

MEASUREMENT, REPORTING & VERIFICATION (MRV) FRAMEWORK DOCUMENT

WITH REFERENCE TO SAFEGUARDS INFORMATION AND
MONITORING OF POLICIES AND MEASURES

Under the
VIET NAM NATIONAL REDD+ PROGRAM

Version 1
Draft 3 / September 2011

This Framework Document is the Draft 3 (Ver 1). It is endorsed by the Vietnam REDD+ Office. It is however a living document and will be improved in accordance with international negotiation process, further guidance from the COPs and process of the REDD+ implementation in Vietnam as well as through consultations with key stakeholders. The stakeholder consultation plan for this Document is available as Annex 1.

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ACRONYMS

5MHRP	Five-Million Hectare Reforestation Program, also known as the “661 Program”
AD	Activity Data
AFOLU	Agriculture, Forestry and Other Land Use
AWGLCA	Ad-hoc Working Group on Long-term Collaborative Action (of the UNFCCC)
CFIC	Centre for Forest Information and Consultancy
CLAI	Centre for Land Archives and Information of the General Department of Land Administration
CLRIA	Centre for Land Resources Investigation and Assessment
COP	Conference of Parties
CPC	Commune People’s Committee
DPC	District People’s Committee
EF	Emission Factors
FAO	Food and Agriculture Organization of the United Nations
FIPI	Forest Inventory and Planning Institute
FL	Forestry Land
FORMIS	Forest Management Information System
FPD	Forest Protection Department
GDLA	General Department of Land Administration
GHG-I	Green House Gas -Inventory
GIZ	German International Cooperation
GoV	Government of Viet Nam
GPG	Good Practice Guidance
GSO	General Statistics Office
HPPMG	Harmonized Program and Project Management Guidelines
ICD	International Cooperation Department (MARD)
ICRAF	World Agroforestry Centre
IPCC	Inter-governmental Panel on Climate Change
LMS	Land Monitoring System
LULUCF	Land Use, Land Use Change and Forestry
MARD	Ministry of Agriculture and Rural Development
MONRE	Ministry of Natural Resources and the Environment
MRV	Measurement, Reporting and Verification
NAMA	Nationally Appropriate Mitigation Action
NC	National Communication
NCI	National Carbon Inventory
NFA	National Forest Assessment
NFIMAP	National Forest Inventory, Monitoring and Assessment Program
NFL	Non-Forestry Land
NGHGEI	National Green House Gas Emissions Inventory

NOCCOP	National Office for Climate Change and Ozone Protection
PaMs	Policies and Measures
PPC	Provincial People's Committee
QA/QC	Quality Assessment/Quality Control
RS	Remote Sensing
SBSTA	Subsidiary Body for Scientific and Technological Advice
STI VN	Space Technology Institute of Viet Nam
STWG-MRV	Sub-Technical Working Group on MRV
UNFCCC	United Nations Framework Convention on Climate Change
UN-REDD	United Nations Collaborative Program on Reducing Emissions from Deforestation and Forest Degradation in Developing Countries
VFDS	Viet Nam Forestry Development Strategy 2006 – 2020
VNFOREST	Viet Nam Administration of Forestry

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EXECUTIVE SUMMARY

The development and implementation of mechanisms to reduce emissions from deforestation and forest degradation; and the role of conservation, sustainable management of forests and enhancement of forest carbon stocks (REDD+) has become a national priority for the Government of Viet Nam as part of its climate change mitigation and adaptation strategy. Viet Nam's National REDD+ efforts strive towards internationally recognised standards and verification under the United Nations Framework Convention on Climate Change (UNFCCC).

This Document sets out a framework for developing, implementing and operationalising Viet Nam's MRV System and for taking initial responses to the development needs for Information provision (including on the REDD+ Safeguards) and monitoring of policies and measures (PaMs) as set out by the UNFCCC Decision 1/CP.16 (Cancun Agreement), following the most recent internationally agreed decisions under the UNFCCC and methodological guidelines of the Intergovernmental Panel on Climate Change (IPCC), where applicable.

This Framework Document focuses on description of MRV and its components; Information, and Monitoring of PaMs are also discussed in the context of its monitoring/collection and provision of information, and their mutual linkages, and linkages to the MRV System. MRV refers to the commitment under the Convention (Art. 4) to address anthropogenic emissions by sources and removals by sinks including for the forestry sector. This system must enable identification and tracking of actions and processes related to the five activities identified under REDD+, following the most recently adopted or encouraged IPCC methodological approaches (Decision 4/CP.15). Information refers to the commitments under the Convention for countries to promote the exchange of all types of information related to climate change, as well as to UNFCCC's request for Parties aiming to undertake REDD+ activities to develop a system for providing information on how REDD+ Safeguards are being addressed and respected throughout the implementation of REDD+ activities, while respecting sovereignty. Monitoring of PaMs, or the second "M" of what is referred to as "MRV&M", are the monitoring actions responding to what each country defines as necessary to ensure that its REDD+ actions are results-based. This Framework Document is developed to feed in directly to the National REDD+ Program document, for parts relevant to MRV, Safeguards information, and monitoring of PaMs.

Development and implementation of these respective systems and monitoring frameworks for REDD+ will follow the phased approach contained in paragraph 73 of the Cancun Agreement. Viet Nam is currently in Phase I, building national REDD+ capacity through international partnerships and initiatives. In Phase I, Viet Nam will also need to determine its institutional arrangements for MRV, as well as for the development and implementation of an Information System and the monitoring of national level PaMs. This Framework Document aims to facilitate the discussions that will set out institutional arrangements and capacity building needs to develop and implement these elements.

In Phase II, Viet Nam needs to begin implementing national policies and demonstration activities, ensuring they are results-based through a national forest monitoring system, and develop a system for providing information including on the REDD+ Safeguards, as set out by the UNFCCC.

In Phase III REDD+ will be fully integrated with other formally agreed mitigation mechanisms under UNFCCC, and REDD+ activities will need to be fully measured, reported and verified. This will require an operational Land Monitoring System (LMS) to provide activity data on forest area and forest area changes,

and a National Carbon Inventory (NCI) for REDD+ to quantify emissions or removals per unit activity. The data from these two systems will be combined in a REDD+ GHG-I for submission to the UNFCCC.

1 CONTEXT

1.1 REDD+ AND MRV UNDER THE UNFCCC

The 15th Conference of the Parties (COP15) to the United Nations Framework Convention on Climate Change (UNFCCC) in 2009 adopted a decision on “Methodological guidance for activities relating to reducing emissions from deforestation and forest degradation and the role of conservation, sustainable management of forests and enhancement of forest carbon stocks in developing countries” (REDD+), and in COP16 the following year, further decisions were adopted including those on “Policy approaches and positive incentives on issues relating to 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”.

The decision adopted by Parties at COP16 in 2010 lists the five forest-related activities which jointly comprise REDD+. This broad scope was agreed in order to reflect the wide range of countries’ national circumstances (e.g. high forest cover and high deforestation/high forest cover and low deforestation/expanding their forest area and their carbon stocks).

<UNFCCC Decision 1/CP.16 Paragraph 70>

Encourages developing country Parties to contribute to mitigation actions in the forest sector by undertaking the following activities, as deemed appropriate by each Party and in accordance with their respective capabilities and national circumstances:

- (a) Reducing emissions from deforestation;*
- (b) Reducing emissions from forest degradation;*
- (c) Conservation of forest carbon stocks;*
- (d) Sustainable management of forests;*
- (e) Enhancement of forest carbon stocks.*

The objective of the MRV System, would be to enable assessment of national GHG emissions and removals in the forestry sector and to report this to the UNFCCC, in a transparent, accountable and verifiable manner. While the deliberations from COP 16 requests the Subsidiary Body for Scientific and Technological Advice (SBSTA) to develop modalities for MRV (Appendix II (c), Decision 1/CP.16), the text does not provide a clear definition of MRV. However, work on defining MRV (such as this Document) is encouraged, aiming to inform the UNFCCC negotiation process.

<UNFCCC Decision 4/CP.15 Paragraph 1>

Requests developing country Parties, on the basis of work conducted on the methodological issues set out in decision 2/CP.13, paragraphs 7 and 11, to take the following guidance into account for activities relating to decision 2/CP.13, and without prejudging any further relevant decisions of the Conference of the Parties, in particular those relating to measurement and reporting:

(...)

(c) To use the most recent Intergovernmental Panel on Climate Change guidance and guidelines, as adopted or encouraged by the Conference of the Parties, as appropriate, as a basis for estimating anthropogenic forest-related greenhouse gas emissions by sources and removals by sinks, forest carbon stocks and forest area changes;

(d) To establish, according to national circumstances and capabilities, robust and transparent national forest monitoring systems and, if appropriate, sub-national systems as part of national monitoring systems that:

(i) Use a combination of remote sensing and ground-based forest carbon inventory approaches for estimating, as appropriate, anthropogenic forest-related greenhouse gas emissions by sources and removals by sinks, forest carbon stocks and forest area changes;

(ii) Provide estimates that are transparent, consistent, as far as possible accurate, and that reduce uncertainties, taking into account national capabilities and capacities;

(iii) Are transparent and their results are available and suitable for review as agreed by the Conference of the Parties;

Note: Underlines by author for emphasis. (Also applicable to all boxes appearing in this Document.)

For MRV, the 2006 IPCC Guidelines (though not yet formally adopted by the UNFCCC) provide the methodological basis because they are the most up-to-date guidelines produced by the IPCC and are fully consistent with the 2003 IPCC Good Practice Guidance (GPG) for Land Use, Land Use Change and Forestry (LULUCF), which are currently adopted by the UNFCCC for reporting GHG Inventories.

Developing countries will also need to respond to the Convention's commitments for exchange of information on the climate system and climate change and a COP Decision requesting countries to provide information on Safeguards through for instance, establishment of a Information System.

<UNFCCC Convention Article 4 Paragraph 1>

All Parties, taking into account their common but differentiated responsibilities and their specific national and regional development priorities, objectives and circumstances, shall: ...

(h) Promote and cooperate in the full, open and prompt exchange of relevant scientific, technological, technical, socio-economic and legal information related to the climate system and climate change, and to the economic and social consequences of various response strategies.

<UNFCCC Decision 1/CP.16 Paragraph 71>

Requests developing country Parties aiming to undertake the activities referred to in paragraph 70 above, (...), to develop the following elements: (...)

(d) A system for providing information on how the safeguards referred to in appendix I to this decision are being addressed and respected throughout the implementation of the activities referred to in paragraph 70 above, while respecting sovereignty;

National performance on GHG emissions and removals under REDD+ will need to be linked with the implementation of PaMs at national and sub-national levels. This is achieved through a monitoring system for REDD+ PaMs implementation which will allow the country to track the success of its PaMs, and to adjust them accordingly, as necessary. This monitoring system may also be a key element to support and operationalise the payment of positive incentives.

<UNFCCC Decision 1/CP.16 Paragraph 76>

Urges Parties, in particular developed country Parties, to support, through multilateral and bilateral channels, the development of national strategies or action plans, policies and measures and capacity-building, followed by the implementation of national policies and measures and national strategies or action plans that could involve further capacity-building, technology development and transfer and results-based demonstration activities, including consideration of the safeguards referred to in paragraph 2 of appendix I to this decision, taking into account the relevant provisions on finance including those relating to reporting on support;

At COP16 in 2010 Parties also agreed to a series of rules to formally structure REDD+, including a decision to implement REDD+ in phases.

<UNFCCC Decision 1/CP.16 Paragraph 73>

Decides that the activities undertaken by Parties referred to in paragraph 70 above should be implemented in phases, beginning with the development of national strategies or action plans, policies and measures, and capacity-building, followed by the implementation of national policies and measures and national strategies or action plans that could involve further capacity-building, technology development and transfer and results-based demonstration activities, and evolving into results-based actions that should be fully measured, reported and verified;

This is significant as it allows developing countries to undertake a learning-by-doing approach, and allows the participation of all potential REDD+ countries regardless of their current national circumstances. Paragraph 73 also provides an indication of three REDD+ phases:

1. Phase I is *“the development of national strategies or action plans, policies and measures, and capacity-building”*. The present REDD+ Program document (under development) as well as this Document are examples of such “national strategies” describing the development and implementation of components including for Information, PaMs and MRV System;
2. Phase II is *“the implementation of national policies and measures and national strategies or action plans that could involve further capacity-building, technology development and transfer and results-based demonstration activities”* of REDD+. By the end of this phase, the elements that are necessary to ensure that the demonstration activities are results-based will have to be fully operational. These elements are the Land Monitoring System (LMS), and a monitoring system for demonstration activities at the sub-national level;
3. Phase III is the evolution of all the REDD+ activities *“into results-based actions that should be fully measured, reported and verified”*. This is the phase when REDD+ will be fully integrated with other mitigation mechanisms under UNFCCC. In terms of monitoring and MRV, all elements will have to be operational. The MRV system and the resultant data will be subjected to verification by the UNFCCC Secretariat. Information including on Safeguards will also be made fully available.

MRV applies to the mitigation performance of REDD+ activities of a country and is based on the use of commonly accepted methodologies (i.e. the IPCC guidelines on GHGs National Inventories and further guidance from the COP), which allows comparability among countries. A complete and robust MRV will allow countries to access international performance-based REDD+ finance.

<UNFCCC Decision 1/CP.16 Appendix II>

In the development of its work programme, the Subsidiary Body for Scientific and Technological Advice is requested to:

(c) Develop, as necessary, modalities for measuring, reporting and verifying anthropogenic forest-related emissions by sources and removals by sinks, forest carbon stocks, and forest carbon stock and forest-area changes resulting from the implementation of the activities referred to in paragraph 70 of this decision, consistent with any guidance on measuring, reporting and verifying nationally appropriate mitigation actions by developing country Parties agreed by the COP, taking into account methodological guidance in accordance with decision 4/CP.15, for consideration by the COP at its seventeenth session.

The Cancun Agreements also set out a number of elements that developing country Parties aiming to undertake REDD+ activities under the Convention are requested to develop:

<UNFCCC Decision 1/CP.16 Paragraph 71>

Requests developing country Parties aiming to undertake the activities referred to in paragraph 70 above, in the context of the provision of adequate and predictable support, including financial resources and technical and technological support to developing country Parties, in accordance with national circumstances and respective capabilities, to develop the following elements:

(a) A national strategy or action plan;

(b) A national forest reference emission level and/or forest reference level or, if appropriate, as an interim measure, subnational forest reference emission levels and/or forest reference levels, in accordance with national circumstances, and with provisions contained in decision 4/CP.15, and with any further elaboration of those provisions adopted by the Conference of the Parties;

1.2 CONTEXT OF VIET NAM

Viet Nam has been an active participant in the international climate change arena since it signed the UNFCCC in 1994 and the Kyoto Protocol in 2002. It was recognised in the 2007 COP 13 to the UNFCCC as one of the five countries expected to be most affected by climate change, given its long coastline and already pressured natural resources.

Viet Nam presents an interesting case for REDD+, owing to its rare trend of increasing forest cover, which makes Viet Nam one of the few tropical countries on the right side of the forest transition curve (Hoang et al., 2010). Almost 40 per cent of Viet Nam is covered by forests (0.26% is primary forest). Nonetheless, despite an overall increase in forest area, various regions of Viet Nam still have high rates of deforestation and the forest is continuously being degraded. Whereas Viet Nam's forest area has increased from 9.18 million hectares in 1990 to 13.38 million hectares in 2010, these gains are mainly attributed to the establishment of plantations while exploitation and degradation of natural forest areas continues. However, Viet Nam has also made progress in slowing the rate of degradation of natural forests (Cuong, 2010).

Vietnam has a long experience with forest inventory, including a continuous inventory and mapping program, which may serve as a basis for Viet Nam's REDD+ MRV System. In this sense, the existing capacity and institutional arrangements become important foundation to build on. The following information is provided to inform the reader of the existing context in which the MRV System for REDD+ will be developed upon, in Viet Nam.

The Land Law (2003) (currently under revision) regulates the State's administration on land use along with the Law on Forest Protection and Development (2004) for forestry land. GDLA under MONRE is the state

agency responsible for monitoring of all land use, including forestry land¹. GDLA is mandated to conduct land inventories in five-year cycles and produce land use statistics annually based on reports from communes up to the provincial and national levels. These land use statistics and inventories, however, are not sufficient for the use of estimating GHG emissions/removals for forest lands due to the unsuitable classification system employed where, forestry land is classified into only three sub-categories based on forest management (i.e. protection forest, special-use forest, and production forest) rather than by forest type.

VNFOREST of MARD is responsible for monitoring forestry land and designates this task to FIPI and FPD. Since 1990, FIPI has been implementing a programme named National Forest Inventory, Monitoring and Assessment Programme (NFIMAP)². This programme aims at monitoring and mapping forests and is conducted in five year cycles. So far, four cycles have been completed and the fifth cycle is being prepared. This programme includes two main tasks: forest area monitoring and assessment of forest trends and forest quality inventorying. For the first task, FIPI applies Remote Sensing (RS) technologies while for the second task, a systematic permanent sample plot system is employed.

As for annual monitoring of forests and forestry land use changes, these functions and tasks are assigned by MARD (VNFOREST) to FPD. Based on an initial database on forestry land area (derived from the results of the 1998 General Forest Statistics and Inventory Program, which have apparent deficiency in accuracy and may introduce some systematic errors), local forest rangers (located in district/commune forest protection stations) are assigned to collect information on changes of forests and forestry land use and update these changes to the database. The means of information collection by the local forest rangers at the district and commune levels are not standardized, mainly relying on statistical methods, and to some extent on verbal reporting from forest users/managers. Very few districts/communes use RS in combination with GPS measurement and drawing as a basis for annual updates. While local forest rangers are an important force for collecting field data, they receive inadequate training. The lack of technical equipments also leads to low quality of information. Provincial Forest Protection Sub-departments periodically synthesize the data and report to the Provincial People's Committee for releasing of provincial data on forest and forestry land. Finally, the FPD at the central level synthesizes the data and reports to MARD for releasing of annual data on forest and forestry land.

For the MRV for REDD+, the two ministries, MONRE and MARD, need to be consistent on the land classification system. In the past, MONRE have classified forest and forestry land into four categories (land with natural forests, land with plantation forests, land zoned for natural forest regeneration and land planned for forest plantation) while MARD has classified forest and forestry land into three broad land categories (land with natural forests, land with plantation forests and land without forest). Due to these differences, the use and management of forest and forestry land was inconsistent between the two ministries. This issue, however, was partially solved with the issuance of the Inter-Ministerial Circular No. 07/2011/TTLT-BNNPTNT-BTNMT dated on 29/01/2011 issued jointly by the two ministries. This Circular provides a definitions on "Land Planned for Forestry" and "Forestry land" and thereby providing a legal basis for MARD to define a forest and forestry land classification system consistent with these definitions.

Under the UNFCCC, REDD+ GHG-I will form a part of the National GHG-I, i.e., it is a component in the GHG-I for the LULUCF sector. Until now, Viet Nam has submitted two National Communications (NC) to the

¹ In the context of this document, "forest land" refers to land which meets the definition of forests in Vietnam, whereas "forestry land" refers to land administratively designated for the purpose of forestry development. The latter may not have actual forest cover.

² In reality, not all four cycles of the FIPI forest inventory have applied the same name (NFIMAP), but for the purpose of this document, all cycles are consistently referred to as NFIMAP. The fifth cycle currently under preparation may also employ a different name, but in this document, will be referred to as the fifth cycle of the NFIMAP.

UNFCCC. These two NCs, which report GHG-I for the years 1994 and 2000, have been submitted in 2003 and 2010, respectively. Both of them were compiled by the National Office for Climate Change and Ozone Protection (NOCCOP) under the Department of Meteorology, Hydrology and Climate Change in MONRE applying methodologies described in the Revised 1996 IPCC Guidelines. It should be noted that the forest classification system for Viet Nam is different from that of this Guideline, and study on their correlation is necessary. Also, to estimate GHG emissions/removals, the Guidelines recommend biomass growth data which are hardly available and need to be developed in the future.

1.3 OBJECTIVES & SCOPE OF THIS DOCUMENT

The scope of this Document entails key aspects of Viet Nam's REDD+ strategy, which will allow the country to leverage maximum benefits from the future REDD+ mechanism under the UNFCCC by guiding the country through a phased approach to forest monitoring and MRV, fully integrated with the phases of the REDD+ mechanism. The phased approach would also allow optimal allocation of human, material and financial resources.

Establishing clear long-term institutional arrangements, roles and responsibilities is essential in order to design, establish and manage an MRV System under the UNFCCC. Clear institutional mandates must therefore be put in place for the coordination of administrative and technical duties, quality checking of reported measurements and fulfilment of procedural requirements of MRV for REDD+. Moreover, effective coordination mechanisms will be required to ensure interaction between all stakeholders at the national and sub-national levels, which will involve capacity building for the implementation of MRV components as an essential first step in the implementation of REDD+.

This Framework Document is intended to address the requirements as set out by the UNFCCC on developing countries' development needs in preparation for REDD+. This Document focuses on the mechanism through which GHG emissions and removals from the forestry sector will be measured, reported and internally verified (i.e. the national MRV System). Information on Safeguards, and Monitoring of PaMs are also discussed in this Document in the context of monitoring/collection and provision of information, their mutual linkages, and linkages to the MRV System.

Figure 1 provides a description of the respective systems/frameworks which respond to the UNFCCC requirements for MRV, Information including on Safeguards and monitoring of PaMs. The monitoring of PaMs is a domestic tool to monitor the implementation of PaMs, although such information may also be made available to the international community.

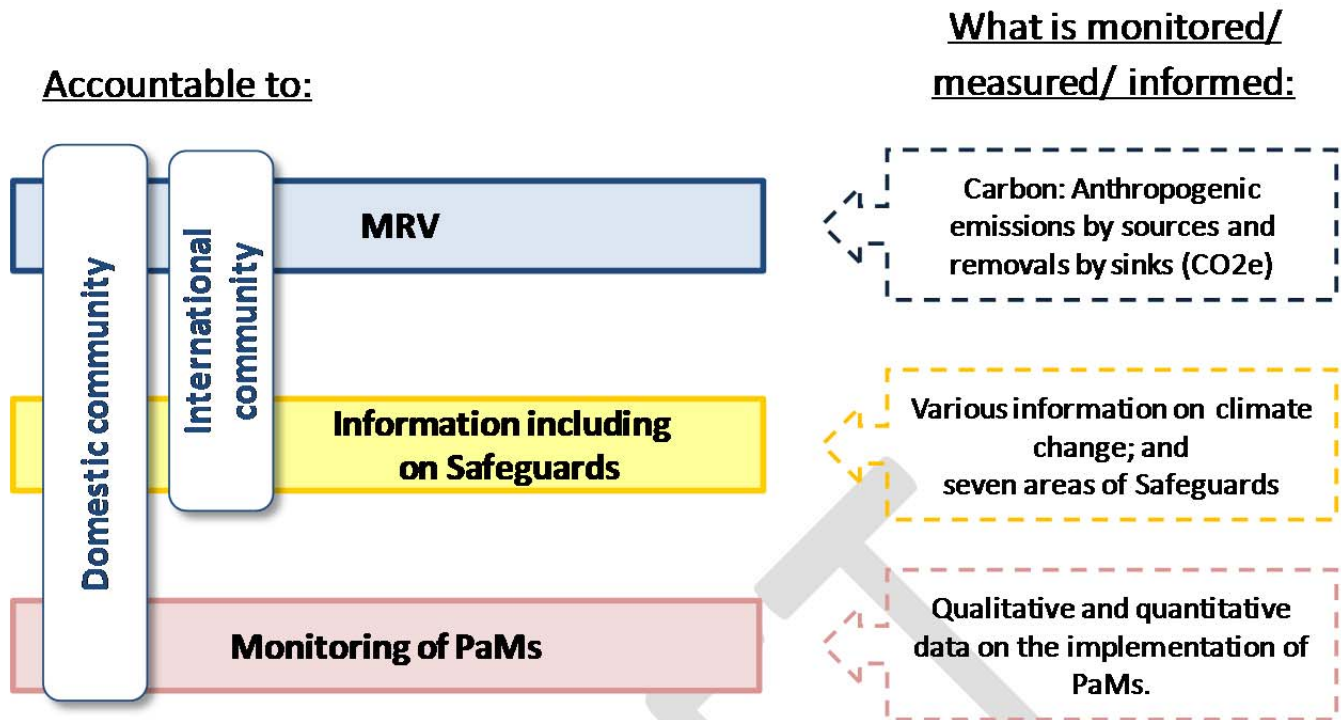


Figure 1. The three systems/frameworks for responding to MRV, Information including on Safeguards and Monitoring of PaMs

This Framework Document is intended to support the development of Viet Nam's MRV System, providing information on:

- The technical requirements and competences of various government and research entities in relation to the inventory development process, as well as the existing institutional, legal and procedural arrangements made to date;
- A description of the information needed for generating and estimating of Activity Data (AD), Emission Factors (EF), and methods for compiling the GHG-I;
- A description of the process involved in acquiring Activity Data (AD), Emission Factors (EF), and methods for compiling the GHG-I.

1.4 GUIDING PRINCIPLES

The approach taken to the development of Information, Monitoring and MRV System for REDD+ in this Document has been guided by a number of key principles and technical guidance. The key principles are the following (based on principles and provisions of Article 4 of the UNFCCC):

1. **National ownership:** Viet Nam will have the full control on all processes. International organisations or institutions will provide support for technical capacity building and institutional capacity development.
2. **Support to UNFCCC process:** Viet Nam will be expected to fully integrate REDD+ under the UNFCCC, and to incorporate REDD+ into their national policies and legislation.
3. **Autonomy:** Viet Nam will be able to develop the system according to national circumstances, capabilities and priorities.
4. **Responsibility:** Viet Nam will be fully and solely responsible for their REDD+ implementation, monitoring and reporting.
5. **Consistence with MRV for NAMA:** The REDD+ MRV System needs to be consistent with the MRV for any potential NAMAs in the Agriculture, Forestry and Other Land Use (AFOLU) sector.

Other principles guiding the Document. are the following:

1. **Nationally tailored:** The MRV System will be robust, flexible, transparent and country-driven, to respond to national circumstances.
2. **Operational:** The MRV System, resulting in a REDD+ GHG-I to be reported every four years and updated biennially.
3. **Leverages existing competencies, capacities and information:** Institutional arrangements shall be based where possible on existing institutions, with the creation of new ones being the result of necessity.
4. **IPCC compliance:** The MRV System must be in line with the most recently adopted or recommended IPCC Guidance and Guidelines.
5. **Cost-efficient:** Activities will seek out the most cost-effective solutions at all stages and structural levels.
6. **Multiple benefits:** The MRV System together with the Information System, and monitoring of PaMs must go beyond carbon, integrating with other information systems in forestry and rural development and become a multifunctional instrument, aiming to serve as a guide for social, economic and environmental policies and provide information on forestry-related fields such as biodiversity and socio-economic development. The system should be useful for multiple functions where appropriate, also by linking into /interacting with existing initiatives and other national monitoring systems.
7. **Phased approach:** Following the three phases of REDD+, development and implementation of the MRV System, Information System and monitoring of PaMs will be undertaken in phases consistent with COP decisions, and in accordance with national capacity and support from international development partners.
8. **Participatory:** Viet Nam recognises the importance of involving local people, communities, civil society organizations, and particularly the local forest managers in the development and implementation of forest management and monitoring. (The role and responsibilities of local forest managers and authorities in forest monitoring and reporting are mandated in the Item 2 of Article 32 of the 2004 Law on Forest Protection and Development.) In the context of REDD+, this collaboration in forest monitoring changes the dynamics of forest management, as participatory monitoring can drive learning, adaptation and improvement, which are essential elements of sustainable forest management (Evans and Guariguata, 2008).

2 MRV SYSTEM

The primary objective of the MRV is to comply with the international reporting rules, although it will also be used at the national level to inform and guide the development and implementation of domestic PaMs to implement REDD+, and to provide information on certain Safeguards. The MRV System may also contribute to the benefit distribution system at the sub-national level (e.g. provincial level).

2.1 COMPONENTS OF THE MRV SYSTEM

The 2006 IPCC Guidelines provide the methodological basis for the proposed Vietnamese national MRV System, as the most up-to-date guidelines produced by the IPCC, fully consistent with the 2003 IPCC GPG for LULUCF currently adopted by the UNFCCC for reporting GHG Inventories. In the IPCC's GPG, the most common methodological approach is to combine information on the extent to which a human activity takes place (AD) with coefficients which quantify the emissions or removals per activity unit (EF). The estimate is thus: $\text{GHG Emissions} = \text{AD} \times \text{EF}$ (Figure 2).

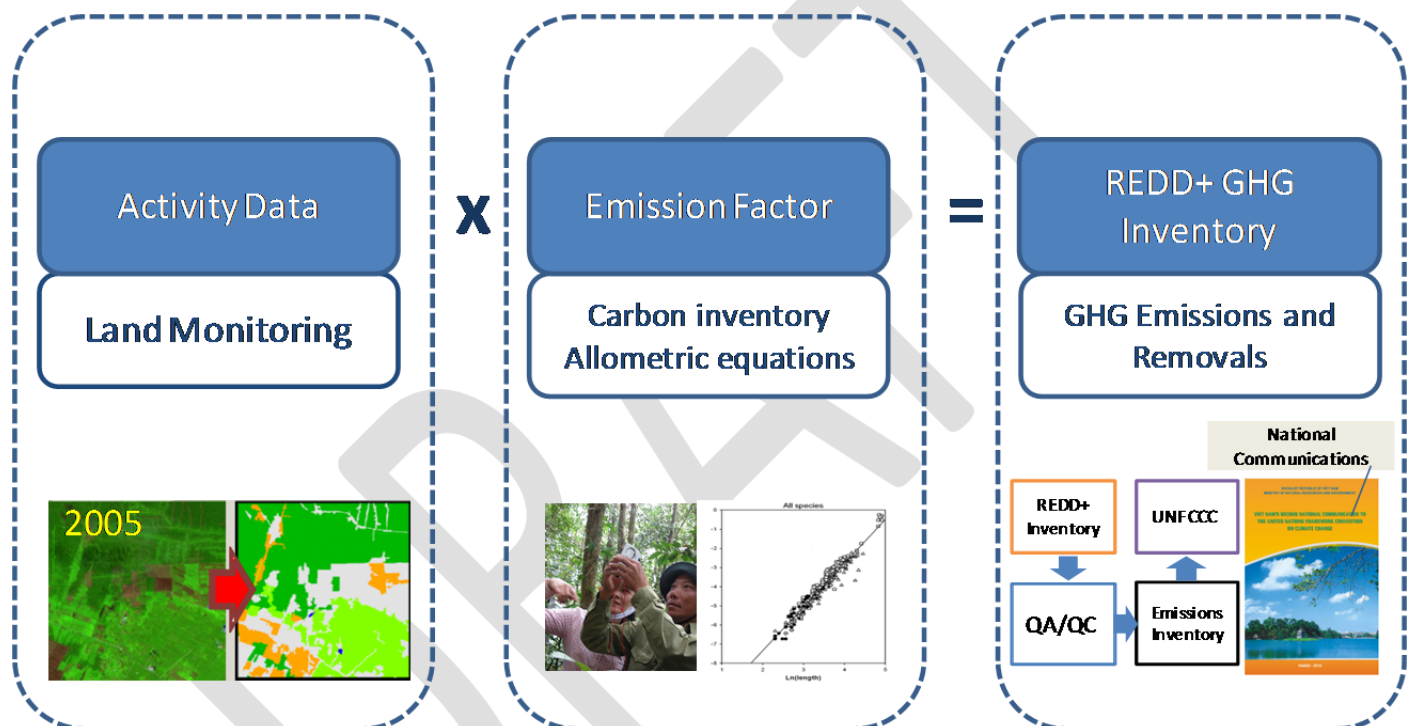


Figure 2. The IPCC's methodological approach to calculate anthropogenic GHG emissions by sources and removals by sinks related to forest land

Together, the AD and EF comprise the "Measurement" element of the MRV. To collect these data for REDD+, Viet Nam will need the following:

1. Generation of AD: a Land Monitoring System (LMS) to assess forest area and forest area changes through assessment of forestry and non-forestry land (section 3.3.1);
2. Estimation of EFs: a National Carbon Inventory (NCI) to assess biomass and to collect data for assessment of relevant carbon pools; the NCI is composed of a robust national forest inventory (currently operational under the name National Forest Inventory, Monitoring and Assessment Program: NFIMAP in Viet Nam) as well as a carbon inventory for other representative types of land uses which experience conversion to/from forests. In addition to data generated from these inventories, country-specific allometric equations and conversion/expansion factors will need to be developed (where they are not existent), for each homogeneous strata identified by the national stratification (section 3.3.2);

3. Compilation of a GHG-I: information from the above two components is combined to compile a GHG-I for REDD+, forming part of countries' National Communications to the UNFCCC; the "Reporting" element of MRV.

Beyond the REDD+ specific functions and objectives, the MRV system components will have the capacity to be used as general forest management tools. The early establishment of a structured long-term vision for Viet Nam's MRV system could therefore generate co-benefits for national policies and local practices.

2.1.1 Generation of Activity Data (AD)

For the REDD+ MRV System, obtaining AD is one of the principal aims. In order to generate the AD a LMS is needed. The LMS described here is an operational wall-to-wall system based on Approach 3³ of the IPCC (2006). The LMS is based primarily on remote sensing data, as it needs to comply to the IPCC (2006) guidance is to provide consistent land representation of 20 years (as a default), to capture lands that have been Forest Land for more than the transition period required.

<IPCC, 2006 Chapter 4>

Section 4.2 covers the methodology that applies to lands that have been Forest Land for more than the transition period required to reach new soil carbon levels (default is 20 years). Section 4.3 applies to lands converted to Forest Land within that transition period. The 20-year interval is taken as a default length of transition period for carbon stock changes following land-use change. It is good practice to differentiate national forest lands by the above two categories. The actual length of transition period depends on natural and ecological circumstances of a particular country or region and may differ from 20 years.

While the use of 20 years, as a threshold, is consistent with the defaults contained in the 2006 IPCC Guidelines, countries may use different periods where appropriate to national circumstances.

In Viet Nam, as mandated by the Law on Forest Protection and Development (2004) the NFIMAP has been generating AD (for forestry land) for the past 20 years (since 1991) on a five-year cycle, with the use of a combination of various RS images and permanent sample plots on the ground. The government has invested substantially in the establishment of a ground receiving station, which is aimed to provide high-resolution satellite images (e.g., SPOT and other EU satellites) for natural resources and environmental monitoring. The system has been in operation since 2007 and provided SPOT-5 images for forest mapping and the national land use monitoring program in 2010.

Following the practice in the past, the generation of AD for Viet Nam in the future, should be based on satellite RS data. RS techniques are well adapted to fit the principles of accuracy, comparability, consistency, completeness, and transparency required by the IPCC GPG (2003). As biennial updated reports are required (according to the Cancun Agreement), the LMS will need to cover the entire territory at least every two years. However, technical constraints associated with optical RS technology dictate that the LMS needs to represent the entire national territory more regularly. In particular, mapping forest degradation with RS data is more challenging, as degraded forest is a complex mix of different land cover types (vegetation, dead tree, soil, shade) and the spectral signature of the degradation changes rapidly (i.e., <2 years) (GOF-C-GOLD, 2009). Similarly, application of optical remotely sensed data in detecting other REDD+

³An essential step in the implementation of a GHG inventory is to allocate the entire national territory into land use and land use change classes. According to the IPCC 2006 Guidelines, this allocation can be done in either of three approaches. In the most simple situation (Approach 1), the country is only able to identify, at any point in time, the area of land uses, but it cannot estimate the conversions between land uses since a previous point in time. In a more developed situation (Approach 2), the area of all land uses and all conversions is available, however, only as summary values for the whole country, i.e., not in a spatially explicit format (in other words, one does not know where the conversions occur). Finally, in the most advanced situation (Approach 3), the area and the location of the conversions can be tracked (Zoltan, 2009)

activity such as the enhancement of forest carbon stock is challenging. Further, for seasonal differences, the appropriate method must ensure that annual climatic variations are not leading to false identification of variations in canopy cover as deforestation (DeFries et al., 2007). Finally, a higher temporal resolution increases the likelihood of cloud-free images and can augment data sources where persistent cloud cover is problematic. Hence, observations over multiple times a year might be required to capture the dynamics associated with degradation and/or inter annual variability.

For Viet Nam, a comprehensive LMS will need to be developed based on the existing systems and capacities in the country. The methodologies to analyse remote sensing data need to enable detecting annual changes in forest cover as well as assessing changes in land use. For this purpose, experiences of developing robust methodologies employed in other countries should be learned. The European Commission's Joint Research Centre (JRC) together with FAO developed the RS Forest Resource Assessment (FRA-RS) approach, which can serve as a basis to assess land use changes. Another example of an operational system for detecting annual changes in forest cover is employed by Brazil to track forest changes in the Amazon.⁴

The LMS may best be made operational through an open source software platform for data analysis and management, which will facilitate easy alterations in the future while allowing full country ownership.⁵ For data access, a web based system may be the best operational solution to accommodate data-bases and applications for the LMS. A computing infrastructure is currently under development in Viet Nam (the Forestry Management Information System: FORMIS), and may be considered as a platform for the Vietnamese LMS (c.f. section 3.3.1).

Functions of the LMS

In terms of reporting requirements, the outputs of the LMS will be:

- An annual land use change matrix, for reporting on land use changes processes (Table 1);
- An annual conversion matrix, for reporting on changes in activities between each land use sub-category (Table 2).

⁴ Currently, Brazil is the only country in the world with an operational and near real-time Deforestation and Degradation Tracking system (DETER). Following national and international concern over its forest loss in the 1980s, Brazil in the 1990s set up a satellite-based system to track changes in forest cover in the Amazon. In order to ensure transparency of its policies, actions and tracking of the deforestation activities, the Brazilian Government made its system available via an open website in 2003. The Brazilian PRODES system (Amazon Deforestation Monitoring Project) produces a yearly assessment of forest cover loss.

⁵ The Brazilian PRODES system provides a useful example of such platform.

Table 1. Example of land use change matrix.

Initial / Final	FL Managed Montane forest	FL Managed Mangrove forest	FL Managed Limestone forest	FL Unmanaged Mixed timber and bamboo forest	FL Unmanaged Bamboo forest	FL Unmanaged Timber forest	GL Managed Cattle pasture	GL Unmanaged Steppe	Crop Land	Wet Land	Settlement Land	Other Land	Final Area (T1)
FL <i>Managed</i> Montane forest	51												51
FL <i>Managed</i> Mangrove forest		42											42
FL <i>Managed</i> Limestone forest			60										60
FL <i>Unmanaged</i> Mixed timber and bamboo				50									50
FL <i>Unmanaged</i> Bamboo forest					26								26
FL <i>Unmanaged</i> Timber forest						20							20
GL <i>Managed</i> Cattle pasture				13			10		13				36
GL <i>Managed</i> Steppe							2	10					12
Crop Land									29				29
Wet Land										0			0
Settlement Land									5		15		20
Other Land												5	5
Initial Area (T0)	51	42	60	63	26	20	12	10	47	0	15	5	351
Net change ($\Delta = T_0 - T_1$)	15	0	0	-13	0	0	24	2	-18	0	-5	0	0

Legend: FL = Forest Land, GL = Grass Land. These categories are firstly assigned to a land-use change types, e.g., Forest land remaining Forest Land and Other land becoming Forest Land; then further subdivided into sub-categories (homogeneous strata) i.e. forest types, grassland types, etc... Column and row totals show the total land area for each sub-divisions at times T0 (Initial Area) and T1 (Final Area), the Net Change (last row) is estimated as the difference between T0 and T1.

Table 2. Example of Activity change matrix within a land use subcategory.

Initial \ Final	Degraded Burning	Degraded Selective logging	SMF	ECS (restoration)	ECS (afforestation/ reforestation)	Conservation	...	Final Area
Degraded Burning	4							4
Degraded Selective logging		5						5
SMF			1					1
ECS (restoration)				12				12
ECS (afforestation/ reforestation)					15			15
Conservation						0		0
...								...
Initial Area	4	5	5	12	15	0	...	41
Net Change ($\Delta=T0-T1$)	0	0	-4	0	0	0	...	0

Legend: SMF = Sustainable Forest Management, ECS = Enhancement of Carbon Stocks. Column and row totals show the total land area for each activities at times T0 (Initial Area) and T1 (Final Area), the Net Change (last row) is estimated as the difference between T0 and T1.

The LMS will also serve several functions by providing geo-spatial data on aspects related to the REDD+ Safeguards, and monitoring of PaMs.

2.1.2 Estimation of Emission Factors (EF)

The other principal aim of the REDD+ MRV System is to obtain information on GHG emission factors (EF) for forest lands and each of the forest-related land use change type⁶ (Maniatis & Mollicone 2010). This can be done through a National Carbon Inventory (NCI), development of allometric equations and conversion/expansion factors. The NCI for REDD+ can include RS (for example LiDAR images) and field surveys. EF are specific to local conditions (e.g. site fertility and tree species) and are thus usually very diverse, therefore, in addition to the NCI, data on allometric equations and conversion/expansion factors are necessary. The generation of EFs will require extensive field-based data collection.

As mentioned above, EFs are specific to local conditions such as site fertility. Therefore, EFs should be generated specifically for each ecological region. Currently, for the purpose of management of the forestry sector, Viet Nam is divided into 8 agro-ecological regions. This classification system, however, does not have a sound scientific basis to be applied for forest ecological classification, and may not be suitable as a basis for generating EF. For this reason, recently, the UN-REDD Viet Nam Programme has supported a research on ecological region stratification, which has resulted in stratification of the country's territory

⁶ IPCC identified six broad land-use categories as basis for estimating and reporting greenhouse gas emissions and removals from land use and land-use conversions. These categories are firstly assigned to a land-use change types e.g. Forest land remaining Forest Land and Other land becoming Forest Land; then further subdivided into sub-categories (homogeneous strata) i.e. forest types, grassland types, etc...

into eight ecological regions based on climate, topography, forest-ecology and soil types in this order of importance, and further sub-strata of 47 sub-regions. It is suggested that Reference (Emission) Levels (REL/RL) will be established for each of the eight ecological regions.

In the case of Viet Nam, the existing capacities of the NFIMAP carried out by FIPI for over the past 20 years, provide a strong basis for development of the NCI (for forestry land) which cater to the requirements of REDD+. However, as is stands, the design of historical cycles of the NFIMAP exhibit insufficiency in a number of aspects for direct application for generation of EFs for the purpose of REDD+ (i.e. field inventories are conducted only every five years, excluding measurement of carbon pools other than aboveground trees, based on 2100 sample plots plus 100 permanent plots located in protected areas (for Cycle IV 2006-2010); stratification methods do not take into account level of anticipated impact/change.). The National Forest Assessment (NFA) project (implementation until 2013) is aimed at improving the NFIMAP methodologies for responding to emerging national and international information needs and is aiming to reach IPCC's Tier 3 using the NFIMAP together with other efforts targeted to establish country-specific allometric equations. A review (or external verification) of the NFIMAP data was also conducted as part of the JICA supported study for generating an interim REL/RLs (study on-going as of 2011), and preliminary results indicate as much as 30% difference (under-estimation) of forest resources as compared to what was surveyed through the experts' verification process.

Allometric equations and conversion/expansion factors need to be developed by the research community. This information will allow NFIMAP to generate EF for forest lands and each of the forest-related land use change types. EF for non-forestry land also need to be generated using similar approaches as with the NFIMAP with the involvement of relevant national institutions and the research community. In turn, the EF generated will be used by the GHG-I team to compile the REDD+ GHG-I.

Participatory Carbon Monitoring (PCM, Box 1) has been introduced by the UN-REDD Programme for Viet Nam as a concept and method for providing forest managers a means for assuring themselves that their performance is being appropriately awarded, and also possibly as a tool for generating EFs . One of the advantages of PCM is that it mobilizes the local communities in the measurement of different parameters, including possibly for forest carbon and therefore can generate a huge amount of data. If data on forest carbon can be adequately generated through PCM, this can be used in combination with the NCI data generated through the NFIMAP process for forestry land, for cross-checking and therefore have the potential of improving the accuracy of the EFs. The potential pitfalls of PCM in generating EFs include (i) difficulty in maintain quality of the data and, (ii) additional costs for implementation.

Box 1. Participatory Carbon Monitoring

The role of Participatory Carbon Monitoring (PCM) and Participatory Monitoring for awareness raising, engagement of local communities and gathering high quantities of data is widely recognized (Skutsch, 2009). Nonetheless, the discussion on the role of PCM to provide data for estimating Emission Factors (EFs) for the GHG Inventory in Vietnam remains.

Gathering large quantities of data on tree diameter at breast height (DBH) and tree species (i.e. wood density) using PCM could increase the accuracy of EF data obtained by the existing NFIMAP for each homogeneous stratum of forest land. Further, there is evidence that once communities are responsible for a forest area and start to manage it, forest degradation is reduced significantly and carbon stocks start to build up in the area (Skutsch and Solis, 2010). However, the level of technical guidance required to conduct a nationwide PCM for EF data (and hence the costs incurred) are yet to be determined.

In Vietnam, a series of piloting activities involving PCM are being planned and should yield valuable results to feed into the discussions on the technical robustness and the cost-effectiveness of PCM.

2.1.3 REDD+ GHG-I

National Communication (NC) and Greenhouse Gas Inventory (GHG-I)

With the full development and operation of the two elements (AD and EF) of the MRV system Viet Nam will be able to generate its REDD+ related National GHG-I⁷, estimating anthropogenic emissions by sources and removals by sinks, for reporting to the UNFCCC in order to access the funds from payments for verified performance in the future (in Phase III of REDD+). The National GHG-I for REDD+ will ultimately form part of Viet Nam's National GHG-I⁸, which will be submitted every four years as its National Communication (NC) to UNFCCC.

Under Articles 4 and 12 of the UNFCCC, all Parties are required to prepare NCs. The Convention requires NCs to include a National GHG-I, steps taken or envisaged by the Party to implement the UNFCCC and other relevant information. Current guidelines outlining what needs to be included in NCs for Non-Annex I countries date from 2002. The Copenhagen Accord indicates that new reporting guidelines may be needed, implying that the REDD+ component of the national inventory report will need to be submitted to the UNFCCC every two years: the "Reporting" element of MRV. (However, further guidance on the specifics of reporting to the UNFCCC will need to wait further deliberation of the COP.)

⁷ The IPCC has developed specific reporting guidelines (IPCC 2006) in order to support Parties in providing information and estimates of anthropogenic GHG emissions and removals.

⁸ The UNFCCC requirements to regularly submit inventories of GHG emissions and removals are relevant for all sectors of the economy. REDD+ will be one of these sectors. The periodic production of national GHG-I requires countries to set a series of functions for their planning, preparation and management. Article 5.1 of the Kyoto Protocol of the UNFCCC, formalised these functions in a decision text as the "National System" for a GHG-I. The National System will need to include "all institutional, legal and procedural arrangements made within a country for estimating anthropogenic emissions by sources and removals by sinks of all greenhouse gases not controlled by the Montreal Protocol, and for reporting and archiving inventory information" (Decision 1/CP.13). The Kyoto Protocol stipulates that the National System needs to be supported by a legal act. National Systems should be designed and operated to ensure the transparency, consistency, comparability, completeness and accuracy of inventories.

<UNFCCC Decision 1/CP.16>

Decides to enhance reporting in national communications, including inventories, from Parties not included in Annex I to the Convention on mitigation actions and their effects, and support received, with additional flexibility to be given to the least developed country Parties and small island developing States:

- (a) The content and frequency of national communications from Parties not included in Annex I to the Convention will not be more onerous than that for Parties included in Annex I to the Convention;*
- (b) Parties not included in Annex I to the Convention should submit their national communications to the Conference of the Parties, in accordance with Article 12, paragraph 1, of the Convention, every four years or in accordance with any further decisions on frequency by the Conference of the Parties, taking into account a differentiated timetable and the prompt provision of financial resources to cover the agreed full costs incurred by Parties not included in Annex I to the Convention in preparing their national communications;*
- (c) Developing countries, consistent with their capabilities and the level of support provided for reporting, should also submit biennial update reports containing updates of national greenhouse gas inventories, including a national inventory report and information on mitigation actions, needs and support received;*

Under the UNFCCC, information reported in GHG-I⁹ represents an essential link between science and policy, providing the means by which the Conference of Parties (COP) can monitor progress made by Parties in meeting their commitments and in achieving the Convention's ultimate objectives. The information reported in a national GHG-I provides the basis for assessing each Party's performance as compared to its reference level (or commitment), and is therefore a requisite antecedent for assigning eventual incentives or penalties. The quality of GHG-I relies not only upon the robustness of the science underpinning the methodologies and the associated credibility of the estimates, but also on the way this information is compiled and presented. Information must be well documented and consistent with the reporting requirements outlined in the UNFCCC guidelines (UNFCCC 2004).

A National GHG-I is typically divided into two parts: reporting tables (standardized data tables that contain mainly quantitative information) and an inventory report (comprehensive and transparent information about the inventory e.g. overview of trends, inventory compilation methodology and information on uncertainties).

Viet Nam will initially aim for adherence to Tier 2 reporting by the end of Phase II and aim for Tier 3 reporting in Phase III. In Viet Nam, the current proposal of the NOCCOP is to maintain the use of the Revised 1996 IPCC Guidelines until Viet Nam has obtained enough capacity to employ further updated IPCC Guidelines/Guidance.

With support from JICA, Vietnam is now implementing a project to strengthen institutional and technical capacities for national GHG Inventory, for which REDD+ is a key element.

Uncertainties, QA/QC and Verification

A GHG-I is only complete if uncertainties are reduced as far as practicable. The IPCC Guidelines (2006) stipulates that it is good practice to ensure that data uncertainties are reduced and that a high quality of the GHG-I is achieved and maintained (Zoltan, 2009).

Quality Control (QC) consists in a system of routine technical activities designed to assess and maintain a high quality of GHG-I. This should be performed by personnel compiling the GHG-I. QC activities include general methods such as accuracy checks on data acquisition and calculations, and the use of approved standardized procedures for emission and removal calculations, measurements, estimating uncertainties,

⁹ The UNFCCC established the commitment for Parties to report national inventories of anthropogenic emissions by sources and removals by sinks of all greenhouse gases not controlled by the Montreal Protocol, to the extent its capacities permit, using comparable methodologies to be promoted and agreed upon by the Conference of the Parties.

archiving information and reporting. QC activities also include technical reviews of categories, activity data, emission factors, applicability and quality of RS data, other estimation parameters, and methods.

Currently, under the NFIMAP, QC activities are carried out aimed to detect, redress and rectify the errors and problems which have arisen in the data collection process. The QC activity is carried out by the technical staff at all levels of FIPI (including all of FIPI's centres and sub-FIPI offices) and held regularly during the field inventory process. The process involves a review of the field inventorying through randomly sampling of the inventoried plots. To date, there are no prescribed sampling rates for QC. Depending on available resources of the inventory team, the extent of the QC is determined. This is carried out following FIPI's "Regulations on contents and methodologies for verification and assessment of sample plot data".

Quality Assurance (QA) is another planned system of review procedures which must be performed on the completed GHG-I by an independent third party, as a domestic process. The QA is performed after the QC procedures have been performed.

Currently, under the NFIMAP, QA activities are carried out aimed to ensure the quality of the results annually, before using the data for processing. This process is carried out at the Central and sub-FIPIs, by applying an evaluation through randomly sampling the plots inventoried that year. Following the annual work plan, the number of sample plots subject to the process is determined with a prescribed rate of 15 to 20 percent for sub-FIPIs, and five to ten percent for the Central FIPI. Sub-FIPIs report the results of their QA to the Central FIPI in writing (accompanied by photographs of the inspection team at the sub-institute level for all verified sample plots). Upon receipt of satisfactory QA completion results from the sub-institute level, the QA at the Central FIPI will be carried out. Again, the process is carried out following FIPI's "Regulations on contents and methodologies for verification and assessment of sample plot data".

Verification is a process of independent review (checking the accuracy and reliability of data submitted), undertaken by the UNFCCC Secretariat through its roster of experts, of reported information and the procedures used to generate information. One way of verifying data is, for example, to compare estimates using the stock change method vs. those using the gain-loss method. Whereas QA/QC are carried out domestically, verification is a process carried out at the international level by the UNFCCC expert review team.

Currently, under the NFIMAP, after the completion of an inventory cycle, the Programme Steering Board (chaired by the vice minister of MARD) will organize a committee to verify the acceptability of the programme results, however, specific methods for such verification are not prescribed.

Uncertainties can also be reduced by analyzing the methodology used for the GHG-I. Uncertainties may arise from the methods and assumptions applied, the activity data, the conversion and expansion factors. Some of the uncertainties are of qualitative nature, i.e. they cannot be expressed in numbers. For example, if a relevant source of emission is omitted in the development of the GHG-I, one can only state this fact as a qualitative statement, but may not be in the position to tell how much the inventory is off in terms of the estimated emissions. On the other hand, uncertainties can often be quantitatively estimated when any type of statistical sampling, measurements and certain assumptions are made. The 2006 IPCC Guidelines provides methods and formulas that can be applied in such cases.

In case a time series of estimated GHG data is available, it is also essential to check the time series consistency of the data. This also means that when methodologies are developed (and there is always a need and possibility for that) the time series is always checked and, if necessary, recalculated.

DRAFT

2.2 INSTITUTIONAL ARRANGEMENT FOR THE MRV FOR REDD+

Figure 3 provides an overview of the institutional arrangement proposed for Viet Nam’s MRV system. The requirements for each component of the system are analysed in the sections below.

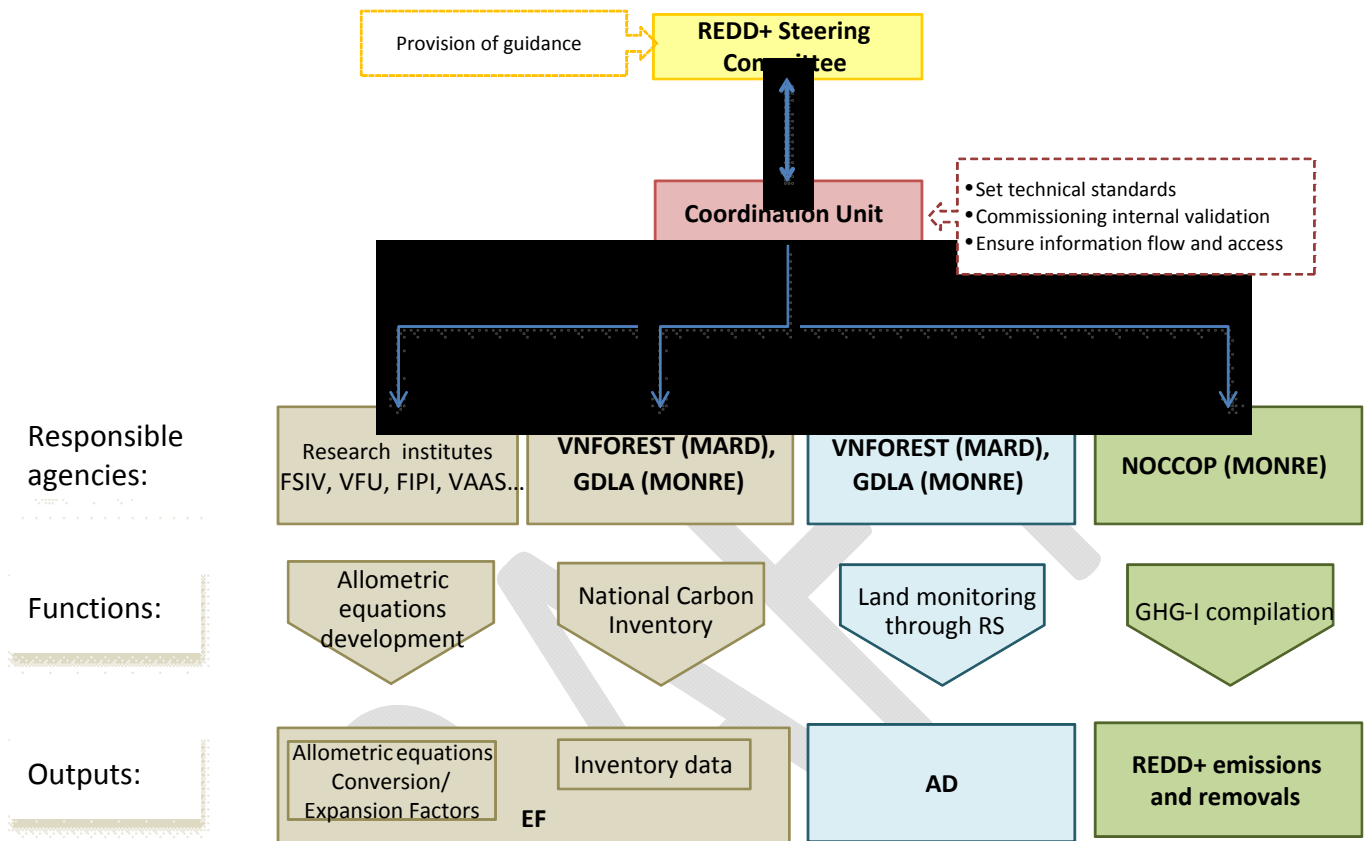


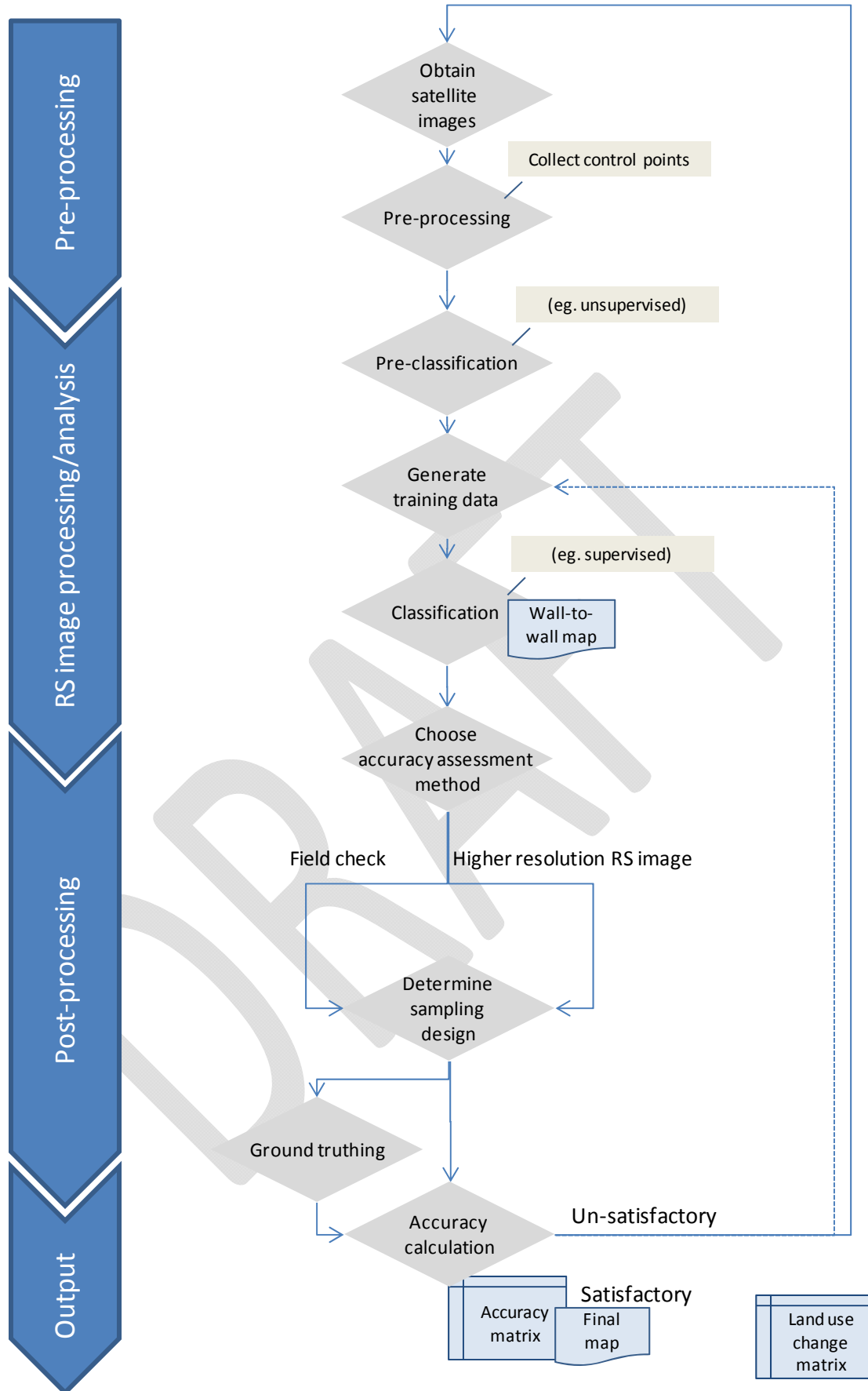
Figure 3. Institutional arrangement of the MRV System

- Estimation of EF: NCI will need to be generated through operations of two organizations: VNFOREST (through integration of information generated through the NFIMAP implemented by FIPI) for the forestry land and GDLA and its sub-national agencies for forests and converted land under non-forestry land. Development of allometric equations and conversion/expansion factors will be responsible by the research community including FSIV, VFU, FIPI, VAAS etc.
- Generation of AD: The LMS may be best jointly operated by two organizations: VNFOREST for the forestry land and GDLA for the non-forestry land. For forestry land, VNFOREST will designate tasks specifically to FIPI and FPD. FIPI will be in charge of generating forest cover maps using RS images while FPD will be responsible of ground-truthing using ground-surveys. FPD will use its local staff to guide forest owners to verify the maps generated from RS images and correct them as necessary.
- Compilation of GHG-I for REDD+: This will be done by NOCCOP under MONRE.

2.3 EXISTING CAPACITY AND CAPACITY GAPS OF THE MRV SYSTEM

2.3.1 Generation of Activity Data (AD)

Generation of AD will entail the following key steps and work flows:



Legend: Actions represented in diamonds, DBs represented in rectangles.

Figure 4. Work flow diagram for generation of AD

For the generation of AD and management and storage of the generated data, the LMS will need to perform three distinct operational functions:

- Land cover mapping through GIS and RS, to provide wall-to-wall land representation of REDD+ activities through the collection and analysis of satellite data;
- System and application development and maintenance, to monitor the global development of GIS and RS software and provide regular advisory on the latest technologies and techniques for mapping through GIS and RS; and
- Data management and storage.

Building on the existing capacity and mandates of the agencies in Viet Nam, the LMS may best be jointly operated by two core agencies, namely VNFOREST (mainly FIPI and FPD) under MARD and GDLA under MONRE. A joint steering committee will need to be established among these agencies to coordinate the scope and coverage of their work, plan activities, auditing and compliance, and manage the budget.

Existing capacities

- **Land cover mapping through GIS and RS:**

Forestry land (FL): Existing capacities to undertake mapping of forestry lands with use of RS exist primarily within FIPI – a technical consulting agency of the Vietnam Administration of Forestry – including its Centers and sub-regional offices (“sub-FIPIs”). FIPI has been engaged in the mapping of the country’s forest cover for over 20 years, through its four cycles of the NFIMAP. Reviews of the past NFIMAP work have indicated problems such as inconsistent use of classification categories throughout the past cycles, and low accuracy due to discrepancies in RS visual interpretation skills applied (JICA, Draft Interim Report, 2010). An outline of existing capacities in FIPI is available in Annex 2. Reporting annual changes in forest area has been conducted by the Forest Protection Department (FPD) with about 11,000 forest rangers working at provincial, district and commune levels. However, forest rangers generally lack training in remote sensing and mapping, jeopardizing data quality.

Non-forestry land (NFL): Forest cover maps produced by the NFIMAP also include key non-forest land use classes. However, with no evaluation. Existing capacity to undertake mapping of all land uses exist within GDLA, Mapping Companies of MONRE and its sub-offices at the sub-national levels. However, GDLA currently carries out non-forestry land mapping based on field inventories and field-based reporting, without use of RS technologies. It is suggested for the first and second phases, MARD/VNFOREST will need to cooperate with MONRE/GDLA in improving the accuracy of the NFL classes and to ensure data consistency.

- **Software development and maintenance:** Capacity to develop and maintain LMS related software and applications exist in the country in various institutions. The LMS software development and maintenance will need to be outsourced to specialised research institutions, which will monitor the global development of GIS and RS software and provide regular advisory on the GIS and RS latest technologies and techniques. Table 4 provides a list of research institutions which have the required capacity for this task.

- **Data management and storage:**

FL: Data management pertaining to forestry land is currently undertaken in the Science, Technology and Technical Department of FIPI. All the data generated by FIPI (including forest cover maps and plot inventory data) are managed and archived by the said Department, using its two data servers. The forest cover maps are stored in MapInfo format. The plot inventory data are stored as a database in MS Access format. Both types of data are not made accessible through the internet at this point.

NFL: Data management pertaining all land uses is currently undertaken in the Center for Land Archiving and Information under GDLA. (NEED TO DEFINE WHAT KIND OF DATA MANAGEMENT IS UNDERTAKEN.)

Table 3. Technical requirements, existing capacity and gaps for establishing an operational LMS in Viet Nam

LMS functions	Existing capacity	Capacity gaps
Mapping land cover through GIS and RS	<ul style="list-style-type: none"> • Forestry Land (FL): FIPI (FREC, CFIC and sub-FIPs) – currently carrying out national forest mapping using primarily SPOT 5 images (applying visual interpretation). • Non Forestry Land (NFL): GDLA, MONRE – has the mandate to monitor all land types, but current capacity is limited to ground-based monitoring. 	<ul style="list-style-type: none"> • Lack of a coordinating mechanism between forestry land and non-forestry land inventory and statistics managed by VNFOREST and GDLA for establishing wall-to-wall land cover maps representing all forest areas and land use changes. • Setting harmonized land classification standards between MARD and MONRE, which are compatible with IPCC classifications, and meet REDD+ requirements; • Establishment of QA/QC procedures. • Shifting from visual interpretation of satellite images into digital processes. • Setting improved standards for properties of RS data to meet the requirements of digital image processing. • FL: Revising the standardized protocol for collecting field data; Revising the standardized guidelines for interpretation of RS imageries; Revising the standardized manual for validation; Improving capacity (through increasing number of trained staff and provision of relevant software and licenses) for sub-FIPs in particular, in improving quality of RS interpretation (including through automatic image interpretation) and accuracy assessments (see also section on capacity building needs under estimation of EF). A more frequent national forest monitoring technique based on medium to high-resolution satellite images (annual and biennial) should be developed to meet reporting requirements. • NFL: Building overall capacity in RS-based land mapping. • QA/QC is not sufficiently institutionalized.
LMS software development	<ul style="list-style-type: none"> • Space Technology Institute of Viet Nam (STI VN), Department of Remote Sensing Technology, GIS & GPS. 	The capacity building needs for this function will depend on the institution to undertake the work

and maintenance	<ul style="list-style-type: none"> • GIS and Remote Sensing Research Centre, Institute of Resources Geography, Ho Chi Minh City. • Department on Cartography, RS & GIS, Geography and Geology Faculty, University of Science, Hue University. • Centre for Applied Research in Remote Sensing and GIS (CARGIS), University of Science, National University, Hanoi. 	
Data management	<ul style="list-style-type: none"> • FL: FIPI (Science Technology Technical Department) • NFL: Centre for Land Archiving and Information (CLAI). 	<p>The technical capacity for data management within FIPI and GDLA is considered to be generally sufficient – to be further reviewed for confirmation.</p> <ul style="list-style-type: none"> • Capacity for data sharing to be developed.

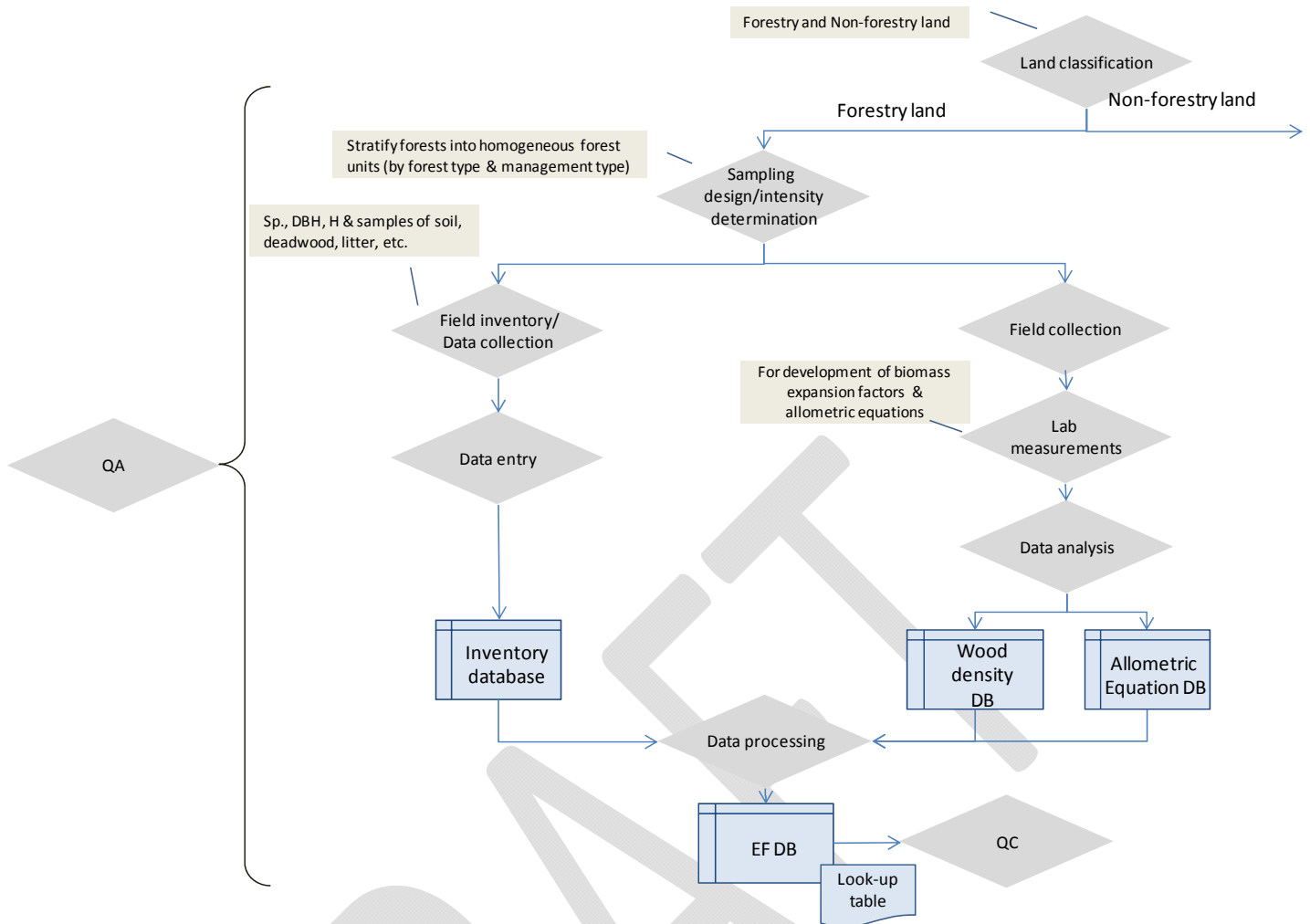
Capacity building needs

Based on the above existing capacity in Viet Nam and required capacity and work flows in the future, capacity building in the following areas will be imminently required in respective national institutions.

- **Land cover mapping through GIS and RS:** Setting harmonized land classification standards between MARD and MONRE, which meet REDD+ requirements; Establishment of QA/QC procedures; Shifting from the current application of visual interpretation of satellite images into digital processes; Setting improved standards for RS data properties to meet digital image processing requirements; **FL:** Revising the standardized protocol for collecting field data; Revising the standardized guidelines for interpretation of RS imageries; Revising the standardized manual for validation; Improving capacity (through increasing number of trained staff and provision of relevant software and licenses) for sub-FIPIs in particular, in improving quality of RS interpretation and accuracy assessments (see also section on capacity building needs under estimation of EF). **NFL:** Building overall capacity in RS-based land mapping. During the second phase, the capacity of local authorities and forest managers, particularly the forest companies, forest management boards and local communities shall be strengthened to promote their participation in forest mapping and monitoring.
- **LMS software development and maintenance:** The capacity building needs for this function will depend on the institution to undertake the work, and needs to be identified during Phase I of REDD+.
- **Data management and storage:** The technical capacity for data management within FIPI and GDLA is considered to be generally sufficient (for FIPI the above mentioned NFA project will further address enhancement of data management capacity including improvement in physical infrastructure). However, with further clarification of the terms and conditions for data access and sharing under LMS, further capacity upgrading requirements in data management may become more evident.

2.3.2 Estimation of Emission Factors (EF)

Estimation of EF will entail the following key steps and work flows;



Legend: Actions represented in diamonds, DBs represented in rectangles.
Acronyms: DB: Database QA: Quality Assurance QC: Quality Control Sp: Species DBH: Diameter at Breast Height
 H: Height EF: Emission Factors

Figure 5. Work flow diagram for estimation of EF

For the estimation of EF, management and storage of the generated data, several distinct operational functions are required;

- **NCI establishment:**
FL: Carry out field inventories to collect data on biomass and to collect samples of relevant carbon pools for lab analysis, per forest strata;
NFL: Carry out field inventories to collect data on biomass, and to collect samples of relevant carbon pools for lab analysis on representative types of land use which are likely land uses for conversion from/to forests;
- Development of allometric equations and conversion/expansion factors;
- Data management and storage.

Building on the existing capacity and mandates of agencies in Viet Nam, estimation of EF will rely on a number of existing institutions under MARD and MONRE. A joint steering committee will need to be established to coordinate the scope and coverage of their work, plan activities, auditing and compliance, and manage the budget.

Existing capacities

- **NCI establishment:**

FL: For the collection of biomass data and samples of relevant carbon pools for forestry land, FIPI through its NFIMAP has the relevant institutional capacity. Data collection will be carried out at the sub-national level through the decentralised sub-FIPs which will act as the data collection hubs: sub-FIPs in North-West, North-East, Northern Part of Central Viet Nam, Central Part of Central Viet Nam, Southern Part of Central Viet Nam and Central Highland, and South Region. Building on its current capacity, technical support and capacity building at the national and sub-national levels will be provided by FAO-Finland's cooperation project for National Forest Assessment (NFA)¹⁰. The project will support FIPI to adapt current practices to internationally-recognised standards, data collection and analysis methodologies.

NFL: For collection of general parameters related to carbon inventory on representative non-forestry land uses, which are likely to undergo conversion from/to forests, no permanent capacity for collection of such data is existent in the country; data exists only through research projects.

- **Development of allometric equations and conversion/expansion factors:** Work on the development of allometric equations and conversion/expansion factors have been undertaken in Viet Nam, but sporadically, and in a number of different institutions. Consolidation of existing work, and development of allometric equations for the eight ecological zones is being undertaken under the UN-REDD Programme (in 2011 and 2012). Institutions with existing capacity to undertake related work in full or in part include FSIV, VFU, FIPI, and Tay Nguyen University. Outside the forestry sector, institutions under MARD, such as the Viet Nam Academy of Agricultural Sciences (VAAS) have generated some related data.
- **Data management and storage:** Overall, there is no common platform for storing/sharing of EF related data in the country. Specifically within FIPI, technical capacity for data management is considered to be generally sufficient (the above mentioned NFA project will further address enhancement of data management capacity including improvement in physical infrastructure).

Capacity building needs

- **NCI establishment:**
The most immediate activity will be the training for and development of one or two specialised carbon inventory database(s). Training on generation of EF drawing from the results of the inventory work and the allometric equations and conversion/expansion factors will be required. For instance, FIPI will require training to use data from plot censuses (e.g. diameter at breast height, tree identification, soil carbon content) and from research (tree allometry data) to estimate EFs for each homogeneous strata identified through the stratification process.
FL: At the most generic level, the existing NFIMAP design will need to be revised to accommodate: 1) a protocol for collecting field data of all relevant carbon pools, and 2) a sampling design responsive to forest stratification and accuracy requirements under REDD+. FIPI field inventory capacity, particularly in sub-FIPs, will require training on new field inventory protocols and be supported by the GIS and RS, which will provide them with maps detailing the locations of sample plot sites.
NFL: For NFL, field inventory for carbon needs to be institutionalized within GDLA. Building capacity for conducting the inventory based on standardized protocols for collection of field data will also be a requirement.
- **Development of allometric equations and conversion/expansion factors:** Technical capacity to develop allometric equations and conversion/expansion factors is considered sufficient in the

¹⁰ The NFA project for Vietnam (under FAO-Finland Cooperation Project) will be operational for three years from March 2011, with the overall objective of assisting the government of Vietnam in developing and improving its NFIMAP. Specific areas of work include: 1) establish broad national consensus on the needs and approaches of the NFIMAP; 2) capacity building of VNFOREST and FIPI; 3) development of a harmonized basis for developing forest maps and inventory database.

country. However, it is recognized that there is need for substantive resources to reach reporting at Tier 3 levels.

- **Data management and storage:** Viet Nam needs to develop a specialized database to house and manage and share all EF related data in the country. Alternately, Viet Nam may chose to develop two specialized databases housing EF respectively for FL and NFL. The two databases will need to be connected and integrated for mutual quality control.

2.3.3 REDD+ GHG-I

Existing capacities

Currently, NOCCOP under the Department of Meteorology, Hydrology and Climate Change of MONRE has the overall mandate to generate and compile the National GHG-I, and acts as the official UNFCCC focal point. As Viet Nam continues its efforts and actions towards the implementation of its commitments as a Non-Annex I Party to the UNFCCC, NOCCOP has compiled and submitted its Initial National Communication to the UNFCCC in 2003, detailing the National GHG Emissions Inventory (NGHGEI) for the year 1994. The Second National Communication (submitted in 2010) details the NGHGEI for the year 2000.

In practice, the NOCCOP as an administrative office oversees the drafting and compilation process while sector-specific GHG-I is generated through consignments of work to a team of experts from related institutes per sector. As a Non-Annex I Party, Viet Nam currently carries out the inventory work as “projects” at the time of drafting of each NC, meaning there are no permanent capacities for this type of work. In the past, for the forestry sector, data used was generated by FIPI as well as by sub-national units of VNFOREST – e.g. Forest Protection Sub-Departments at provincial, districts and communes – in charge of monitoring forest land, and already normalized by the General Statistics Office. After the compilation of data, RCFEE (FSIV) undertook uncertainty assessment through a consignment by NOCCOP.

Capacity building needs

For REDD+ GHG-I, the most important thing is to develop a data set needed to compile the inventory. IPCC guidelines should be followed closely to select the data set needed for implementing REDD+ GHG-I.

Recognizing the need to build capacity, technical support and capacity building is being provided by JICA’s cooperation project. The project will support NOCCOP to

Currently, it is not obligation for developing countries to build permanent capacity for the MRV for national GHG-I (including MRV for REDD+). In the near future, however, MRV for NAMAs will need to be developed. Therefore, it is necessary to develop permanent capacity for MRV for NAMAs at the national level. There are two obtions to do this: each sector develop a separate permanent MRV or a general MRV will be developed by NOCCOP. In any event, for REDD+, a coordination unit to act as focal point for forestry sector MRV will need to be established, and this unit will either report to or work in coordination to the NOCCOP for NC.

The fact that NOCCOP implemented the GHG-I through consignments with professional teams from relevant institutions is not sustainable and does not make use of all existing capacities (especially in the forestry sector) and not following the MRV principle of cost-effectiveness. VNFOREST and GDLA may need to establish specialized units to implement REDD+ GHG-I and implement capacity building for these units.

It is proposed that uncertainty assessments remain as an area of work, which will need to be conducted by relevant agencies, on a consignment basis, as the capacity required in this type of work can be found in various institutions across the country. The development of standardized guidelines for carrying out

uncertainty assessment will be of particular importance, especially in the instance that this is to be carried out on a consignment basis.

2.4 COORDINATION OF THE MRV SYSTEM

2.4.1 Coordination Unit

The MRV System will capitalize on capacities and information from different national institutions and agencies and will require coordination by a “coordination unit” that will support the REDD+ Steering Committee operationally. The coordination unit provides technical guidance to the functional units needed to operationalise the MRV System. The coordination of this system is supported by an information sharing platform (section 3.3.1). The MRV System related functions of this coordination unit would include:

- Advisory to provide technical guidance on the UNFCCC requirements for GHG-I;
- Coordination with other larger information systems (e.g. FORMIS) to ensure the streamlining of data and flow of information;
- Coordination between the MONRE and MARD agencies carrying out each component of the MRV System, including on (i) definition of forest classification, (ii) boundary between forestry land and non-forestry land, (iii) technical guidance in developing methodological guidance for each component of the MRV including mapping (e.g. resolution), frequency of monitoring (at least 2 years) - compliant to the UNFCCC requirements and the reporting rules still to be developed for REDD+, and (iv) organization of periodic joint reviews;
- Coordination to generate the GHG-I through or with NOCCOP, including (i) receiving mandate to work on REDD+ GHG-I, (ii) coordination of the GHG-I for REDD+ with the GHG-I of other sectors (including following relevant technical standards). The REDD+ GHG-I team may be recommended as the entity with the mandate to manage, oversee and guide all activities relating to MRV of REDD+ in Viet Nam; and
- Ensuring that QA/QCs are carried out regularly and adequately.

The Viet Nam REDD+ Office may be an appropriate candidate to fulfil the role of this coordination unit. However, as the capacity and mandates of the Viet Nam REDD+ Office have yet to be fully identified at the stage of drafting of this Document, it is still premature for decision. It is the intention of this Document to promote discussion on the relevant capacity to fulfil this role.

For higher-level coordination of the MRV System, the REDD+ Steering Committee may be in the best position to carry this out. The key functions for the Steering Committee in coordination would be:

- Manage budget resources
- Plan and supervise the Coordination Unit’s activities
- Provide technical guidance on the UNFCCC requirements for GHG-I.

2.4.2 Information sharing platform

A major part of the coordination work may be addressed by employing a computer-based information sharing platform, which updates information flows regularly from each of the MRV components/agencies.

For example, for the generation of AD, a shared platform for the development and operation of the LMS for REDD+ can be coordinated by relying on an information platform as:

- A distributed database management system, which permits the management of a distributed database consisting of at least two logically interrelated databases, for the forestry land database managed by FIPI and the database managed by GDLA for non-forestry land;
- A platform for the development and maintenance of the LMS and software; and

- An information to ensure access to use of information on land use change among MRV related institutions, as well as other institutions working on Viet Nam’s REDD+ Program who will need to avail of such land-based information (e.g. for monitoring of PaMs, Safeguards etc.).

Similarly, estimation of EF can be facilitated through an information platform shared across all related agencies working on collection of field inventory data, development of allometric equations and conversion/expansion factors.

After the AD and EF are made available through an information platform, a REDD+ GHG-I application also launched on the information platform can support the GHG-I team to generate GHG-I data for reporting.

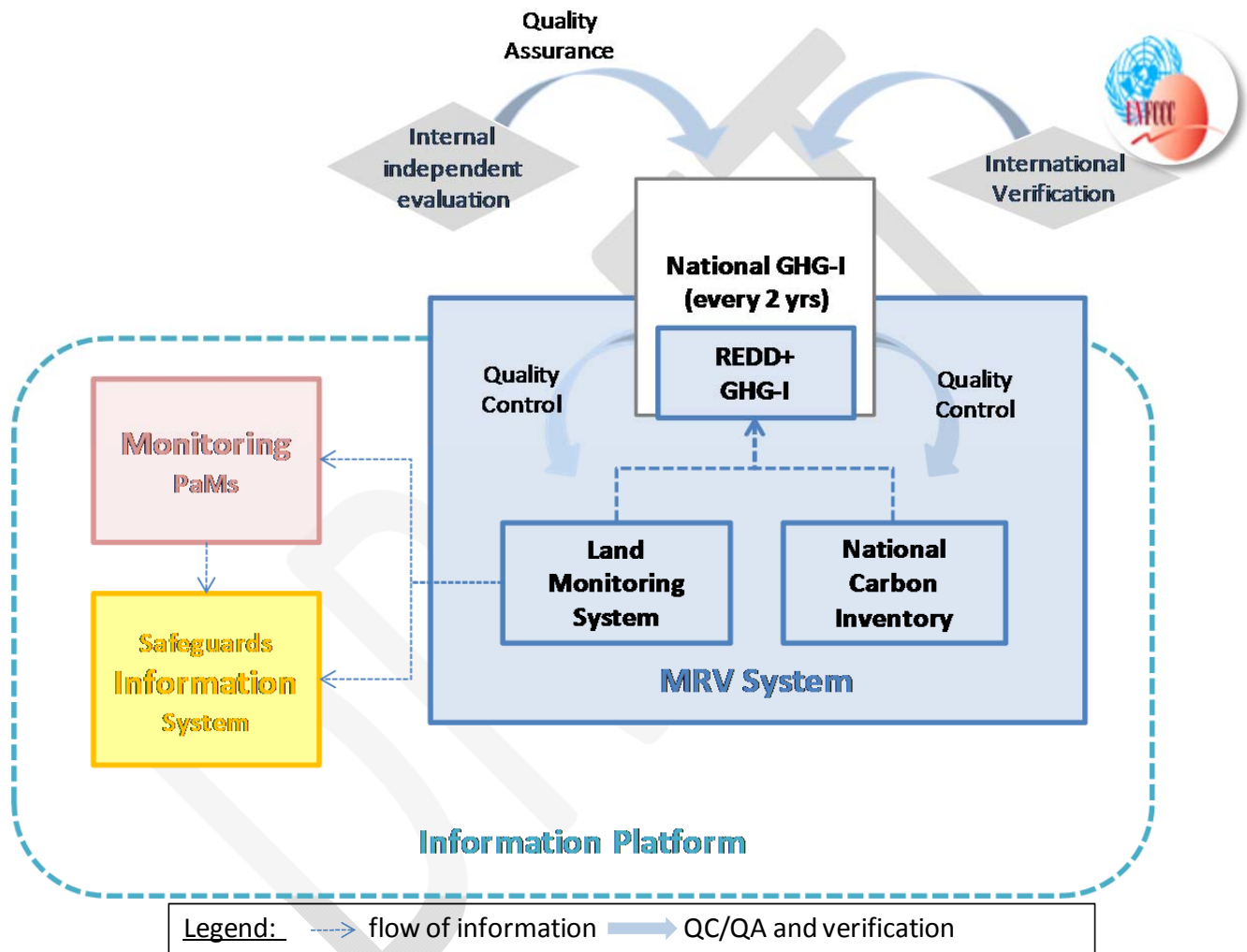


Figure 6. Information sharing platform

For instance, FORMIS has an adequate structure and capacity for integrating and sharing data through standard interfaces for REDD+, although it operates beyond the scope of REDD+. The FORMIS system is proposed to be comprised of 3 sub-systems: (i) the database will store quantitative and qualitative data collected and managed by agencies inside and outside of the FORMIS system; (ii) the platform will provide capacity for integration of existing and new data and applications, security, exposing data and business functionalities in standardized manners; and (iii) the content delivery layer, which includes different channels such as the portal for delivering the information to the target users and for accessing various applications (e.g. to the Safeguard Information System and monitoring of PaMs). As the FORMIS is currently in development (FORMIS, 2010), input on the requirements for the various sub-systems will need to be identified with the FORMIS team.

3 SAFEGUARDS AND POLICIES & MEASURES (PaMs)

In accordance with the COP 16 deliberations, countries participating in REDD+ will need to develop along with their MRV System, a system for providing information on how Safeguards are being addressed and respected, and to demonstrate “results-based actions that should be fully measured, reported and verified.” Two mechanisms, namely the Information System, and the monitoring of PaMs are proposed as mechanisms to respond to these specific requirements.

<UNFCCC Decision 1/CP.16 Paragraph 71>

Requests developing country Parties aiming to undertake the activities referred to in paragraph 70 above, (...), to develop the following elements: (...)

(c) A system for providing information on how the safeguards referred to in appendix I to this decision are being addressed and respected throughout the implementation of the activities referred to in paragraph 70 above, while respecting sovereignty;

<UNFCCC Decision 1/CP.16 Paragraph 73>

Decides that the activities undertaken by Parties referred to in paragraph 70 above should be implemented in phases, beginning with the development of national strategies or action plans, policies and measures, and capacity-building, followed by the implementation of national policies and measures and national strategies or action plans that could involve further capacity-building, technology development and transfer and results-based demonstration activities, and evolving into results-based actions that should be fully measured, reported and verified;

The monitoring of PaMs is a domestic tool to monitor the implementation of PaMs, although it may also be made available to the international community. The Information System is purely an information system containing information on how Safeguards are addressed, to provide information to all relevant stakeholders, international and domestic.

3.1 REDD+ SAFEGUARDS

The concept of safeguards was introduced during COP15 and was adopted during COP16, elaborated in Appendix I “Guidance and safeguards for policy approaches and positive incentives on issues relating to 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”.

<UNFCCC Decision 1/CP.16 Appendix I>

When undertaking the activities referred to in paragraph 70 of this decision, the following safeguards should be promoted and supported:

- (a) That actions complement or are consistent with the objectives of national forest programmes and relevant international conventions and agreements;*
- (b) Transparent and effective national forest governance structures, taking into account national legislation and sovereignty;*
- (c) Respect for the knowledge and rights of indigenous peoples and members of local communities, by taking into account relevant international obligations, national circumstances and laws, and noting that the United Nations General Assembly has adopted the United Nations Declaration on the Rights of Indigenous Peoples;*
- (d) The full and effective participation of relevant stakeholders, in particular indigenous peoples and local communities, in the actions referred to in paragraphs 70 and 72 of this decision;*
- (e) That actions are consistent with the conservation of natural forests and biological diversity, ensuring that the actions referred to in paragraph 70 of this decision are not used for the conversion of natural forests, but are instead used to incentivize the protection and conservation of natural forests and their ecosystem services, and to enhance other social and environmental benefits;*
- (f) Actions to address the risks of reversals;*
- (g) Actions to reduce displacement of emissions.*

As requested by the Convention, countries will need to develop a system that provides all the necessary information including on the current legislation pertaining to land uses and designations, indigenous rights and all measures and activities that the country is undertaking to promote them. The system will also provide information on the Vietnamese governance structures and functions addressing REDD+, from central government to sub-national government level, and non-government (communities, NGOs, private actors) activities.

This information system will be an important tool for helping to secure the full and effective participation of national and international stakeholders in the REDD+ process through free access to information on how the REDD+ Safeguards are being addressed. To ensure this open and free access, the system would be best operated through a web portal. Wherever appropriate, information can be freely accessed over the Internet, promoting transparency, and will act as the entry point for any stakeholder or otherwise interested party seeking information on REDD+ in Viet Nam.

Wherever possible, the information to be gathered on Safeguards will be based on existing capacities.

3.2 POLICIES AND MEASURES (PaMs)¹¹

The REDD+ GHG-I (generated through the MRV System) will be used to report Viet Nam's REDD+ performance in terms of CO₂ equivalent to the UNFCCC. However, Viet Nam's REDD+ performance will likely be the result of many "policies and measures" executed simultaneously at the national and sub-national levels, and varying widely in nature, from legal to socio-economic to land management.

¹¹ Article 4.2 of the UNFCCC lays out the commitments of Annex I Parties to mitigate climate change. According to Article 4.2(a), each Annex I Party "shall adopt national policies and take corresponding measures on the mitigation of climate change, by limiting its anthropogenic emissions of greenhouse gases and protecting and enhancing its greenhouse gas sinks and reservoirs". The Kyoto Protocol goes further by linking the achievement of Annex I targets with the implementation of emission reduction PaMs. The Protocol does not oblige governments to implement any particular policy, but rather gives an indicative list of PaMs that might help cut emissions and promote sustainable development (Article 2(a), Kyoto Protocol, 1998) and among the suggested PaMs there are two relevant for the AFOLU sector:

- Protection and enhancement of sinks and reservoirs of greenhouse gases not controlled by the Montreal Protocol, taking into account its commitments under relevant international environmental agreements; promotion of sustainable forest management practices, afforestation and reforestation; and
- Promotion of sustainable forms of agriculture in light of climate change considerations.

Monitoring (representing the second “M” in “MRV&M”) of these activities will therefore require diverse monitoring parameters, responding to the context in which REDD+ is being implemented.

The structure of the most appropriate sub-national monitoring methodology will depend on the way Viet Nam decides to link national mitigation performance with sub-national activities, i.e. the approach taken to ‘nesting’ REDD+. Nesting refers to the process of undertaking sub-national REDD+ activities within a national-level framework. The two principle ways in which this can be done are the “sub-national (e.g. provincial) approach” or the “project approach”¹². So far, Viet Nam’s REDD+ dialogue has geared towards a sub-national approach to nesting REDD+, rather than a project approach. Under this approach, the national government may set a national framework for PaMs, which may be best adapted individually for each sub-national entity according to their circumstances, through a sub-national PaMs framework (which need to also be integrated with national/local Socio-Economic Development Plans). Sub-national entities promote sub-national PaMs through provision of technical support (including support to non-government REDD+ projects). The emissions reductions and enhancement of removals resulting from these PaMs (including projects) are then measured against the sub-national emissions reduction targets, which are in turn collated nationally and measured against the national target and reference emission level/reference level (REL/RL).

PaMs monitoring will be required, at least at two levels:

- The central level for assessing national REDD+ PaMs performance and providing guidance to the sub-national levels; and
- The sub-national level for monitoring sub-national REDD+ PaMs (e.g. starting at the provincial level).

While discussions on REDD+ PaMs are still premature, it is currently being proposed that further discussion on the development of PaMs for Viet Nam will take place through piloting of demonstration activities in the second phase of REDD+. As Viet Nam develops, revises and adopts new PaMs at the national and/or sub-national levels, the monitoring needs may change, thus the monitoring framework requires regular review and revision.

Viet Nam is designing its strategies for REDD+ placing local communities to play an essential role. To this end, the involvement of local communities in monitoring PaMs, particularly at the sub-national levels may be a valid approach. Participatory Monitoring has the benefits of (i) raising awareness, (ii) encouraging local stakeholder participation and commitment, (iii) addressing intra-national mechanisms, such as REDD+ payment distribution to local communities.

3.3 INFORMATION SHARING PLATFORM

Similar to the information sharing modality under the MRV System, employing a shared information platform – the same platform as that for the MRV System – is suggested for the Information System and monitoring of PaMs. As mentioned above, to ensure free and open access, the use of a web-based portal (such as FORMIS) is proposed.

¹² A “project approach” means that the national government would set a national framework on rules and regulations relating to REDD+ projects, against which Government and non-government actors (i.e. NGOs, private sector) would develop REDD+ project proposals. Each proposal would undergo a review by a Regulatory Board (similar in function to the CDM Executive Board), which approves, rejects and/or provides feedback and/or recommendations on the proposals it receives. The emissions reduction and removals enhancement resulting from these projects would then be measured against the national target and REL/RL. This approach would require greater institutional capacity development than the sub-national level implementation approach adopted by Vietnam.

Benefits of using a shared information platform for and among these mechanisms for MRV, Safeguards and PaMs include:

- Integrating information collected by the various agencies involved in the collection of data for Safeguards and monitoring of PaMs, whereby promoting coordination and collaboration amongst agencies.
- Cross-referencing of data between results as generated through the MRV System and how Safeguards are being addressed, in a geo-spatially explicit manner.
- Connecting the results of MRV with the sub-national implementation of PaMs, in a geo-spatially explicit manner.

DRAFT

4 PHASED APPROACH TO REDD+

Following the COP16 Decision, MRV, Safeguards Information and Monitoring of PaMs will be developed following the three phases of the REDD+ mechanism (Figure 7). Each phase aims to build capacity and prepare for the subsequent phase, meaning that there can be an element of overlap between phases.

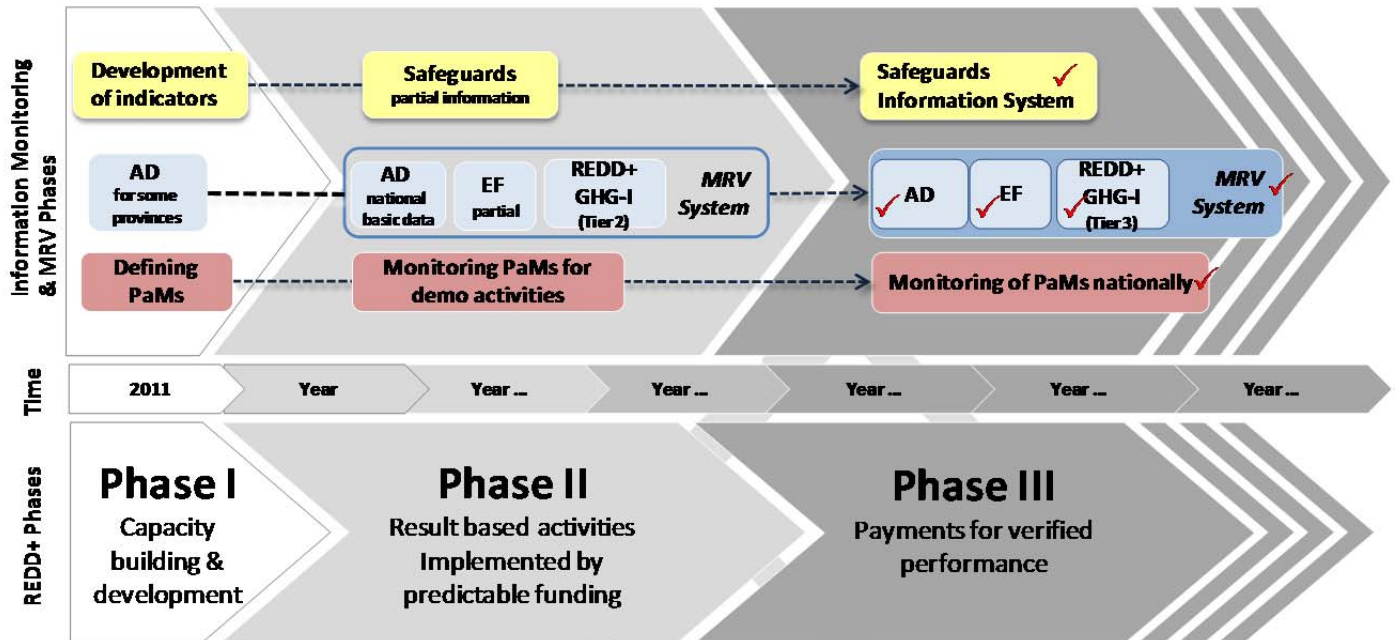


Figure 7. The phased approach to REDD+ and development of MRV, Safeguards and monitoring of PaMs

The time taken to progress from one phase to the next will vary from country to country. Viet Nam is currently in Phase I, involving the development of the National REDD+ Program, PaMs, and capacity building. Transitioning to successive phases will depend on national conditions and decisions, as well as progress of negotiations at the UNFCCC COPs.

4.1 REDD+ PHASE I: CAPACITY BUILDING & INSTITUTIONAL ARRANGEMENTS

As part of Phase I, Viet Nam will need to define its structure for MRV, Information and for monitoring of PaMs for REDD+ and initiate capacity building for all the institutions involved, with a view to operationalising these institutional arrangements in Phase II. Ultimately, after the institutional arrangements are agreed in consultation with stakeholders (based on existing forest/land-related monitoring systems and institutions), this will need to be made official.

Another area of work under Phase I is the development of a national framework of REDD+ PaMs. This process will involve defining where and how the five REDD+ activities will be distributed across the national territory, and thereby delineate the mitigation potential in exact figures of REDD+ in the country. This is a critically important process for monitoring because defining the ways in which the REDD+ PaMs will be defined and implemented will allow for the development of specific methodologies for monitoring. Several factors work to the advantage in developing the MRV system in Vietnam, including the reference to key requirements such as institutional arrangements legally mandated by the Land Law (2003) and Law on Forest Protection and Development (2004) and other legal instruments. Another factor is the legal basis for participatory approaches to land and forest monitoring and the socio-economic census. Once the national framework for PaMs is established, sub-national level PaMs will need to be developed.

As national and sub-national PaMs are agreed on, a monitoring framework and system should be identified, including identification of institutional arrangements and capacity building for its implementation.

By the end of Phase I, it is expected that Viet Nam will have:

- ✓ Defined and proposed the necessary institutional structure to begin working on all components of MRV, Information, and monitoring of PaMs;
- ✓ Initiated capacity building in all relevant institutions;
- ✓ Initiated defining a national PaMs framework, and begun with defining sub-national PaMs;

At the same time, MRV capacities/components already existing in the country will continue to be operational, or undergo reviews for revision of a design to respond to REDD+ requirements.

- ✓ The NFIMAP is on-going, and will be reviewed against REDD+ requirements;
- ✓ The NFIMAP will produce forest cover maps in forestry land in some provinces, providing AD for these provinces.

Also, in the context of reference emission level (REL) and/or reference level (RL), Viet Nam will also need to have obtained the necessary historical data for establishing its REL / RL by the end of Phase I. Viet Nam is expected to have gathered its historical data by March 2012.

4.2 REDD+ PHASE II: OPERATIONALIZATION AT DEMONSTRATION ACTIVITY LEVEL

This is a transition phase, which focuses on the implementation of national PaMs and national strategies and action plans, technology development and transfer, and results-based demonstration activities. Based on the national PaMs framework, sub-national (e.g. starting with provincial level) PaMs will be implemented, starting with a few pilot provinces.

In Phase II of REDD+ the implementation of the national REDD+ PaMs will result in demonstration activities that must be results-based, i.e. resulting in measurable positive outcomes. In order to follow these activities, a monitoring system for demonstration activities will be required in Phase II. This system will monitor the results obtained by all the demonstration activities and also provide information relating to land use and land use changes over areas where demonstration activities are being implemented.

By the end of this phase, Viet Nam should be able to prepare its national REDD+ GHG-I adhering to Tier 2 reporting¹³. To this end, Viet Nam will need to generate EFs hence, develop allometric equations and conversion/expansion factors, and implement the NFIMAP tailored (during Phase I) to meet REDD+ requirements. By the end of Phase II, AD should be generated to inform basic national-level forest land and land use change of some broad land use (land cover) sub-categories through a Land Monitoring System (LMS).

In Phase II, the LMS will be a crucial element to monitor the implementation of REDD+ PaMs through provision of land use and land use change data generated through RS (and field measurements, where

¹³ The estimation of both the activity data (AD) and the appropriate emission factors (EF) can be conducted in multiple ways. The IPCC 2006 Guidelines categorize them into three levels of methodological complexity called Tiers. Tier 1 is based on basic assumptions and methods, as well as default parameter values (e.g. EFs) and spatially coarse globally available estimates of AD provided in the IPCC 2006 Guidelines. In Tier 2, the same methodological approach is applied together with country specific data providing higher temporal and spatial resolution. Finally, Tier 3 requires that a country develops its specific higher order methods and sub-national data measurements repeated over time, to achieve an even higher accuracy (Box 1.1, IPCC, 2006). *"In general, moving to higher tiers improves the accuracy of the inventory and reduces uncertainty, but the complexity and resources required for conducting inventories also increases for higher tiers. If needed, a combination of tiers can be used, e.g., Tier 2 can be used for biomass and Tier 1 for soil carbon"* (IPCC, 2006).

appropriate) for sub-national demonstration activities. Under this phase, data made available by the LMS may be used for as a basis for provision of positive incentives for relevant stakeholders taking part in the REDD+ demonstration activities. Indeed, monitoring of PaMs (for demonstration activities) will provide evidence that demonstration activities to be accounted for in the national REDD+ GHG-I are “results-based” (i.e. measurable positive outcomes). The LMS will also contribute to providing information on Safeguards, specifically, those Safeguards which require geo-spatial referencing.

By the end of Phase II, Viet Nam will have:

- ✓ Basic AD for forestry land nationally, and to a limited extent for non-forestry land generated through the LMS, supporting the monitoring of PaMs implemented through demonstration activities;
- ✓ Partial EF data (including some allometric equations and conversion/expansion factors) for the National Carbon Inventory (NCI);
- ✓ National REDD+ GHG-I adhering to Tier 2 reporting requirements of the UNFCCC;
- ✓ Information System: partial geospatial, social, ecological and governance data and information; a web-based application to make appropriate information on REDD+ Safeguards available; uploaded and updated information on the web portal as available;
- ✓ Monitoring system and methodology for assessing and ensuring that the implementation of REDD+ demonstration activities is result-based (i.e. measurable positive outcomes against the various set indicators/parameters);
- ✓ Appropriate institutional arrangements and capacity for REDD+ monitoring at sub-national levels (e.g., provincial and district levels) where demonstration activities take place are strengthened.

4.3 REDD+ PHASE III: FULL OPERATIONALIZATION

In Phase III, REDD+ will be fully integrated with other formally agreed mitigation mechanisms under UNFCCC.

The MRV System will become fully operational as AD is made available for the national level and EFs can be estimated generating a national REDD+ GHG-I, aiming at Tier 3 reporting requirements. This will require that the LMS and the NCI for REDD+ become fully operational and data available. This Phase will result in payments for verified performance; hence the system and the resultant data will be subjected to verification by the UNFCCC Secretariat.

In Phase III of REDD+ the monitoring of PaMs system will be expanded to cover the national territory to validate that the implementation of national PaMs on all the national territory are results-based (i.e. determines how much of each REDD+ activity is taking place over the national territory and how these are changing).

Under Phase III, Viet Nam will have:

- ✓ A fully operational MRV System accountable at the international level, including an LMS providing AD (with land use change matrix), an NCI for REDD+ providing EF;
- ✓ National REDD+ GHG-I adhering to Tier 3 reporting requirements of the UNFCCC;
- ✓ A fully operational Information System including information on Safeguards ;
- ✓ A monitoring system operational at the national level, to monitor the implementation of PaMs.

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MRV Framework Document Consultation Plan

1. Background

Viet Nam is in the process of establishing its National REDD+ Program (NRP) with the objective of applying the principles of the REDD+ mechanism over its entire forest estate.

In January 2011, the Government of Viet Nam has established a National REDD+ Steering Committee to propose relevant policies and approaches on REDD+, coordinate with other State Agencies on REDD+ and to formulate and implement the National REDD+ Program. The Viet Nam REDD+ Office was established to act as the Standing Office for the National REDD+ Steering Committee and to undertake administrative and operational tasks of the National REDD+ Program¹. With these top-level structures in place, the expectation is that definition of relevant policies (e.g. the National REDD+ Program) will be undertaken with priority and implementation of (pilot) activities started shortly.

MRV is one of the core components of the National REDD+ Program, being the mechanism through which Vietnam will assess and report on its national performance on GHG emission and removals in the LULUCF sector, in order to access international REDD+ performance-based finance. This document presents a stakeholder consultation plan for drafting of the “MRV Framework Document; with reference to safeguards information and monitoring of PaMs Ver.1” and is consistent with an emerging (but still evolving) consultation strategy for REDD+ in Viet Nam.

2. Objectives of the consultation

To develop the MRV Framework Document (Ver 1 for Phase I of REDD+) under the REDD+ Program for Vietnam through an open and consultative process

3. Scope of consultation

Ver 1 MRV Framework Document (for Phase I of REDD+)

4. Stakeholders

<Non-government>

- Sub-Technical Working Group on MRV (STWG-MRV) members
- Other international authorities on MRV (e.g. IPCC)

<Government>

Direct stakeholders:

- MARD: VNFOREST, Vietnam REDD+ Office, FIPI, FSIV, VFU
- MONRE: GDLA (CLAI, CLRIA), VNCCO
- Projects: FORMIS, NFA, JICA for GHG-I

Other Government stakeholders ²:

¹ Letter 282/VP-CP-QHQT, “Instruction of Prime Minister on the Report on the results of COP16 and CMP6 in Cancun, Mexico”, dated 13 January 2011; MARD Decision 39/QĐ-BNN-TCCB, “On establishment of the Steering Committee for implementation of the ‘Reducing Emissions from deforestation and forest degradation, and the role of conservation, sustainable management of forests and enhancement of forest carbon stocks in developing countries (REDD+)’ in Viet Nam”, dated 7 January 2011; and MARD Decision 18/QĐ-TCLN-VP, “On establishment of the Viet Nam REDD+ Office”, dated 19 January 2011.

² Not including stakeholders for Safeguards and PaMs (Committee for Ethnic Minority Affairs, MOLISA, Sub-national level PCs, DARD and DONRE offices) who may be of relevance for subsequent versions of the Framework Document.

- Vietnam Academy of Space Technology (Space Technology Institute), MPI, MoF, Office of Government

5. Guiding principles of drafting and consultation

1. The consultation process proposed here is for the Ver 1 Document, which represents the REDD+ MRV discussions for Phase I of REDD+ (in reference to the COP 16 decision that REDD+ activities be implemented in phases). It is the intention that a similar consultation process be implemented during each of the further phases.
2. The MRV Framework Document is an evolving document, which should be updated as necessary to be consistent with the conditions and needs in Vietnam, and in accordance with international dialogue. Consultations may thus need to take place outside the scope of the plans being proposed, and can be proposed to the Vietnam REDD+ Office.
3. As REDD+ MRV is relevant for not only Vietnam, but also for the international stakeholders, the Framework Document will be produced in both English and Vietnamese languages.
4. The drafting of the Framework Document will be undertaken by a “drafting team” composed of the following individuals funded through the UN-REDD Programme:
 - National consultant(s) with expertise/experience in the field of forestry, forest inventory/monitoring, forestry institutions, local forestry institutions,
 - Technical guidance by international experts on MRV (from FAO),
 - Coordinator (FAO).
5. The consultation will be primarily facilitated and organized by the drafting team, in collaboration with other relevant parties as necessary, with technical supervision by FAO.
6. Minutes consultation meetings (only formal meetings) will be made available through the STWG-MRV page of the VN REDD+ website ³.
7. After Draft 2, each of the draft Framework Documents will be posted on the above website, open for comments and public access. Comments from the general public will be archived, and taken into account as appropriate, in the drafting of the subsequent draft/Version.

6. Steps of the consultation

- Step 1: Drafting of the MRV Framework Document Draft 1 (completed)
- Step 2: Consultations of Draft 1 with the STWG-MRV (completed)
- Step 3: Drafting of Draft 2 based on feedback (on-going)
- Step 4: Consultations with the Government on Draft 2
- Step 5: Drafting of Draft 3 based on feedback
- Step 6: Peer reviews for Draft 3
- Step 7: Drafting of Final Draft based on peer reviews
- Step 8: Integration into the National REDD+ Program Document (NRP)

³ Minutes of the meetings available from: <http://vietnam-redd.org/Web/Default.aspx?tab=newsdetail&zoneid=108&subzone=113&child=149&itemid=201&lang=en-US>

Step 1: Drafting of the MRV Framework Document Draft 1 (completed)

- Preparation of Draft 1 by drafting team through focused discussions with relevant key stakeholders.
- April - May 2011

Step 2: Consultations of Draft 1 with the STWG-MRV (completed)

- Consultation of Draft 1 with the STWG-MRV:
 - Preliminary consultation meeting on 24 April
 - Draft 1 circulated through email to STWG-MRV members, with copy to REDD+ Network for comments to be fed-back at the STWG-MRV meeting, or through email by 31 May.
 - Consultation meeting on 20 May
- April – May 2011

Step 3: Drafting of Draft 2 based on feedback (on-going)

- Preparation of Draft 2 by the drafting team based on comments received from the meetings, and through email.
- Translate Draft 2 into Vietnamese
- Share Draft 2 with the STWG-MRV (copy to Network) and GoV stakeholders, and publish through website
- Indicative schedule: June 2011

Step 4: Consultations with the Government on Draft 2

- Consultation of Draft 2 with Government stakeholders:
 - At least one general consultation meeting with all government stakeholder agencies;
 - Multiple consultation meetings with individual stakeholder agencies as necessary.
- Indicative schedule: June – July 2011

Step 5: Drafting of Draft 3 based on feedback

- Preparation of Draft 3 by the drafting team based on comments received from the meetings, and through email.
- Share Draft 3 with the STWG-MRV (copy to Network) and GoV stakeholders, and publish through website
- Indicative schedule: August 2011

Step 6: Peer reviews for Draft 3

- Undergo technical peer review by relevant authorities on MRV and background of the MRV related institutions in Vietnam. Peer reviews are employed to provide credibility.
- Total 3 peer reviews are proposed, including 1 international and 2 national reviews. Peer reviewers should be able to objectively comment on the MRV System for Vietnam, independent of their institutional affiliations.
- Indicative schedule: September 2011

Step 7: Drafting of Final Draft based on peer reviews

- Preparation of Final Draft by the drafting team based on peer review comments.

- Share Final Draft with the STWG-MRV (copy to Network) and GoV stakeholders, and publish through website.
- Indicative schedule: October 2011

Step 8: Integration into the National REDD+ Program Document (NRP)

- Submit the Final Draft for integration into the NRP, as text (excerpt summary) and annex (entire document).
- Official government endorsement/approval of the Final Document will be through the form of the NRP document text and annex.
- Indicative schedule: December 2011

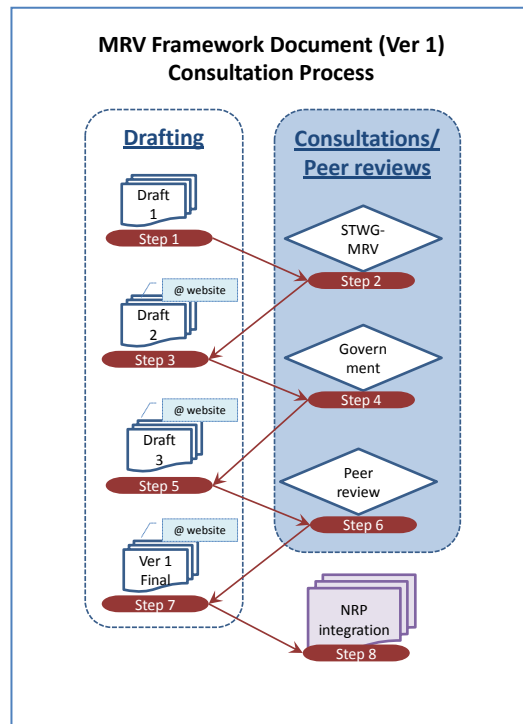


Figure: Consultation plan diagram

ANNEX 2

Existing capacity for MRV at FIPI

Forest Inventory and Planning Institute (FIPI)

Vinh Quynh – Thanh Tri – Ha Noi

Tel: 043.8613858

Fax: 043.8612881

Website: <http://www.fipi.vn>

Email: fipivn@hn.vnn.vn

The Forestry Inventory and Planning Institute (FIPI), established in 1961, with headquarters in Hanoi, is an organization with the mandate to map the forest cover of the whole country each five years and is one of the most important users of satellite data for forest cartography.

I. Status and mandate

The status and mandate of FIPI are stated in Decision 276/QĐ-TCLN dated 19/06/2010 by the General Director of VNFOREST as follow:

1. FIPI is a government service unit under the Vietnam Administration of Forestry (VNFOREST), having main functions of conducting basic forest resources survey and inventory, forest land planning, and the national development and management of forest resources in Vietnam to meet the requirements of the VNFOREST for the forestry sector.
2. FIPI has a legal status, seal and separate bank account at the State Treasury and the Bank in accordance with the laws; regular costs for operating its functions and tasks are ensured by the state budget.
3. FIPI is a self-financing agency as a public service unit stipulated by Ministry of Agriculture and Rural Development (MARD).
4. The Institute's headquarters is located in Hanoi.

II. Tasks and Responsibilities

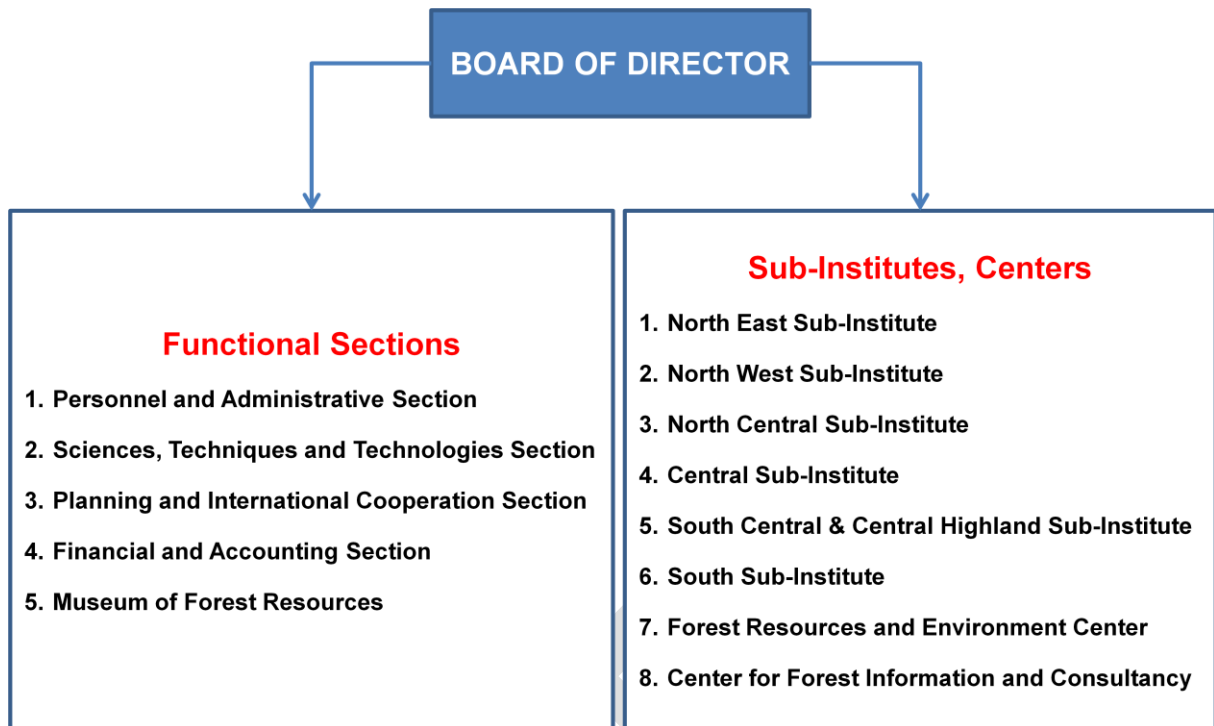
Tasks and responsibilities are also stated in Decision 276/QĐ-TCLN dated 19/06/2010 by the Director General of VNFOREST:

1. Proposing and establishing the standards, national technical regulations, procedures, economic and technical cost norms in the forestry sector; implementing forestry programs, projects; conducting regular national annual forest surveys; doing forest planning and making annual report to the Director General of VNFOREST.
2. Establishing guideline for making report to the Director General of VNFOREST regarding to the forest inventory and planning, identification, demarcation of forest types on maps and on field; providing contents and methods for forest inventory and monitoring the changes in forest resources.
3. Assisting the Director General of VNFOREST in synthesizing the area data on forest planning and inventory results for publishing periodically as prescribed.
4. Assisting the Director General of VNFOREST in managing, implementing the tasks of establishment and development of the Museum of forest resources in the Vietnam's nature museums system.

5. Implementing the basic programs, research and applications; the projects on forest inventory and planning; and forest resources changes monitoring and assessment at the national scale.
6. Conducting researches on the applications of information technology, GIS, remote sensing imagery processing, GPS, and other technologies for building and managing database systems; generating forest maps for developing the investment and planning project, forestry development plans.
7. Participating in formulating the national forest development strategies, and taking part in the analysis and assessment of the impacts of mechanisms and policies for the development of forestry and participating in the assessment of forest protection and development planning of the local government related to forest inventory and planning and forest environment.
8. Taking the chair of or participating in the international cooperation projects, joint-venture or cooperation in the field of forest resources inventory, forest environment, and forestry development planning.
9. Compiling guidelines on the field of forest inventory and planning. Participating in training human resources and professional training on the forest inventory and planning as assigned by the VNFOREST.
10. Implementing consulting services:
 - a) To investigate and evaluate forests resources – fauna and flora, biodiversity, forest site and environment at all levels for forestry sector development;
 - b) To investigate and study the issues of socio-economic, environment for forestry development, including economic resources, marketing economy, regional economy, local economy, environmental economy and issues of cultural, social, climate change related to the management, usage and development of forest resources;
 - c) To investigate and participate in conducting the development of land use planning, protection planning and development of forests and forestry development planning, socio-economic development and planning in the rural and mountainous areas;
 - d) To investigate and develop economic and technical proposals, forestry investment and development projects, such as modulation of forests, sustainable forest management, community forest management, forest valuation and support to the mechanism of payments for environmental services of forest, development of ecotourism, development of urban trees and forest landscapes;
 - e) To organize the design of forestry implementation such as land and forest allocation, afforestation, forest restoration, forest enrichment, forest road network; agro forestry models; resettlement, population stabilization;
 - f) To implement activities and other advisory services in the field of forestry and rural development as transferring of models of agriculture and forestry production and development, measuring and establishing topographic maps and cadastral maps / parcel addresses; printing the documentation and maps of all kinds;
11. To manage and use the labor, property, and finance of FIPI in accordance with the laws;
12. To perform other duties assigned by the Director General of VNFOREST.

III. Organization Structure

The organization structure of FIPI is shown below:



IV. Human Resource Capacity

As of December 31, 2009, the number of officials and employees of the Forest Inventory and Planning Institute is 570 people, including 8 doctors, 46 masters, 68 engineers and 352 workers having college degrees. In terms of the organization, FIPI is under the VNFOREST, Ministry of Agriculture and Rural Development (MARD) with a structure of the 5 functional sections and 8 units (6 sub-FIPIs and 2 centers).

V. Facilities Capacity for Forest Inventory and Forest Cover Mapping

The assets of FIPI counted on 31/12/2009 as below:

5.1. Equipment

- Desktops: 465
- Notebook: 153
- A0 Printer: 12
- A4 Printer: 121
- Photocopiers: 16
- Projectors: 24
- GPS: 61
- Digital Cameras: 102
- Cars: 29
- Other Instruments: Sunto, Bumley, compass, binocular...

5.2. Software

- ARC / GIS: 3 licenses
- ERDAS / IMAGINE: 1 license
- ILWIS: 1 license
- eCognition: 1 license
- MICROSTATION: 1 license
- MAP / INFO: 3 licenses

VI. Professional Centers of FIPI:

There are 2 professional centers of FIPI, namely the Center for Forest Resources and Environment (FREC) and the Center for Forest Information and Consultancy (CFIC). The basic information about these two centers are as the following:

6.1. Forest Resources and Environment Center (FREC)

Add.: Vinh Quynh commune, Thanh Tri istrict, Hanoi city

Tel.: 04,8615513

Fax: 04,8616081

Email: frec@hn.vnn.vn

Director: Dr. Nguyễn Huy Dũng

Deputy director: MSc. Vũ Tiến Điền

6.1.1. General information

The Forest Resources and Environment Center was established in 1989 directly under FIPI by the Decision 430/QĐ/TC-LĐ dated 3rd August, 1989 of the Ministry of Forestry (now called MARD). The Center is now organized into five functional and professional units:

- General Unit
- Planning and technical Unit
- GIS and Remote Sensing Unit
- Biodiversity and Environment Unit
- Forest Resources and Planning Unit

These functional and professional units are reasonably organized to promote the best expertise of the staff and implement activities in the Center.

6.1.2. Functions and Duties

- Establishing forest and land use maps, based on the Remote Sensing and GIS technology combined with field survey, of communal, district, provincial, regional and national levels to monitor, analyze and review the changes of forest resources and plan projects on agriculture and forestry,
- Studying the characteristics of forests and biodiversity assessment, as well as environmental impact assessment in forestry,
- Carrying out feasibility studies and making investment plans for special use forest areas, protection forest projects, and economic and social development projects in mountainous areas,

- Carrying out scientific studies on agriculture and forestry sector,
- In cooperation with the international organizations over the above issues.

6.1.3. Capability and Facility

a. Capability

The Center has 50 staff members, of which 92% of the staff has university and postgraduate degrees (2 doctors, 11 masters, 30 engineers and bachelors). The Center has many experiences in the fields of biodiversity survey and assessment of forest resources, planning and implementing development projects in the agriculture and forestry sectors.

b. Facility

The units of the Center are fully equipped with devices to undertake the tasks assigned by the Ministry and FIPI as well as implementation of contracts with organizations, local and foreign individuals in the related fields. All units are equipped with new generation computers and specialized software, for example: ERDAS, ENVI, ILWIS, ArcGIS, etc. (Table X-1) to meet their professional duties. The computers are connected to the local area network (LAN) and with high speed internet connection (ADSL) to easily exchange and access information with other agencies in the country.

The Center has been applying advanced technologies to improve and accelerate the progress of engineering works such as Remote Sensing, Digital Image Processing, GIS (Geographical Information System), GPS (Global Positioning System).

Table X-1: The FREC's facilities and equipments

No.	Name, Code, Technology	Number	Status
1	Cars (4 and 9 seats)	2	In good function
1	PC	50	In good function
2	Laptop	15	In good function
3	Printer (A4)	10	In good function
3	Color printer (A3)	1	In good function
4	Scanner (A4)	1	In good function
5	Color printer A0	1	In good function
6	Digital camera	15	In good function
7	Camera	1	In good function
8	GPS	10	In good function
9	EDART software	3 licenses	In good function
10	ENVI software	2 licenses	In good function
11	Arc/info - GIS software	5 keys	In good function
12	Arcview- GIS software	2 licenses	In good function
13	Mapinfo - GIS software	3 licenses	In good function

14	eCognition	01 license	New
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6.1.4. Main Achievements

The Center is among the leading units of the FIPI in the implementation of its tasks in the National Forest Inventory, Monitoring and Assessment Program. **Some of the Center's main projects relating to remote sensing in recent years are as below:**

2010: Creating a project plan of forest allocation for lease in Bac Can province: Using SPOT5 images for current forest and land use mapping – signed with Forest Protection Department of Bac Kan province, Duc Xuan, Bac Kan town; tel: 0281870521.

Updating forest types maps in 5-year periods of 1990, 1995, 2000 and 2005 for the southern provinces (based on the remote sensing images) as a basis for building the baseline properties of carbon-absorbing, a contract between JICA, NORDECO and FIPI, under the REDD program of the MARD (JICA representative office located in FIPI head quater, Thanh tri, Ha Noi).

2009: Establishing a project of development of protection forests in Lang Son province: Using SPOT5 image for current forest land use mapping – signed with Department of Agriculture and Rural Development of Lang Son province.

2008: Forest and land use status mapping in Ninh Thuan province and Da Nang city by using SPOT 5 images (signed with FIPI, Thanh Tri, Ha Noi, tel: 0438613858).

2007: Forest and land use status mapping in Dak Nong province by using SPOT 5 images (signed with FIPI, Thanh Tri, Ha Noi, tel: 0438613858).

Forest and land use status mapping for Dak To forest enterprise, Kon Tum province and Van Chan forest enterprise Yen Bai province with Quick Bird and Spot 5 images (contract with GTZ – Vietnam, Germany forestry program, 340 Bach Dang, Ha Noi).

2006: Forest and land use status mapping in Thanh Hoa and Hoa Binh provinces with SPOT 5 images in 2005 (signed with FIPI, Thanh Tri, Ha Noi, tel: 0438613858).

Forest and land use status mapping in Yen Bai province with ASTER images (contract with the Agriculture and Forestry Institute, Mendel-Czech Republic).

Forest and land use status mapping for Bac Quang district, Ha Giang province with Sport 5 images in 2005 (contract with Ha Giang's Department of Forestry).

Mapping forest and land use status for Madrac forest enterprise, Dak Lak province and Namg Nung forest enterprise, Dak Nong province with Quick Bird images (contract with GTZ- Vietnam, Germany forestry program, 340 Bach Dang, Ha Noi).

2005: Mapping land use status for coastal districts of four provinces of Tra Vinh, Bac Lieu, Soc Trang and Ca Mau (contract with the – World bank project - Forestry PMU -1st, De La Thanh Street, Ha Noi).

6.2. Center for Forest Information and Consultancy (CFIC):

Add.: 340 Bach Dang Str., Hoan Kiem Dist., Hanoi City

Tel.: 04. 39320717

Fax: 04. 39320745

Email:

Director: Dr. Dinh Huu Khanh

Director: Mr. Nguyen Cao Tung

6.2.1. General information

Center for Forest Information and Consultancy (CFIC), which is under the management of Forest Inventory and Planning Institute (FIPI), was established in 1970 with its initial tasks for applying computers in forest inventory and planning. Up to now, a large amount of maps, satellite images and GIS data have been achieved. CFIC has a lot of experiences in IT, GIS, RS, mapping, training, technology transferring, especially in the fields of forest inventory and planning, forest management, forest land allocation, plantation, forest protection, forest conservation, mountainous ecological environment, and land use planning.

6.2.2. Human Resources Capacity

There are more than 70 staff (1 doctor, 10 masters, 50 engineers and bachelors) currently working full-time at CFIC. Their educational backgrounds are Forestry and Agriculture, Geography, Pedagogic, Mathematics, Informatics, Geodesy, Mapping, Economics, Finance, etc. CFIC has also partnered with lots of top experts from other institutions and colleges in relevant areas.

6.2.3. Equipment and Software

CFIC is equipped with various types of computers, central server, and an LAN network, A0-sized printers (HP), Scanners, GPS and other supplementary equipment. Its software and IT system is largely comprehensive and wide-ranging, especially those software packages associated with GIS and RS standards such as INTERGRAPH, MICROSTATION, MAPINFO, ArcVIEW, Arc/INFO, ArcGIS, ERDAS, etc.

6.2.4. Main Fields of Interest

- Designing and building GIS-databases: During the 1990s, the Center had developed by itself a GIS software which was used for monitoring and managing forest data. The software had been used widely for large programs such as building a GIS-database for the National Forest Inventory, Monitoring and Assessment Program cycle I (1990-1995), cycle II (1995-2000); a GIS-database for PAM 3352 and 4304 projects, a GIS-database for forest resources of 34 forest enterprises of Bai Bang paper material company in 1994-1995. The on-screen digitizing technology based on scanned images has been applied in the Center since 1995 which is supported by INTERGRAPH's software such as IRASB, IRASC and GEOVEC in MICROSTATION environment. Currently, a lot of GIS-databases has been built by using popular software such as MAPINFO, ArcVIEW, Arc/INFO, and ArcGIS. Technical guidelines on making GIS-databases (system design, implementation, testing and completion) is updated and improved regularly. Five typical GIS-databases in the Center are:

i) Administrative boundary management at all level for four provinces Yen Bai, Quang Tri, Tuyen Quang and Binh Dinh.

ii) Forest resource and forest land allocation in Thanh Hoa province.

iii) National Forest Inventory, Monitoring and Assessment Program, Cycle III (2001-2005) and Cycle IV (2006-2010).

iv) National forest land inventory (decision no. 286-TTg); and

v) Forest change monitoring program for ten provinces (Instruction no. 32), three forest categories program for the country (2008-2009).

- Satellite image interpretation/classification technologies: CFIC has been applying satellite image interpretation/classification technologies since 1990s. A huge amount of Landsat ETM images and SPOT 5 images is stored in the Center. The satellite images were used to map forest maps of 20 provinces in the National Forest Inventory, Monitoring and Assessment Program, cycles II and III, 6 provinces in cycle IV. It is also used for updating forest cover maps of 10 provinces following the Instruction No. 32 of MARD. Furthermore, satellite images are currently being used for mapping forest status maps at scale 1/10,000 in Kon Tum, Dien Bien and Son La provinces.

- GIS application on land use planning, especially in development of decision support systems in combination with expert knowledge for Forestry and Agriculture planning scenarios. There are some typical examples such as:

i) National program on planning for three types of forest

ii) A decision support system for forest plantation.

- Information, consulting, training, survey, scientific research, monitoring and transfer of technology: In the recent years, the center has organized many training courses on GIS applications and image processing in Forestry; sending experts to teach at universities on GIS application in territorial planning. About scientific research, CFIC has been performed 02 case studies at ministry level and some studies at institute level.

- Cooperation with international organizations such as ITC, JICA, GTZ and relevant agencies in order to develop proposals and to implement projects.

- GIS and IT application on survey, inventory, preparation of investment projects, development of socio-economic rural areas and mountainous projects, monitoring, evaluation and management of forestry-sector.