REDD+ MEASUREMENT, REPORTING AND VERIFICATION (MRV) MANUAL

SUMMARY FOR POLICYMAKERS

INTRODUCTION

REDD+ refers to mitigation actions in developing countries relating to reducing emissions from deforestation and forest degradation, with the "plus" signifying conservation, sustainable management of forests, and enhancement of forest carbon stocks. Under the auspices of the United Nations Framework Convention on Climate Change (UNFCCC), developing countries wishing to engage in REDD+ activities need to ensure that they have the necessary capacity to implement climate change mitigation actions in the forestry sector using a three-phased approach (Box 1). Successful implementation of such actions relies on robust capabilities to routinely and reliably monitor changes in forest areas, carbon stocks, and associated greenhouse gas (GHG) emissions and removals through the establishment of a Measurement, Reporting and Verification (MRV) system.

About FCMC

The United States Agency for International Development (USAID) launched the Forest Carbon, Markets and Communities (FCMC) Program to support partner governments and local and international stakeholders with technical assistance in developing and implementing integrated REDD+ initiatives. FCMC focuses on activities in four technical task areas: social and environmental soundness (SES); finance and carbon markets; MRV; and low emissions development strategies (LEDS). In addition to these technical areas, a fifth element, entitled "Cross-Cutting," was introduced. The objective of the cross-cutting element was making links and integrating work, where appropriate, between the thematic areas and undertaking activities that are clearly cross-cutting in nature. As part of the MRV task, FCMC has produced a REDD+ MRV Manual to assist developing countries in the establishment of REDD+ MRV systems. This document complements the Manual, introduces key MRV concepts and focuses on essential and fundamental components. It is intended as an overview document for policymakers involved in the UNFCCC negotiations on REDD+ and those who are tasked with developing national MRV systems.

MRV FOR REDD+

MRV for REDD+ specifically refers to the measurement, reporting and verification of a country's forest, and associated GHG emissions and removals, including their changes over time. The reliability of the generated information depends on whether data comply with defined quality criteria: transparency, comparability, consistency, completeness, and accuracy. Overall guidance on how to adhere to these criteria has been provided by the Intergovernmental Panel on Climate Change (IPCC) at the invitation of the UNFCCC.

Box 1: Three-Phase Approach for REDD+

During **Phase 1** (often referred to as "REDD+ readiness"), countries would develop a national strategy or action plan; a national Forest Reference Emission Level and/or Forest Reference Level; a robust and transparent national forest monitoring system; and a system for providing information on how social, legal, and environmental safeguards are being addressed and respected throughout the implementation of the REDD+ activities.

Phase 2 involves the implementation of national policies and measures and national strategies or action plans, which could involve further capacity-building, technology development and transfer, and results-based demonstration activities.

Phase 3 involves implementation of REDD+ activities that are measured, reported, and verified emission reductions and removals from the forestry sector for results-based payments.

As countries are at different levels of development and have different capacity needs, implementation of these three phases is taking place on different timeframes. For example, some countries will need to start from scratch and ensure that they go through the first two phases before they are ready to implement REDD+ activities, while others could skip earlier phases if they have already put in place the elements needed under Phase 1 and 2.

Measurement refers to the direct or indirect measurement of emissions or removals from forest areas as a result of human activities. Direct measurement can include both field measurements and remote sensing, and can be supplemented with modeling. Indirect measurement involves estimation of emissions reductions using equations based on data on land areas and specific emission factors or the use of complex models that take into account a number of different parameters that affect the release or sequestration of carbon and other GHGs.

Reporting refers to the presentation of measured information in a transparent and (often) standardized manner. Reported information encompasses forest-related data and estimates of GHGs and the methodologies used to derive them, as well as other related issues, such as quality assurance and quality control (QA/QC) activities and uncertainty estimation, among others. For example, under the UNFCCC reporting agreements, developing countries can report their GHG inventory data as part of their national communication to the UNFCCC and in the context of biennial update reports. For both of these types of reports, instructions regarding their content have been developed and agreed upon.[1]

Verification refers to the assessment (through internal and external checks) of the completeness, consistency, and reliability of the reported information through an independent process. Verification provides inputs to improve data (including GHG emissions and removals as well as all measured data or derived parameters) and helps to build confidence in, and improve scientific understanding of, estimates and trends.

In addition to MRV, **monitoring** is another activity of particular importance for REDD+ activities. In general, monitoring can be categorized as a management function that entails reviewing

[1] Further decisions on MRV for REDD+ are expected to be adopted at the next Meeting of the Conference of the Parties (COP) to the UNFCCC (COP 19) in Warsaw, Poland, November 2013.

implementation of planned objectives and goals. It brings together multiple objectives and aims to maximize total benefits. Monitoring encompasses MRV, governance aspects, and generating information on the effectiveness of policies and forest management practices as part of REDD+ implementation.

A MRV system for REDD+ is not a stand-alone activity. The system should be integrated with a country's overall goals for sustainable development. It should be designed to capture sufficient detail for an assessment of the GHG impacts of policies and measures that are planned or implemented, plus the impacts on other activities. Monitoring systems must include all lands that are impacted by human activity and are defined as managed lands. While developing a MRV system for REDD+, a country has the opportunity to identify its national and regional development objectives and actions associated with its REDD+ strategy. This information facilitates the design of a MRV system that can report on the effectiveness of these actions. Furthermore, the system should be coordinated with any system put in place for nationally appropriate mitigation actions (NAMAs) and related reporting.

In countries with nested REDD+ programs under development, where REDD+ activities exist at multiple levels, MRV must be coordinated to ensure that sub-national systems do not conflict with the national system. In addition, a MRV system should be linked to decision making and enforcement for better adaptive management and policy implementation at the national level. During UNFCCC negotiations, governments agreed that local communities should be involved in the MRV process.[2] However, there is no specific guidance on how this local engagement should be achieved and countries have the flexibility to decide the extent and modalities of such involvement.

During the 19th session of the United Nations Climate Change negotiations in Warsaw (December 2013), seven decisions on REDD+ were adopted that are collectively known as the "Warsaw Framework for REDD+." Among other things, these decisions provide guidance to countries on MRV-related matters, including:

- Coordination of support for the implementation of activities in relation to mitigation actions in the forest sector by developing countries, including institutional arrangements;
- Modalities for national forest monitoring systems;
- The timing and the frequency of presentations of the summary of information on how all the safeguards are being addressed and respected;
- Guidelines and procedures for the technical assessment of submissions from Parties on proposed forest reference emission levels (FRELs) and/or forest reference levels (FRLs); and
- Modalities for measuring, reporting and verifying.

These decisions are described in more detail in the Manual[3].

According to decision 12/CP.17, forest reference emission levels and/or forest reference levels expressed in tonnes of CO2 equivalent per year are benchmarks for assessing each country's performance in implementing REDD+ activities. There are no formal definitions of FRELs and FRLs under the UNFCCC.

[2] Decision 4/CP.15 (preamble and Paragraph 3).

[3] http://www.fcmcglobal.org/mrvmanual.html

KEY INSTITUTIONAL CONSIDERATIONS

As with any international system in which an accounting procedure is foreseen, the GHG information reported is the basis for assessing performance compared to its reference (emissions) level and could also form the basis for assigning any eventual incentives. Under the UNFCCC, forest monitoring systems provide the means by which countries can monitor progress in enhancing carbon removals from the atmosphere and achieving the Convention's ultimate objective.

To facilitate REDD+ implementation, countries should establish institutional (national and interim sub-national, as appropriate) arrangements that ensure sustainable estimation of GHG emissions and removals from REDD+ activities. These arrangements should cover all managed lands and activities relevant to REDD+, and adhere to the IPCC quality criteria (transparency, comparability, consistency, completeness, and accuracy) and relevant UNFCCC guidance (see for example, UNFCCC decisions 2/CP.13, 4/CP.15 and 12/CP.17).[4]

Countries can use their own definitions of managed and unmanaged lands, which may refer to internationally accepted definitions, such as those used by the United Nations Food and Agriculture Organization (FAO) or the Convention on Wetlands of International Importance (Ramsar Convention). Managed land may be distinguished from unmanaged land by fulfilling not only a production but also an ecological and social function. The detailed definitions and national approach to distinguishing between unmanaged and managed lands should be described in a transparent manner in an inventory report.

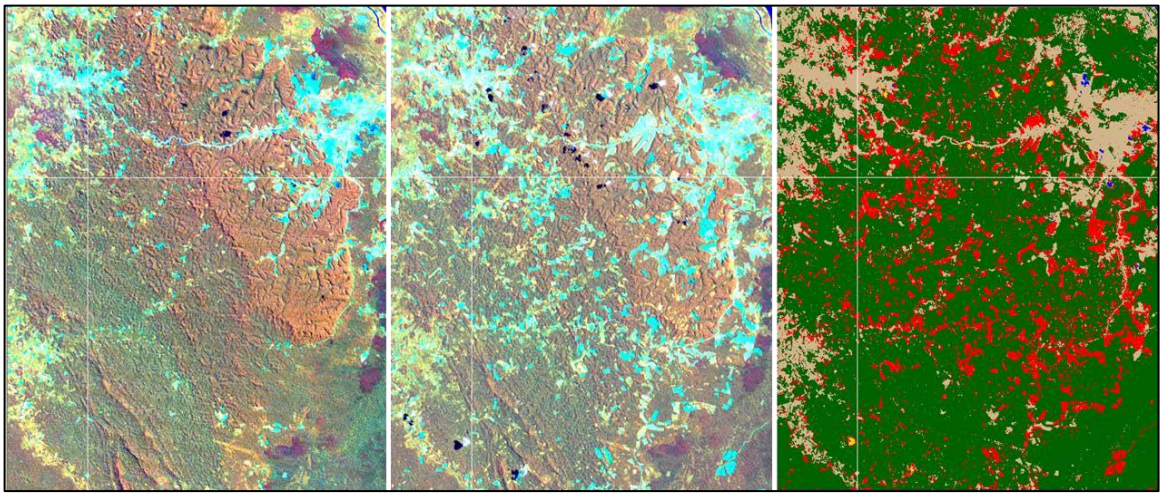
A key benefit of these arrangements is the development and maintenance of stronger in-country technical capacities and relevant national and regional institutions and organizations. Other benefits include broader environmental monitoring and GHG accounting, sustainable economic development, and natural resource management. Such arrangements can enable countries to participate in future financial mechanisms, environmental markets, and voluntary or compliance-based mechanisms.

Institutional arrangements help a country establish and maintain the institutional, legal, financial, and procedural framework that brings together—and defines the roles of—government agencies and other entities involved in the preparation of emission and removal estimates from REDD+ activities. These arrangements also ensure that sufficient capacity exists for the timely collection of data needed for estimating anthropogenic GHG emissions by sources and removals by sinks, as well as sufficient capacity in terms of the technical competence of the staff involved.

Establishing institutional arrangements includes a number of specific activities, which depend on the identified MRV goals including, but not limited to, preparation of national reports and communications to meet international commitments, seeking funding for REDD+ projects, and implementation of national or regional initiatives on REDD+.

[4] http://unfccc.int/resource/docs/2007/cop13/eng/06a01.pdf#page=8; http://unfccc.int/resource/docs/2009/cop15/eng/11a01.pdf#page=11; and http://unfccc.int/resource/docs/2011/cop17/eng/09a01.pdf#page=14.

The first step involves identifying specific actions consistent with MRV goals and developing a plan of action, including securing the resources and commitment of all relevant stakeholders in the country. This first step also includes: the designation of a national-level entity with the overall responsibility to coordinate the REDD+ MRV system; identification of other organizations or institutions that will contribute to various aspects of the MRV process; definition of working arrangements (for example, establishment of working groups or task forces) to undertake specific tasks; and development of procedures and systems for collecting, analyzing, reporting, and archiving information.



Example of deforestation mapping using imagery from two different time periods (left and center)

Once the specific actions are identified, a country needs to establish the necessary administrative and organizational arrangements. Every country will likely have its own approach on how to implement the necessary administrative and institutional arrangements for REDD+. Whatever approach is taken, the process requires development of clear roles and responsibilities. It is recommended, for example, that the national-level entity be charged with the overall responsibility to deal with the REDD+ MRV system, perhaps as a subset of a more comprehensive GHG inventory.

METHODOLOGICAL CONSIDERATIONS

To produce reliable data on GHG emissions and removals from REDD+ activities, it is important to consider the inventory's scope, data needs, and methodologies. It is also critical to ensure that the national GHG inventory covers all anthropogenic emissions and removals within a country's managed lands over a specified time period.

Guidance on the estimation of GHG emissions and removals is provided in the IPCC Good Practice Guidance for Land Use, Land-Use Change, and Forestry (GPG-LULUCF). The GPG-LULUCF offers a hierarchical three-tier system including methods ranging from the use of default values and simple equations (Tier 1) to increasingly country-specific values, data, and models (Tier 3). This system reflects increasing levels of accuracy and data requirements; a country can select which Tier, or combination of Tiers, it will use. In addition, the GPG-LULUCF provides three approaches for gathering activity data (such as forest areas) ranging from collecting data at an aggregate level to disaggregated spatially explicit collection systems. Although countries are free to choose the approach most appropriate to their national circumstances, REDD+ implementation is likely to require detailed information to ensure

the accuracy of the estimates especially of those sub-classes of land cover and change that have a significant contribution to the total emissions or removals.

Based on the methodological approach suggested by the IPCC, the minimum objective of countries that participate in a mitigation mechanism connected to positive incentives (e.g., REDD+ activities) under the UNFCCC should have the capacity to estimate carbon stock changes with a known uncertainty. To meet this condition, a country needs to have:

i) Country-specific emission factors (for example, by using a national forest inventory) for those changes associated with forest lands;
ii) Multi-temporal inventory data; and
iii) Uncertainty estimates associated with any data reported.

According to UNFCCC guidance, countries will have to establish national forest monitoring systems that quantify changes in terrestrial carbon stocks and changes in land cover. As part of a broader natural resource monitoring program, all countries would benefit from a well-designed, ground-based forest inventory in combination with remote sensing. In addition to acquiring information on carbon stocks, forest inventories provide information that countries can use to make wise resource management decisions. While the opportunity costs associated with forest inventories can be high, an efficient sampling design is needed, which can be facilitated by the collection of data from remote sensing. In the absence of a design-based forest inventory, producing remote sensing or other model-based carbon stock maps allows for estimates of forest-related GHG emissions and removals to be generated, but with potentially higher levels of uncertainty.

Post-deforestation palm oil plantation; Photo by John Musinsky

Many satellite remote sensing techniques exist to enable a country to generate both a historical baseline (or benchmark) of forest cover extent and multi-temporal forest cover change or land-use change information as part of a monitoring system. According to the GPG-LULUCF, it is good practice for a country to account for all relevant land areas designated as managed, and should use a wall-to-wall mapping process or a sampling approach, depending on the resources available and specific land-use change patterns. Additional land-use change information that cannot be adequately derived from remote sensing products can be incorporated through the use of ancillary data layers (including vegetation-type maps and elevation models) and information.

CAPACITY BUILDING CONSIDERATIONS

Developing countries are at various stages of building capacity for developing a valid and transparent MRV system for REDD+. Some already have the necessary infrastructure for an MRV system in place to undertake REDD+ activities; others have started developing national capacity; others are still at the initial stage of identifying needs and seeking international assistance to develop their MRV systems. For all developing countries, however, the following considerations are common for capacity building. As progress is made in building capacity and staffing and defining methods, projections of cost estimates for a sustainable MRV system should be made for overall REDD+ planning purposes.

Carbon stock inventories are necessary for the development of country-specific emission factors, while in general, carbon stock data would be generated through fieldwork. Therefore, a country must consider whether a well-designed sample-based inventory to generate the carbon stock data already exists, or whether a repeatable field campaign, based on permanent plots, will need to be developed. For example, if a field campaign is needed and well-documented protocols covering field methods and sampling strategies already exist in the country, then this will reduce this activity's impact on resources. If possible, a country should concurrently consider the sampling strategies that will be required for the monitoring of selected land-use change types, thus increasing the efficiency of field campaigns.

In addition to carbon stock data, a country may need to develop a program to generate both the historical baseline land cover extent and a land-use and change monitoring system to produce the activity data required for estimating GHG emissions and removals. Much of this information will require the use of satellite remote sensing. Therefore, several capacity-related issues need to be addressed, including the extent of capacity building needs on remote sensing, taking into consideration the complexity of the forest system to be mapped, and the current technical expertise of staff. A country must also consider the appropriate image resolution needed to capture land use and change, the frequency with which this information is needed, based on the change dynamics and specific satellite characteristics, and the future satellite launch and data acquisition strategy and image cost policies. A country could choose to pursue in-depth remote sensing training to generate the information domestically, or could form partnerships with neighboring countries or specialized regional institutions to share or reduce costs associated with capacity building.

Countries should also determine how to incorporate local communities in a MRV system, as appropriate. In general, the strategy for a community-based monitoring component, which could incorporate many different options, includes a robust stakeholder engagement process to gain a thorough understanding of the actual capacities of the various local communities, and fully considers possible linkages to local forest management and vigilance.

The requirements of a robust data management and reporting system must be considered as part of all countries' capacity development. Further, it will be particularly important for countries to develop MRV systems that are transparent and facilitate a verification process.

Illegal deforestation; Photo by Trond Larsen

Expert input and consultation throughout the MRV development process can help with using hardware, developing and deploying software, preparing educational programs, understanding methodological requirements, and developing institutional infrastructure. Various activities may be tested at the sub-national level and then expanded to the national level. It is also imperative that the development of roles and responsibilities for the various institutions involved in the MRV process be clearly developed, articulated, and fully integrated into the capacity building process to ensure efficiency.

CONCLUSIONS

- The establishment of MRV systems for REDD+ is a key component for the successful implementation of mitigation actions in the forestry sector.
- MRV systems for REDD+ ensure the reliable monitoring of carbon and carbon stock changes through the collection and dissemination of transparent, comparable, consistent, complete, and accurate data.
- Having in place robust institutional, legal, and procedural arrangements among government agencies and other entities involved in REDD+ activities ensures sustainable estimation of associated GHG emissions and removals. Key elements of such arrangements are:
  - Identification of specific actions consistent with MRV goals;
  - Development of a plan for completion of the actions, including securing the resources and commitment of all relevant stakeholders in the country;
  - Designation of a national-level entity;
  - Identification of all other organizations or institutions that will contribute to various aspects of the MRV process;
  - Definition of working arrangements to undertake specific tasks; and
  - Development of specific procedures and systems for collecting, reporting, and archiving information.
- To produce estimates of emissions and removals, it is imperative to follow the guidance provided by the IPCC GPG-LULUCF and relevant decisions by the COP.
- A key requirement is for countries to establish national forest monitoring systems that quantify changes in terrestrial carbon stocks and changes in land cover. This encompasses: analysis of data collected via remote sensing, e.g., satellite or aerial images, to produce a forest benchmark map to facilitate the generation of FREL/FRL information, and estimate changes over time; as well as field-based inventories of carbon stocks in different types of forest and other land-use classes.
- Some key capacity building considerations include:
  - Development of carbon stock inventories in order to identify appropriate Emission Factors;
  - Development of a program to generate both the historical baseline land cover extent (Including a benchmark forest extent map and land use information) and a land-use and change monitoring system to produce activity data required for the estimation of GHG emissions and removals;
  - Development of MRV systems that are transparent and facilitate a verification process; and
  - Development of roles and responsibilities for the various institutions involved in the MRV process that are clearly articulated and fully integrated into the capacity building process to ensure efficiency.

FCMC MRV Task Lead: Marc Steininger, m.steininger@conservation.org
FCMC Chief of Party: Stephen Kelleher, stephen.kelleher@fcmcglobal.org
FCMC Contracting Officer's Representative: Olaf Zerbock, ozerbock@usaid.gov
USAID FCMC MRV Activity Manager: Evan Notman, enotman@usaid.gov

FCMC Project Website: www.fcmcglobal.org **| Office:** 1611 North Kent Street, Suite 805, Arlington, VA 22209

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