National Forest Monitoring System Development in Cambodia

5th UN-REDD Regional Lesson Learn Workshop "Forest Monitoring System and Reference Levels for REDD+"

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Presented by: Chivin LENG

(MRV TT, UNREDD and JICA-CAMREDD)

The Cancun Agreements Decision 1/CP.16

Elements requested to be developed":

"….requested developing country Parties aiming to undertake the REDD+ activities, in the context of the provision of adequate and predictable support, including financial resources and technical and technological support, in accordance with national circumstances and respective capabilities, to develop:

1. *A national strategy or action plan*
2. *Forest reference emission level and/or forest reference level*
3. ***A robust and transparent national forest monitoring system for the monitoring and reporting of REDD+ activities***
4. *A system for providing information on how the safeguards are being addressed and respected"*

The Copenhagen Accords Decision 4/CP.15

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

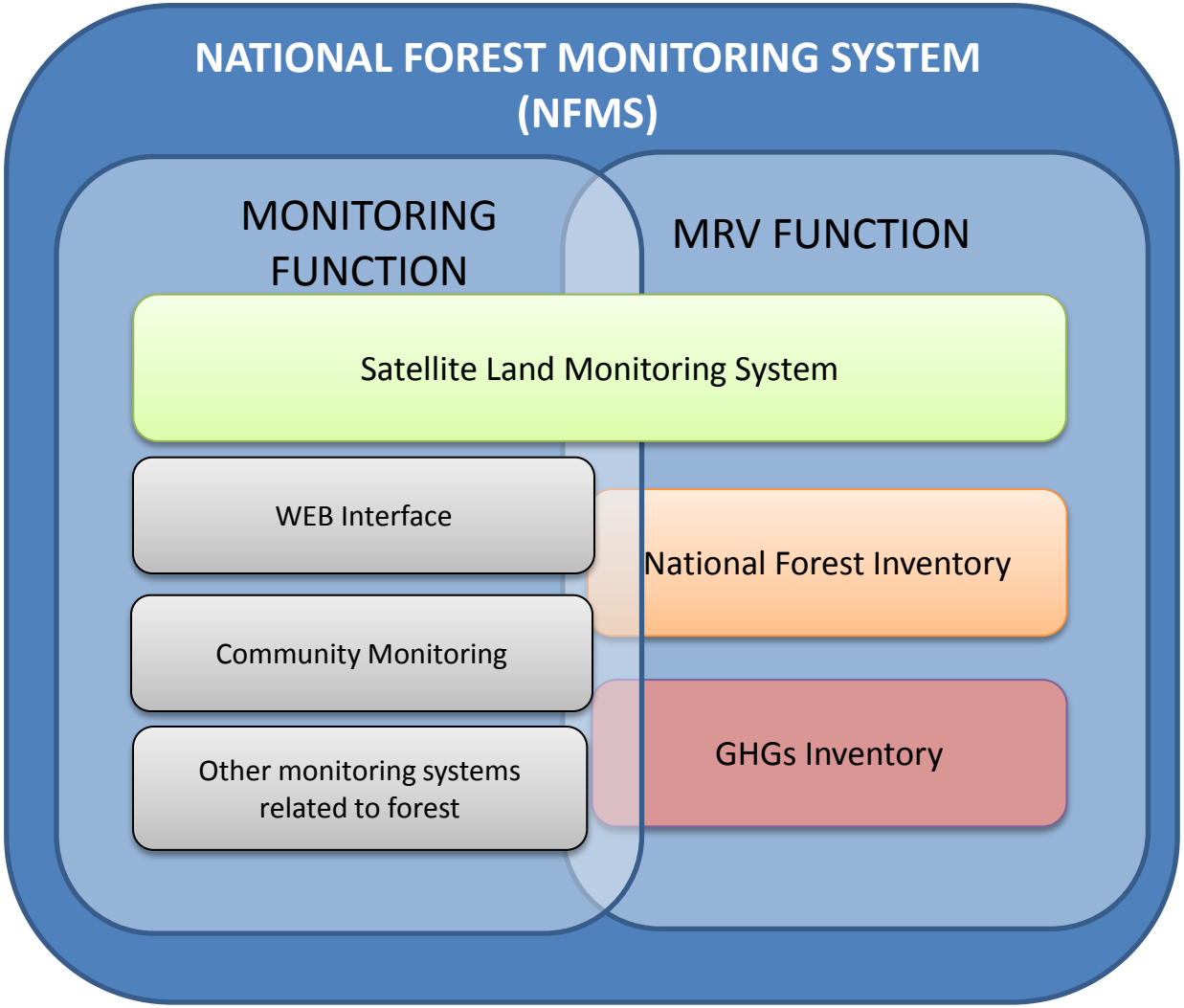
  1. Use a **combination** of **remote sensing** and **ground-based forest carbon inventory** approaches for estimating, as appropriate, anthropogenic forest-related greenhouse gas emissions by sources and removals by sinks, forest carbon stocks and forest area changes;
  2. Provide estimates that **are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

The Warsaw REDD+ framework 11/CP.19

- **National forest monitoring systems (NFMS)** should be guided by the most recent Intergovernmental Panel on Climate Change **(IPCC) guidance and guidelines**, as appropriate, as a basis for estimating anthropogenic forest-related greenhouse gas emissions by sources, and removals by sinks, and forest carbon stock and forest-area changes;

  - The data and information estimation should be provided through the **biennial update reports (BURs)** with some flexibility to the least developed countries and small island developing States;
  - The NFMS should **build on existing systems**, as appropriate
  - Enable the **assessment of different types of forest** in the country
  - Allow for improvement, reflecting when possible the **phased approach** of REDD+

NFMS - National Forest Monitoring system in concept



National Forest Monitoring system (NFMS)

NFMS has **two functions** in REDD+ context:

I. **Monitoring** (M) of Policies and Measures

II. **Measurement, Reporting and Verification** (MRV) of emissions & removals

NFMS will be developed in a stepwise approach:

- Develop the NFMS in a stepwise approach through 3 Phases of REDD+ (1. Readiness, 2. Result-based demonstration, 3. Result-based actions)
- Fully operational in Phase 3, to allow for positive incentives under an international mechanism

I. **Monitoring** function of NFMS

- In practice the monitoring function of NFMS can be defined only broadly. Its components will vary depending on national circumstances. Therefore primarily a tool to allow countries **to assess and refine Policies and Measures**
  - implementation and performance
  - Indicators to track implementation of a specific policy or measure – proxy indicators for forest carbon e.g volume of timber harvested through an SFM measure, as a proxy for impact on carbon
- Using existing tools where possible (e.g. network of forestry officers) and new tools where necessary (e.g. satellite remote sensing system, web platform)
  - Need to Harmonize existing tools with new tools and with newly required capacities for MRV

II. **MRV** function of NFMS

Objectives:

- To **Measure** the emissions coming from forests and land use change as outcomes of REDD+ activities
- To **Report** these emissions to the UNFCCC following the most recent methodological guidance of the Intergovernmental Panel on Climate Change (IPCC)
- To **Verify** the results by making the emissions inventory available for review by the UNFCCC

The reporting and verification of results will be through **National Communications (NCs)** and **Biennial Update Reports (BURs)** which cover also other sectors.

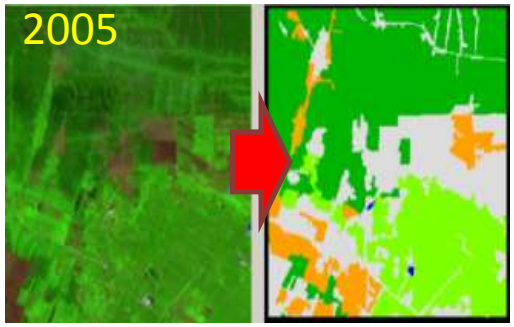
II. **MRV** function of NFMS

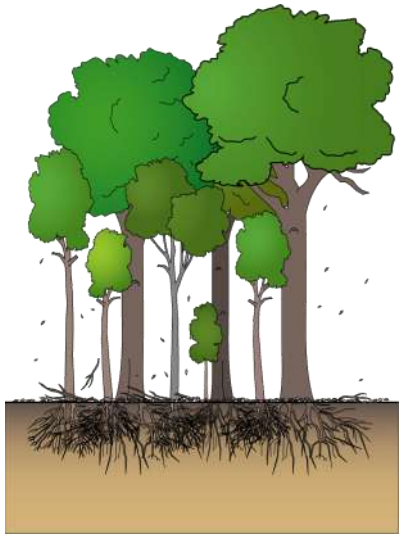
In practice, the MRV function will consist of three (3) main components also called 'pillars':

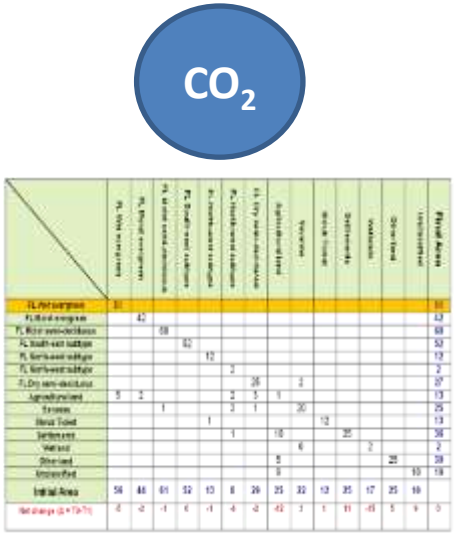
1. **The satellite land monitoring system (SLMS)**
   To collect Activity Data (AD)
2. **The national forest inventory (NFI)**
   To gather information for obtain emission factors (EFs)
3. **The national GHG inventory (GHG-I)**
   To provide emissions & removals estimates for national report

Data coming from the first (AD) and second pillar (EFs) will be used to provide timely estimates of emissions and removal from the AFULO and/or Forest sub-sector

II. **MRV** function of NFMS







Area change data from satellite remote sensing

Forest carbon stock data from a national forest inventory

Inventory of greenhouse gas **emissions/removals** from the forest sector/AFOLU

ACTIVITY DATA

EMISSION FACTOR

EMISSIONS ESTIMATE

Current and Future Outlook

Stratification System

	1988/1989	1992/3	1996/7	2002	2005/2006	2010	2014 (Base Map)
Satellite	LANDSAT	LANDSAT	LANDSAT	LANDSAT ETM+	LANDSAT ETM+	LANDSAT ETM+	**Landsat 8**
	Hardcopy	Hardcopy	Hardcopy	On-screen	On-screen	On-screen	**on-screen**
Method	Interpretation						**Semi-Autoclassification**
By	Mekong Secretariat	Mekong River Commission GTZ	Mekong River Commission GTZ	FA Supported by DANIDA	FA Supported by DANIDA	FA Supported by DANIDA	**FA Supported by UN-REDD**
Land cover class	20 (Forest 9)		30 (Forest 15)	8 (Forest 4)	5 (grouping of 2002 nomenclature))	5 (grouping of 2002 nomenclature))	**13 classes**
Scale	1/250,000	1/250,000	1/250,000	1/50,000	1/50,000	1/50,000	**1/50,000**
Minimum unit	1km2	1km2	1km2	0.2km2	0.2km2	0.2km2	
Accuracy					**74% (71% before grouping)**		**Will use high resolution image (sport, geo-eye)**

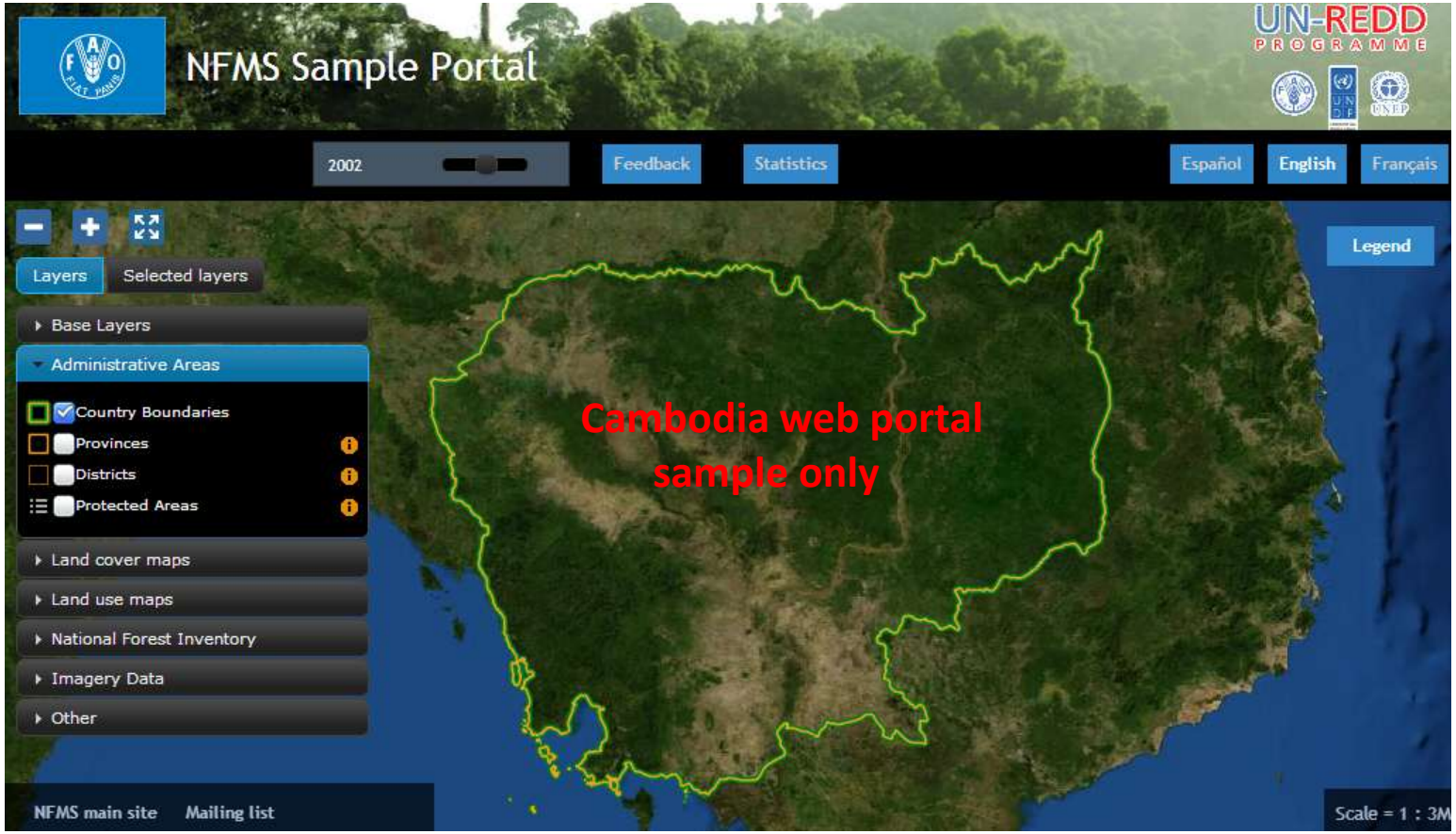
Software and satellite image that Forestry Administration received in year 2011/12

ID	Description	Supported by
Software		
1	EDARS 2011	JIC
2	eCognition	JIC
3	ArcGIS 10.1	JIC
4	ArcInfo	JIC
Satellite Image		
1	Landsat 1989 ,1998	FFPRI, JIC
2	Sport 2004, 2005,2008,2009,2010	FFPRI
3	ALOS-AVNIR2	JIC
4	ALOS-PALSAR	JIC
5	ALOS-PRISM	JIC
Equipment		
1	Office and analyst	JIC and JICA-CAM-REDD
2	Field forest inventory equipment	JIC and JICA-CAM-REDD

Towards the NFMS for Cambodia

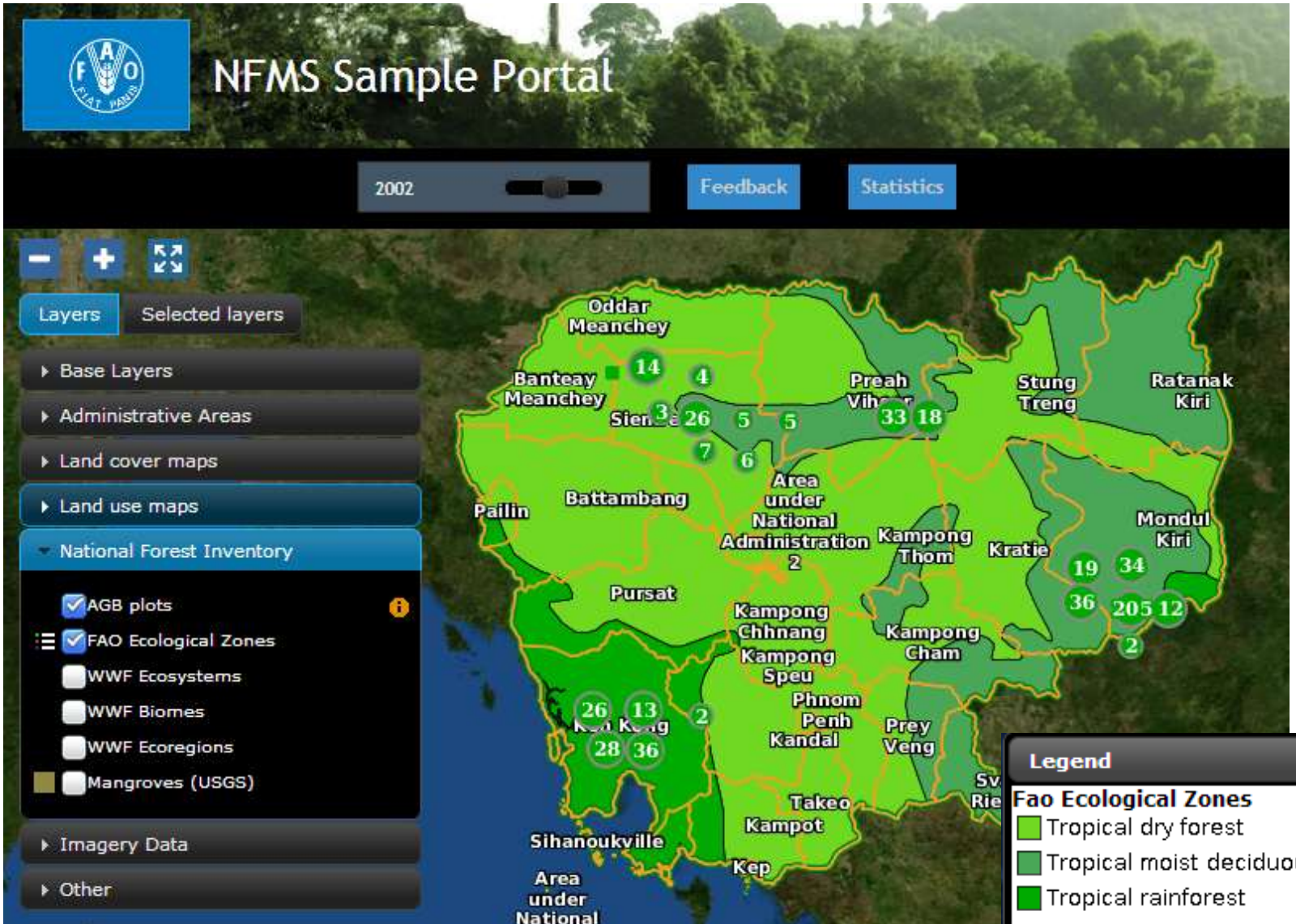
The **Monitoring function** will be supported by the development of a NFMS web portal

- **A sample portal has been developed which can be refined with different layers of data when becoming available**



Towards the NFMS for Cambodia

Example of a layer displaying AGB plots and Ecological zones



Towards the NFMS for Cambodia

The **Measurement, Reporting and Verification** (MRV) function will follow the RGC decisions of national GHG reporting

- **National Communications (NCs)** are to be submitted every for four(4) years
- **Biennial update reports (BURs)** are to be submitted every two (2) years; with some flexibility to the least developed countries

- The MRV/REL technical team is being trained in calculation forest/land sector emissions for the **year 2006 using the latest IPCC guidelines (IPCC, 2006**), with an interim GHG for the forest sector to be completed by the end of 2014.

The timing of national report could be the following:

- Year 2006, 2010, 2014, etc. for National Communications
- Year 2014, 2016, etc. for Biennial Update Reports. (the First BUR would be submitted by Cambodia in 2016).

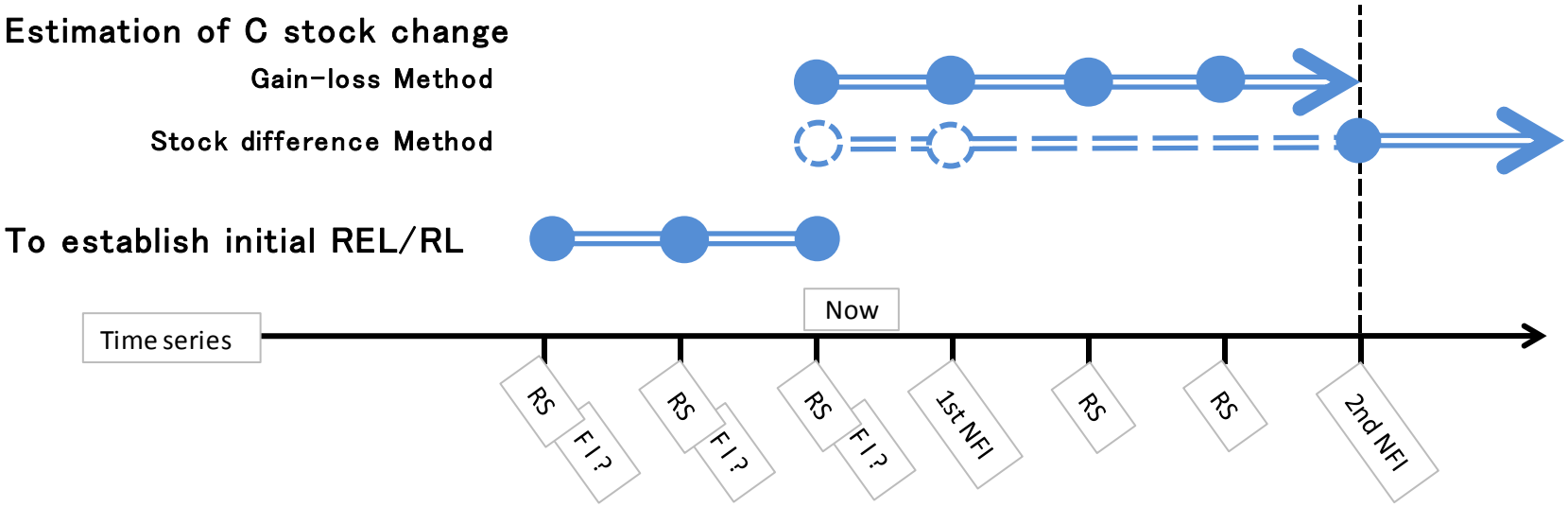
Towards the NFMS for Cambodia

In order to ensure the accuracy, reduce uncertainties and build national capacities for GHG forest/AFOLU sector reporting, both improved **remote sensing** and **ground-based forest carbon inventory** approaches are being developed or could be implemented.

- **Remote sensing:** Using existing system and obtained additional data, improving methods to create consistent land use and land use change series, consistent with IPCC 2006 reporting guidelines
- **Ground-based forest carbon inventory:** Using existing data and data that will be obtained (Eg. planned flooded forest AE and EF development), and planned National Forest Inventory (NFI)*.

*with two NFI cycles a gain-loss method could be substituted to a stock-gain method to assess forest degradation or growth.

Towards the NFMS for Cambodia



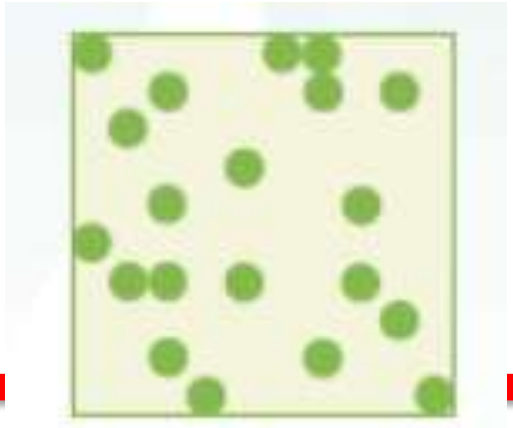
Existing/Acquired data							
Activity Data	✔	✔	✔	✔	✔	✔	✔
Emission Factor	?	?	?	✔			✔
Land use/vegetation map	✔	✔	✔		✔	✔	

RS: remote sensing survey
NFI: national forest inventory
FI: any forest inventory survey

FOREST DEFINITION

The United Nations Framework Convention on Climate Change (UNFCCC) It requests countries to estimate the forest area according to their own national definitions which should be documented in the greenhouse gas inventory report.
if the definition is different from the definition used by FAO, the country should explain why a different definition was chosen.

It has been discussed on the most appropriate **Crown Cover** value to apply in for the forest definition



From Landsat images is very hard to estimate the crown cover consistently.
From VHR images it is possible to measure the cover.
In the filed it is possible to measure the cover.

Considering a Forest definition

Forest: is the unit of the **natural ecosystem** or **plantation** in the forms of wetland, low land and dry land which covers by natural stands or plantation trees which canopy cover threshold at minimum 20%, with a height minimum of 2.5 m, and an area criterion with a minimum of 0.5 hectares. Any area of woody vegetation (regardless of whether it is locally defined as forest or woodland or wasteland) that drops below the threshold is considered to have been deforested, in other words, it has undergone change from forest to non-forest (i.e. to agriculture, pasture, urban development etc).

Cont….!

- Deforestation: is indicated by abrupt drop in the red line. Loss of forest related to a change in land use that prevents the natural forest re-growth usually results in considerable carbon emissions, and preventing deforestation from happening is therefore a primary objective of REDD+.

Degradation: it refers to loss of carbon stock within forests that remain forests, however, the detail of explanation of this term will determine by local expert regard link to the international concept.

Sustainable Forest Management: Considered the areas of forest remaining forest, lead to increase or decrease in containable forest carbon stock.

The Legend has been set up using LCCS v3 has guiding tool

	CLASS name
1	Evergreen Forest
2	Pine forest
3	Bamboo
4	Forest regrowth
5	Semi-Evergreen Forest
6	Deciduous Forest
7	Mangrove coastal
8	Mangrove rear
9	Flooded Forest
10	Tree Plantation
11	Rubber Plantation
12	Palm oil Plantation
13	Pine Plantation
14	Crop generic (agricolture)
15	Paddy rice
16	Built up Area
17	Village
18	Grass
19	Woodshrub
20	Rock outcrop
21	Sandy beach
22	Water

FOREST

CROP

SETTELMENTS

GRASS

BARE

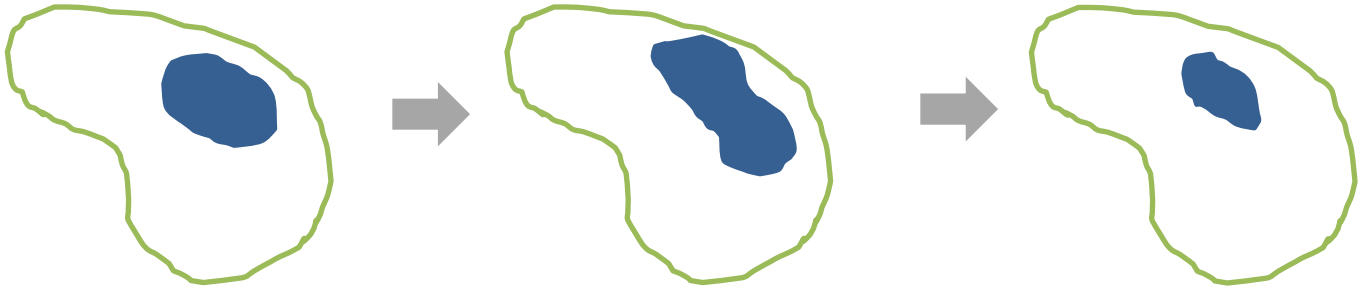
WETLAND

13 FOREST CLASSES have been defined. All the 13 classes are consistent to the past forest assessment conducted by FA.

A second stratification will be produced in order to defined the wetland classes.

CAMBODIA REDD+ NATIONAL PROGRAMME

Cambodia Land Monitoring Proposal



(i) As the baseline map, "2014 map" will be produced by using 2013 & 2014 satellite image data (LANDSAT 8). This map will cover the full country surface (Forest/Non-Forest) and will function as a basis for future monitoring future land use and land use changes;

(ii) Two Historical maps will be used to derive historical land use and carbon stock change development

- **(i) By upgrading of existing 2010 FA map of 2010 . Verification of the map will be done by using ALOS AVNIR2 data for inaccessible areas. (Size of forest and non-forest area may change as the result of upgrading or modification). And consideration of other data sources for non-forest areas.**
- **(ii) By translating the 2005/2006 FA map in a comparable legend. Verification of this map has already been carried out by GRAS. And consideration of other data sources for non-forest areas**

(iii) Additional maps/data points will be considered

Actions required

- Make land use/cover map (make new map and add non-forest information to existing Forest Cover map of FA of 2005/6 and 2010)
- Implement NFI (testing plus implementation)
- Prepare implementation plan for the initial NFI
- Data sets accumulation and exchange (between institution and through web platform)
- Continue to build capacity to use new mapping method and GHG inventory preparation
- NFMS strategy to be further designed and operation as a part of REDD+ strategy.
- Maintaining consistency of methodology of REL/RL development

Thank You!

Chivin LENG

Email: lengchivin@gmail.com

Website: www.cambodia-redd.org / http://www.un-redd.org