

**NATIONAL FOREST MONITORING SYSTEM  
OF CAMBODIA**

November, 2015

## Acknowledgements

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## CONTENTS

<b>Acknowledgements</b> .....	i
<b>Executive Summary</b> .....	1
<b>Chapter 1. Background and Purpose</b> .....	2
<b>Chapter 2. UNFCCC Requirements</b> .....	3
<b>Chapter 3. Current Forest Monitoring in Cambodia</b> .....	5
<b>3.1. General situation</b> .....	5
<b>3.2. Institutional structure</b> .....	5
<b>3.3. General status of forest condition in Cambodia</b> .....	5
<b>3.3.1. National forest definition for sustainable forest management</b> .....	6
<b>3.4. Forest definition for REDD+ programme</b> .....	9
<b>3.5. Land use/cover mapping</b> .....	9
<b>3.6. Forest inventory survey</b> .....	11
<b>3.7. Information collection from local offices and communities</b> .....	11
<b>3.8. Data management</b> .....	12
<b>Chapter 4. Principles of NFMS development for Cambodia</b> .....	15
<b>Chapter 5. Concept design of future NFMS for Cambodia</b> .....	17
<b>5.1. Composition of NFMS</b> .....	17
<b>5.2. Phased approach</b> .....	18
<b>5.3. Relation with Other activities</b> .....	21
<b>Chapter 6. Development of future NFMS Components</b> .....	22
<b>6.1. MRV function</b> .....	22
6.1.1. Satellite Land Monitoring System (SLMS).....	22
6.1.2. National Forest Inventory .....	23
6.1.3. GHG Inventory for Land use and Land Use Change and Forestry Sector	25
6.1.4. Report and verification .....	27
<b>6.2. Monitoring function</b> .....	29
6.2.1. Purpose .....	29
6.2.2. Scope.....	29
6.2.3. Development Schedule.....	31
<b>6.3. Data Management System</b> .....	32
6.3.1. Functions of data management system.....	32
6.3.2. Phased development .....	32
<b>6.4. Institutional arrangement</b> .....	33

6.4.1. Institutional arrangement of MRV .....	33
6.4.2. Institutional arrangement of Monitoring.....	33
<b>Chapter 7. Capacity Building .....</b>	<b>35</b>
<b>Chapter 8. Cost Consideration.....</b>	<b>36</b>
<b>References.....</b>	<b>38</b>
<b>Annex I.....</b>	<b>39</b>
<b>Annex II .....</b>	<b>40</b>
<b>Annex III.....</b>	<b>41</b>
<b>Annex IV .....</b>	<b>42</b>
<b>Annex V .....</b>	<b>45</b>
<b>Annex VI.....</b>	<b>47</b>

## List of Abbreviations and Acronyms

AD	Activity Data
BUR	Biennial Update Report
CAM-REDD	Cambodian REDD+ program
COP	Conference of the Parties
DFC	Department of Forestry and Community Forest
EF	Emission Factor
FAO	Food and Agriculture Organization of the United Nations
FA	Forestry Administration, MAFF
FiA	Fisheries Administration, MAFF
FREL	Forest Reference Emission Level
GDANCP	General Department of Administration for Nature Conservation and Protection (Cambodia)
GIS	Geographic Information System
GHG	Greenhouse Gas
GSSD	General Secretariat for Sustainable Development
ICA	International Consultation and Analysis
IPCC	Intergovernmental Panel on Climate Change
JICA	Japan International Cooperation Agency
MAFF	Ministry of Agriculture, Forestry and Fisheries
MoE	Ministry of Environment
MRV	Measurement, Reporting and Verification
NC	National Communication
NFI	National Forest Inventory
NFP	National Forest Programme
NFMS	National Forest Monitoring System
NPASMP	National Protected Areas Strategic Management Plan
PAM	Policies and Measures
PFE	Permanent Forest Estate
QA/QC	Quality Assurance/Quality Control
REDD+	Reducing emissions from deforestation and forest degradation and the role of conservation, sustainable management of forests and enhancement of forest carbon stocks in developing countries
RGC	The Royal Government of Cambodia
RS	Remote Sensing

RUA	Royal University of Agriculture
RUPP	Royal University of Phnom Penh
SIS	Safeguard Information System
SLMS	Satellite Land Monitoring System
SPFF	Strategic Planning Framework for Fisheries
UNFCCC	United National Framework Convention on Climate Change
UN-REDD	The United Nations Collaborative Programme on REDD
WFA	Watershed Management and Forest Cover Assessment Office of FA

## Executive Summary

Effective policies and measure to address deforestation and forest degradation depends on reliable information on forest and socio-economic conditions of the target area. Assessment of the output of implemented policies and measures also depends upon the same type of information collected during and after the implementation.

In Cambodia three government agencies are responsible for the management of forests. They are Forestry Administration (FA), Fisheries Administration (FiA) of the Ministry of Agriculture, Forestry and Fisheries (MAFF) and General Department of Administration of Nature Conservation and Protection (GANCP) of the Ministry of Environment.

FA has assessed forest conditions every four years by making national forest cover map using satellite images. While not covering the entire forest, forest inventory surveys were carried out for a variety of purpose. Also, the three agencies are running a mechanism to collect information on the forest under their respective administration in a form of regular reporting from local offices to the central offices.

In order to implement more efficient policies and measures to address deforestation and forest degradation and to become eligible to receive results-based payment for the implementation of REDD+ activities, the parties are obliged to establish a national forest monitoring system. Cambodia has decided to establish the system based on existing mechanism and modality in a phased approach by 2020. Target is the GHG inventory covering five carbon pools at the level higher than Tier 2.

## Chapter 1. Background and Purpose

Monitoring forest condition is the base for effective forest management. Cambodia has been practicing forest monitoring since long time. From 2002, forest assessment has been implemented every four years. Forest inventory surveys have been carried out in various places in the country although they do not cover the entire country in a systematic manner. There is also a reporting mechanism to send information from local offices to the central offices.

And in COP19 decision, National Forest Monitoring System (NFMS) was listed as one of four conditions for parties to become eligible to apply for the results-based payment. The other three conditions are establishment of National Strategy, Forest Reference Emission Level (FREL) and Safeguard Information System (SIS) under REDD+ mechanism.

Cambodia has decided to develop a National Forest Monitoring System (NFMS) which suits the purpose of implementing REDD+ activities and also useful for ordinary forest management based on existing mechanism and tools.

The work to establish a National Forest Monitoring System of Cambodia started in 2011 even before the formal establishment of REDD+ Taskforce and MRV/REL Technical Team under the taskforce. Existing map and forest inventory survey data were analyzed and provisional idea for improvement was discussed. Activity on NFMS establishment became active after the full swing activity of MRV/REL Technical Team in early 2014. Proposal for NFI design and field manual were made in parallel with the review of exiting land use/cover classes and also the introduction of new mapping technologies. At the same time, a database management system and a WEB interface were constructed.

This indicates that Cambodia is in the midst of NFMS development. Some items need further improvement and while some items need further examination and discussion.

**This draft document** describes the design of NFMS of Cambodia which will be constructed in a phased approach.

## Chapter 2. UNFCCC Requirements

Major COP decisions stating the needs and contents of NFMS for REDD+ are:

### **Decision 4 of COP 15: 2009 (Copenhagen, Denmark)**

The Conference of the Parties requests developing country Parties to establish, according to national circumstances and capabilities, robust and transparent national forest monitoring system that:

- (1) Use a combination of remote sensing and ground-based forest carbon inventory approaches for estimating, as appropriate, anthropogenic forest-related greenhouse gas emissions by sources and removals by sinks, forest carbon stocks and forest area changes;
- (2) Provide estimates that are transparent, consistent, as far as possible accurate, and that reduce uncertainties, taking into account national capabilities and capacities;
- (3) Are transparent and their results are available and suitable for review as agreed by the Conference of the Parties

### **Decision 1 of COP 16: 2010 (Cancun, Mexico)**

The Conference of the Parties requests developing country Parties to develop the following elements:

- (c) A robust and transparent national forest monitoring system for the monitoring and reporting of the five activities: (1) Reducing emissions from deforestation, (2) reducing emissions from forest degradation, (3) conservation of forest carbon stocks, (4) sustainable management of forests and (5) enhancement of forest carbon stocks, with the provisions contained in decision 4 of COP15.

### **Decision 11 of COP 19: 2013 (Warsaw, Poland)**

The conference of the Parties decides that national forest monitoring system should

- (a) Build upon existing systems, as appropriate;
- (b) Enable the assessment of different types of forest in the country, including; natural forest, as defined by the Party;

- (c) Be flexible and allow for improvement;
- (d) Reflect, as appropriate, the phased approach as referred to in Decision 1 of COP 16.

## **Chapter 3. Current Forest Monitoring in Cambodia**

### **3.1. General situation**

Cambodia has already been implementing forest monitoring. First of all, distribution of four major types of forests, namely, Evergreen, Semi-evergreen, Deciduous and other type in Cambodia, have been monitored approximately every four years by forest cover assessment program of FA.

For the monitoring of activities in forests, each of the three key agencies responsible for forest management, namely, FA, FiA and MoE, has similar monthly, quarterly, semester and annual reporting mechanism to collect information from local offices. Report on illegal activities is being sent to the central offices as needed. And a mechanism to collect information on community forestry is now being designed.

### **3.2. Institutional structure**

In Cambodia three main government agencies, namely FA, MoE and FiA are responsible for forest resources management. FA is responsible for reporting the assessment of forest cover conditions for the entire country as well as for producing nationwide walls to walls land use/cover maps. However, field of forest inventory assessment will implement individually by FA, MoE and FiA respectedly.

### **3.3. General status of forest condition in Cambodia**

For the purpose of sustaining effective forest reform, Cambodia developed the National Forest Programme. The National Forest Programme is based on the vision outlined and well embedded in the Statement of the Royal Government on National Forest Sector Policy. The vision is: “The Royal Government of Cambodia considers the ecologically, socially and economically viable conservation and management of forest resources as a major pillar of public welfare directly contributing to environmental protection, poverty reduction and socio-economic development.”

### 3.3.1. National forest definition for sustainable forest management

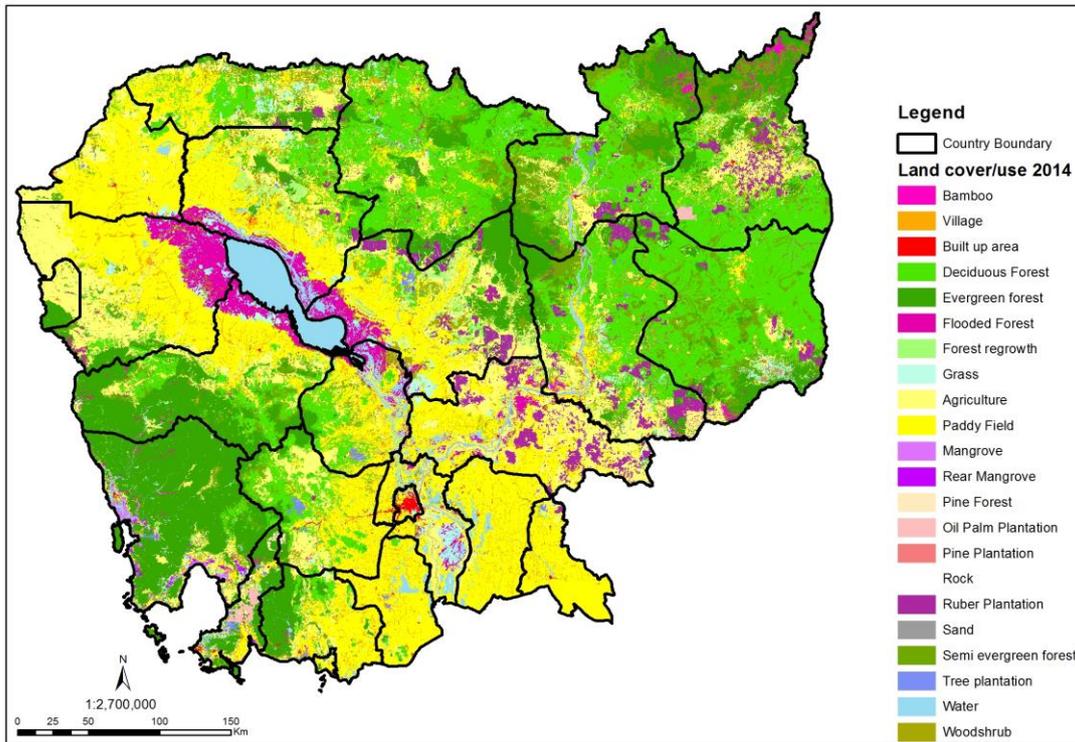
Under National Forest Programme (NFP) of Cambodia, forest is defined as follows:

*Forest is the unit of natural ecosystem or plantation in the form of wetland, low land and dry land which covers by natural stands of plantation trees with a height from 5 meters on an area at least 0.5 hectares with a canopy of more than 10 percent The plantations such as rubber, oil palm, teak, acacia and eucalyptus and other kinds of trees which fall under the above criteria will also be classified as forests.*

Cambodia will continue to follow this definition for national sustainable forest management.

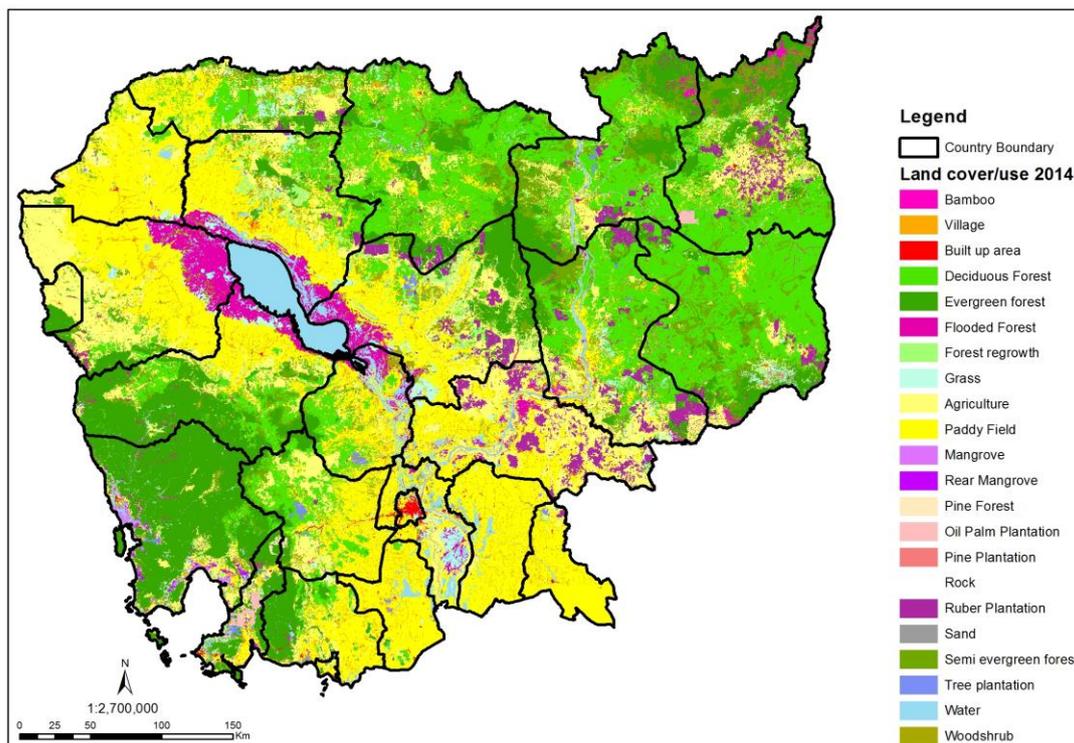
Before 1970, forests covered about 73 % of the country's land area. These forests have been degraded and deforested gradually due to civil war, illegal logging, shifting agriculture, forest land encroachment and conversion to other land-use.

According to the Forestry Administration assessment in 2002, forest cover was 61.15%. However, forest cover decreased to 59.09% and 57.07% in 2006 and 2010, respectively.



**Figure 1 Land use/cover map 2014**

Figure 1 is land use/cover map of 2014 – the most recent assessment of land use/cover.



**Figure 1 Land use/cover map 2014**

According to the 2014 map the forest cover ratio was 49.48%. Table 1 shows the change of forest cover from 2006.

**Table 1 Forest Cover Ratio Change**

Forest Type	2006	2010	2014
Evergreen	20.2%	19.27%	16.38%
Semi-evergreen	7.5%	7.02%	6.10%
Deciduous	25.84%	24.68%	19.21%
Other forest	5.55%	6.1%	7.83%
Total forest	59.09%	57.07%	49.48%

Note: Please refer to the forest definition stated in NFP.

Forests in Cambodia fall under the general jurisdiction of the Ministry of Agriculture, Forestry and Fisheries (MAFF), with the Forestry Administration of MAFF charged as the responsible Government Authority (Forestry Law 2002, Article 3), the Ministry of Environment is responsible for Protected Areas, and the Fisheries Administration of MAFF is responsible for flooded forest and mangrove areas (Fisheries Law 2006, Article

3). Cambodian Law is hierarchical, therefore all subsidiary regulations should respect the differentiation of responsibilities laid out in the Forestry Law (and other Laws, see below), i.e. subsidiary regulations cannot amend responsibilities laid out in a Law. As a consequence, management and regulatory jurisdictional authority over forest resources in Cambodia falls under the responsibility of several different government agencies under Cambodian Law (Fisheries Law 2006, Forestry Law 2002, Land Law 2001, Protected Areas Law 2008, Environmental Protection and Natural Resources Management Law 1996, 1993 Royal Decree on Creation and Determination of Nature Reserves, 2009 Sub-decree #83 on Registration of Land of Indigenous Communities, etc).

### **3.4. Forest Definition for REDD+ programme**

In order to implement Cambodian REDD+ programs, forests was re-defined as follows:

*“Forest” under the REDD+ programme refer to the unit of the ecosystem in the form of wetland and dry land covered by natural or planted vegetation with area cover at least 0.5ha, height from 5 meter, and canopy crown cover more than 10%.*

*Areas also included in the REDD+ programme are forest regrowth and areas under afforestation or reforestation. Rubber, oil palm plantations and perennial crops are excluded from this definition.*

### **3.5. Land use/cover mapping**

#### **Methodology**

Under the Forestry Law of Cambodia, the Forestry Administration is responsible for assessing forest cover every four years. LANDSAT images were the major source of satellite data. On-screen digitizing technique was introduced for producing the 2002 forest map.

In 2014, image segmentation software was introduced to the Forestry Administration. Following that, a series of training on the use of the segmentation technique was conducted. Image segmentation was used to stratify Non-Forest and Other Forest areas of existing 2006 and 2010 maps as well as to produce the land use/cover map for the 2014 epoch.

## Data Produced

Forest cover assessments were carried out for the 1965, 1992/93, 1996/97, 2002, 2006 and 2010 epochs. However, accuracy assessment was performed for the 2006 and 2010 forest cover maps only, and therefore they are considered to be suitable for FRL calculations. Nonetheless, the land use/cover classes of the 2006 and 2010 maps are not suitable for initial FREL calculation because rubber and oil palm plantations; which Cambodia decided to exclude from the category of forest,- were not separated from forest. Furthermore, non-forest area was not stratified.

For this reason, details of land use/cover classes were reviewed in order to determine a new set of classes suitable for REDD+ purpose and also compatible with IPCC six land use/cover classes. Table 2 shows the relation between old classes and new classes. New set of land use/cover classes was used to upgrade the existing 2006 and 2010 maps as well as produce the 2014 map.

**Table 2 Comparison of old and new land use/cover class**

	Old category		New category
1	Evergreen forest	1	Evergreen forest
2	Semi-evergreen forest	2	Semi-evergreen forest
3	Deciduous forest	3	Deciduous forest
4	Bamboo	4	Bamboo
5	Wood shrub Dry	5	Wood shrub
6	Wood shrub evergreen		
7	Other forest	6	Mangrove forest
		7	Rear mangrove
		8	Rubber plantation
		9	Flooded Forest
		10	Forest Regrow
		11	Pine Tree
		12	Pine plantation
		13	Oil palm
8	Non-forest	14	Tree plantation
		15	Paddy Field
		16	Crop Land
		17	Grass
		18	Built-up area

		19	Village
		20	Rock
		21	Sand
		22	Water

### **Collection of available data (SLM)**

By support activity development of NFMS, FA was submitted, the reliable of activity data following by transparency QA/QC assessment report in order makes it's available for development of historical baseline map of land use/cover 2014, 2010, 2006 and all are conducted consistency checking.

### **3.6. Forest inventory survey**

#### **Current situation**

FA has implemented forest inventory surveys for various purposes such as for collecting timber volume data in forest concession, for assessing forest resources in Economic Land Concessions (ELC), community forests and REDD+ project areas, Forest plantation, as well as for research project purposes. However, forest inventory data covering the entire forests of Cambodia do not exist and are not publicly available.

MoE and FiA have not carried out forest survey for the purpose of forest biomass survey.

#### **Available data**

Some of the results of forest inventory surveys listed above were available. Some of the data are still in the process of compilation and validation and not readily available. Available forest inventory survey results were compiled by FAO (2015) (unpublished). Annex II is a part of the result of the compilation.

### **3.7. Information collection from local offices and communities**

Forestry Administration has 4 inspectorates, 21 cantonments, 55 divisions and 170 triages. Information from local offices is sent to the central office in one of the following three routes.

- Monthly report from Inspectorate → Dept. of Administration, Planning, and Finance
- Monthly report from Protected Forest → Dept. of Wildlife and Biodiversity Conservation

- Report on illegal activities → Dept. of Legislation and Law Enforcement

Items of the monthly report are as listed in Annex V. As shown in Annex V, reporting item is comprehensive. Major items covered in the report are:

- Forest demarcation, classification and registration
- Forest community development
- Timber and non-timber product management
- Tree plantation development and silviculture
- Wildlife and biodiversity conservation
- Forest industry, commercial development and management
- Capacity building
- Forest law enforcement

FiA and GDANCP of MoE have a similar reporting mechanism.

“Preliminary Investigation Report”, a reporting format used for a Case Tracking System of FA, is presented in Annex IV. The report is designed to collect information to be stored in a database. While this system is not working now, this report format can be used as one of bases to develop a more comprehensive reporting format.

### **3.8. Data management**

FA has mandate to manage and store the map data in FA database. Forest inventory survey data have not yet been managed by mandate office or department.

#### **Database system**

For the purpose of improving data management, a database management system was developed. Land use/cover maps produced by FA have already been stored in digital database operated by REDD+ Taskforce Secretariat.

The Windows-based computer server was chosen for the management of data collected from REDD+. The system was developed so that both commercial GIS software (ArcGIS which is familiar to most of the MRV team members) and open-source GIS software (QGIS which is being increasingly used by GIS users in Cambodia).

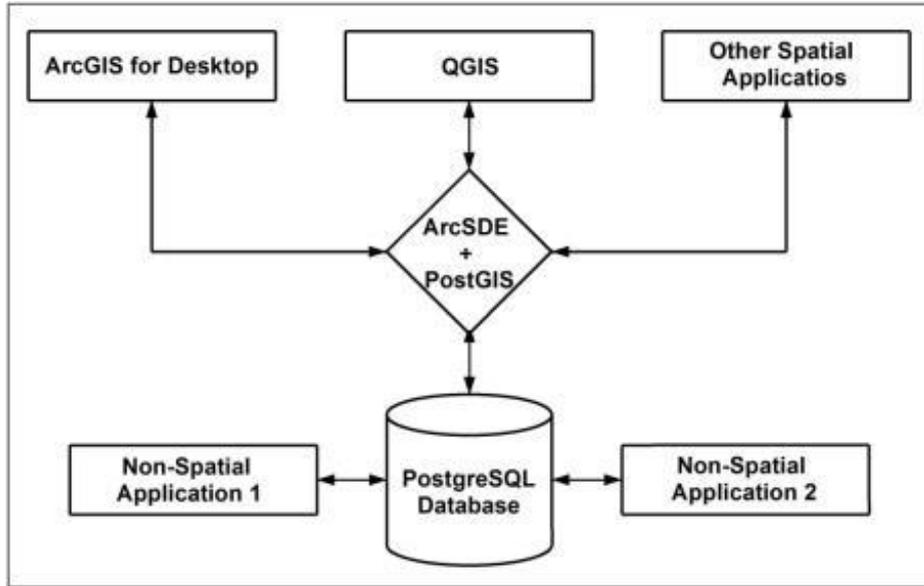


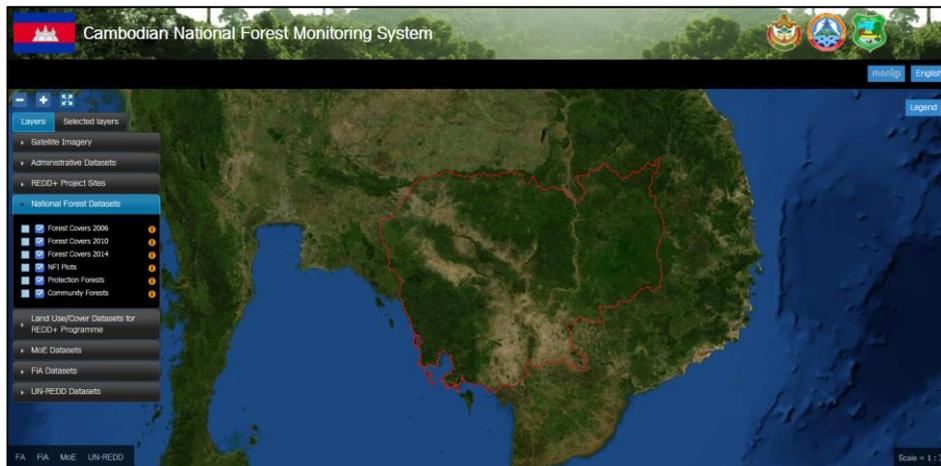
Figure 2 Conceptual design of the abovementioned database management system

On the other hand, information monitoring on illegal activity provided in a form of reports from local office to the central office is used to take necessary actions but not yet stored in a systematic way in FA, FiA and GDANCP. Reporting mechanism to monitor conditions of community forest project is now being designed.

**List of collected data**

The MRV team has identified and created a list of potential data to be used for REDD+ and they already collected some datasets from various government agencies and relevant NGOs organizations (See annex...)

For the purpose of providing information on REDD+ activities, a WEB platform is now being developed as shown in Figure 3. Training on the management of the WEB site and database was conducted for the officials of FA, FiA and GDANCP.



**Figure 3 Design of WEB site of Cambodian NFMS**

## Chapter 4. Principles of NFMS Development for Cambodia

Cambodia has adopted principles listed below for the development of future NFMS.

### **Multiple benefits:**

NFMS must go beyond carbon and become a multifunctional instrument, aiming to serve sustainable forest management and then NFP, NPASMP and SPFF.

### **National ownership:**

Cambodia has the full control of all NFMS-related processes and is fully and solely responsible for the NFMS implementation.

International organizations or foreign institutions can provide support for technical capacity building and institutional capacity development.

### **Autonomy:**

NFMS is developed according to national circumstances, capabilities and priorities. Institutional arrangements should be based where possible on existing institutions, with the creation of new ones being the result of necessity.

### **Operational:**

NFMS should be funded by the state budget and activities should seek out the most cost-effective solutions at all stages and structural levels.

### **Centrally coordinated, standardized and scalable top-down system:**

Institutions responsible for the implementation of NFMS should define standardized methodology protocols and agree data supply plans with data suppliers.

### **IPCC compliance**

NFMS must be in line with the most recently adopted or recommended IPCC Guidance and Guidelines and also with relevant COP decisions.

### **Phased approach:**

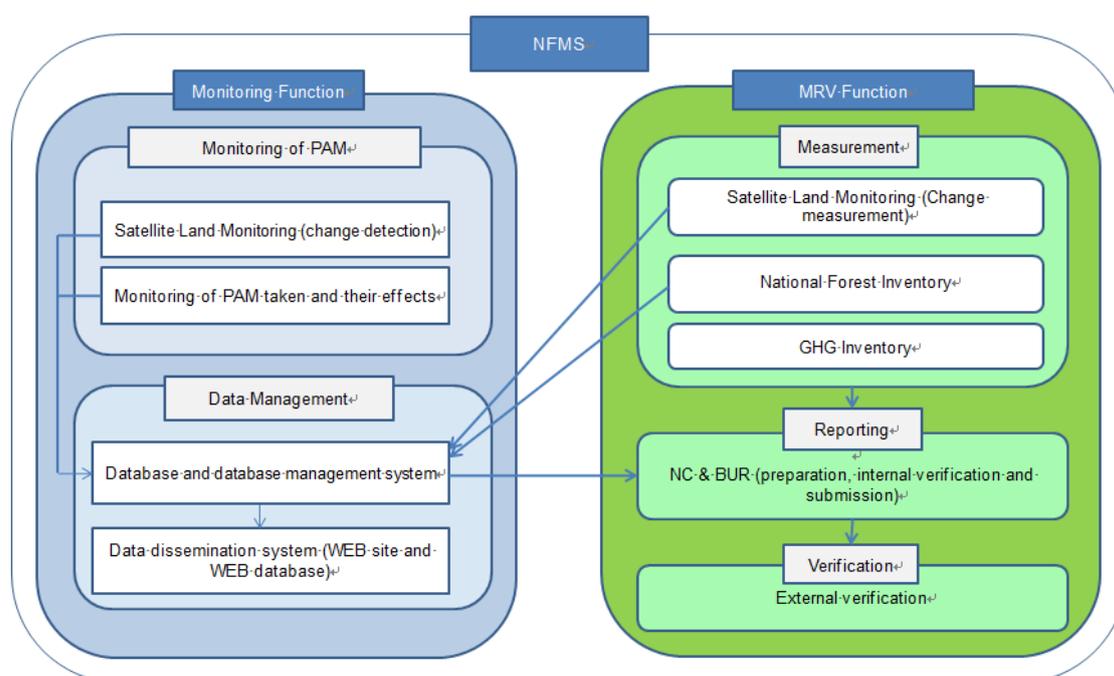
Cambodia aims at GHG inventory of Tier 2 or higher level covering 5 carbon pools with higher certainty level and develops NFMS following a phased approach –

starting with the use of the most important information, then develop NFMS into more comprehensive structure. This step synchronizes with the three phases of REDD+ program as presented in Figure 5.

## Chapter 5. Concept design of future NFMS for Cambodia

### 5.1. Composition of NFMS

Figure 4 shows the composition of NFMS in Cambodia. NFMS of Cambodia will have two interrelated functions – MRV Function and Monitoring function.



**Figure 4 Composition of NFMS and its components**

#### **MRV function**

MRV Function is divided into three elements, namely, Measurement, Reporting and Verification.

The Measurement consists of Satellite Monitoring, National Forest Inventory (NFI) and GHG Inventory. Satellite monitoring will measure land use/cover change in order to obtain Activity Data (AD). NFI is designed to obtain forest biomass data to determine Emission Factor (EF). And based on AD and EF, GHG inventory is carried out.

The data and output of the measurements are also used for the design of policy and measure on sustainable forest management.

Reporting and Verification are the process for compiling the result of the

measurement to report to UNFCCC. Verification comprises of two steps. One is internal verification by Cambodia and the other is international verification by UNFCCC.

### Monitoring Function

The monitoring function focuses on monitoring REDD+ activities, or policies as well as measures to address drivers of deforestation and forest degradation. This function consists of monitoring as well as data management parts. Data management part is further divided into database management and dissemination (publication) parts. Some necessary information can be obtained from outside sources.

## 5.2. Phased Approach

The development of NFMS of Cambodia follows a phased approach. Criteria for developing the phases are requirements of national policies as well as of UNFCCC, data availability, cost for operation, capacity of users of NFMS to operate the system and use the information provided by the system in a meaningful way. This step generally synchronizes with the phases of REDD+ program as presented in Figure 5.

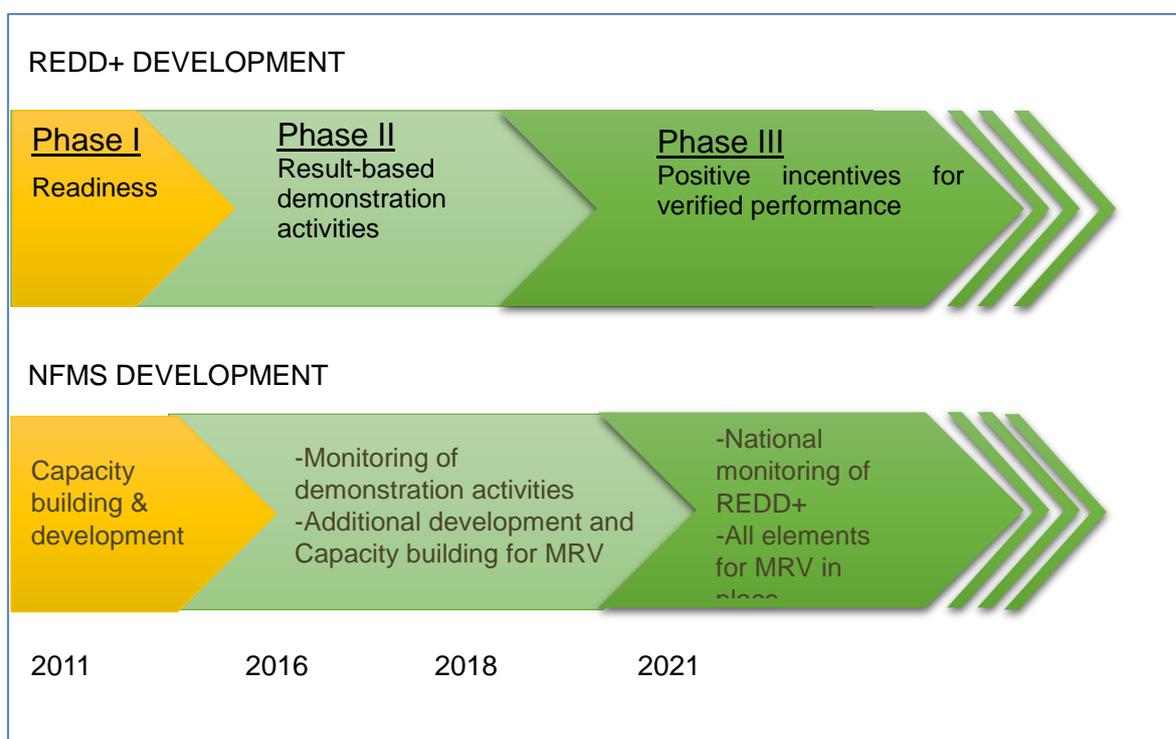


Figure 5 Phased approach of Cambodian REDD+ and NFMS development

Concept and major activities for each Phase of NFMS is as described below. Detailed activities of each component are described in Chapter 6.

### **Phase I (Preparatory Stage) (2011-2015)**

Cambodia started its REDD+ readiness activities in 2011. Designing of NFMS and necessary capacity building of Cambodian officials were major activities related to NFMS.

What have been accomplished by the end of November 2015 are as listed below, for which the details are described in Chapter 3.

- Development of new satellite monitoring system by introducing new methodology for land use/cover mapping to detect land use/cover change between different land/use cover classes.
- Update of 2006 and 2010 maps and production of new 2014 map by using the developed mapping methodology. (*Implementation of SLMS*)
- Development of design of national forest inventory. (*Still in progress*)
- Analysis of GHG inventory method to assist choosing one of the two methods. (*Selection has not yet been made.*)
- Establishment of a database management system and WEB interface supporting REDD+ of Cambodia. (*Construction of WEB site is still in progress.*)

### **Phase II Development Stage (2016-2020)**

Phase II is for further development of NFMS and also for design and for testing methodologies and mechanism of NFMS designed in Phase I. Some components of NFMS will be implemented.

#### (1) 2016-2017

Next cycle of land use/cover mapping using satellite images will start in 2016. NFI will start from the completion of its design and field manual followed by the preparation of action plan and practical training of officials of local offices. Then, in 2017, implementation of NFI will start with relatively small scale. GHG Inventory for the reporting year of 2014 (the third NC or the first BUR) is carried out using AD acquired by past satellite monitoring and existing EF calculated based on the results of past studies.

For Monitoring Part of NFMS, action plan will be made on the monitoring of Policies and Measures (PAMs) addressing drivers of deforestation and forest degradation. Most of the PAMs listed in the National REDD Strategy (NRS) of Cambodia are monitored by documents such as relevant laws and decrees. Some of PAMs with numerical target, progress of REDD+ activities can be monitored quantitatively.

In parallel with the identification of monitoring indicators for PAMs, a new mechanism to collect monitoring information from local offices to the central offices will be examined.

For data management, data entry into the database will start. And design of WEB interface is completed and operation of the WEB site will start.

#### (2) 2018-2020

In Transition Phase, activities are developed in accordance with the situation and the capacity along with the design.

The next cycle of land use/cover mapping will be carried out. The first cycle of NFI continues. GHG Inventory for the fourth NC or the second BUR might be carried out until its completion. New AD by Satellite Monitoring and new EF by 1<sup>st</sup> NFI could be used.

#### **Phase III (Full-operation Stage) (2021 - ):**

In this phase, all the items designed are monitored and reported. Data management system is also fully operationalized. Necessary information for PAM and Safeguard Information System is sufficiently provided. PAM is efficiently monitored.

Satellite Monitoring is periodically carried out at two year cycle. NFI can enter the second cycle reflecting experiences gained in the 1<sup>st</sup> cycle. GHG Inventory could utilize the data from two NFIs as EF by which forest degradation might be detected. New AD from Satellite Monitoring will be also available.

Monitoring part of the NFMS is carried out with full specification and data management fully functions.

### **5.3. Relation with Other activities**

Although NFMS of Cambodia shall be composed as an independent system, it relates to other activities outside of it. Safeguard Information System (SIS) is a typical outside activity linked to NFMS.

NFMS will offer some necessary information to SIS though the structure of the SIS of Cambodia has not yet been agreed upon. The type of information to be offered to the SIS – particularly through its Monitoring Function of NFMS - will be determined along with the development of the SIS. At the same time, SIS should be constructed under well coordination with elements of NFMS to avoid duplication in the function and in the type of information to be managed.

## Chapter 6. Development of future NFMS Components

As explained in Chapter 3 and previous chapters, Cambodia has monitored the distribution of forest areas using satellite-based forest cover maps. Furthermore, various types of forest inventory surveys have been carried out. Also, the initial National Communication was submitted to UNFCCC in 2002. Therefore, Cambodia already has the foundation for the development of a national forest monitoring system.

The major modification of the existing forest monitoring mechanism for Cambodia will be:

- Expand the target of forest inventory surveys to all the forest types in the country and make it systematic.
- Develop a mechanism to collect information other than those directly related to the measurement of carbon and size of forests.
- Develop a mechanism for the better management of collected data and also for dissemination to various stakeholders.

### 6.1. MRV function

#### 6.1.1. Satellite Land Monitoring System (SLMS)

##### 6.1.1.1. Purpose

SLMS has two purposes. While it provides Activity Data (AD) for MRV, it also provides information for land use/cover classes change detection between class categories.

##### 6.1.1.2. Scope

###### **Target activity**

Due to technological limits detection of land use change including deforestation is the initial target. Detection of changes occurring in a land use/cover class, or forest degradation, is subject to technological development.

###### **Measurement cycle**

FA is going to update land use/cover map (data) in two years interval. Upgrading of the map content will also be considered.

###### **Methodology:**

FA used land use/cover maps in vector format to monitor land use and cover since long time. Land use/cover maps in vector format were produced because boundary line of each land use/cover class was required for forest management. In 2014 and 2015, segmentation was used to produce the 2014 land use/cover map. Technical details of the mapping process are shown in Annex IV.

Freely available LANDSAT 8 images will be used to produce land use/cover maps since high resolution satellite images are expensive. However, changes occurring inside forests are difficult to detect on medium resolution images such as LANDSAT8. As a result, only land use change including deforestation is the initial target of detection.

#### 6.1.1.3. QA/QC measures

For quality control, QC, manuals explaining details of the operation of software or procedures were prepared. For quality assurance, QA, accuracy assessment of a map of one epoch has been established. Method of accuracy assessment of land use/cover change will be developed.

#### 6.1.1.4. Development Plan of SLMS (2016-2018)

(1) Revision of current mapping technique.

Preparation for next cycle of mapping is initiated. The preparation includes, the review of the mapping technique introduced for the 2014 mapping.

(2) Exploration of technique to detect different carbon stock level

Exploration of cost effective methodology to detect forest degradation other than those caused by land use change will be carried out. Also explored is a technique to stratify forests according to different carbon stock level.

(3) Exploration of technique to assess accuracy of land use/cover change.

(4) Further capacity building of young officials, both men and women, in satellite image interpretation and analysis will be conducted.

#### 6.1.2. National Forest Inventory

#### 6.1.2.1. Purpose

National forest inventory is implemented in order to obtain precise information on biomass volume of forests of different type, different age, different density and different location. The data to be collected are used to calculate emission and removal of forest carbon. Before one cycle of NFI is completed, EF needs to be obtained from existing studies.

#### 6.1.2.2. Scope

##### **Target carbon pool:**

All the five carbon pools, namely, above ground biomass (AGB), below ground biomass (BGB), dead wood, litter and soil organic matters, are targeted.

##### **Implementation Cycle:**

Four to five years according to the NFP of Cambodia.

##### **Methodology**

Field survey at sampling plots. PSP is distributed in forested areas by stratified systematic method. Different point density is applied for upland forest stratum, inundated forest stratum and mangrove stratum as presented in Table 3.

**Table 3 Number of PSP for each stratum**

Stratum	Area (km <sup>2</sup> )	Number of sampling plot (clusters) expected in forest or other wood land
Uplands	152,751.3	2,751
Wetlands	27,742.0	322
Mangrove	1,207.6	97
Total	181,701.0	3,170

Source\* FAO (2014)

##### **Data to be collected**

Biomass data such as diameter and height are principal targets. In addition to biomass data, conditions of forest in and around the plots will be described. Such information is useful to understand ecological and socio-economic conditions.

#### 6.1.2.3. QA/QC measures

The manual was developed for the standardization of survey method.

Documented field manual makes survey personnel to understand survey method in correct way and thus contributes to reduce errors. For Quality Assessment, sampling survey will be conducted for 5% of the surveyed plots. Independent QA/QC team comprised of specialists re-measures the plots to ensure the quality of measurement of the field team and provide feedback to improve the data quality.

#### 6.1.2.4. Development plan of NFI

##### (1) 2016-17

It is expected that detailed design and practical training are carried out in 2016, then, the implementation will start in 2017 with small scale. Reflection and adjustment from learning shall be required for carrying out full scale operation of NFI with success in the next phase.

##### (2) 2018-20

The first cycle of NFI is fully operated until its completion of Quality control is strongly required because this will going to be the first large scale forest inventory survey in Cambodia.

##### (3) 2021

Second NFI will start after the design and methodology of initial NFI will be reviewed.

#### 6.1.3. GHG Inventory for Land use and Land Use Change and Forestry Sector

##### 6.1.3.1. Purpose

The purpose of the national GHG inventory is to estimate and report on the climate change mitigation impact resulting from the implementation of REDD+ activities.

The national GHG inventory will follow standard international templates and be developed following Good Practice Guidance of the Intergovernmental Panel on Climate Change (IPCC); and be reported to the UNFCCC Secretariat on a regular basis.

The mitigation results reported through the GHG inventory will form the basis

for results-based payments for REDD+, once the results have undergone a process of verification through International Consultation and Analysis (ICA).

#### 6.1.3.2. Scope

##### **Target carbon pool:**

Among five carbon pools, AGB and BGB are the target. because of present data availability of Tier 2 level data. Deadwood, litter and soil organic matter will be added after initial NFI is completed.

##### **Target activities**

“Deforestation” including “conservation”, “sustainable management of forests” and “enhancement of forest carbon stocks” are targeted. “Forest degradation” is not included until Full-operation Phase in which efficient EFs for two times can be obtained.

##### **Target GHG:**

CO<sub>2</sub> only. (CH<sub>4</sub>, CO, N<sub>2</sub>O, NO<sub>x</sub> are not included.) “Biomass burning” which is principal source of Non-CO<sub>2</sub> GHG in LULUCF sector is not included in the inventory until necessary data (area burnt, amount burnt and etc.) become available. On the other hand, since organic soil, which is the other sink/source of non-CO<sub>2</sub> GHGs, has very limited distribution in Cambodia and is not significant sink/source, it has little importance to be considered.

##### **Tier level**

Tier 2 with country specific AD and EFs.

##### **GHG Inventory Cycle:**

##### **Methodology:**

Gain-loss method was used in making both the first and second National Communication of Cambodia. However, if aiming at Tier 2 level GHG inventory, then, it is difficult to collect a number of country or regional specific data required in Gain Loss method. Stock Difference method also has a problem that emission factor can be obtained only after two cycles of NFI are completed. Selection of the method will be made in the process of preparing the first BUR which is planned to be submitted in 2018. After completion of two cycles of NFI, Cambodia may consider using Stock Difference method.

#### 6.1.3.3. Development plan of GHG-I

(1) Initial Phase: (2016-2017)

GHG Inventory is carried out for the 3<sup>rd</sup> NC or the 1<sup>st</sup> BUR. Reporting year shall be 2014. A series of data set provided by Satellite Monitoring done by 2015 is used for AD. EFs are obtained from existing studies on Cambodian forests.

(2) Transition Phase: (2018-2020)

GHG Inventory is carried out for the 4<sup>th</sup> NC or the 2<sup>nd</sup> BUR. New AD will be added by new mapping. EFs obtained from existing studies can also be replaced to those from 1<sup>st</sup> NFI although it depends on the progress of the NFI and the schedule of the GHG inventory.

(3) Full-operation Phase (2021 - )

GHG Inventory is expected to be carried out periodically. AD by Satellite Monitoring is also periodically accumulating. Two sets or more EFs by NFI are available after the completion of 2<sup>nd</sup> NFI.

#### 6.1.4. Report and verification

Reporting and review requirements for non-Annex I Parties under the UNFCCC are as follows:

**Biennial Update Reports (BUR):** Submit biennially.

Contain information on national circumstances, national GHG inventory, mitigation actions and their effects, constraints and gaps, and related financial, technical and capacity needs, etc. This report is subject to International Consultations and Analysis (ICA).

**National Communications (NC) :**

Contain information on national circumstances, national GHG inventory, mitigation measures, adaptation measures, vulnerability assessment, constraints and gaps, and related financial, technical and capacity needs, etc. No review process

Reporting and review requirements for non-Annex I Parties under the UNFCCC when implementing and seeking result based payments:

**Forest Reference (Emission) Levels (FREL/FRL):**

Voluntary submission as benchmarks for assessing each country's performance in implementing REDD+ activities”

Contain information on Forest definition, Scope (activities, pools, gases included), historical data used and AD & EF, Construction approach, Scale, etc.. (Subject to technical assessment. )

**Technical annex to BUR (REDD+):**

Supplemental information, non-Annex I Parties may supply a technical annex including sector-specific information (e.g. information on REDD+) seeking to obtain and receive payments for results-based actions. Contain information on assessed forest reference emission level, Results of REDD-plus activities, consistent with the assessed forest reference emission level, etc. (Subject to International Consultations and Analysis (ICA).)

Relation among map/activity data, national forest inventory, forest reference level establishment and NC and BUR is summarized in table 4:

**Table 4 Provisional schedule of NC and BUR submission**

Year	Map/Activity Data		National Forest Inventory		Forest Reference Emission Level			National Communications (NC)			Biennial Update Report (BUR)			
	Data	Production	Data collection	Completion	Baseline	Submission	Technical assessment	Inventory Year	Preparation	Submission	Inventory Year	Preparation	Submission	ICA
2014	•				•			•			•			
2015		•				•				•				
2016	•		•				•		•			•		
2017		•	•						•			•		
2018	•		•		•			•	•	•	•	•	•	
2019		•	•			•					•			•
2020	•		•	•			•		•		•	•	•	
2021		•	•						•			•		•
2022	•		•		•			•	•	•	•	•	•	
2023		•	•			•					•			•
2024	•		•	•			•		•		•	•	•	
2025		•	•						•			•		•
2026	•		•					•	•	•	•	•	•	

## 6.2. Monitoring function

### 6.2.1. Purpose

Monitoring part of NFMS focuses on the effect of policies and measures to address drivers of deforestation and forest degradation. The flow of information between NFMS and PAM is interactive. Firstly, the NFMS needs to function to provide necessary information for executing PAM. And after implementation of PAM, NFMS monitors the progress and outcome of PAMs. Items which need to be monitored shall be decided by necessity and feasibility.

6.2.2. Scope: Two main activities under REDD+ are, deforestation and forest degradation plus some areas of enhancement carbon stock is defined.

### Methodology and Monitoring Items

Two types of tool will be used for the monitoring of PAMs.

#### (1) Assessment of implemented plans

Documents describing the contents of policies and measures and allocated budget will be used as the evidence of implementation of policies and measures. Performance of policies and measures also can be monitored by documented reports such as auditing report.

Auditing system already existing in government agencies can be used as the base to monitor planned REDD+ activities and allocated and spent budget.

(2) Assessment of outcome

Detection of land use/cover change is implemented to monitor the effect of policies and measures. This is to be done by using satellite images and the information to be provided by local governments, local offices of central government and/or local communities. Since the purpose is not measurement, satellite image analysis can be implemented in a shorter cycle than the measurement.

1) Satellite monitoring

Land use/cover map is to be produced every two years. Considering recent rapid change in land use/cover in Cambodia, it will be better to monitor land use/cover change more frequently.

SLMS, which is a key for the measurement part of the MRV function, also provides frequent information on land use/cover condition for the monitoring purpose. Information provided from local offices or local government will be merged with the information derived from satellite image to increase the reliability of monitoring.

2) Monitoring through information collection from local area

In principle, details of the target of monitoring will be determined according to policies and measure to be taken.

If PAM taken is measurable such as the demarcation of forest boundary or establishment of community forestry projects, then they can be monitored by checking the length of demarcated boundary or the number of new community forest projects which are recorded on documents or reports.

Information from local areas is essential to monitor situation of REDD+ activities. Close communication between central and provincial government is one of keys for successful REDD+ activities and NFMS. A mechanism will be established to collect information from provincial governments on forest conditions in each province. At the same time, central government needs to provide provinces with the information

she has to support the better forest management by the provinces.

Regular reporting from local offices of the three government agencies, namely, FA, FiA and MoE is also very necessary for the monitoring. Existing mechanism of reporting will be modified if necessary or the establishment of a reporting mechanism exclusively for MRV could be considered.

Impact of PAM on local communities and biodiversity also need to be monitored. This type of monitoring needs to be done by a well-coordinated group of government, academia, NGO and representative of local government and community.

### **Scale of Monitoring**

Monitoring will be carried out at two different scales – monitoring of entire country and monitoring of REDD+ activity areas or areas which need close monitoring.

#### Monitoring of entire country

- Early detection of nation-wide land use/cover change
- Low to medium resolution satellite images acquired free of charge can be used
- Image analysis by using software will be combined with information from local office to identify significant land use/cover change
- Land use/cover maps produced regularly are also used

#### Monitoring of REDD+ activity areas

- Close monitoring of effect of policies and measures taken for specific areas
- Medium to high resolution satellite image can be used depending upon budget availability
- Result of image analysis will be combined with information from local offices for confirmation of the findings

### 6.2.3. Development Plan

#### (1) Development phase: (2016 –2020)

While detailed items of monitoring cannot be determined before action plan of NRS is made, the following preparation can be done.

- Revision of existing mechanism of reporting from local offices to the central offices

for fully using the information contained in the reports.

- Design of information flow between local governments and the central offices of FA, FiA and MoE related to REDD+ activities.
- Build capacity of local offices on the use of satellite image for monitoring purpose. And satellite monitoring can be started.
- If, the details of PAM are developed, then, indicator for PAM monitoring will be selected and monitoring starts.

(2) Full implementation phase (2021-)

Full scale monitoring will be carried out.

### **6.3. Data Management System**

#### 6.3.1. Functions of data management system

Data management system has two functions. One is data storage and the other is data dissemination. Data necessary for monitoring and for making GHG inventory and reports are stored in a database. This database is basically used by Cambodian government officials responsible for NFMS activities.

#### 6.3.2 Data dissemination mechanism

Data dissemination is a device to ensure all relevant stakeholders have access to data and information on REDD+ processions. For this purpose a website has been developed for sharing information such as land use/cover change and statistics. The type of data to be provided through the website is under discussion. FA will be responsible for uploading the data.

#### 6.3.2. Phased development

By the end of 2015, a database has been designed. Even if database is designed, it is not easy to collect all the information data in a short period of time. Therefore, data which can be easily obtained will be stored first.

WEB site for data dissemination has almost been completed by the end of November 2015. WEB site construction is expected to be completed in 2016.

## 6.4. Institutional arrangement

### 6.4.1. Institutional arrangement of MRV

The institutional arrangements for MRV part of the Cambodia's national forest monitoring system are set out in Figure 6. Key institutions involved in the coordination and management of the monitoring system are Forest Administration (FA/MAFF), General Department of Administration for Nature Conservation and Protection (GDANCP/MoE) and Fisheries Administration (FiA/MAFF).

For wall to wall map production, FA will lead the work. For the mapping of mangrove and flooded forest areas, the three organizations will cooperate.

NFI including data processing and necessary laboratory work will be implemented collaboratively by FA, FiA and MoE for forested areas under their respective jurisdiction. Collected biomass data of all the forest areas of Cambodia will be reviewed by the MRV/REL Technical Team to check consistency and necessary revision will be made by respective organizations, if necessary.

Involvement of research institutes of Cambodia will be necessary according to the type of information to be collected.

Task of each party involved in MRV part of NFMS and procedures of MRV will be formalised through institutional arrangements and legal act to ensure the long-term sustainability and accountability of the system information.

### 6.4.2. Institutional arrangement of Monitoring

As far as the central government is concerned, the same mechanism as presented in Figure 6 will be used for monitoring. Each agency is responsible for the monitoring of activities implemented in areas of their jurisdiction.

What needs to be developed is a mechanism to exchange information between central government, local governments, local offices of relevant government agencies and local communities. Just like for MRV, task of each party involved in the monitoring part of NFMS and procedures of monitoring will formalised through institutional arrangements and legal act to ensure the long-term sustainability and accountability of the system.

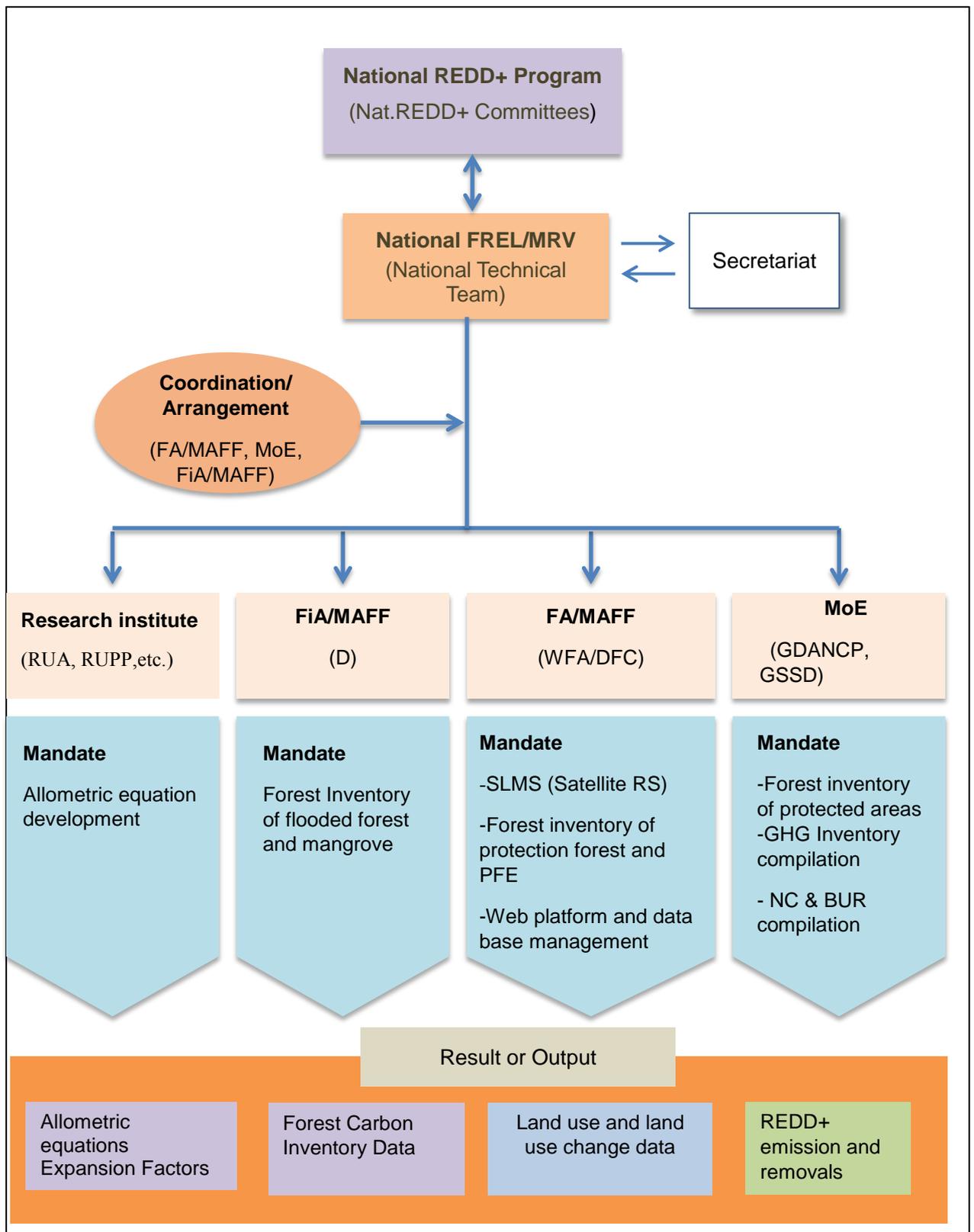


Figure 6 Institutional Arrangement for MRV

## Chapter 7. Capacity Building

Through a series of lectures, workshops and on-the-job type training, capacity of Cambodian officials on forest monitoring increased substantially. However, there are still some areas which needs further capacity building and improvement as follows:

- Accuracy assessment of land use/cover change
- Forest inventory survey
- Monitoring of PAM
- Upgrading capacity to management system database and WEB site
- Management of entire NFMS
- GHG-Inventory for LULUCF sector

It is expected that additional capacity building will be carried out in 2016 and 2017. Capacity building of “Accuracy assessment of land use/cover change” and “Monitoring of PAM” will be carried out after methodologies are fully developed except for the detection of land use/cover change using satellite images.

## Chapter 8. Cost Consideration

Cost for major elements of NFMS which involves field survey will be estimated as follows.

	Work and cost item	Unit cost	Qty.	Cost
1	Satellite Land use/cover mapping			
1.1	Pre-processing			
1.1.1	Personnel cost			
2	Accuracy verification survey			
2.1	Personnel cost			
2.2	High resolution satellite image			
2.3	Travelling cost			
2.3	Field survey cost			
3	National Forest Inventory			
3.1	Field work			
3.1.1	Personnel cost			
3.1.2	Travelling cost			
3.1.3	Field survey cost			
3.1.4	Equipment cost			
3.2	Indoor work			
3.2.1	Personnel cost			
3.2.2	Laboratory test – litter			
3.2.3	Laboratory test - soil			

**SLMS**

Activity	Cost	Remarks
1. Image Interpretation	\$350,000-\$400,000/each cycle	
2. Accuracy assessment of map and land use/cover change	\$250,000/each cycle	
3. Capacity to improve the effective of tasks	\$40,000	
4. Workshop and publication	\$20,000/each publication	
5. Capacity Building		
5.1 Long term such as studying for master's degree	\$65,000/person × 3-4 persons	
5.2 Short course trainings	\$60,000/course	
5.3 Training workshop at different levels	30,000/workshop /year × 2 years	

**NFI except litter and soil survey**

Activity	Cost	Remarks
Field survey (One cycle)	US\$6,500,000 (4-5 years)	
Field survey (Future)	US\$1,000,000/year	

**Litter and soil survey and analysis**

Activity	Cost	Remarks
1 For Personnel for soil and litter sampling in the field	0	
2 For procuring equipment for soil and litter sampling	US\$4,104	
3 For laboratory work for litter analysis	US\$2,000	
4 For laboratory work for soil analysis	US\$4,718	

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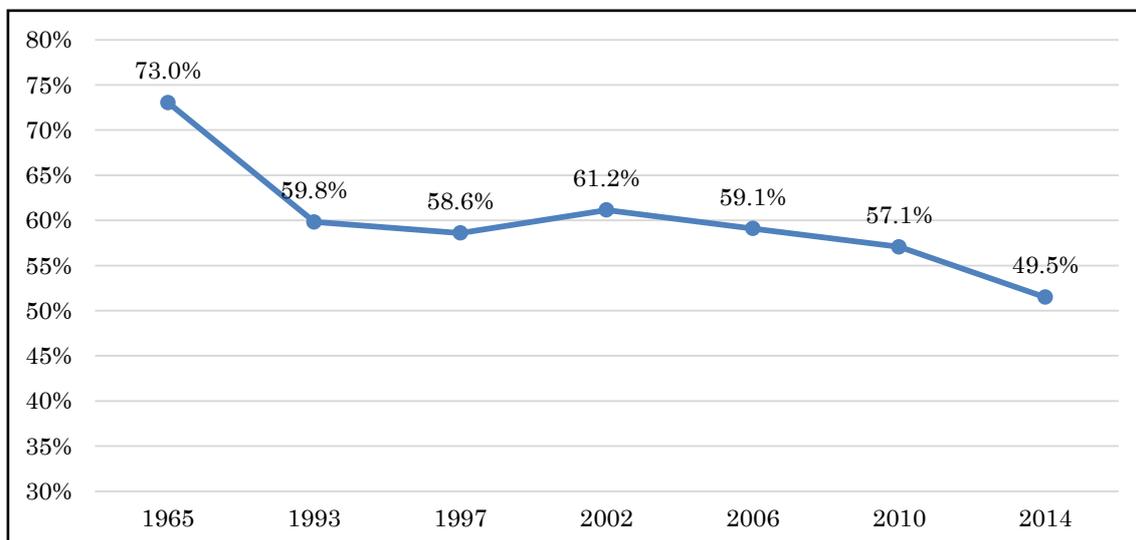
UNFCCC (2009) Decision 4 COP15

UNFCCC (2010) Decision 1 COP16

UNFCCC (2013) Decision 11 COP19

## Annex I

**Historical change in forest cover of Cambodia**  
(1965, 1992/93, 1996.97, 2002, 2006 and 2010)



## Annex II

Plot characteristics of various forest inventories in Cambodia

Institution	Project	Plot shape	Nested	Level 1 Condition	Level 1 shape	Level 1 area (ha)	Level 2 condition	Level 2 shape	Level 2 area (ha)	Level 3 condition	Level 3 shape	Level 3 area (ha)	# of plots	# of trees	Min DBH (cm)	Max DBH (cm)	Tree height
WA	Cardamom	rectangle	Yes	DBH $\geq$ 30 cm	25x200m (twice)	1	DBH: 5 - 29 cm	10x25m (twice)	0.05	DBH $\leq$ 5 cm	10x6m (twice)	0.012	105	20124	1	462	Sample
CFMP-FAO	All	rectangle	yes	DBH $\geq$ 30 cm	50x100m	0.5	DBH: 10 - 29 cm	50x50m	0.25	DBH $\leq$ 10 cm	50x25m	0.125	218	16485	2	209	No
CFMP-RECOFTC	Kampong Thom CF	rectangle	yes	DBH $\geq$ 30 cm	50x100m	0.5	DBH: 10 - 29 cm	50x50m	0.25	DBH $\leq$ 10 cm	50x25m	0.125	79	4904	10	150	Sample
CFMP-RECOFTC	Anh Chanh CF	rectangle	yes	DBH $\geq$ 30 cm	50x100m	0.5	DBH: 10 - 29 cm	50x50m	0.25	DBH $\leq$ 10 cm	50x25m	0.125	7	753	10	131	No
WCS	Cherndar PV	rectangle	No	No	250x20m	0.5	No	No	No	No	No	No	15	1465	20	150	No
CFMP-FA	All	rectangle	Yes	DBH $\geq$ 30 cm	50x50m	0.25	DBH: 10 - 29 cm	25x50m	0.125	DBH $\leq$ 10 cm	25x25m	0.0625	40	2717	10	166	Yes
CFMP-RECOFTC	Okrasang CF	rectangle	yes	DBH $\geq$ 30 cm	50x50m	0.25	DBH: 10 - 29 cm	25x50m	0.125	DBH $\leq$ 10 cm	25x25m	0.0625	57	1419	10	75	No
CFMP-RECOFTC	Okrieng CF	rectangle	yes	DBH $\geq$ 30 cm	50x50m	0.25	DBH: 10 - 29 cm	25x50m	0.125	DBH $\leq$ 10 cm	25x25m	0.0625	106	3488	10	100	No
FA-PSP	Koh Kong and Siem Reap	rectangle	yes	DBH $\geq$ 30 cm	50x50m	0.25	DBH: 15 - 29 cm	20x20m	0.04	DBH $<$ 15 cm	10x10m	0.01	40	1570	7.1	133.4	No
PACT	Oddar Meanchey	rectangle	no	No	50x50m	0.25	No	No	No	No	No	No	151	12063	2.5	200	No
PACT	Siem Reap	rectangle	yes	DBH $\geq$ 20 cm	25x25m	0.0625	DBH: 5 - 19 cm	15x15m	0.0225	DBH $\leq$ 5 cm	10x10m	0.01	51	1949	1	124	No
CFMP-GERES	All	rectangle	Yes	DBH $\geq$ 30 cm	20x30m	0.06	DBH: 10 - 29 cm	10x10m	0.001	DBH $\leq$ 10 cm	2x2m	0.0004	350	3648	5	216	No
WCS	Kulen Promtep WS	circles	Yes	DBH $\geq$ 30 cm	20m radius (3 times)	0.377	DBH: 15 - 29 cm	15m radius (3 times)	0.212	DBH $<$ 15 cm	5m radius (3 times)	0.024	57	3573	5	190	No
WCS	Preah Vihear PF	circles	Yes	DBH $\geq$ 30 cm	20m radius (3 times)	0.377	DBH: 15 - 29 cm	15m radius (3 times)	0.212	DBH $<$ 15 cm	5m radius (3 times)	0.024	61	3523	5	161	No
CI	Prey Long	circles	yes	DBH $\geq$ 30 cm	20m radius	0.126	DBH: 15 - 29 cm	15m radius	0.071	DBH $<$ 15 cm	5m radius	0.0079	51	1056	5	143.6	No
WCS	Seima PF	circles	Yes	DBH $\geq$ 30 cm	20m radius	0.126	DBH: 15 - 29 cm	15m radius	0.071	DBH $<$ 15 cm	5m radius	0.0079	308	7819	5	217	No
FFI	CCPF	circles	Yes	DBH $\geq$ 10 cm	15m radius	0.071	DBH $<$ 10 cm	5m radius	0.0079	-	-	-	71	1476	5	104	No

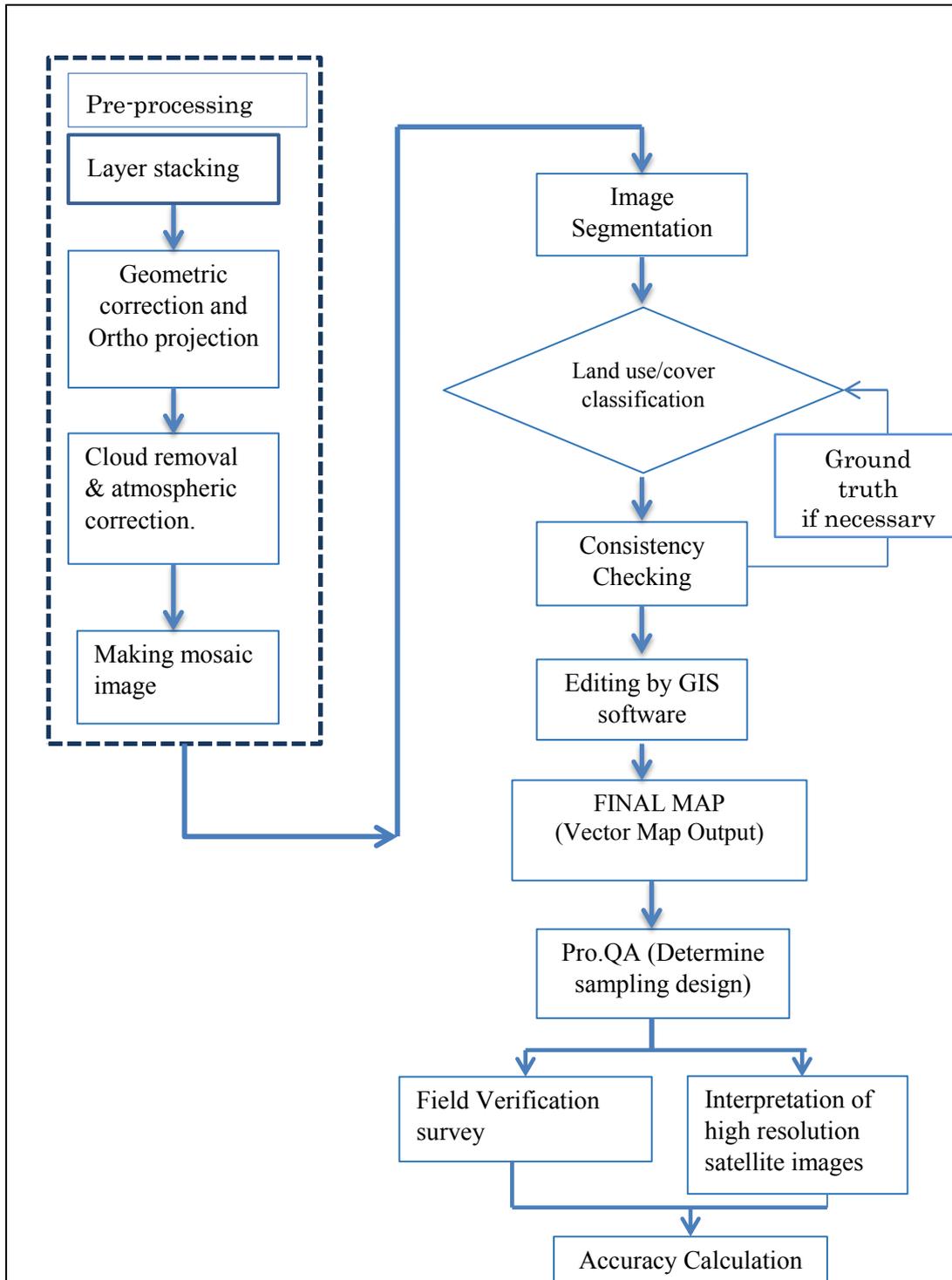
## Annex III

### Land use/cover classes

	Land cover class	Description
1	Evergreen forest	Areas covered by trees maintaining their leaves during the whole year.
2	Semi-evergreen forest	Contain variable percentages of evergreen and deciduous trees.
3	Deciduous forest	Comprised of dry mixed deciduous forest and dry Dipterocarp forests
4	Bamboo	Areas dominated by bamboo
5	Wood shrub	Areas dominated by evergreen and deciduous woodland with a height less than 5 meters
6	Mangrove forest	Areas dominated by Mangroves i.e. coastal salt tolerant species
7	Rear Mangrove	Mostly growing in coastal zone after mangrove spp. however, this species also seen growing in some other places which containing soil type of "Podzol"
8	Rubber plantation	Areas currently supporting, and areas reserved for, rubber plantation
9	Flooded Forest	This forest type is found in Tonle Sap Lake. Most of the forests are low and disturbed. In many cases, there is only a mosaic remaining
10	Forest Regrowth	<p>Areas of naturally regenerated forest where there are clearly visible indication of human activities such as selective logging, areas regenerating following agricultural land use, areas recovering from human induced fire, etc.</p> <ul style="list-style-type: none"> <li>- Include forest where it is not possible to distinguish whether planted or naturally regeneration.</li> <li>- Include forests with mix of naturally regenerated trees and planted/seeded trees, and where the naturally regenerated trees are expected to constitute more than 50 percent of the growing stock at stand maturity.</li> <li>- Include abandoned forest land and bare land which will regrow into forest within ten years</li> </ul>
11	Pine Tree	The area dominated by pine tree
12	Pine plantation	The area domunated by pine tree plantation
13	Oil palm	The area dominated by oil palm tree.
14	Tree plantation	This class includes the following type: teak, eucalyptus, acacia, jatropha and others.
15	Paddy Field	Paddy field is a flooded parcel of arable land used for growing semiaquatic rice.
16	Crop Land	This category includes arable and tillage land, and agro-forestry systems where vegetation falls below the thresholds used for the forest land category
17	Grassland	Grasslands are characterized as lands dominated by grasses rather than large shrubs or trees. It is crucial that the rainfall is concentrated in six or eight months of the year, followed by a long period of drought when fires can occur.
18	Built-up area	The patch of land with building and construction
19	Village	The patch of land with houses and garden surrounding house.
20	Rock	Land of naturally exposed rocks or strip mines, quarries and gravel pits.
21	Sand	In general, land of sand having thin soil or sand including deserts, dry salt flats, beaches, sand dunes.
22	Water	Area of fresh and sea water

## Annex IV

### Scope and Method of Land Use/Cover Mapping



**Minimum mapping unit (MMU):**

MMU for existing maps is 25ha. For new mapping, 5ha MMU was used.

**Land use/cover classes:**

Table 4 shows land use/cover classes that will be monitored, while table 4 shows the relation with IPCC's six classes.

**Land Use/Cover Classes for forest monitoring in Cambodia**

Class defined in IPCC guideline	Newly defined classes of Cambodia
Forest Land	Evergreen forest
	Semi-evergreen forest
	Deciduous forest
	Forest regrowth
	Pine
	Pine plantation
	Tree plantation
	Mangrove
	Rear mangrove
	Flooded forest
	Bamboo
Cropland	Rubber plantation
	Oil palm plantation
	Agriculture
	Paddy field
Grassland	Grass
Settlement	Built-up area
	Village
Other land	Wood Shrub
	Rock outcrop
	Sandy beach
Wetland	Water

(Page 1.9 of 2006 IPCC Guidelines for National Greenhouse Gas Inventory)

**QA/QC measures**

Necessary measures, such as logical check of mapping results, have been introduced for

quality control (QC). For quality assurance (QA), map accuracy is verified through an accuracy assessment process. Accuracy assessment points are selected among from planned PSP of NFI. Systematic stratified random method will be used for the selection.

## **Annex V**

### **ITEMS OF MONTHLY REPORT OF FA**

1. Forest and Forest Community management and development
  - 1.1 Forest Demarcation, Classification and Registration
  - 1.2 Forest Community
  - 1.3 Timber and Non timber Product management
  - 1.4 Practice other work beside
2. Tree Plantation development and Silviculture
  - 2.1 New Plantation and Old Plantation Protection from year 1 to year 5
  - 2.2 Seedling Transplant for providing to local People
  - 2.3 Nursery Preparation and Creation
  - 2.4 Genetic resource development
  - 2.5 Tree Transplant inventory (verify and making map for tree plantation)
  - 2.6 Other work related to development of tree plantation development and private forest
3. Wildlife and Biodiversity Conservation
  - 3.1 Protected Forest and Wildlife Conservation area
  - 3.2 Wildlife Research
  - 3.3 Wildlife Conservation
  - 3.4 Monkey Feeding and Breeding
4. Rescuing, Rehabilitation biological animal breeding and release into natural forest
  - 4.1 Repair and Protect
  - 4.2 Rescue, Take Care, and Protected
  - 4.3 Wildlife improving
  - 4.4 Others
5. Forest Industry, Commercial development and management and International Operation
  - 5.1 International Operation
  - 5.2 Forest Carbon Credit and Climate Change
6. Forest Factor ability improving and researching
  - 6.1 Training
  - 6.2 Researching by using national budget
  - 6.3 Operation with Partner development
7. Forest Law enforcement to contribute to sustainable forest
  - 7.1 Advertising and training of law related to Forest

- 7.2 Improving Forest law to against Forest crime
- 7.3 Follow, Check, Verify on Deforestation
- 7.4 Abstract forest information from news, do research, verify information and take legal action
- 7.5 Examine and Verify forest crime, Wildlife crime, deforestation and Proof the forest crime
- 7.6 Administer and Encourage forest crime to court
- 7.7 Prevent and Repress forest Crime, Wildlife Crime and deforestation by forestry

# Annex VI

## Preliminary Investigation Report for tracking illegal cases

PRELIMINARY INVESTIGATION REPORT	CASE ID										INITIAL REPORT		
	at Level	Level	Year			Case Type	Case Type Number	Province Code	District Code	Province	District	Yes	No
	National	FN	-	2	0	1	5	-	-	-	-	-	-
	Inspectorate	FI	-	2	0	1	5	-	-	-	-	SUSPECT	
	Cantonment	FC	-	2	0	1	5	-	-	-	-	Known	
	Division	FD	-	2	0	1	5	-	-	-	-	Unknown	
Triage	FT	-	2	0	1	5	-	-	-	-			

• Section I – Incident Report

CASE TYPE	Main Type	Sub-Type	Short Description	Day	Month	Year	Time
							DATE OF OCCURRENCE
PLACE OF OCCURRENCE				Read from map		Yes No	
Province	District	Sub-District	Village	Map Scale	Map Type	DATE OF ARRIVAL AT SCENE	
UTM (MAP) COORDINATES				Coordinates read from		GPS	
Easting (UTM)	Northing (UTM)	Map Scale	Map Type	Map	Map Sheet Number	DATE OF REPORT TO OFFICE	
TYPE OF PREMISE				REPORTED TO		REPORTED BY	
National Park				Forestry Administration		Division	
Wildlife Reserve				Inspection		Triage	
Protected Landscape				Cantonment			
Multiple Land Use Area				Other State Owned Forest			
Concession (specify)							
Other (specify)							
REPORTING OFFICER	Name	Title	ID	Officer has been at Scene			
				No (specify Witness below)			
OFFICER WHO FILLED FORM	Name	Title	ID	Signature			

• Section II – Personal Information

P E R S O N	Suspect	Reportee	Witness	Victim	Other (specify)		SEX	DATE OF BIRTH		
	Name	Nick Name	Nationality	Position	Male	Female	Day	Month	Year	
	ADDRESS HOME OFFICE	Province	District	Sub-District	Village	Street	Phone Number	Country		
1	Mobile Phone	People	Military	Police	Forest Service	Concession (specify) Other Governm. Agency (specify)				

P E R S O N	Suspect	Reportee	Witness	Victim	Other (specify)		SEX	DATE OF BIRTH		
	Name	Nick Name	Nationality	Position	Male	Female	Day	Month	Year	
	ADDRESS HOME OFFICE	Province	District	Sub-District	Village	Street	Phone Number	Country		
2	Mobile Phone	People	Military	Police	Forest Service	Concession (specify) Other Governm. Agency (specify)				

P E R S O N	Suspect	Reportee	Witness	Victim	Other (specify)		SEX	DATE OF BIRTH		
	Name	Nick Name	Nationality	Position	Male	Female	Day	Month	Year	
	ADDRESS HOME OFFICE	Province	District	Sub-District	Village	Street	Phone Number	Country		
3	Mobile Phone	People	Military	Police	Forest Service	Concession (specify) Other Governm. Agency (specify)				

• Section III – Transportation Information

VEHICLE	License Number	Country	Make	Type	Year made	Frame Number	Color	Confiscated
1								Yes
2								Yes
3								Yes
Other Transportation (specify)								

• Section IV – Information on Impounded Items (Add Detailed Impound Inventory)

IMPOUNDED ITEM	Kept where	Destroyed	IMPOUNDED ITEM	Kept where
Vehicles		Yes	Round Logs	m <sup>3</sup>
Sawmill Equipment		Yes	Square Timber	m <sup>3</sup>
Weapons		Yes	Sawn Timber	m <sup>3</sup>
Other (specify)		Yes	Veneer	m <sup>3</sup>
			Wildlife	
			Other	

• Section V – Narrative (who, what, when, where, how, why) – USE BACK SIDE OF THIS FORM!

• Attachments

Photographs	Map	Other Agency Report	Other (specify)
Sketch	Impound Inventory	Witness Statement	