



# **Designing a Land Monitoring System for REDD+ in Vietnam: Review of regulations and programmes and recommendations**

**UN-REDD PROGRAMME**

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## Table of Contents

1. Introduction .....	5
2. Legal basis for forest and forest land monitoring.....	6
2.1 Definition and frequency of implementation .....	6
2.2 Responsibilities and institutional arrangement .....	8
3. Existing domestic forest/forestry land monitoring systems.....	14
3.1 The Programme for Surveying, Monitoring and Assessment of Changes in Forest Resources Nationwide (NFIMAP) .....	14
3.1.1 Comments on the potential role for the LMS for REDD+ .....	16
3.2 The General Forest (Survey) Inventory (GFI/GFSI) Programme.....	16
3.2.1 The General Forest Inventory (GFI) 1997-1999.....	16
3.2.2 The General Forest Survey and Inventory (GFSI) Project in the period 2010-2015...	18
3.2.3 Comments on potential role of GFSI for the REDD+ LMS .....	19
3.3 The Annual Forest Statistics and Reporting Programme .....	20
3.3.1 Comments on the potential role for the LMS for REDD+.....	21
4. Existing foreign forest/forestry land monitoring systems .....	21
4.1 The TerraAmazon System of Brazil .....	21
4.1.1 Comments on the suitability of the TerraAmazon system to Vietnamese context...	23
4.2 TerraCongo and the National Forest Monitoring System in DRC .....	23
4.2.1 Comments on the applicability of DRC's National Forest Monitoring to Vietnam ....	24
5. Preliminary proposals for developing a REDD+ LMS for Vietnam .....	24
5.1 Proposed functions of the LMS .....	24
5.2 Proposed institutional arrangement.....	25
5.3 Proposed data analysis and management .....	25
References .....	27
Annex: Legislation on forest and forest land monitoring.....	29
The Law on Forest Protection and Development .....	29
Decree No. 23/2006/ND-CP ON THE IMPLEMENTATION OF THE LAW ON FOREST PROTECTION AND DEVELOPMENT.....	31
Decree No. 119/2006/ND-CP ON ORGANIZATION AND OPERATION OF THE FOREST PROTECTION SERVICE.....	34
Decree No. 01/2008/NĐ-CP DEFINING THE FUNCTIONS, TASKS, POWERS AND ORGANIZATIONAL STRUCTURE OF THE MINISTRY OF AGRICULTURE AND RURAL DEVELOPMENT .....	35

Decision No. 04/2010/QĐ-TT REGULATING FUNCTIONS, TASKS AUTHORITIES AND ORGANIZATIONAL STRUCTURE OF VIETNAM ADMINISTRATION OF FORESTRY (VNFOREST) UNDER MARD.....	35
Decision No. 38/QĐ-TCLN-VP REGULATING FUNCTIONS, DUTIES, AUTHORITIES AND ORGANIZATIONAL STRUCTURE OF FOREST PROTECTION DEPARTMENT.....	36
Decision No. 276/QĐ-TCLN REGUALTING FUNCTIONS, TASKS, AUTHORITIES AND ORGANIZATIONAL STURCTURE OF FOREST INVENTORY AND PLANNING INSTITUTE (FIPI) UNDER VNFOREST .....	36
Decision No. 07/2012/QĐ-TTg PROMULGATING SOME POLICIES FOR ENHANCEMENT OF FOREST PROTECTION WORK .....	37
Decision No. 803/QĐ-TTg ON APPROVAL OF NATIONAL INVENTORY AND STATISTICS PROGRAMMES .....	37
TABLE 1: RESPONSIBILITIES OF MINISTRIES.....	8
TABLE 2: RESPONSIBILITIES WITHIN MARD .....	10
TABLE 3: RESPONSIBILITIES OF FIPI .....	11
TABLE 4: RESPONSIBILITIES OF PEOPLE’S COMMITTEES .....	12
TABLE 5: RESPONSIBILITIES OF FOREST OWNERS.....	13
FIGURE 1: THE CONTRIBUTION OF EACH PROJECT IN THE TERRAAMAZON SYSTEM TO REDD+ .....	22
FIGURE 2: FUNCTIONS OF THE TERRACONGO WEBSITE.....	24

## List of acronyms

AD	Activity Data
COP	Conference of Parties
EF	Emission Factors
FAO	Food and Agriculture Organization of the United Nations
FIPI	Forest Inventory and Planning Institute
FPD	Forest Protection Department
GDLA	General Department of Land Administration
GFI	General Forest Inventory
GFSI	General Forest Survey and Inventory
GHG-I	Green House Gas -Inventory
GPG	Good Practice Guidance
GSO	General Statistics Office
IPCC	Inter-governmental Panel on Climate Change
LFPD	Law on Forest Protection and Development
LMS	Land Monitoring System
MARD	Ministry of Agriculture and Rural Development
MONRE	Ministry of Natural Resources and the Environment
MRV	Measurement, Reporting and Verification
NFIMAP	National Forest Inventory, Monitoring and Assessment Program
PC	People's Committee
QA/QC	Quality Assessment/Quality Control
RS	Remote Sensing
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
VNFOREST	Viet Nam Administration of Forestry

## 1. Introduction

In preparation for REDD+ implementation, one key area of work for Vietnam during its “piloting phase” (or REDD+ Phase II within the phased approach of REDD+ according to the UNFCCC Decision 1/CP.16) will be to develop a Land Monitoring System (LMS) which will be central to monitoring of implementation of the REDD+ activities and to support the REDD+ MRV system through the assessment of the Activity Data (AD) – one of the two primary inputs for calculating emissions and removals from forest land.

In particular during the REDD+ Phase II, the LMS should be able to assess the results generated through the REDD+ demonstration activities, while in Phase III LMS should be able to assess the results generated by all REDD+ actions (as a result of REDD+ Policies and Measures) and also able to assess the Vietnamese mitigation performances in terms of activity data to support the formulation of the National GHGs Inventory. The LMS should also be able to provide information on REDD+ Safeguards.

The LMS will be developed following a wall-to-wall approach so all REDD+ initiatives in the country will be monitored and consistent with Approach 3 of the IPCC (2006). The LMS is based primarily on remote sensing (RS) data, as it needs to comply with the IPCC (2006) guidance to provide consistent land representation. RS techniques are well adapted to fit the principles of accuracy, comparability, consistency, completeness, and transparency required by the IPCC GPG (2003). Biennial updated reports are required (according to the Cancun Agreement), but the LMS will need to cover the entire territory at least every year as some forest related processes (e.g. forest degradation or sustainable management of forest) require a high temporal frequency in order to be tracked.

For Vietnam, a comprehensive LMS for REDD+ will need to be developed based on the existing systems and capacities in the country. The methodologies to analyse RS 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.

This document aims to review relevant regulations, institutions and existing processes related to forest/forestry land monitoring in order to propose a suitable LMS for REDD+ in Vietnam. The organization of the document is as follows: Section 2 gives a review on current legislation bases for forest/forestry land monitoring in Vietnam. Section 3 provides a review of domestic forest/forestry land monitoring systems while Section 4 gives a review of some foreign forest/forestry land monitoring systems. Finally, recommendations for developing a LMS for REDD+ in Vietnam are provided in Section 5.

## 2. Legal basis for forest and forest land monitoring

The legal basis for Vietnam’s national programs (tasks) for forest resource and land monitoring are found in some key legal documents including the following (see Annex A for details on each of the legal documents).

- The Law on Forest Protection and Development<sup>1</sup> (LFDP) (03/12/2004)
- Decree No. 23/2006/ND-CP on the Implementation of the Law on Forest Protection and Development (03/03/2006), Prime Minister
- Decree No. 119/2006/ND-CP on organization and operation of the forest protection service (16/10/2006), Prime Minister
- Decree No. 01/2008/NĐ-CP Defining the Functions, Tasks, Powers and Organizational Structure of the Ministry of Agriculture and Rural Development (03/01/2008)
- Decision No. 04/2010/QĐ-TT Regulating Functions, Tasks, Authorities, and Organizational Structure of Vietnam Administration of Forestry (VNFOREST) under MARD (25/01/2010)
- Decision No. 38/QĐ-TCLN-VP (22/04/2010) Regulating Functions, Duties, Authorities and Organizational Structure of the Forest Protection Department (FPD)
- Decision No. 276/QĐ-TCLN Regulating Functions, Tasks, Authorities and Organizational Structure of Forest Inventory and Planning Institute (FIPI) under VNFOREST (19/06/2010)
- Decision No. 07/2012/QĐ-TTg Promulgating Some Policies for Promotion of Forest Protection Work (08/02/2012), Prime Minister
- Decision No. 803/QĐ-TTg On the approval of the National Statistic Inventory Program, (28/06/2012) Prime Minister

The following provides an overview of the legal basis for carrying out national programmes for forest inventory, monitoring, and assessment. The italics in the tables indicate excerpts from the translation (official and unofficial) of original legislation.

### 2.1 Definition and frequency of implementation

In the LFDP, three types tasks associated with forest inventorying, monitoring, and assessment are identified;

- Forest statistics,
- Forest inventory, and
- Monitoring changes in forest resources

All of these three tasks generate data on forest/forestry land areas of one point in time and the changes thereof as compared with the results of another point in history. According to the legal definition, the difference seem to be the format of data, whereas forest statistics are provided as information on forest expanse in tabulated form, forest inventory includes the output in the form of maps. Forest statistics are assessed and reported yearly, whereas forest inventory is done every five years. The details of methodologis and outputs generated are defined elsewhere. Monitoring changes in forest resources is defined most comprehensively including monitoring of expanse, as well as forest resource quality. The tasks have overlaps between one another.

Legal documents also refer to tasks such as “surveying” which may likely mean the equivalent of or a part of the work under “statistics”, “inventorying” and “monitoring”.

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<sup>1</sup> Promulgated through [ORDER No. 25/2004/L-CTN OF DECEMBER 14, 2004 ON LAW PROMULGATION](#)

	Law on Forest Protection and Development <sup>2</sup> (LFPD) (03/12/2004)	Decree No. 23/2006/ND-CP on the Implementation of the Law on Forest Protection and Development (03/03/2006)
Forest statistics	<ul style="list-style-type: none"> <li>• cadastral dossier-based synthesization<sup>3</sup> and assessment of the acreage and quality of assorted forests at the time of conducting the statistical work and of forest changes at the interval between two statistical times</li> <li>• shall be conducted annually and publicized in the first quarter of the subsequent year</li> </ul>	<ul style="list-style-type: none"> <li>• annual recording and summing up in books of area and status of forests of each kind</li> <li>• results shall be announced in the first quarter of every year</li> </ul>
Forest inventory	<ul style="list-style-type: none"> <li>• cadastral dossier-based and <u>field</u> synthesization and assessment of the acreage, reserves and quality of assorted forests at the time of inventory and of forest changes at the interval between two inventories</li> <li>• shall be conducted once every five years and publicized in the second quarter of the subsequent year</li> </ul>	<ul style="list-style-type: none"> <li>• examination and comparison between data recorded in statistical books and <u>maps</u> and the assigned or leased forest areas on field</li> <li>• conducted once every five years and in the year with the [last]unit number being zero or five</li> <li>• results shall be announced in the second quarter of the first year of the subsequent inventory period</li> </ul>
Monitoring of changes in forest resources	<ul style="list-style-type: none"> <li>• shall be conducted regularly</li> </ul>	<ul style="list-style-type: none"> <li>• Contents: cover changes in forest area, forest reserves, forest quality, quantity and composition of forest fauna and flora; changes of forests in relation with economic, social and environmental factors so as to find out laws of changes in forest resources</li> <li>• assessment of the monitoring of changes in forest resources shall be conducted regularly and announced once every five years</li> <li>• changes shall be announced at the</li> </ul>

<sup>2</sup> Promulgated through [ORDER No. 25/2004/L-CTN OF DECEMBER 14, 2004 ON LAW PROMULGATION](#)

<sup>3</sup>“Cadastral dossier-based synthesization” is understood to mean the summary data from forest management dossiers. According to Decree 23/2006, “forest management dossiers comprise data on forest area, status and management situation, enclosed with maps of forest lots. Such dossiers must be complete, accurate, updated regularly and promptly. They must be kept and managed in paper and digital form for computerized management; forest management dossiers shall be compiled for each commune whereby the smallest unit shall be forest lot, the statistical unit shall be compartment and the collective unit shall be commune.”

		latest by June 30 of the first year of the subsequent five-year cycle of monitoring changes in forest resources
Base units for statistics, inventory and monitoring	<ul style="list-style-type: none"> <li>communes, wards and townships</li> </ul>	<ul style="list-style-type: none"> <li>National and local</li> </ul>

## 2.2 Responsibilities and institutional arrangement

The Ministry of Agriculture and Rural Development (MARD) is assigned as the prime ministry over the tasks of forest statistics, inventory, and monitoring of changes in forest resources, coordinating implementation with other ministries, namely the Ministry of Natural Resources and Environment (MONRE) and the General Statistics Office (GSO). Within MARD, the Vietnam Forestry Administration (VNFOREST) has the overall mandate to “direct” and “guide” all three tasks and to publicize the results. Under VNFOREST, Forest Protection Department (FPD) has the role to “direct” and “organize” the tasks with its provincial, district, and commune level offices.

The Forest Inventory and Planning Institute (FIPI) under VNFOREST of MARD has two distinct types of mandates. One is the technical mandate to develop and propose technical guidelines and methodologies including for all three tasks of statistics, inventory and monitoring of forest resources; and the other is the implementation of certain forest inventory and monitoring programmes.

Within each province or municipality, at the province level, the People’s Committees (PCs) are mandated to “organize” a number of related activities including surveying, inventory, statistics as well as the development of forest cover maps; for the first time, the District level PC is mandated to “conduct” tasks of statistics, inventory, and monitoring, and also to “direct” the Commune level PCs; the Commune level PC also “carry out” forest statistics tasks through “summing-up” and “updating” forest area and changes. The Commune PC also is tasked to delineate forest boundaries on maps.

Finally, it is the responsibility of the forest owner, either organization or individual, to “make” forest statistics and inventory and to carry out monitoring of forest resources.

**Table 1: Responsibilities of ministries**

	Law on Forest Protection and Development (LFPD) (03/12/2004)	Decree No. 23/2006/ND-CP on the Implementation of the LFPD (03/03/2006)	Decree No. 01/2008/NĐ-CP Defining the Functions, Tasks, Powers and Organizational Structure of the MARD (03/01/2008)
MARD	<ul style="list-style-type: none"> <li>assume the prime responsibility for, and coordinate with the Ministry of Natural Resources and Environment and the central statistical agency in, prescribing the contents and</li> </ul>	<ul style="list-style-type: none"> <li>assume the prime responsibility for, and coordinate with the central statistical agency in, summing up forest statistic and inventory results of their respective localities</li> </ul>	<ul style="list-style-type: none"> <li></li> </ul>

	forms and guiding the methods of forest statistics and inventory as well as monitoring of forest resource developments		
		<ul style="list-style-type: none"> <li>guide the survey, determination and delimitation of boundaries of forests of all kinds on maps and on field for uniform implementation nationwide</li> </ul>	
		<ul style="list-style-type: none"> <li>guide and direct the statistics, inventory and monitoring of changes in forest resources and afforestation land, and the compilation of forest management dossiers</li> </ul>	<ul style="list-style-type: none"> <li>guide and direct the survey, determination and demarcation of forests of all types; conducting of forest statistics and inventory, monitoring of forest resource developments in service of afforestation, compiling of forest management dossiers and</li> </ul>
		<ul style="list-style-type: none"> <li>announce national forest statistic and inventory results</li> </ul>	<ul style="list-style-type: none"> <li>announcing of annual forest status and results of five-year forest inventories</li> </ul>
Ministry of Natural Resources and Environment		<ul style="list-style-type: none"> <li>coordinate with the MARD in comparing data on areas of forests of all kinds with areas of land of all categories in accordance with the provisions of the Land Law and provisions of the Law on Forest Protection and Development</li> </ul>	
General Statistics Office		<ul style="list-style-type: none"> <li>coordinate with the MARD in formulating forms of statistics and</li> </ul>	

		inventory, guide local statistical agencies in coordinating with provincial/municipal Agriculture and Rural Development Services as well as assigned functional divisions in assisting PCs at all levels in conducting forest statistics and inventory	
		<ul style="list-style-type: none"> <li>• coordinate with the MARD in summing up forest statistic and inventory results to be reported to the Prime Ministry</li> </ul>	

**Table 2: Responsibilities within MARD**

	Decision No. 04/2010/QĐ-TT Regulating Functions, Tasks, Authorities and Organizational Structure of the Vietnam Administration of Forestry (VNFOREST) Under MARD (22/04/2010)	<a href="#">Decree No. 119/2006/ND-CP</a> on Organization and Operational of Forest Protection Services (16/10/2006)	Decision no. 38/QĐ-TCLN-VP Regulating Functions, Duties, Authorities and Organizational Structure of the Forest Protection Department (FPD) (22/04/2010)
VNFOREST	<ul style="list-style-type: none"> <li>• submit to the Minister of Agriculture and Rural Development criteria for forest identification and classification, functional compartments of special-use forests; make public...results of <u>forest inventories</u>, and <u>5-year and annual developments of forest resources</u></li> </ul>		
	<ul style="list-style-type: none"> <li>• issue guidelines, templates, and methodologies on <u>forest statistics</u>, <u>inventories</u>, <u>monitoring of forest</u></li> </ul>		

	<u>resources</u> , plantation land, and forest management profile		
Forest Protection Department		<ul style="list-style-type: none"> <li>direct the making of <u>statistics</u> on and <u>inventory</u> of forests and forest land</li> </ul>	<ul style="list-style-type: none"> <li>organize the implementation of the works of forest statistics and inventory, and monitoring of forest changes nationwide;</li> <li>submit to the VNFOREST Director General the results of annual <u>forest statistics and results of forest inventories</u>...</li> </ul>
Forest Protection Sub-Departments		<ul style="list-style-type: none"> <li>make <u>statistics</u> on, and <u>inventory</u> of, forests and forest land</li> </ul>	
Forest Protection Bureaus		<ul style="list-style-type: none"> <li><u>monitor</u> the forest and forest land developments</li> </ul>	
Commune forest rangers		<ul style="list-style-type: none"> <li>make <u>statistics</u> on, and <u>inventory</u> of, forests and forest land under their assigned management; to inspect the use of forests by forest owners in localities</li> </ul>	

**Table 3: Responsibilities of FIPI**

	Decision No. 276/QĐ-TCLN Regulating Functions, Tasks, Authorities and Organizational Structure of Forest Inventory and Planning Institute (FIPI) Under VNFOREST (19/06/2010)
FIPI	<ul style="list-style-type: none"> <li>conducting basic <u>inventories</u> on forest resources; planning, <u>surveying</u> and designing forest and forest land nationwide</li> <li>propose and develop national technical standards, procedures, regulations, technical-economical norms, long-term and annual national programmes, projects in the field of <u>forest inventory</u> and planning for submission to General Director of VNFOREST</li> <li>propose and develop guidelines and instructions for submission to General Director of VNFOREST for carrying out tasks of <u>inventory</u>, forest protection and development planning; <u>identifying</u> and delimiting boundaries of forest categories on maps and on</li> </ul>

	<p><u>the field</u>; preparing guidelines and methodologies on <u>forest statistics and inventory and monitoring of forest resource changes</u></p>
	<ul style="list-style-type: none"> <li>• assist General Director of VNFOREST in preparing documents and data on forest planning, results of national forest resource inventory for regular announcement in compliance with existing regulations</li> </ul>
	<ul style="list-style-type: none"> <li>• carry out basic and applied research programmes and projects; projects on <u>basic inventory, surveying</u> and planning in the forestry sector; programmes on <u>national surveying, monitoring and assessment of forest resource and environment changes</u></li> </ul>

**Table 4: Responsibilities of People’s Committees**

	Law on Forest Protection and Development (LFPD) (03/12/2004)	Decree No. 23/2006/ND-CP on the Implementation of the LFPD (03/03/2006)	Decision No. 07/2012/QĐ-TTg Promulgating Some Policies for Promotion of Forest Protection Work (08/02/2012)
People’s Committees (PCs) at all levels	<ul style="list-style-type: none"> <li>• organize and inspect forest statistics and inventory as well as the monitoring of forest resource developments</li> </ul>		
	<ul style="list-style-type: none"> <li>• report on the results of forest statistics and inventory and forest resource developments to the PCs of higher level or to MARD for provincial level</li> </ul>		
Provincial/ municipal People’s Committees (PCs)		<ul style="list-style-type: none"> <li>• organize the classification of forests, delimitation of boundaries of forests of all kinds in localities...</li> </ul>	<ul style="list-style-type: none"> <li>• organize the survey, inventory, statistics, classification of forest, and developing forest cover maps on the province’s management area</li> </ul>
		<ul style="list-style-type: none"> <li>• organize the statistics, inventory and monitoring of changes in forest resources in provinces or cities under the guidance of the MARD</li> </ul>	
District-level People’s Committees		<ul style="list-style-type: none"> <li>• classify forests, delimit boundaries of forests of all kinds in localities</li> </ul>	<ul style="list-style-type: none"> <li>• direct commune-level PCs to carry out statistics and</li> </ul>

(PCs)		under the direction of provincial-level PCs	monitoring changes on forest and forestry land
		<ul style="list-style-type: none"> <li>conduct statistics, inventory and monitoring of changes in forest resources in localities</li> </ul>	
		<ul style="list-style-type: none"> <li>report changes in forest resources to the provincial level PC</li> </ul>	
Commune/township People's Committees (PCs)	<ul style="list-style-type: none"> <li>declare <u>forest statistical and inventory</u> data for forest areas under their direct management, which have not yet been assigned or leased</li> </ul>	<ul style="list-style-type: none"> <li>carry out <u>forest statistical</u> work and sum up the situation of management of forests within their respective localities, including the situation of forest and afforestation land areas which have not yet been assigned or leased;</li> <li>grassroots forest rangers shall advise and submit sum-up reports on changes in forest resources to commune-level PCs</li> </ul>	
		<ul style="list-style-type: none"> <li>delimit boundaries of forests of all kinds on maps and on field under the direction of district-level PCs</li> </ul>	
		<ul style="list-style-type: none"> <li>conduct <u>statistics, inventory and monitoring</u> of changes in forest resources in localities and report thereon to district-level PCs</li> </ul>	<ul style="list-style-type: none"> <li>monitor, update changes on forest and forestry land; regularly check the utilization of forest and forestry land of organizations, households, individuals and communities on the commune's management area</li> </ul>

Table 5: Responsibilities of forest owners

	LAW ON FOREST PROTECTION AND DEVELOPMENT (LFPD) (03/12/2004)	Decree No. 23/2006/ND-CP ON THE IMPLEMENTATION OF THE LFPD (03/03/2006)
Forest owners	<ul style="list-style-type: none"> <li>make <u>forest statistics and inventory and monitor forest resource developments</u> under the guidance of, and submit to the inspection by, specialized forestry agencies of the provinces and centrally-run cities, if they are domestic organizations...; or specialized forestry agencies of urban districts, rural districts, provincial towns or cities, if they are domestic households or individuals</li> </ul>	<ul style="list-style-type: none"> <li>make recording, statistics and inventory of forests under the guidance of the MARD</li> <li>monitor changes in forest resources in the assigned or leased forest area</li> </ul>
	<ul style="list-style-type: none"> <li>declare data of forest statistics and inventory as well as forest resource developments according to the forms set by commune/ward/township PCs</li> </ul>	<ul style="list-style-type: none"> <li>report the forest statistics and inventory results to the commune-level PCs of the localities where exist the forests</li> </ul>

### 3. Existing domestic forest/forestry land monitoring systems

As pointed out in Section 2, there are three tasks related to forest/forestry land monitoring and corresponding to these three tasks, three major forest/forestry land monitoring programmes have been in operation in Vietnam.

#### 3.1 The Programme for Surveying<sup>4</sup>, Monitoring and Assessment of Changes in Forest Resources Nationwide (NFIMAP)

The Programme, commonly referred to as the National Forest Inventory, Monitoring and Assessment Programme: NFIMAP is a basic forest resource inventory program with a 5-year cycle; what is referred to under the FPD as “monitoring changes in forest resources”. NFIMAP has been implemented by FIPI since 1991. So far, four cycles (Cycle I: 1991-1995; Cycle II: 1996-2000; Cycle III: 2001-2005; and Cycle IV: 2006-2010) have been completed. However, the NFIMAP is not being implemented for the period 2011-2015. This is probably because a General Forest Survey and Inventory Project is being implemented during this period. The detail information about the previous cycles is as follows:

##### *Legal basis*

NFIMAP is implemented based on a series of Decisions by the Prime Minister. Cycle I is based on Decision No. 575/TTg dated 27/11/1993. Cycle II is based on Decisions No. 446/TTg dated 21/06/1997. Cycle III is based on Decisions No. 10/2002/QĐ-TTg dated 14/01/2002. Finally, Cycle IV is based on No. 258/2006/QĐ-TTg dated 09/11/2006.

##### *Objectives*

The objectives of NFIMAP, according to the above Decisions, include:

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<sup>4</sup> The original term in Vietnamese is “điều tra”. In many previous documents, this term is translated as “inventory”. However, in this document, “inventory” is reserved for the Vietnamese term “kiểm kê”, which has a slightly different meaning with the Vietnamese term “điều tra”.

- To collect comprehensive data on quantity and quantity; and assess the development trend of forest resources through the national comprehensive and constant forest inventory under the context of socio-economic development, serving as a tool for developing forest use plans and strategies, forest protection and development and socio-economic development plans over the whole country.
- To integrate, analyze and assess current status and changes of forest resources over different 5-year periods, study socio-economic reasons and causes for the changes, helping to elaborate and adjust the long-term forestry development plannings/plans at the provincial/regional/national levels.

### *Methodologies*

The method for survey areas of forests and forestry land is to use RS in combination with ground surveys. Based on the results of satellite image interpretation and using the forest cover maps of the previous cycle as a baseline, initial forest cover maps are developed. After that, ground surveys will be conducted for checking and carrying out supplementary revision to develop the final forest cover maps. Specific information about the satellite imagery, spatial resolution and interpretation method for each cycle are as follows:

- Cycle I (1991-1995): Landsat MSS and Landsat TM imagery with the spatial resolution of 30×30m were used. The images were in hardcopy at scale 1:250,000. Interpretation was done visually by drawing on the hardcopy images.
- Cycle II (1996-2000): SPOT3 imagery with the spatial resolution of 15m×15m was used. The images were in complex colors in hardcopy at scale 1:100,000. Like Cycle I, interpretation was done by visual interpretation drawing on the hardcopy images.
- Cycle III (2001-2005): Landsat ETM+ imagery with the spatial resolution of 30m×30m was used. The images were in digital form and interpretation was undertaken with the assistance of the ERDAS software.
- Cycle IV (2006-2010): SPOT5 imagery with the spatial resolution of 2.5m×2.5m or 5m×5m was used. The images were in digital form and interpretation was done with the assistance of the software ERDAS and ENVI.

### *Results*

Each cycle has generated provincial forest cover maps at the scale of 1:100,000; regional forest cover maps of six forestry regions at the scale of 1:250,000 and a national forest cover map at the scale 1:1,000,000. Cycle IV has also generated commune-level (scale 1:25,000) and district-level (scale 1:50,000) forest cover maps.

### *Shortcomings*

- In Cycles I, II, and III, as forest cover maps were developed based on Landsat, SPOT3, Landsat ETM7 satellite images with medium spatial resolution, the identification of forest areas at the macro level is relatively accurate. However, it is difficult to distinguish several forest types (for example, between newly-rehabilitated natural forests and bare land with scattered trees etc.) in commune and district maps. The development of forest cover maps based on SPOT 5 imagery was only implemented from the central level down to the commune level in Cycle IV.
- The reliability and promptness of data on forest resource developments needs to be improved, requiring more accuracy and timely generation. However, in the past, the budget for the implementation of NFIMAP, especially for the development of forest cover maps has been limited, and did not match the workload and quality requirements.

### 3.1.1 Comments on the potential role for the LMS for REDD+

- As mentioned in the Introduction, the LMS for REDD+ will primarily be based on RS. The outputs of NFIMAP (i.e. Cycle IV methodology) meet this criterion. Moreover, FIPI - the primary institution implementing the NFIMAP - is the most experienced agency in Vietnam in the field of generating forest cover maps based on RS images. Another feature of the NFIMAP (i.e. Cycle IV) which does not suit the LMS for REDD+ is that the programme reports the results (including of AD) once every 5 years while the LMS for REDD+ needs to generate the AD once every 4 years, with biennial updates.
- It has been generally understood that the LMS for MRV of REDD+ can be based on the outputs of the NFIMAP, with additional capacity building efforts at FIPI. However, there is concern about the continuation of this programme. As aforementioned, the Programme is not being implemented for the period 2011-2015 but instead a General Forest Survey and Inventory Project is being implemented. In this on-going project, there is a component for generating forest cover maps based on RS images in combination with ground surveys. A recent Decision by the Prime Minister (i.e. Decision No. 803/2012/QĐ-TTg) with regards this new government program appears to suggest that the NFIMAP, if it will still be implemented in the future, will no longer contain the forest area surveying part. If this is confirmed to be the case, then the basis for LMS for MRV of REDD+ will also need to be reconsidered under the new program.

### 3.2 The General Forest (Survey) Inventory (GFI/GFSI) Programme

This GFI aims to implement the task of forest inventory and has been implemented twice since 1990. The first GFI was implemented during 1997-1999<sup>5</sup>; the second one is for the period 2011-2015 and is on-going at the time of writing (under the name of “General Forest Survey and Inventory Programme”).

#### 3.2.1 The General Forest Inventory (GFI) 1997-1999

##### *Legal basis*

On 2 May 1997, the Prime Minister signed the Directive No. 286/TTg assigning MARD to take the lead and cooperate with relevant ministries and sectors to carry out a GFI nationwide. According to the Directive, provincial-level People’s Committees have the responsibilities to organize the implementation of forest inventory on their management area. The implementation agencies were different from province to province. In most of the provinces, FIPI (including its sub-FIPIs) was contracted to conduct the forest survey and inventory work. In other provinces, where more capacity was present, the work was assigned to local forest inventory divisions.

##### *Objectives*

- To assess thoroughly overall situation of existing natural forests and plantations;
- To support the process of formulating policies on forest establishment and development;
- To accomplish inventory data and forest cover maps at commune, district and provincial levels which will be used as a basis for handing over forest to local authorities at all levels and forest owners for forest management, protection and development;

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<sup>5</sup> During this period, theoretically, two national programmes (i.e. The Programme for surveying, monitoring and assessment of changes in forest resources nationwide and the General Forest Inventory Programme) were being undertaken simultaneously. But in reality, FIPI and sub-FIPIs were implementing the inventory work for many provinces, so as a result, the work was only conducted once in these provinces including the forest cover maps, and updated the maps as necessary.

- To conduct the demarcation of boundaries between forest types, especially boundaries between protection forests and special-use forests, based on inventory data and maps.

### *Tasks*

- Conduct nation-wide inventory of existing natural forests and plantations; review the area of bare land and denuded hills, apart from the inventory of the area of existing forest types
- Conduct an inventory of the volume of natural forests and plantations
- Develop forest cover maps at commune/district/provincial levels and integrate them into a national cover map
- Develop statistical tables on forest area and volume according to administrative units; according to forest owners; and according to 3 forest types

### *Methodologies*

The method for survey forest areas is to be categorized into 2 levels of details:

- Level 1: This level is applied to forest areas which have experienced many changes/developments or which have been faced illegal logging, disputes and encroachment. For these areas, the minimum area for demarcation is 1 ha. The forest sub-compartment is considered as the smallest statistic unit. For forest areas where satellite images/aerial photographs are already acquired, imagery interpretation should be conducted to develop forest cover maps. Otherwise, ground surveys should be carried out.
- Level 2: This level is adopted in the forest areas with few changes and in the forests in mountainous and remote areas. In remote and isolated forest areas, the existing inventory data is inherited. In forest areas which locate near transport roads, ground surveys should be conducted to verify the forest status of these areas.

### *Results*

At the end of 1999, basically the GFI of all areas of forests, bare land and denuded hills has been completed. The results were approved by the Prime Minister under the Decision No. 03/2001/QĐ-TTg dated 05/01/2001.

The specific outcomes of the Programme are as below:

- Statistical data tables: data tables on forest area and volume divided by administrative units, by 3 forest types, and by forest managers/owners;
- Forest cover maps: at scales 1:25,000 for the commune level, 1:50,000 for the district level, 1:100,000 for the provincial level, and 1:1,000,000 for the national level.

### *Shortcomings*

The GFI was conducted throughout the country. The ambitious implementation of a GFI within a limited time-period has resulted in generation of data which falls short of quality requirements;

- RS images were not widely applied to generate the input forest cover maps. Many provinces conducted the inventory based on out-dated forest cover maps generated by FIPI during the 1991-1995 Cycle I. Therefore, the quality of the data generated by the GFI is not high and differs from province to province.
- The application of new technologies to field surveys as well as the development of forest cover maps remained limited. At that time, throughout the whole country, only one institution, namely FIPI under MARD had adopted new equipment and technologies such as GPS, MapInfo, Arcview etc. Most of local inventory divisions collected inventory data using traditional methods,

leading to longer implementation time, more human resources, limited data quality and causing many difficulties and obstacles for data management and storage.

- The fund for GFI was not sufficient to cover the amount of work and quality requirements.
- Disincentives worked against honest reporting, resulting in exaggerated forest protection performance; substantially affecting the accuracy of the data in many provinces.
- The coordination and cooperation among relevant ministries and sectors, especially between MARD and the Land Cadastral Bureau (now called the Ministry of Natural Resources and Environment – MONRE) in identification of boundaries of agricultural and forestry land areas as well as criteria for forest and forestry land classification, were weak. Forest and forestry land data were not consistent between the two ministries, causing difficulties in forest management.

### 3.2.2 The General Forest Survey and Inventory (GFSI) Project in the period 2010-2015

#### *Legal basis*

- On 29/10/2008, the Prime Minister signed Decision No. 144/2008/QĐ-TTg on approval of national inventory and statistics programmes, which includes the Forest Survey and Inventory Programme. On 27/04/2009, MARD passed Decision No. 1169/QĐ-BNN-KH on approving the General Forest Survey and Inventory (GFSI) Project period 2010-2015<sup>6</sup>. On 5/5/2009, MARD issued the Official letter No. 25/2009/TT-BNN guiding the making of forest surveying and inventory and the compilation of forest management statistical dossiers. On 20/10/2009, the Prime Minister passed Decision No. 1698/2009/QĐ-TTg on the establishment of the Steering Committee for the GFSI Project period 2010 – 2015. On 22/07/2011, the Prime Minister passed Decision No. 1240/ QĐ-TTg on approval of the Pilot Forest Survey and Inventory Project in the two provinces Bac Kan and Ha Tinh.

#### *Objectives<sup>7</sup>*

- To identify accurate data on area and quality of existing forests; identify area and vegetation status of non-forest land areas which have been planned for forestry activities;
- To develop forest management statistical records; to develop database system according to forest and forest land management units and according to administrative units at all levels, contributing to update and monitor the annual developments of forest and forest land;
- To use the findings of the national forest survey and inventory as background for proposing solutions to improve the performance of forest protection and development work.

#### *Methodologies*

The GFSI Project is a national-scale project. Moreover, this project is to be implemented over a relatively long duration (5 years). Therefore, piloting is being implemented in two provinces first with the aim to draw experiences and lessons as well as to refine organizational structure and relevant documents to prepare for a large-scale, rapid, convenient, and efficient forest survey and inventory in the subsequent years.

According to the author's opinion, the GFSI Project period 2011-2015 is in fact a combination of the NFIMAP (mentioned in above section) and the GFI Programme. To back this perspective, the NFIMAP,

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<sup>6</sup> In reality, the Programme commenced in 2011.

<sup>7</sup> In addition to these objectives listed, in practice, another objective is being sought; the delineation of forest boundary by forest owner. This is not mentioned in this legal document.

usually done on a 5-year cycle will not be implemented separately during the surveying period of the GFSI Project 2011-2015.

- First step “Forest survey step”; interpretation of RS imagery will be used in combination with ground surveys to generate non-cadastral-dossier-based forest cover maps (which we will call the “forest surveyed maps”). The scales of forest surveyed maps are 1:10,000 or 1:25,000 for the commune level, 1:50,000 for the district level, and 1:100,000 for the provincial level.
- Second step “Forest inventory step”, the forest surveyed maps will be used as inputs to overlay with the cadastral-based forest owner boundary maps to generate the cadastral dossier-based forest cover maps (which we will call the “forest inventoried maps”). The scales of forest inventoried maps are the same with forest surveyed maps. The forest inventoried map will be printed out as a deliverable to each forest owner for verification and revised as necessary. As the generation of forest inventoried maps employs a participatory method, higher accuracy is expected compared to the forest surveyed maps.

#### **Current status**

- To serve the objective of successfully implementing the GFSI Project 2011-2015, two provincial-level pilot projects are being implementing in Bac Kan and Ha Tinh provinces in the years 2011-2012. The pilot project in Bac Kan province is being implemented by FIPI while the pilot project in Ha Tinh province is being implemented by Vietnam Forestry University (VFU). At the time of writing (mid-2012), both projects have finished the forest survey step and are currently conducting the forest inventory step. The two institutes are employing different approaches both technically and institutionally to develop forest surveyed maps, and comparing methods for the purpose of developing a national guideline.

#### **3.2.3 Comments on potential role of GFSI for the REDD+ LMS**

- It is the author’s opinion that the LMS for REDD+ on the forestry land can be developed based on the methodology being proposed for the GFSI Project through the piloting exercises. High accurate cadastral dossier-based maps and database on current forest status will have been generated. The data on forest area and quality can be aggregated at the national level to use as the AD for estimating the GHG emissions/removals for REDD+. This means that the maps and data generated through this Project will be able to address the different scale requirements under REDD+, including MRV at the national scale for international reporting, and monitoring and benefit distribution related purposes at the local levels.
- Moreover, according to Decision No. 803/QĐ-TTg, the Project will very likely be implemented in subsequent cycles. This suggests that the NFIMAP approach for generating forest cover maps based on RS images in combination with ground surveys will need to be intergrated into the GFSI Project. In this case, the outputs of this Project will be a reliable source of AD for the LMS for REDD+.
- However, the methodology for conducting the Project should be considered carefully. It is the author’s opinion that the “forest survey” step should be implemented by specialized agencies that have enough capacity and experiences in both generating forest cover maps from RS images and conducting forest field surveys. For the Piloting of GFSI in the two provinces of Bac Kan and Ha Tinh, the main difference between the methods of two organizations is that, after the automatical generation of forest cover maps from RS images, FIPI has conducted field surveys intensively for supplementary drawing and correction while VFU has not. According to the author’s experience when checking the implementation of the forest survey step in Bac Kan, it is difficult to use only RS imagery (even if high resolution such as SPOT 5 is used) to classify forest types with high precision and accuracy, using the current forest classification system.

Some forest types are difficult to distinguish on the image such as between re-growth forests and plantation forests, or between poor evergreen forests and mixed woody-bamboo forests. Therefore, the work of ground survey for supplementary drawing and revising is very important. If this work is not conducted, it will cause difficulty to the forest inventory step, which as currently regulated, will be implemented by localities where technical capacity is still limited. This may affect to the implementation time and quality of the resulting forest inventoried maps. The results of the Pilot GFSI Project in two provinces Bac Kan and Ha Tinh should be analyzed carefully in order to find the best methodology for implementing the GFSI period 2010-2015 and subsequent cycles.

- Another issue is that this Project, as currently regulated, will be implemented once every 5 years while the LMS for REDD+, as required by the IPCC Decision, needs to generate the AD once every 4 years with biennial updates. It is suggested that the LMS for REDD+ will use the results of the latest cycle of this Project in association with annual updates conducted by the Annual Forest Statistics and Reporting Programme (see below).

### **3.3 The Annual Forest Statistics and Reporting Programme**

#### ***Legal basis***

- This Project is implemented under the Directive No. 32/2000/CT-BNN-KL dated 27/03/2000 by MARD assigning Forest Protection Department (FPD) and its sub-offices at provincial, district and commune levels to monitor forest resource changes nation-wide. The Project has been implemented since 2001.

#### ***Objectives***

- To identify annually, area of different existing forest and forest land types, development of forest types, types of land areas planned for forest production for the purpose of forestry policy decision-making at the local and central levels with aims to serve forest protection and development.
- Update areas of forest types and forest land under the forest and forest land classification system as regulated, based on the inventory database developed under the Directive 286/TTg in 1999.
- Identify changes in forest and forest land areas caused by different drivers.

#### ***Methodologies***

- Based on forest baseline maps of the latest GFI, forest rangers collect information on changes in their responsible communes, and then update these changes in the database and maps. These updates are usually based on reports from forest owners and do not requires field surveys.
- A software for updating and monitoring forest changes is developed and used to consistently manage the database of the entire sector.

#### ***Results***

- Forest and forest land baseline maps developed annually at the commune level, at the scales of 1:25,000 or 1:10,000, district-level maps at the scale of 1:50,000 and provincial-level maps at the scale of 1:100,000;
- Data on annual forest and forest land development are updated in the logbook maintained in communes and aggregated data categorized by administrative units are generated from the commune-level up to the national level. These aggregated results are the basis of the annual GSO statistics books.

### **Shortcomings**

- Capacity (both quantity and quality) to carry out tasks at the local levels are limited. The application of modern technologies such as database, GIS and remote-sensing technologies remains very limited.
- Forest rangers need to annually update changes based on forest cover maps generated by the GFI<sup>8</sup>. However, some of the forest cover maps used in the past were of poor quality, and results in varied quality of outputs among different provinces, districts and communes.
- Most high forest cover provinces are poor provinces; on the other hand the budget for monitoring the development of forest and forestry land is from the local budget, resulting commonly in lack of funds to carry out the program sufficiently.
- For most provinces and localities, updates of forest area is done on the basis of reports from forest owners and do not involve field surveys. Therefore, only changes on areas of plantation forests and changes on areas of natural forests caused by events such as forest fires are updated. Natural re-growth forests are, in general, not updated. This is supported by preliminary results of the Pilot GFSI Project in Bac Kan province. The difference between the preliminary results of the pilot project and the results of the annual forest statistics and reporting programme in 2011 is quite large.
- The application of RS technologies in this Programme is limited.
- By the nature of the mandate of the Forest Protection Forces (including FPD and local forest protection offices), being to protect the forests, there is a tendency for exaggerated achievements or under-reporting of negative figures which can and has significantly affected data accuracy.
- QA/QC procedures of this Programme are limited.

#### **3.3.1 Comments on the potential role for the LMS for REDD+**

The results of this programme are announced annually. As aforementioned, the LMS for MRV of REDD+ needs to generate the AD once every 4 years with biennial updates so it can be based on the results of this programme for the years that the GSFI is not implemented. However, capacity building should be undertaken and QA/QC procedures should be strengthened to improve the quality of the programme's results. At the time of this writing, it is still unclear how this programme relates to the new implementation of the NFSI project period 2010-2015, or beyond. There is no plan for strengthening the programme to match up with the new NFSI project.

## **4. Existing foreign forest/forestry land monitoring systems**

### **4.1 The TerraAmazon System of Brazil**

TerraAmazon is a system developed by the Brazilian National Institute for Space Research (INPE) for monitoring of the Amazon forest. The system is developed based on the open source TerraLib library. It uses a unified database for all projects. It allows a multi-user and multi-project working environment. The system has four projects, namely, PRODES, DETER/DETER-B, DEGRAD, and TERRAClass.

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<sup>8</sup> As specified under the Directive no. 286/TTg (1997).

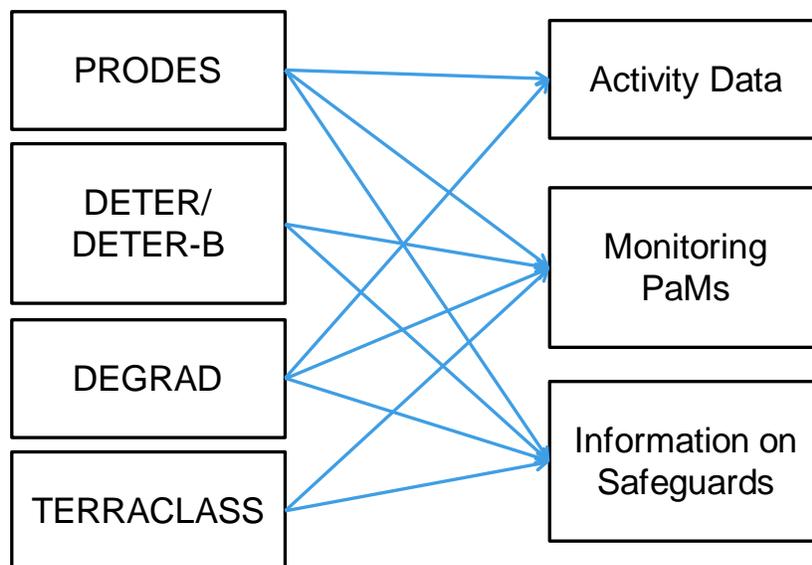


Figure 1: The contribution of each project in the TerraAmazon system to REDD+

- PRODES - Program for the Calculation of Deforestation Amazon - measures the annual rate of clear-cutting from 1988 to increments greater than 6.25 hectares (<http://www.obt.inpe.br/prodes/>). Because it is weather dependent for acquiring cloud free images between May and September, it is done only once a year, with a release scheduled for December of each year. PRODES uses images of TM sensors (LANDSAT NASA), CCD (CBERS INPE) and DMC (DMC satellite International Imaging) covering the Amazon with high temporal frequency (variations of 16, 26 days and almost daily) and have spatial resolution of 30, 20 and 32 meters respectively. With these sensors it is possible to map deforestation areas greater than 6.25 hectares. PRODES has estimated the annual rates of clear-cutting deforestation since 1988. From 2002 these estimates have become disclosed along with a multi-temporal geographic database, where digital maps are available from deforestation (<http://www.dpi.inpe.br/prodesdigital/prodes.php>).
- DETER - Deforestation Detection System in Real Time is a support system for the supervision and control of Amazon deforestation (<http://www.obt.inpe.br/deter/>). With DETER, INPE publishes a monthly map of alerts, which shows deforestation areas larger than 25 ha. These maps indicate areas fully cleared (clear-cutting) and areas in the process of progressive deforestation. This system uses images from the MODIS sensor aboard the NASA's Terra satellite, and images from the WFI, aboard the satellite CBERS-2B INPE. These sensors cover up the Amazon with high temporal frequency, two and five days respectively, but with a spatial resolution limited to 250 meters (MODIS) and 260 meters (WFI). With this spatial resolution, these images allow the detection of deforested areas which are larger than 0.25 km<sup>2</sup> (or 25 hectares). The high frequency of observation compensates for the limitation of spatial resolution, reducing problems imposed by frequent cloud cover in the Amazon region. The high frequent observation in surveys allows alerting of deforestation fortnightly and monthly ("Real Time"). It is important to distinguish between the time of occurrence and the detection time. A forest can be gradually cleared, but its detection as a shallow cut or degraded area occurs only when the conditions of observation by the satellite are favorable. In DETER, all deforestation identified in an image and that has not been previously detected by PRODES is considered new deforestation, independent of chronological time. In DETER, any changes in forest cover observed in the period of analysis is indicated as "alert area" and subject to supervision, i.e. seeking DETER identify intermediate

stages of the process of deforestation. This happens when the spectral attributes of the fraction of exposed soil dominate the reflectance of vegetation senescent, due of recurrent fires. The main objective of DETER is to provide indicators for supervision. Every 15 days, when viewing conditions are favorable, DETER produces a digital map with all occurrences of deforestation observed in the previous fortnight. It thereby enables bodies responsible for monitoring (IBAMA, SEMA state, Prosecutor) to plan their actions and field operations combating illegal logging.

- DETER-B is similar to DETER but using AWiFS imagery with the spatial resolution of 56m. Therefore, it can detect clear-cutting deforestation with a minimum area of  $\approx 1.25$  ha.
- DEGRAD is based on the degradation data obtained from DETER, depending on the indications of the growth of the Amazon forest, developed by INPE. This is a new system for mapping areas which are in the process of deforestation where forest cover has not been fully removed. The system uses satellite images LANDSAT and CBERS and the goal is to map areas of degraded forest annually and likely to be converted into cutting. Like PRODES, the minimum area mapped by DEGRAD is 6.25 hectares. INPE has developed specific techniques for processing satellite images. The process is to prepare the satellite images, applying sharpening in order to highlight the evidence of degradation. The degraded areas are then mapped individually.
- TERRAClass-This project aims to map land use types in deforested areas which are already identified by the PRODES project. The resulted maps are published biennially.

#### **4.1.1 Comments on the suitability of the TerraAmazon system to Vietnamese context**

Although the TerraAmazon system works well in the context of Brazil, “importing” the same system may not result in similar levels of effectiveness in the context of Vietnam. This is because the characteristics in the forestry sector are different between the two countries. For example, the main REDD+ activity in Brazil is deforestation while it is forest degradation in Vietnam. The scale of deforestation is also different between the two countries. Deforestation takes place in large scales in Brazil but only in small scales in Vietnam. The forest in the Amazon region is homogeneous while in Vietnam, it is a mixture of many forest categories (evergreen broadleaf forests, deciduous forests, coniferous forests, bamboo forests etc.). As a result, the modules within TerraAmazon (“Projects”) would need to be programmed using relevant resolution RS imageries that can provide information at relevant scales of forest dynamics prone in Vietnam.

#### **4.2 TerraCongo and the National Forest Monitoring System in DRC**

This National Forest Monitoring system, inspired by TerraAmazon, allows the DRC to monitor the performance from REDD+ demonstration activities and initiatives, deforestation in protected areas and logging concessions, as well as national policies and measures in the forestry sector. To do so, the system is integrating the information coming from the National REDD+ Registry into a single visualisation interface thus promoting transparency and coordination between the various initiatives underway. The system was designed in a way that can also be used for other monitoring purposes as well as to report on other unrelated areas such as forest law enforcement.

The TerraCongo platform which provides the deforestation statistics to the online National Forest Monitoring System, is following the footsteps of the TerraAmazon platform developed by INPE providing a combination of open-source data, tools and algorithms that were adjusted to the country’s needs. It combines GIS, image processing, database management and data access functionalities. In both systems the information results can be easily verified through an online system.

The TerraCongo has the following functions:

Base map layers:	<ul style="list-style-type: none"> <li>• Enhancement of forest carbon stock</li> </ul>	<ul style="list-style-type: none"> <li>• Intact forest</li> </ul>
<ul style="list-style-type: none"> <li>• Blue marble</li> <li>• FACET forest classification</li> <li>• UCL forest classification</li> <li>• Landsat</li> <li>• Hillshade</li> </ul>	REDD+ registry:	<ul style="list-style-type: none"> <li>• Non-forest land converted to forest land</li> <li>• Afforestation</li> <li>• Reforestation</li> <li>• Biomass fire</li> <li>• Active fire</li> </ul>
Administrative areas:	<ul style="list-style-type: none"> <li>• REDD+ projects</li> <li>• REDD+ activities</li> </ul>	
<ul style="list-style-type: none"> <li>• Provinces</li> <li>• Administrative units</li> </ul>	Forest area and forest area change:	
REDD+ activity:	<ul style="list-style-type: none"> <li>• Forest land remaining in forest land</li> <li>• Degradation</li> <li>• Re-growth</li> <li>• Conservation</li> <li>• Forest land converted to non-forest land</li> <li>• Deforestation</li> <li>• National training data</li> </ul>	Safeguards:
<ul style="list-style-type: none"> <li>• Deforestation</li> <li>• Forest degradation</li> <li>• Conservation of carbon stock</li> <li>• Sustainable forest management</li> </ul>		<ul style="list-style-type: none"> <li>• Environment</li> <li>• Social</li> </ul>
		Other:
		<ul style="list-style-type: none"> <li>• Protected areas</li> <li>• Logging concessions</li> <li>• Hydrography</li> <li>• Eco-regions</li> <li>• Roads</li> <li>• Settlements</li> </ul>

Figure 2: Functions of the TerraCongo website

#### 4.2.1 Comments on the applicability of DRC's National Forest Monitoring to Vietnam

The National Forest Monitoring in DRC provides a good example for the information sharing system of the LMS for REDD+ in Vietnam. The information sharing system of the Vietnam LMS should as a minimum provide the basic functions listed above. However, this does not mean that the Vietnam LMS can "import" either the TerraAmazon or TerraCongo. With different contexts in the forestry sector, Vietnam may need a different approach for generating the AD for REDD+ such as using high resolution imagery in combination with ground surveys to make the forest cover maps.

## 5. Preliminary proposals for developing a REDD+ LMS for Vietnam

### 5.1 Proposed functions of the LMS

The LMS should provide the following outputs:

- A web-based publically accessible geo-spatial database containing all the information used by LMS;
- An interactive tool to allow input from targeted stakeholders and feedback by end users;
- Annual wall-to-wall satellite imagery representation of the entire Vietnam territory;
- In REDD+ Phase II, geo-spatial and attribute data (e.g. area extension, type of REDD+ activity, expected results and result obtained, activity proponent, etc.) for all the provinces in which demonstration activities will take place;
- In REDD+ Phase III, geo-spatial and attribute data for all the REDD+ activities in the entire Vietnam.

In terms of reporting requirements to the UNFCCC, the outputs of the LMS will include:

- A biennial or annual land use change matrix at IPCC sub-division level, for reporting on land use change;
- A biennial or annual conversion matrix, for reporting on changes between each land use sub-categories.

## 5.2 Proposed institutional arrangement

The LMS for REDD+ may be best jointly managed and operated under VNFOREST for the forestry land and GDLA for the non-forestry land. For forestry land, the LMS will be based primarily on the results of the GFSI and the Annual Forest Statistics and Reporting Programmes. Tasks will be designated appropriately to relevant technical institutions. For GFSI implementation, FIPI will be in charge of generating forest surveyed maps using RS in combination with ground-surveys while FPD will be responsible for guiding and directing its local staff and forest owners to generate the forest inventoried maps. For the implementation of the Annual Forest Statistics and Reporting Programme, FIPI will be in charge of detecting changes using medium resolution imagery (and possibly high resolution imagery for hotspots) while FPD will be responsible for verifying FIPI generated results and aggregating them with updates reported by local staff/forest owners that cannot be detected by RS imagery.

Since the LMS will capitalize on capacities and information from different national institutions and agencies, it will require coordination by a “coordination unit”, such as the Vietnam REDD+ Office (VRO). The coordination of LMS is supported by an information sharing platform. The LMS related functions of this coordination unit would include:

- Advisory to provide technical guidance to the functional units needed to operationalise the LMS;
- 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 the LMS, including on (i) definition of forest classification, (ii) boundary between forestry land and non-forestry land, (iii) technical guidance in developing methodological guidance for the LMS including mapping (e.g. resolution), frequency of monitoring - compliant to the UNFCCC requirements and the reporting rules, and (iv) organization of periodic joint reviews;
- Ensuring that QA/QCs are carried out regularly and adequately.

About the information sharing system, each institution will be responsible for development and maintenance of a database of their collected and/or generated data. All of these databases are connected through a web-based information sharing system which uses a distributed database management system to provide unified access and use of information on land use change among MRV related institutions, as well as other institutions working on Vietnam’s REDD+ Program who will need to avail of such land-based information (e.g. for monitoring of PaMs, Safeguards etc.). The Coordination Unit will be responsible for maintenance of this information sharing system for REDD+. All Vietnamese institutions involved in land monitoring together with other institutions such as the Space Technology Institute, and universities will be responsible for system development in their area of expertise. Technical workshops will be held regularly in order to exchange the research results and knowledge among institutions.

## 5.3 Proposed data analysis and management

Regarding data analysis and management issues, the followings are proposed:

- Using a classification system which is detailed enough for estimating GHG emissions/removals at Tier-3;
- Using high resolution RS imagery (e.g. SPOT 5) to generate land cover maps every 5 years;

- Using medium resolution RS imagery (e.g., LANDSAT, CBERS, DMC, LISS-3, ASTER) together with ground surveys to update land cover maps annually (or biennially);
- Using high resolution imagery (SPOT 5) to update forest cover maps at hotspots, which are detected using medium to low resolution imagery.
- Using AWiFS imagery (spatial resolution of 56m) for quick detection of clear-cut deforestation areas > 1.2 ha, reporting monthly or quarterly depending on availability of RS data (DETER-B);
- It is necessary to do a cost-benefit analysis of the utilization of different sources of RS data (LANDSAT TM, CBERS CCD, DMC SLIM6, IRS-P6 LISS-3, TERRA ASTER);
- Software for RS image processing still need to be examined (between commercial software like e-Cognition, ERDAS, ENVI and open source software like TerraAmazon) ; 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.
- Using distributed database management system (one database for forestry land and one for non-forestry land);
- Using an information portal to ensure unified access to information on land cover maps on both forestry and non-forestry land. A web-based portal is currently under development in Vietnam (the Forestry Management Information System: FORMIS), and this may be considered as a platform for the Vietnamese LMS. The information portal should provide basic functions similar to those in the National Forest Monitoring System in DRC described above.

## References

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- Decision No. 1240/ QĐ-TTg dated 22/07/2011 by Prime Minister on approval of the Pilot Forest Survey and Inventory Project in the two provinces Bac Kan and Ha Tinh.
- Decision No. 144/2008/QĐ-TTg dated 29/10/2008 by Prime Minister on approval of national inventory and statistics programmes.
- Decision No. 1698/2009/QĐ-TTg dated 20/10/2009 by the Prime Minister on the establishment of the Steering Committee on national survey and inventory for the period 2010 – 2015.
- Decision No. 276/QĐ-TCLN dated 19/06/2010 by VNFOREST on regulating functions, tasks, authorities and organizational structure of Forest Inventory and Planning Institute.
- Decision No. 38/QĐ-TCLN-VP dated on 22/04/2010 by VNFOREST regulating functions, duties, authorities and organizational structure of Forest Protection Department.
- Decision No. 43/2010/QĐ-TTg dated 02/06/2010 by Prime Minister on promulgating National Statistical Criterion System.
- Decision No. 803/QĐ-TTg dated 28/06/2012 by Prime Minister on approval of national inventory and statistics programmes.
- Decree No. 119/2006/ND-CP dated 16/10/2006 by the Government on organization and operation of the Forest Protection Service.
- Decree No. 23/2006/ND-CP dated 03/03/2006 by the Government on the implementation of the Forest Protection and Development Law.
- Directive No. 286/TTg dated 02/05/1997 by Prime Minister on promotion of urgent measures for forest protection and development.
- Directive No. 32/2000/CT-BNN-KL dated 27/03/2000 by MARD on organization of monitoring of forest and forestry land changes nationwide.
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- Official letter No. 25/2009/TT-BNN dated 05/05/2009 by MARD guiding the making of forest statistics and inventory and the compilation of forest management statistical records.
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## Annex: Legislation on forest and forest land monitoring

### The Law on Forest Protection and Development<sup>9</sup>

The Law on Forest Protection and Development (LFPD) dated 03/12/2004 gives explanations for some technical terms as follows:

1. Forest means an ecological system consisting of the populations of forest fauna and flora, forest microorganisms, forestland and other environmental factors, of which timber trees and bamboo of all kinds or typical flora constitute the major components with the forest canopy cover of 0.1<sup>10</sup> or more. Forests include planted forests and natural forests on production, protective and special-use forestland.

...

3. Forest development means the plantation of new forests, post-exploitation afforestation, the zoning off for forest regeneration and restoration, the improvement of poor forests and the application of other bio-forestry techniques to increase forest areas, raise the value of biodiversity, the forest product-supplying capacity, the protection capacity and other values of forests.

...

20. Forest statistics means the cadastral dossier-based synthesization and assessment of the acreage and quality of assorted forests at the time of conducting the statistical work and of forest changes at the interval between two statistical times.

21. Forest inventory means the cadastral dossier-based and field synthesization and assessment of the acreage, reserves and quality of assorted forests at the time of inventory and of forest changes at the interval between two inventories.”

According to item 4, article 7 of the LFPD, one of the contents of State management over forest protection and development is “conducting forest statistical and inventory work, monitoring changes in forest resources and land for forest development”.

Article 8 of the LFPD specifies State management responsibilities for forest protection and development as follows:

1. The Government exercises the unified State management over forest protection and development.

2. The Ministry of Agriculture and Rural Development takes responsibility before the Government for exercising the State management over forest protection and development nationwide.

3. The Ministry of Natural Resources and Environment, the Ministry of Public Security, the Ministry of Defense and the other ministries as well as ministerial-level agencies shall, within the ambit of their tasks and powers, have to coordinate with the Ministry of Agriculture and Rural Development in exercising the State management over forest protection and development.

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<sup>9</sup> Promulgated through [ORDER No. 25/2004/L-CTN OF DECEMBER 14, 2004 ON LAW PROMULGATION](#)

<sup>10</sup> According to LFPD: Forest canopy cover means the degree of coverage of forest canopy over forestland, which is indicated by the decimal fraction of the forestland covered by the forest canopy to the forestland acreage (author’s footnote).

4. The People's Committees at all levels shall have to exercise the State management over forest protection and development in their respective localities according to their competence.

The Government shall prescribe the organization, tasks and powers of specialized forestry agencies from central to district levels and of forestry officers in communes, wards and townships with forests."

Thus, it can be understood that the Ministry of Agriculture and Rural Development (MARD) shall take the responsibility before the Government for conducting forest statistical and inventory work, monitoring changes in forest resources and land for forest development.

Article 32 of the LFPD specifies regulations on "Forest statistics and inventory, monitoring of forest resource developments" as follows:

1. The forest statistics and inventory and monitoring of forest resource developments are prescribed as follows:

a/ The forest statistical work shall be conducted annually and publicized in the first quarter of the subsequent year;

b/ The forest inventory shall be conducted once every five years and publicized in the second quarter of the subsequent year;

c/ The monitoring of forest resource developments shall be conducted regularly;

d/ The base units subject to forest statistics and inventory as well as monitoring of forest resource developments are communes, wards and townships.

2. The responsibilities for forest statistics and inventory as well as monitoring of forest resource developments are prescribed as follows:

a/ Forest owners shall have to make forest statistics and inventory and monitor forest resource developments under the guidance of, and submit to the inspection by, specialized forestry agencies of the provinces and centrally-run cities, if they are domestic organizations, overseas Vietnamese, foreign organizations or individuals investing in Vietnam; or specialized forestry agencies of urban districts, rural districts, provincial towns or cities, if they are domestic households or individuals;

b/ Forest owners shall have to declare data of forest statistics and inventory as well as forest resource developments according to the forms set by commune/ward/township People's Committees;

c/ The commune/ward/township People's Committees shall have to declare forest statistical and inventory data for forest areas under their direct management, which have not yet been assigned or leased;

d/ The People's Committees at all levels shall have to organize and inspect forest statistics and inventory as well as the monitoring of forest resource developments;

e/ The People's Committees of lower level shall have to report on the results of forest statistics and inventory and forest resource developments to the People's Committees of higher level; the provincial/municipal People's Committees shall report on the results of forest statistics and inventory and forest resource developments to the Ministry of Agriculture and Rural Development;

f/ The Ministry of Agriculture and Rural Development shall assume the prime responsibility for, and coordinate with the Ministry of Natural Resources and Environment in, inspecting and synthesizing the annual forest statistical results and five-year forest inventory results.

g/ The Government shall periodically report to the National Assembly on the status and changes of forest resources.

3. The Ministry of Agriculture and Rural Development shall assume the prime responsibility for, and coordinate with the Ministry of Natural Resources and Environment and the central statistical agency in, prescribing the contents and forms and guiding the methods of forest statistics and inventory as well as monitoring of forest resource developments.

### **Decree No. 23/2006/ND-CP ON THE IMPLEMENTATION OF THE LAW ON FOREST PROTECTION AND DEVELOPMENT**

On 03/03/2006, Decree no. 23/2006/ND-CP was issued by the Prime Minister on behalf of the Government, guiding the implementation of the LFPD. Articles 3-6, Chapter I of the Decree stipulate responsibilities for state management of forest protection and development as follows:

Article 3.- The Ministry of Agriculture and Rural Development's responsibilities for state management of forest protection and development

...

3. To guide the survey, determination and delimitation of boundaries of forests of all kinds on maps and on field for uniform implementation nationwide.

4. To guide and direct the statistics, inventory and monitoring of changes in forest resources and afforestation land, and the compilation of forest management dossiers.

...

Article 4.- Provincial/municipal People's Committees' responsibilities for state management of forest protection and development

...

3. To organize the classification of forests, delimitation of boundaries of forests of all kinds in localities; to establish local protection forests, special-use forests and production forests under the guidance of the Ministry of Agriculture and Rural Development.

4. To organize the statistics, inventory and monitoring of changes in forest resources in provinces or cities under the guidance of the Ministry of Agriculture and Rural Development.

To direct district-level People's Committees to carry out the statistics, inventory and monitoring of changes in forest resources, and make sum-up reports to provincial-level People's Committees.

...

Article 5.- District-level People's Committees' responsibilities for state management of forest protection and development

...

3. To classify forests, delimit boundaries of forests of all kinds in localities under the direction of provincial-level People's Committees.

4. To conduct statistics, inventory and monitoring of changes in forest resources in localities and periodically report thereon to provincial-level People's Committees.

...

Article 6.- Commune-level People's Committees' responsibilities for state management of forest protection and development

...

3. To delimit boundaries of forests of all kinds on maps and on field under the direction of district-level People's Committees.

4. To conduct statistics, inventory and monitoring of changes in forest resources in localities and report thereon to district-level People's Committees.

...

Article 39 of the Decree specifies *regulations on forest statistics and inventory* as follows:

1. Forest statistics mean annual recording and summing up in books of area and status of forests of each kind. Forest inventory means examination and comparison between data recorded in statistical books and maps and the assigned or leased forest areas on field, which shall be conducted once every five (5) years and in the year with the unit number being zero (0) or five (5).

2. Responsibilities of forest owners and commune-level People's Committees for forest statistics and inventory:

a/ Forest owners shall have to make recording, statistics and inventory of forests under the guidance of the Ministry of Agriculture and Rural Development; report the forest statistics and inventory results to the commune-level People's Committees of the localities where exist the forests.

b/ Commune-level People's Committees shall have to carry out forest statistical work and sum up the situation of management of forests within their respective localities, including the situation of forest and afforestation land areas which have not yet been assigned or leased.

3. Reporting and announcement of forest statistic results

a/ Commune-level People's Committees shall sum up and report forest statistic and inventory results to district-level People's Committees.

b/ District-level People's Committees shall sum up and report forest statistics and inventory results to provincial-level People's Committees.

c/ Provincial-level People's Committees shall sum up and report forest statistic and inventory results to the Ministry of Agriculture and Rural Development.

d/ The Ministry of Agriculture and Rural Development shall assume the prime responsibility for, and coordinate with the central statistical agency in, summing up forest statistic and inventory results of their respective localities.

e/ The Ministry of Agriculture and Rural Development shall have to announce national forest statistic and inventory results; People's Committees at all levels shall have to announce local forest statistic and inventory results.

National and local forest statistic results shall be announced in the first quarter of every year; national and local forest inventory results shall be announced in the second quarter of the first year of the subsequent inventory period.

Article 40 of the Decree specifies regulations on monitoring of changes in forest resources as follows:

1. Contents of monitoring of changes in forest resources cover changes in forest area, forest reserves, forest quality, quantity and composition of forest fauna and flora; changes of forests in relation with economic, social and environmental factors so as to find out laws of changes in forest resources.

2. Assessment of the monitoring of changes in forest resources shall be conducted regularly and announced once every five (5) years:

a/ Forest owners shall have to monitor changes in forest resources in the assigned or leased forest area.

b/ Commune-level People's Committees of localities where exist forests shall have to report changes in local forest resources to district-level People's Committees; grassroots forest rangers shall advise and submit sum-up reports on changes in forest resources to commune-level People's Committees.

c/ District-level People's Committees shall have to report changes in forest resources to provincial-level People's Committees-.

d/ Provincial-level People's Committees shall have to report changes in forest resources to the Ministry of Agriculture and Rural Development.

e/ The Ministry of Agriculture and Rural Development shall sum up and report changes in national forest resources to the Prime Minister.

Changes in national and local forest resources shall be announced at the latest by June 30 of the first year of the subsequent five-year cycle of monitoring changes in forest resources.

3. The Ministry of Agriculture and Rural Development shall have to organize the implementation of the program on investigation, monitoring and assessment of changes in forest resources nationwide and in each province, in service of the elaboration of the State's medium- and long-term socio-economic development plans."

Finally, Article 41 of the Decree stipulates the responsibilities of MARD, concerned ministries and People's Committees at all levels for forest statistics and inventory and monitoring of changes in forest resources as follows:

1. The Ministry of Agriculture and Rural Development shall have the responsibility:

a/ To promulgate and guide contents and methods of forest statistics and inventory as well as the monitoring of changes in forest resources; direct its units and localities in conducting forest statistics and inventory and monitoring changes in forest resources; announce the results of forest statistics and inventory as well as the monitoring of changes in forest resources nationwide.

b/ To coordinate with state statistical agencies in formulating forms on forest statistics and inventory and monitoring of changes in forest resources for uniform application nationwide in accordance with the laws on statistics and inventory.

2. The Ministry of Natural Resources and Environment shall have to coordinate with the Ministry of Agriculture and Rural Development in comparing data on areas of forests of all kinds with areas of land of all categories in accordance with the provisions of the Land Law and provisions of the Law on Forest Protection and Development

3. The General Statistics Office shall have the responsibility:

a/ To coordinate with the Ministry of Agriculture and Rural Development in formulating forms of statistics and inventory, guide local statistical agencies in coordinating with provincial/municipal Agriculture and Rural Development Services as well as assigned functional divisions in assisting People's Committees at all levels in conducting forest statistics and inventory.

b/ To coordinate with the Ministry of Agriculture and Rural Development in summing up forest statistic and inventory results to be reported to the Prime Ministry.

### **Decree No. 119/2006/ND-CP ON ORGANIZATION AND OPERATION OF THE FOREST PROTECTION SERVICE**

On 16/10/2006, Decree no. 119/2006/ND-CP was issued on organization and operation of the Forest Protection Service by the Prime Minister, on behalf of the Government. Regulations on the tasks and powers related to forest and forestry land monitoring of the Forest Protection Forces at various administrative levels are as follows:

Article 5.- Tasks and powers of the Forest Protection Department

...

2. Organizing and directing professional operations and providing professional guidance:

...

c/ To direct the making of statistics on and inventory of forests and forest land;

...

Article 7.- Tasks and powers of provincial Forest Protection Sub-Departments

...

2. Organizing and directing forest protection in localities:

...

b/ To organize the forecasting of forest fire dangers; to build up a forest fire prevention and fighting force; to make statistics on, and inventory of, forests and forest land; to participate in controlling forest pests;

...

Article 9.- Tasks and powers of district-level Forest Protection Bureaus

...

3. Organizing, directing and managing professional operation:

...

b/ To arrange, direct and inspect commune forest protectors; to monitor the forest and forest land developments;

...

Article 13.- Tasks of commune forest protectors

...

2. Commune forest protectors have the powers and responsibilities defined in Article 12 of this Decree and the following tasks:

...

b/ To make statistics on, and inventory of, forests and forest land under their assigned management; to inspect the use of forests by forest owners in localities; to certify the origin of lawful forest products at the request of forest owners in localities;

**Decree No. 01/2008/NĐ-CP DEFINING THE FUNCTIONS, TASKS, POWERS AND ORGANIZATIONAL STRUCTURE OF THE MINISTRY OF AGRICULTURE AND RURAL DEVELOPMENT**

On 03/01/2008, Decree no. 01/2008/NĐ-CP was issued regulating the functions, tasks, authorities and organization structure of MARD. According to this Decree, MARD is a governmental agency which performs the function of state management in, among others, the forestry sector. Item 6, Article 2 of the Decree specifies MARD's tasks and authorities related to forest and forestry land monitoring as follows:

6. Regarding Forestry

...

d/ To guide and direct the survey, determination and demarcation of forests of all types; conducting of forest statistics and inventory, monitoring of forest resource developments in service of afforestation, compiling of forest management dossiers and announcing of annual forest status and results of five-year forest inventories;

**Decision No. 04/2010/QĐ-TT REGULATING FUNCTIONS, TASKS AUTHORITIES AND ORGANIZATIONAL STRUCTURE OF VIETNAM ADMINISTRATION OF FORESTRY (VNFOREST) UNDER MARD**

Decision No. 04/2010/QĐ-TTg dated 25/01/2010 on regulating functions, tasks, authorities and organizational structure of the Vietnam Administration of Forestry (VNFOREST) under MARD has specified that VNFOREST shall be responsible for taking advisory roles, assisting MARD in working out state administration functions and tasks on forestry nationwide. Article 2 of the Decision specifies some tasks related to forest and forest land monitoring work as follows:

Article 2. Tasks and authorities

...

6. On forest management

a) ...

b) To submit to the Minister of Agriculture and Rural Development criteria for forest identification and classification, functional compartments of special – use forests; make public forest protection and development plannings and plans, results of forest inventories, and 5 – year and annual developments of forest resources in accordance with legal regulations;

c) To provide instructions on checking and identification of boundaries of forest categories; issue guidelines, templates, and methodologies on forest statistics, inventories, monitoring of forest resources, plantation land, and forest management profile;

#### **Decision No. 38/QĐ-TCLN-VP REGULATING FUNCTIONS, DUTIES, AUTHORITIES AND ORGANIZATIONAL STRUCTURE OF FOREST PROTECTION DEPARTMENT**

Article 1 of Decision no. 38/QĐ-TCLN-VP dated on 22/04/2010 stipulates that “Forest Protection Department (FPD) shall, being an agency under VNFOREST, be responsible for taking advisory roles, assisting the Director General of VNFOREST in carrying out State management on forest protection, ensuring the implementation of the Law on Forest Protection and Development”. Concerning the tasks and authorities of FPD related to forest and forestry land monitoring, Item 8, Article 2 of the Decision stipulates:

To organize the implementation of the works of forest statistics and inventory, and monitoring of forest changes nationwide; to submit to the VNFOREST Director General the results of annual forest statistics and results of forest inventories in compliance with existing State regulations.

#### **Decision No. 276/QĐ-TCLN REGULATING FUNCTIONS, TASKS, AUTHORITIES AND ORGANIZATIONAL STRUCTURE OF FOREST INVENTORY AND PLANNING INSTITUTE (FIPI) UNDER VNFOREST**

Decision no. 276/QĐ-TCLN dated on 19/06/2010 regulating functions, tasks, authorities and organizational structure of Forest Inventory and Planning Institute (FIPI) under VNFOREST specifies that FIPI shall be responsible for “conducting basic inventories on forest resources; planning, surveying and designing forest and forest land nationwide”. Some tasks and authorities related to the forest and forestry land monitoring work are provided in Article 2:

##### Article 2. Tasks and authorities

1. To propose and develop national technical standards, procedures, regulations, technical-economical norms, long-term and annual national programmes, projects in the field of forest inventory and planning for submission to General Director of VNFOREST.
2. To propose and develop guidelines and instructions for submission to General Director of VNFOREST for carrying out tasks of inventory, forest protection and development planning; identifying and delimiting boundaries of forest categories on maps and on the field; preparing guidelines and methodologies on forest statistics and inventory and monitoring of forest resource changes.
3. To assist General Director of VNFOREST in preparing documents and data on forest planning, results of national forest resource inventory for regular announcement in compliance with existing regulations.
- ...
5. To carry out basic and applied research programmes and projects; projects on basic inventory, surveying and planning in the forestry sector; programmes on national surveying, monitoring and assessment of forest resource and environment changes.

## **Decision No. 07/2012/QĐ-TTg PROMULGATING SOME POLICIES FOR ENHANCEMENT OF FOREST PROTECTION WORK**

On 08/02/2012, Decision no. 07/2012/QĐ-TTg was issued by Prime Minister promulgating some policies for enhancement of forest protection work. Regulations related to forest and forestry land monitoring at various administrative levels are stipulated in Article 2 as follows:

Article 2. Decentralize state management responsibilities on forest and forestry land to People's Committees at all levels.

1. Responsibilities of People's Committees of provinces, central-run cities (hereafter abbreviated as provincial-level People's Committees).

...

e) To organize the survey, inventory, statistics, classification of forest, and developing forest cover maps on the province's management area.

...

2. Responsibilities of People's Committees of districts/municipalities/provincial-run-cities (hereafter abbreviated as district-level People's Committees) having forests.

...

d) To direct commune-level People's Committees to carry out statistics and monitoring changes on forest and forestry land.

...

3. Responsibilities of People's Committees of communes/wards/townships (hereafter abbreviated as commune-level People's Committees) having forests

...

h) To monitor, update changes on forest and forestry land; regularly check the utilization of forest and forestry land of organizations, households, individuals and communities on the commune's management area.

## **Decision No. 803/QĐ-TTg ON APPROVAL OF NATIONAL INVENTORY AND STATISTICS PROGRAMMES**

On 28/06/2012, Decision no. 803/QĐ-TTg was issued by Prime Minister approving national inventory and statistics programmes. This Decision replaces the Decision no. 144/2008/QĐ-TTg dated 29/10/2008 by Prime Minister. Among the approved programmes, there is one (programme no. 19) relating to the tasks of forest and forestry land monitoring. This programme is almost the same with the programme no. 12 in the Decision no. 144/2008/QĐ-TTg. Detailed information about this programme is as follows:

Type (General inventory or Inventory and statistics): Inventory and statistics

Name: Forest Survey and Inventory

Objectives: To collect basic data on forest to grasp total forest area, proportion of forest of all kinds, serving the work of forest planning, management and protection, and plantation tendering

Subjects: All kinds of forest

Units: Organizations, individuals having responsibilities of forest management, protection and utilization

Method (complete inventory/sampling): complete inventory

Contents:

- Total forest area
- Proportion of forest areas of all kinds
- Current status of forest management and utilization
- Forest reserves
- Collecting criteria indexed from 0914 to 0918, which is described in Decision No. 43/2010/QĐ-TTg dated 02/06/2010 by Prime Minister (see Table 1 for details).

Time period and time point: 5-year cycle; 1st January (conducting on years having the unit number of zero or five)

Leading agency: Ministry of Agriculture and Rural Development

Coordinating agencies: Ministry of Planning and Investment (General Statistics Office); Ministry of Financial

**Table 6: Information about criteria that should be collected by the Forest Survey and Inventory Programme.**

Code	Criterion name	Categorized mainly by	Publication cycle
0914	Area of existing forest	Forest types, Provinces/Cities	Yearly
0915	Area of newly concentrate planted forest	Forest types	6-month
		Forest types, economical types, Provinces/Cities	Yearly
0916	Area of plantation being tendered	Forest types	6-month
		Forest types, economical types, Provinces/Cities	Yearly
0917	Area of forest delimited for regeneration	Forest types	6-month
		Forest types, economical types, Provinces/Cities	Yearly
0918	Area of forest allocated and leased for protection	Forest types	6-month
		Forest types, economical types, Provinces/Cities	Yearly