



## Measurement, reporting and verification (MRV) systems for REDD+

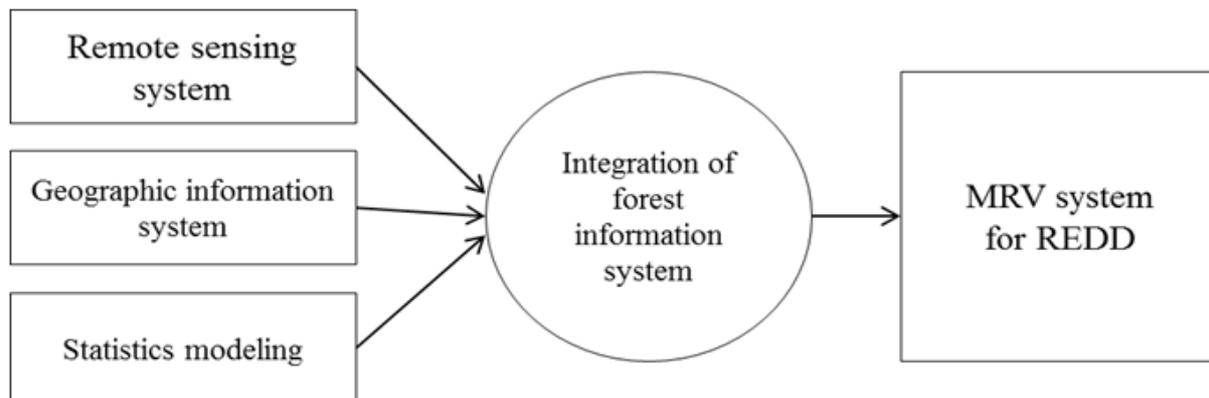
Measurement, reporting and verification (MRV) is an essential aspect of REDD+. Building an MRV system is a question of combining institutional capacity building with the implementation of an operational service. The Norwegian Forestry Group has broad experience from all aspects of the MRV activities and offer assistance in planning and implementation of MRV.



*Measurements are required to verify and report reforestation. (Photo: G-H Strand/NIBIO)*

### **Measurement, reporting and verification (MRV)**

Measurement, reporting and verification (MRV) of the carbon stored in forests is an essential aspect of the effort to offer incentives for developing countries to Reduce Emissions from Deforestation and Forest Degradation (REDD) and promote conservation, sustainable management of forests and enhancement of forest carbon stocks (REDD+). The information collected and verified through MRV systems is the documentation required if developing countries are to receive the payments for their efforts and results achieved in reducing emissions, enhancing carbon stocks and conserving forest resources.



## The three aspects of MRV are

**Measurement:** Obtaining the relevant data

**Reporting:** Preparing and submitting the information to the appropriate authorities

**Verification:** Assessing the data and reported information for completeness, consistency and reliability.

MRV involves a number of processes which have to be organized, standardized and harmonized. The establishment of MRV is therefore essentially an organizational process where the aim is to create or bring together one or more national institutions to undertake the tasks involved. The bulk of work involved in MRV is also closely related to the more general forest and land information systems needed for sustainable forest management and land use policies. Thus, it makes sense to integrate the MRV for REDD+ with the wider institutional capacity building for related national purposes.

## The Measurement components of an MRV system consist of

- a Land Monitoring System to assess activity data on forest area and forest area changes
- a National Forest Inventory to assess emission factors on carbon stocks and carbon stock changes

These two systems provide input to the Reporting component, compiling

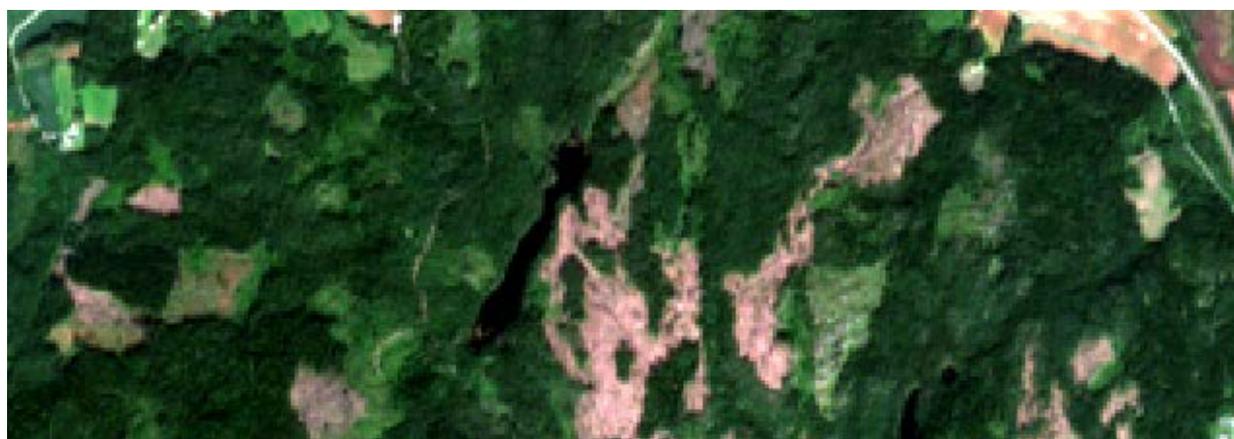
- the land use and forestry sector input to the National GHG Inventory,
- documentation of national forest conservation and sustainable forestry

Finally, the Verification component of the MRV system includes systems for

- assessment of the completeness, consistency and reliability of the information. This is done by the responsible organization itself as well as by independent parties.

There is no fixed solution to how the MRV system should be organized. Each country has its own traditions, experience, knowledge-base and policies. It is important to integrate MRV in existing and planned national systems. In such a way, MRV for REDD+ can greatly benefit from the existing national know-how, and itself also contribute to the wider development of sustainable national land resources policies. The Norwegian Forestry Group and its partner organizations have broad experience with all organizational as well as operational aspects of the MRV system. The experience stems from responsibilities in Norway as well projects as abroad.

The MRV system can either be organized as a single holistic institution embracing all five aspects of MRV listed above, or as a coordinating body cooperating with independent institutions responsible for each of the tasks that constitute the MRV system. The choice depends on national preferences and existing institutional capacity.



*Top: Landsat 8, 21th July 2013. Bottom: Sentinel 2, 22th August 2015. The latter clearly shows the new logging, but also how much more detail we see with 10 m vs. 30 m resolution.*

The Land Monitoring System must in most countries rely on remote sensing from satellites, but aerial photographs and field inventories should be used if available. The Land Monitoring Unit will obtain the necessary imagery; carry out image interpretation according to national or international standards; securely store the resulting maps; process the data

and provide statistical output and reports. A small but essential component is the verification of the results against trusted field data. Members of the Norwegian Forestry Group is responsible for land monitoring systems in Norway and has assisted the development of similar systems abroad, based on field inventories, aerial photo interpretation as well as satellite remote sensing. This work also involves the establishment and maintenance of national standards for land cover and land resource mapping.

The National Forest Inventory is preferably a sample based field inventory of forest resources and condition, if necessary supplemented with aerial photographs, Lidar data or satellite imagery. The Forest Inventory Unit will organize the field inventory and as well as the related image analysis; securely store the results; process the data and provide statistical output and reports. Members of the Norwegian Forestry Group have been responsible for the National Forest Inventory in Norway since its establishment in 1919, and have assisted in the implementation of NFIs in many other countries.

An MRV institution must bring the data provided by the Land Monitoring System and the National Forest Inventory together in order to provide the land use and forestry sector input to the National GHG Inventory. Furthermore, the information compiled through the Measurement components of MRV should be used to document the results of forest conservation efforts and sustainable forestry. Members of the Norwegian Forestry Group who are responsible for this part of the GHG inventory in Norway and provide information on land and forestry to a wide range of stakeholders in Norway.

## Reference projects

National Forest Inventory and Carbon monitoring in Norway

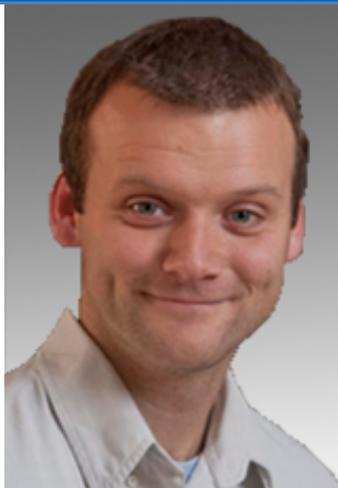
Establishing a National Forest Inventory in Serbia

Introduction of remote sensing courses in Forestry and Agricultural universities in Bosnia-Herzegovina and Serbia

Geographic information science curricula at the Agricultural Universities in West-Balkan

Introduction of Geographic information systems for natural resources management, Asian Institute of Technology, Thailand

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