	Low	Moderate	Moderate	Low	Very high	Very high	Moderate	High

different sectors. We therefore examine whether REDD+ countries have developed mechanisms to coordinate MRV between agencies and levels of government, REDD+ pilots, and different sectors.

4. REDD+ countries progress in implementing technical guidelines and good governance requirements for MRV

4.1. Owning technical methods for MRV

Table 3 shows countries' progress in acquiring and owning technical methods for MRV. Mozambique, Tanzania and PNG have started acquiring and owning RS data while the rest have done so. Also, Peru, Tanzania and PNG have started implementing their NFIs while the rest have done this. However, no country has developed higher-order/country-specific Emission Factors; while all aim to develop higher-order EF, only six have started doing so. In terms of scope of MRV, DRC and Nepal aim to MRV only a few forests, land uses and carbon pools while Tanzania aims to MRV only key forests, land uses and carbon pools. The rest aim to MRV all forests, land uses and carbon pools.

4.2. Developing administrative capacity to implement REDD+ MRV

Table 4 shows that six countries have developed MRV procedures (i.e. methods, protocols, approaches) while five are in the process of doing so. The remaining two plans to do so.

Although all countries (except Mozambique and Nepal) plan to link REDD+ MRV with other GHG measuring systems, only Brazil and Indonesia have developed mechanisms for doing so. The rest are still in the planning stage. In terms of expertise, seven countries have recruited and built expertise for measuring forests while five have started doing so. Only Nepal is still in the planning stage. Eight countries have developed strategic partnerships with national and international research institutes and development agencies to support them in measuring forests. The rest have started developing such partnerships except Nepal, which is in the planning stage.

4.3. Exercising good governance in MRV

Table 5 shows countries' progress in building 'good' governance in MRV. In terms of participation, all countries aim to involve both forestry and non-forestry state agencies, civil society, private sector and local communities in MRV. However, only Brazil, DRC, Tanzania, Nepal and Vietnam have developed mechanisms for involving these actors in MRV. Three others have started developing such mechanisms while another three are in the planning stage. Mozambique and Laos have, however, not considered developing such mechanisms. None of the countries have developed mechanisms for resolving conflicts in MRV specifically, although seven plan to develop mechanisms for

Table 6
Countries' aggregate score on each dimension of and overall effectiveness of REDD+ MRV.

	Owning technical methods	Developing administrative capacity	Exercising good governance	Overall effectiveness of REDD+ MRV
Bolivia	Very high	High	Moderate	Moderate
Brazil	Very high	Very high	Very high	Very high
Peru	Moderate	High	High	Moderate
Burkina Faso	High	Moderate	Low	Low
Cameroon	High	Moderate	Moderate	Moderate
DRC	Moderate	Very high	High	High
Tanzania	Low	Moderate	Moderate	Moderate
Mozambique	Moderate	Low	Moderate	Low
Indonesia	Very high	Very high	High	High
Laos	High	Low	Low	Low
Nepal	Low	Low	Moderate	Low
PNG	Low	Low	Moderate	Low
Vietnam	Very high	High	High	High

resolving REDD+-related conflicts more generally (not shown in the Table).

In terms of transparency, all countries except Tanzania plan to make MRV results public. However, only Brazil, DRC, Mozambique and Indonesia have developed mechanisms for making MRV results public. Three others have started developing such mechanisms. Although nine countries plan to make MRV datasets, methods, etc. public, only Brazil and DRC have developed mechanisms for doing so. Burkina Faso, Cameroon, Tanzania and Laos have, however, not considered making these public. Only Brazil, Peru and DRC will provide MRV results in timely manner. In terms of accountability, Brazil and Vietnam have clarified the roles/responsibilities of the actors who will participate in MRV. Six other countries have started doing so while four are in the planning stage. Only Laos has not considered this aspect. Brazil and Vietnam have clarified reporting channels between actors who will participate in MRV while Tanzania and Peru have started doing so. The rest are in the planning stage except Bolivia, Burkina Faso and Laos that have not considered this aspect. On coordination, Brazil has developed mechanisms for coordinating MRV among involved actors while Peru, Tanzania and Indonesia have started doing so. The rest are in the planning stage except Burkina Faso, DRC and Laos that have not considered this aspect.

4.4. Countries' overall progress in implementing UNFCCC technical and good governance guidelines for MRV

Table 6 shows REDD+ countries' aggregate score on each dimension of, and overall performance in implementing technical guidelines and good governance requirements for MRV.[1] Bolivia, Brazil, Indonesia and Vietnam score very high on 'ownership of technical methods' for MRV. The rest fall within the high and moderate categories except Tanzania, Nepal and PNG, which rank low. In terms of developing 'administrative capacity' to implement MRV, Brazil, DRC and Indonesia rank very high while Bolivia, Peru and Vietnam rank high. Burkina Faso, Cameroon and Tanzania rank moderate while the rest rank low. Finally, on exercising 'good governance' in MRV, only Brazil ranks very high. The rest fall within the high and moderate categories except Burkina Faso and Laos, which rank low. Overall, only Brazil score very high in implementing the technical guidelines and good governance requirements for MRV, followed by DRC, Indonesia and Vietnam. Bolivia, Peru, Cameroon, Tanzania ranks moderate while Burkina Faso, Mozambique, Nepal, Laos and PNG ranks low.

Several potential explanations for these scores can be found in the literature. Brazil's very high overall score on implementing technical and good governance requirements for MRV reflects its long experience in forest measurements in general and deforestation in particular (May et al., 2011). Laos' low overall score is due to its low aggregate score on 'administrative capacity' and 'good governance', which can both be attributed to the limited participation of local population in land-use planning and access to forest information as well as the absence of a fully-developed

civil society (Lestrelin et al., 2013). For Nepal, the low overall score is due to its low aggregate score on 'ownership of technical methods' and on 'good governance'. The latter can be attributed to lack of meaningful consultation on REDD+ (Paudel et al., 2013) and dominance of the REDD+ policy arena by governmental actors (Bushley, 2014), and the former to the mountainous nature of the country, which poses RS challenges and limits large-scale ground-based measurements. PNG's low overall score reflects its slow development of REDD+ policies and institutional arrangements (Brockhaus and Di Gregorio, 2014).

5. Discussion and recommendations

5.1. Owning technical methods

The findings show that REDD+ countries have either started acquiring or have acquired and own technical methods for forest area and area change measuring (i.e. have RS data and implemented NFI). This finding supports those of other authors (Bernard et al., 2014; Romijn et al., 2015). Virtually all REDD+ countries have implemented some form of forest measurements using both RS and ground-based methods, often supported by bilateral, multilateral and international agencies, especially the FAO (Saket et al., 2010). Moreover, since 2008, Landsat images have been available free of cost thereby improving access to RS data. The challenge for most REDD+ countries is to both assemble RS data within their jurisdictions and/or acquire new ones and regularly implement NFIs. International support in both areas is still needed since most high-end RS data are not yet freely available (Wulder and Coops, 2014) and regular implementation of NFI remains a challenge in many countries (Romijn et al., 2015).

It is remarkable that all 13 countries (except DRC and Nepal) plan to measure and report on at least key forest types, land uses and carbon pools. While this is probably driven by countries' desire to generate large emission reductions in order to earn higher result-based payments, it will help minimize leakage and double counting. A major weakness in countries' progress in owning and controlling technical methods for MRV is the fact that none has developed higher-order Emission Factors, as Romijn et al. (2012) also highlighted. This weakness is due to the very large amounts of financial resources involved in estimating higher-order Emission Factors (see Hardcastle and Baird (2008) for country-specific estimates), which most REDD+ countries currently lack. REDD+ donors should therefore support countries with the necessary resources to enable them develop higher-order EFs.

5.2. Developing administrative capacity

The vast majority of the countries ranked only low to moderate on developing administrative capacity to implement MRV (Table 6), which represents a major weakness in their overall progress in implementing technical guidelines and good governance requirements for MRV. This low score on administrative capacity for MRV stems from the fact most countries have not developed mechanisms for linking REDD+ MRV with other GHG measuring systems (Table 5). Yet, as noted in section 3.2, REDD+ MRV should be developed within the broader context of MRV for NAMAS. Moreover, in many countries, REDD+ falls under jurisdictions of forest or related authorities, while authorities responsible for climate change (so-called UNFCCC focal points) and who are responsible for preparing National Communications and reporting on national GHG emissions, are found in the ministries of environment. REDD+ countries should therefore develop clear channels on how information/data from REDD+ MRV will flow to these UNFCCC focal points, and vice versa.

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[1] Eleven criteria and 17 indicators were developed (Table 2). Each indicator received a score of 0–3 depending on progress in its implementation. Overall, the maximum points that a country could score was 51 (17×3). REDD+ country's overall progress in implementing UNFCCC decisions on MRV was rated very high for a score of >40, high for a score of 33–40, medium for a score of 26–32 and low for a score of <26. This scale was defined after analysing the relative distribution of score across the 13 countries. The same procedures was used to calculate aggregate score for each dimension. For example, the maximum possible score for 'ownership of technical methods' is 12 (4×3). Aggregate score on ownership of technical methods was rated very high for a score of >10.25, high for a score of 9.5– <10.25, medium for a score of 8.75– <9.5 and low for a score of <8.75.

Although our findings show that most countries have started recruiting and building expertise for REDD+ MRV, this involved recruiting just a few persons and *ad hoc* training of a handful of people. As Bernard et al. (2014) and Ochieng et al. (Forthcoming) observe, REDD+ countries have not yet developed systematic capacity building programs. Given the tremendous task involved in measuring deforestation and degradation, and the lack of adequate expertise for MRV in many REDD+ countries (Korhonen-Kurki et al., 2013b), REDD+ donors should support countries to recruit and train a critical mass of national actors if MRV is to be durable.

5.3. Exercising good governance in MRV

Like with 'administrative capacity', the vast majority of countries ranked only low to moderate in terms of exercising good governance in MRV, which represents another major weakness in their overall progress in implementing technical guidelines and good governance requirements for MRV. While all countries aim to involve different actors in MRV, including local communities, as Pratihast et al. (2013) also show, only five countries have developed mechanisms for their participation in MRV (Table 5). These included Nepal, Tanzania and PNG where donor-driven programs have developed such mechanisms (Verplanke and Zahabu, 2009), highlighting the need for increased donor/international investments in developing such mechanisms. Moreover, in many REDD+ countries there are conflicts among different levels and agencies of government on MRV-related issues such as responsibilities for data (Korhonen-Kurki et al., 2013a; Ochieng et al., 2015; Robiglio et al., 2014). However, our findings show that no country has developed mechanisms for resolving these MRV-related conflicts. While this attests to the current assumption that MRV is a technical activity, free of political contestations, these conflicts point to the political character of MRV especially as regards distribution of roles and potential benefits associated with assuming such roles. Countries should therefore develop mechanisms specifically aimed at resolving MRV-related conflicts. Clarifying the roles of each actor involved in MRV and the reporting channels among them could also help alleviate conflicts. This will have the added advantage of improving accountability in MRV that is wanting in most countries.

The purpose of REDD+ MRV is not only to measure emission reductions/removals but also to ensure timely response to threats of deforestation and degradation. This requires that MRV results be communicated to relevant authorities to enable them to take appropriate action. Such communication will be effective only if done in a timely manner. However, our findings show that only Brazil has developed mechanisms for coordinating and communicating MRV results between different levels and agencies of government (Table 4). Although Peru, DRC, Mozambique, Indonesia, Nepal and PNG have either started or developed mechanisms for making MRV results public, the rest are yet to do so. Moreover, besides Brazil, only Peru and DRC will provide MRV results in a timely manner. Given its long experience in near-real time deforestation measuring and in coordinating forest measurement results between different levels and agencies of government (see May et al., 2011), Brazil could help other countries build similar capacities within the framework of south–south cooperation. Empowering local-level actors, especially local communities, to not only report but also to act on identified threats should also be considered. This can be done by both allocating communities clear roles in MRV and providing them with tools such as mobile hand-held devices (Pratihast et al., 2012) to enable them record and report identified threats.

6. Conclusion and limitations

In conclusion, this study highlights that there is low to moderate progress in implementing the UNFCCC technical guidelines and good governance requirements for MRV in majority of REDD+ countries, and that this slow progress is because while REDD+ countries rank high in terms of 'ownership of technical methods' for MRV, the vast majority ranks only low to moderate in terms of 'administrative capacity' and 'good governance'. This means that although REDD+ countries have started developing technical methods for MRV (acquiring RS data, implementing NFIs, establishing sampling plots), they have not paid adequate attention to building the capacity to administer MRV and to propagating good governance in MRV. This is problematic, since building administrative competence (including technical expertise of the multiple actors who will participate in MRV) and propagating good governance in MRV are indispensable if the measured and reported REDD+ carbon impacts are to be credible and legitimate in the eyes of both national and international actors. Moreover, participation, transparency, accountability and coordination in MRV are necessary to ensure equitable distribution of REDD+ payments. Therefore, besides developing technical methods for MRV, countries should also pay attention to building administrative capacity for, and propagating good governance in MRV. International vigilance and support in these areas is needed.

While our study has developed new insights on REDD+ countries' progress in implementing technical guidelines and good governance requirements for MRV, it also has several limitations. For one, we have relied on only secondary data. While the coverage of the documents reviewed is extensive (see Annex A), it is also possible that many of the countries have already implemented some of the items indicated in the documents since their publication. In addition, in some countries (e.g. Cameroon), there were contradictions in information provided in the documents. We addressed this by taking the position indicated in the most recent document. Moreover, while the document analysis has allowed us to develop a "bird's eye view" of REDD+ countries' progress in implementing UNFCCC decisions on REDD+ MRV, subsequent analyses should combine document analysis with primary data sources such as interviews and focus group discussions with national-level actors and international experts, as this would provide a more up-to-date and contextualized account of REDD+ countries' progress in implementing MRV. Lastly, the criteria used to assess good governance in MRV do not cover the whole set of principles of good governance, as discussed in section 3.3. Additional good governance principles and indicators could be included in future analyses, as maybe appropriate. Despite these limitations, our study has advanced the assessment of technical MRV capacity by adding an institutional dimension along the lines of 'ownership of technical methods', 'administrative capacity' and 'good governance'.

Appendix A.

National and International Documents Reviewed by Country

	Readiness preparation idea note	Readiness preparation proposal	Emission reduction program idea note	UN REDD national program document	Country REDD+ strategy	MRV framework document	CIFOR country profile	Norwegian international climate and forest initiative evaluation reports
Burkina Faso		Oct. 2013						
Cameroon	July 2008	Jan. 2013					2011	
DRC	March 2008	March 2010	March 2014	March 2010	No Date		2013	2010; Sep. 2013
Mozambique	March 2008	Dec. 2010					2012	
Tanzania	Feb. 2009	Oct. 2010		Oct. 2009	March 2013		2015	2010; Sep.2013
Indonesia		May 2009	Oct. 2014	Oct. 2009	Sep. 2012	Nov. 2012	2012	2010; Sep. 2013
Laos	June 2008	Dec. 2010					2013	
Nepal	April 2008	Sep. 2010	March 2014				2013	
PNG	July 2008	Dec. 2013		Jan. 2011			2013	
Vietnam	March 2008	Nov. 2011	May 2014	Feb. 2011	Feb. 2011	Sep. 2011	2012	
Bolivia	March 2008			March 2010			2014	
Brazil					Dec. 2009		2011	2010
Peru	June 2008	March 2011	May 2014			March 2014	2014	

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