# National Forest Monitoring System (NFMS) to support GHG report in Mozambique

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# Outlines

➢ Elements and data requirements NFMS for GHG for reporting

➢ Barriers to NFMS preparation

➢ Forest inventory in Mozambique

  ➢ National Forest Monitoring System (NFMS)

  ➢ Integrated Land use assessment
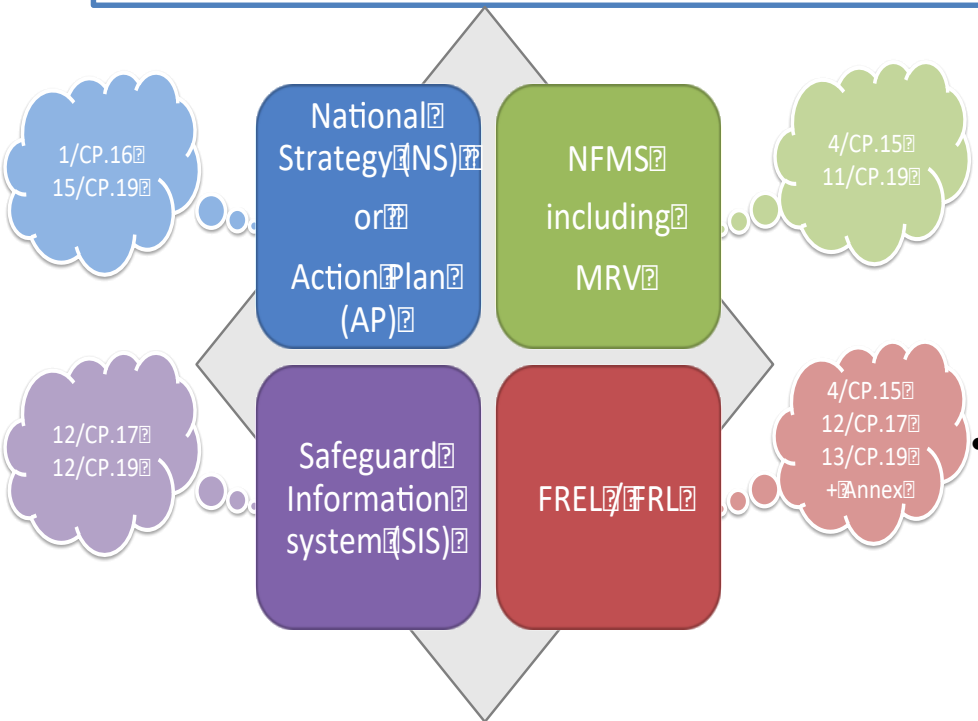
  ➢ Remote sensing

  ➢ REDD+

➢ Conclusion

Compiling s NFMS for GHG reporting requires a fairly lengthy and a interconnected series of task:

     - The UNFCCC requests REDD+ countries to build

> …a robust and transparent national forest monitoring system for the monitoring and reporting of REDD+ activities…
> **(Decision 1/CP.16)**

How to design NFMS depends on the country's national definition and circumstances

**1/CP.16 15/CP.19**

**National Strategy (NS) or Action Plan (AP)**

**NFMS including MRV**

**4/CP.15 11/CP.19**

**12/CP.17 12/CP.19**

**Safeguard Information system (SIS)**

**FREL / FRL**

**4/CP.15 12/CP.17 13/CP.19 + Annex**

## Key REDD+ elements

- There are **4 key REDD+ elements to be developed** by REDD+ countries.

- Selecting appropriate methods, collecting emission factors, and Activity Data, estimation GHG emission and removals, QC/QA, documenting, report results;

- Having these in place is also a requirement for **accessing result-based finance**

# Barriers to NFSM and GHG reporting

➤ Limited resources (e.g. **Dedicated team, fanatical, expertise, lack of easy <u>access of satellite data</u>**);

➤ Luck of documentation in previous NFMS;

➤ Luck of targeted training climate change model at national level;

➤ Institutional arrangement:
- **Assignment of clear responsibility** for each instruction/ sector involved in NFMS (Data generation, Quality Assurance, Authorization;
- **Consistent Data management**: LULC data (Methodology: Sampling, Wall-to-wall, Annual deforestation), Biomass data (NFI, PSP);
- **Systematic Reporting process** (UNFCCC (FREL/FRL, NC/BUR, REDD+ TA), FRA, NFP, NRS&AP, ZILMP);

**FREL**: Forest Reference Emission Level; **NC**: National Communication; **BUR**: Biennial Update Report; **FRA** : Forest Resources Assessment; **NFP** : National Forest Program; **NRS**: National REDD+ Strategy; **AP**: Action Plan; ZILMP: Zambezia Integrated Landscapes Management Program

# Forest Inventory in Mozambique

➢ The **National Directorate of Forest** in Mozambique is in charge of promoting sustainable forest management to meet the goal of REDD+ with support of **JICA** in conjunction with **MRV-Unit** under **FNDS** in charge of implementing REDD+ with **WB** fund support.

▪ The deforestation rate is 0.58% 219 000 ha/year (Marzole,2007);

▪ The estimated average period 2003-2013 using national emission factors, obtained he annual and total of the period emissions are in the order of 46 213 014 tCO2 Eq and 508 343 155 tCO2 Eq (FREL, 2018);

▪ Forest cover 52%;

**DINAF**: National directorate of Forestry    **FNDS:** National Sustainable Development Fund

# NFMS for Mozambique
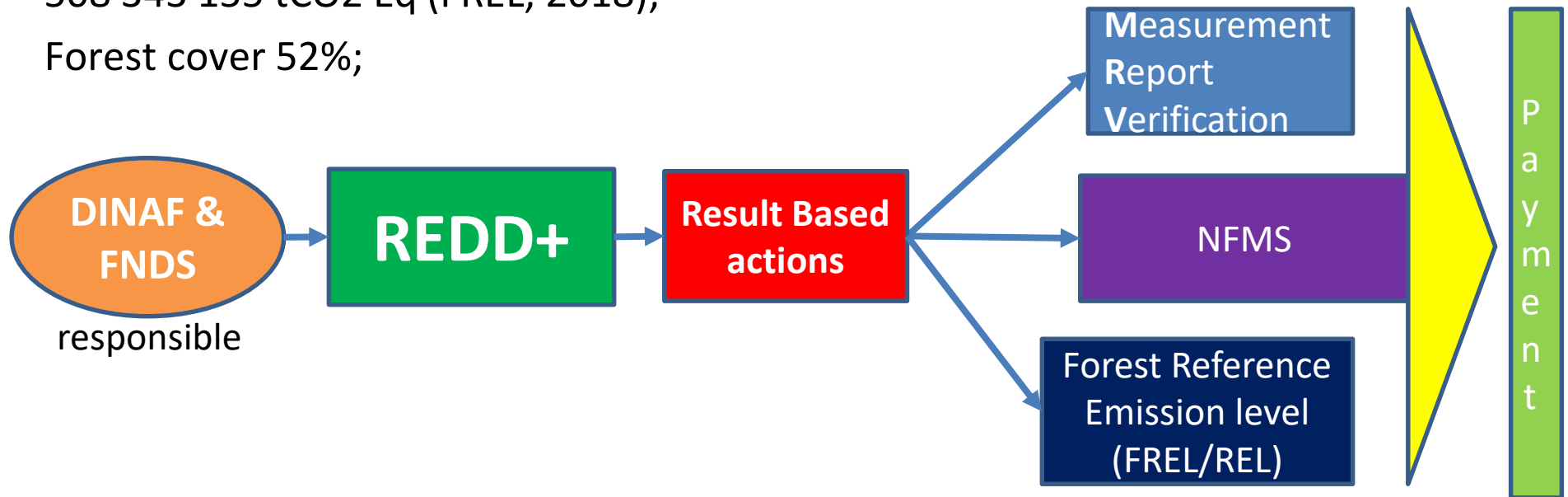
National REDD+ Strategy (Chp. 7) defines "M&MRV" as a system to:
1) Estimate of emissions and removals; and
2) Monitor the effectiveness of PaMs

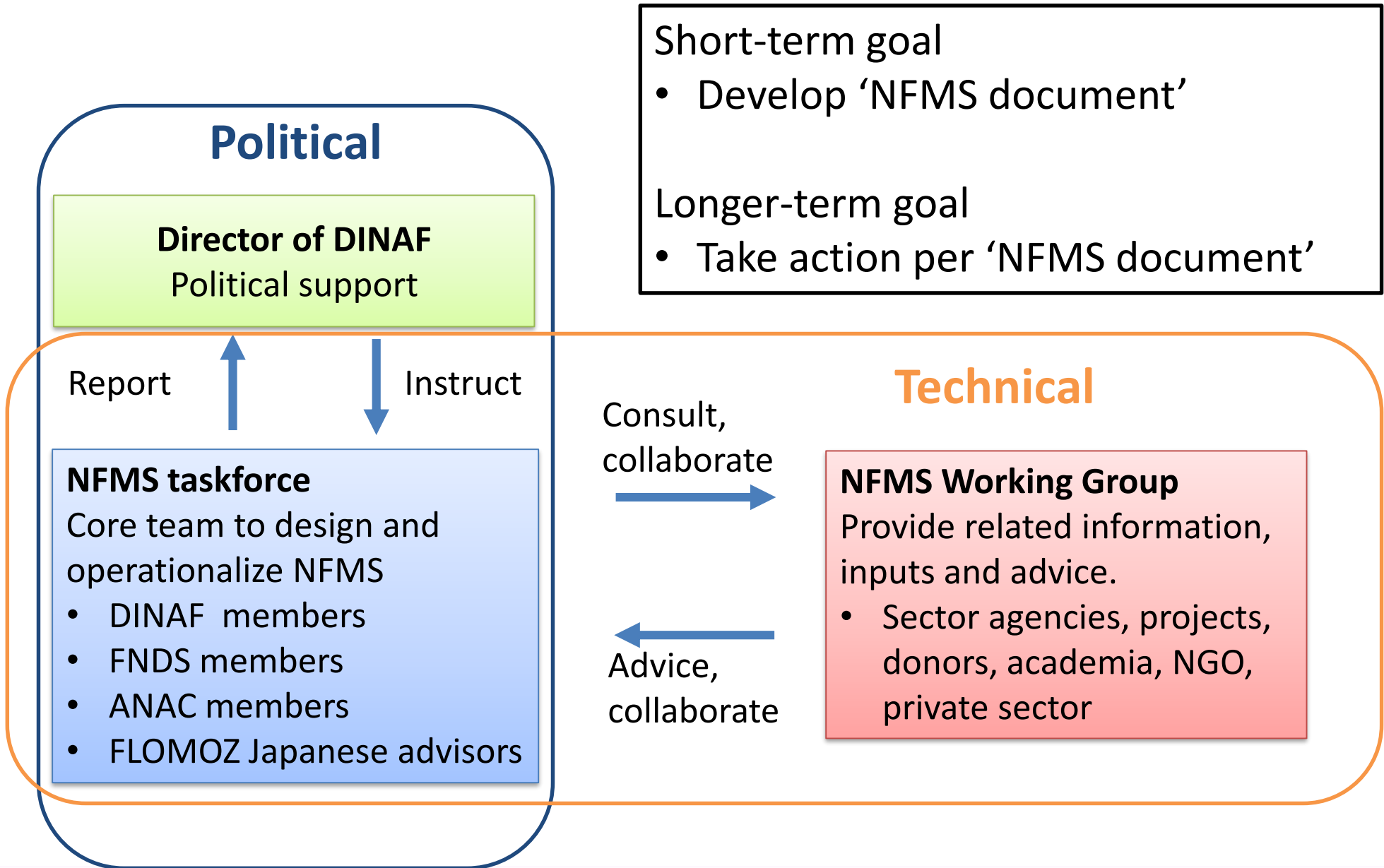O M&MRV de actividades e resultados de REDD+ deve essencialmente:
  i.  Orientar e assegurar a geração de dados e informações que permitam demonstrar com base em resultados e de forma robusta e transparente os compromissos de REDD+ assumidos pelo país particularmente o de contribuir para a mitigação das mudanças climáticas globais; e
  ii. Assegurar e influenciar para que os aspectos relativos à eficácia técnico-científica, tecnológica, económica, bem como os de natureza política–estratégica e de governação presentes, são pertinentes a uma boa implementação de iniciativas de REDD+ no país e abrem maiores possibilidades para melhorar a gestão florestal e o desenvolvimento rural integrado.

Build on this definition,

Reflect the emerging agenda of forestry sector and forest monitoring technologies

Go "beyond REDD+" and apply broadly for SFM!

# Inter-organizational coordination mechanism



**Political**

**Director of DINAF**
Political support

Short-term goal
- Develop 'NFMS document'

Longer-term goal
- Take action per 'NFMS document'

Report — Instruct

**NFMS taskforce**
Core team to design and
operationalize NFMS
- DINAF  members
- FNDS members
- ANAC members
- FLOMOZ Japanese advisors

**Technical**

Consult,
collaborate

Advice,
collaborate

**NFMS Working Group**
Provide related information,
inputs and advice.
- Sector agencies, projects,
  donors, academia, NGO,
  private sector

**JICA**

## National Forest Monitoring System(NFMS)

### Monitoring Function

State of forests and effect of PaM

**Satellite based monitoring**
Forest cover change, forest fire, etc.
Tools: JJ-FAST, GLAD, GFW, MODIS, etc.
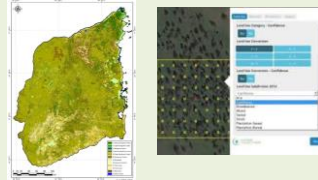
**Field based monitoring**
Target: Deforestation, Forest restoration
Tools: Community monitoring, PSP, etc.

**Activity based monitoring**
Target :Deforestation/degradation, logging
Tools: Concession, charcoal production,
　　　 timber supply-chain, etc.

### MRV Function

**Satellite based** Collect Earth → Activity Data

**Measurement(M)**

**Field based** NFI → Emission Factors

**Reporting(R)**

**Verification(V)**

### Data management Function

MRV PF

**FNDS**

Database → Selected data → Web-portal

F R I P
**JICA**

**FNDS** SIS
REDD+ Safeguards

*The data and output of the measurements are also used for the design of policy and monitoring on SFM

BIOTA The Biomass Tool for Alos
JJ-FAST JICA-JAXA Forest Early Warning System in the Tropics
GLAD Global Land Analysis & Discovery
GFW Global Forest Watch
MODIS MODerate resolution Imaging Spectroradiometer
PSP Permanent Sample Plot

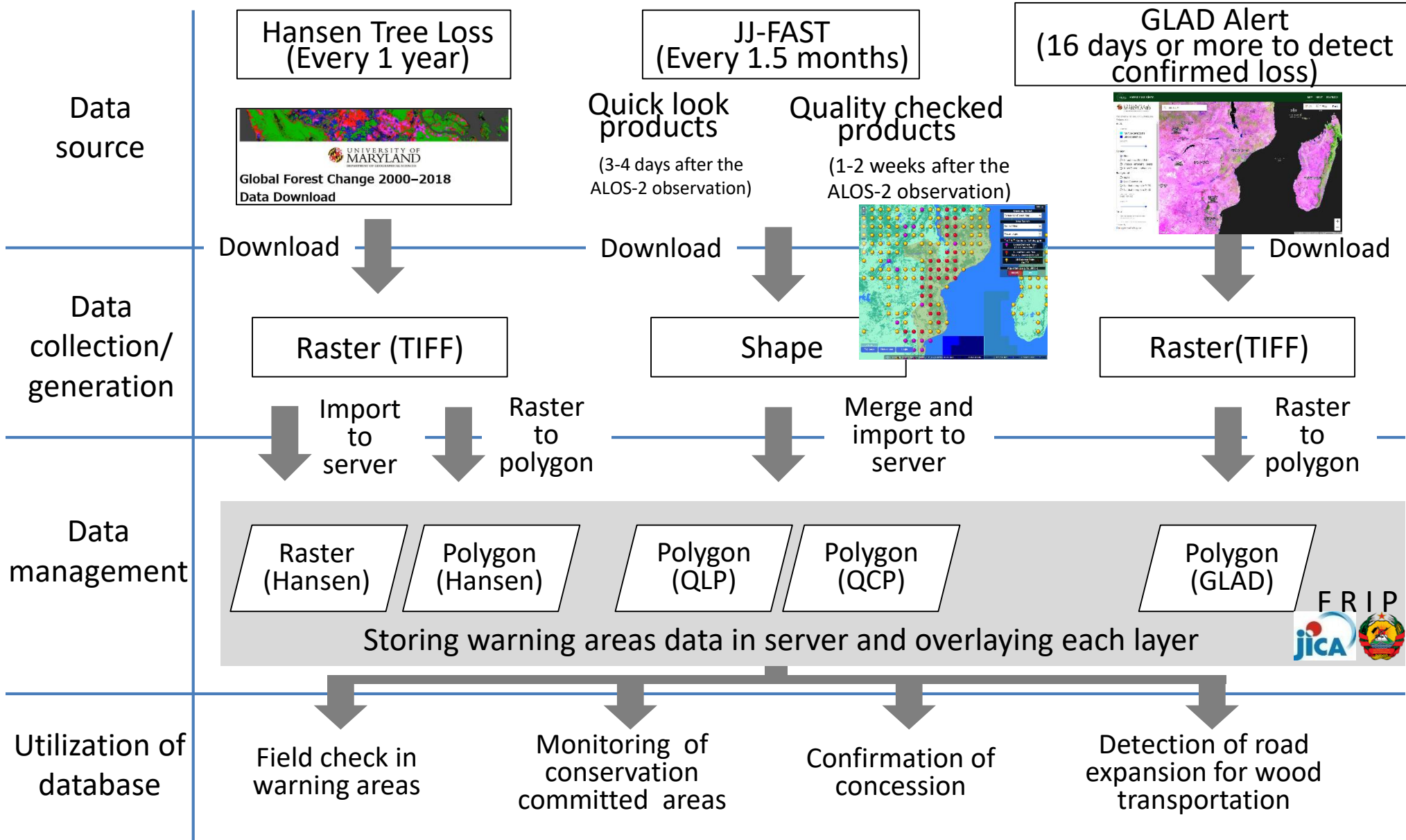| Item | Hansen Tree Loss | JJ-FAST | GLAD Alert |
|------|------------------|---------|------------|
| General descriptions (objectives) | To estimate tree loss and gain by time-series analysis and visualize the global forest extent and their changes. | To constantly monitor the conditions of decreasing tropical forests and detect the change areas. | To estimate and show areas with possible tree cover loss. |
| Satellite imageries | LANDSAT | ALOS-2/PALSAR-2/ScanSAR | LANDSAT 7 and 8 |
| Target area | Whole world | Natural tropical forest areas (Artificial forest areas are excluded.) | All countries between the latitudes 30 degrees north and 30 degrees south |
| Observation frequency | Every year | Every 1.5 months (**Quick look products**: **3-4 days** after the observation) (**Quality checked products**: **1-2 weeks** after the observation) | 16 days or more to detect confirmed loss (Depending on cloud conditions, observation intervals can be extended by several weeks or even several months.) |
| Spatial resolution | 30m | 50m -> 25m(under development) | 30m |
| Observation period | 2001 to 2018 | 2016 or later | 2017 or later |
| Data format | Raster (Tiff) | Shape file and KML | Raster (Tiff) |

# Work flow of satellite based monitoring

**Data source**

| Hansen Tree Loss (Every 1 year) | JJ-FAST (Every 1.5 months) | GLAD Alert (16 days or more to detect confirmed loss) |
|---|---|---|

Quick look products
(3-4 days after the ALOS-2 observation)

Quality checked products
(1-2 weeks after the ALOS-2 observation)

Download — Download — Download

**Data collection/ generation**

| Raster (TIFF) | Shape | Raster(TIFF) |
|---|---|---|

Import to server — Raster to polygon — Merge and import to server — Raster to polygon

**Data management**

Raster (Hansen) | Polygon (Hansen) | Polygon (QLP) | Polygon (QCP) | Polygon (GLAD)

FRIP

Storing warning areas data in server and overlaying each layer

**Utilization of database**

Field check in warning areas | Monitoring of conservation committed areas | Confirmation of concession | Detection of road expansion for wood transportation

# Image of deforestation areas monitoring system

Image of deforestation total areas by early warning system in Niassa Province

# Monitoring(Satellite based)
## (b) Deforestation monitoring (implemented by FNDS)

1. Produce annual deforestation map using NDVI Products from Sentinel-2 images

2. Collect reference data using Collect Earth (stratified sampling)
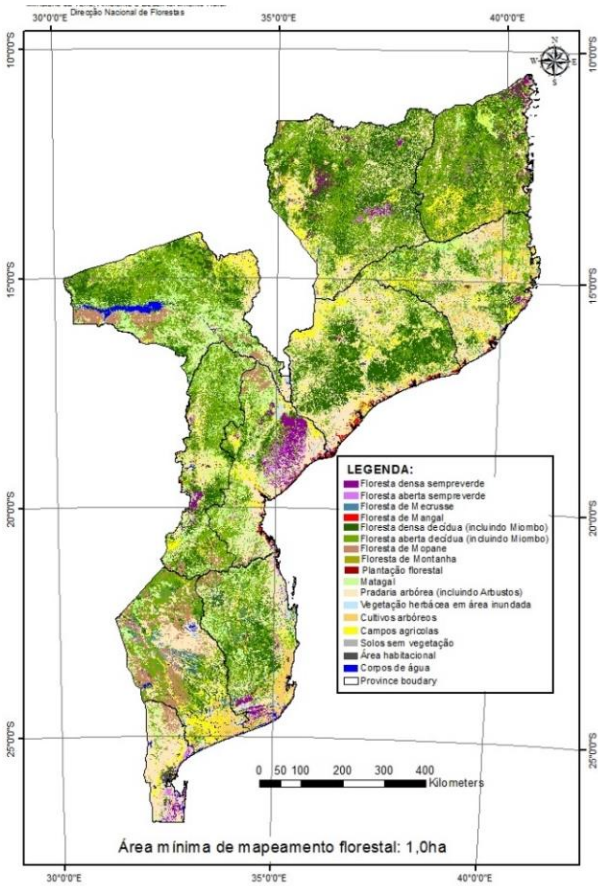
3. Estimate area of deforestation and emissions

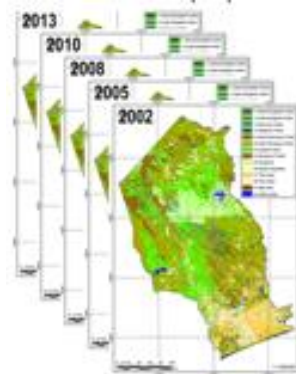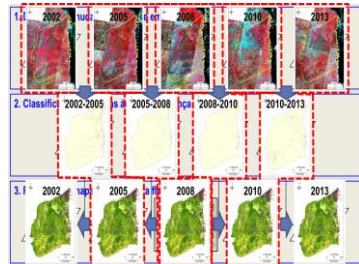Completed 2017 & 2018;

Zambesia, Cabo Delgado, Manica, Sofala,Nampula



*Will be used as MRV data.

- Forest cover land use 2013 base map and LC Changes 2016 ;
- Provision of information about the areas of each forest cover and land use class and their changes



Two provinces with full maps o changes 2002, 2008, 2010, 2013

# Draft country map of Changes

**2016 National Map** of LC changes still under quality assessment and quality control (uses images **Sentinel-2)**

**Images used currently**:
- ALOS2 images (sensor AVNIR-2)
- Landsat 8
- Sentinel-2
-

# MRV Activity Data(AD)

**Activity Data (AD),** also known as area data, refers to spatial extent of each forest cover and **land use type** at a certain time point and is **expressed in hectare**. For areas of deforestation, forest degradation, and carbon stock enhancements, AD refers to the spatial extent of these changing situations.
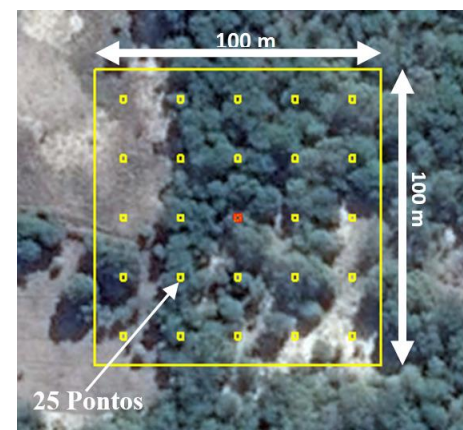


Method(National FREL 2018):

The **entire area of the country** has been visually assessed on a **4 x 4 km grid at national level using high and medium resolution imagery by using Collect earth**. Area change was estimated annually from **2003 to 2016**.

# MRV Emission Factor(EF)

EF is a component used for **estimating carbon emissions** from **deforestation** and **forest degradation** and **carbon removals** from the activities associated with carbon.

EF used for FREL/FRL was developed by using the data obtained from **national forest inventories(NFI**), **PSP and allometric equations**.

IPCC default values were also utilized for EF development.

| Contents of NFI | Items |
| --- | --- |
| Pools | AGB, BGB and Deadwood(8 provinces only |
| Sampling | Stratified random sampling method |
| Plot shape | Square of 100m x 100m |
| Implementation cycle | Every 10 years |

# Conclusion
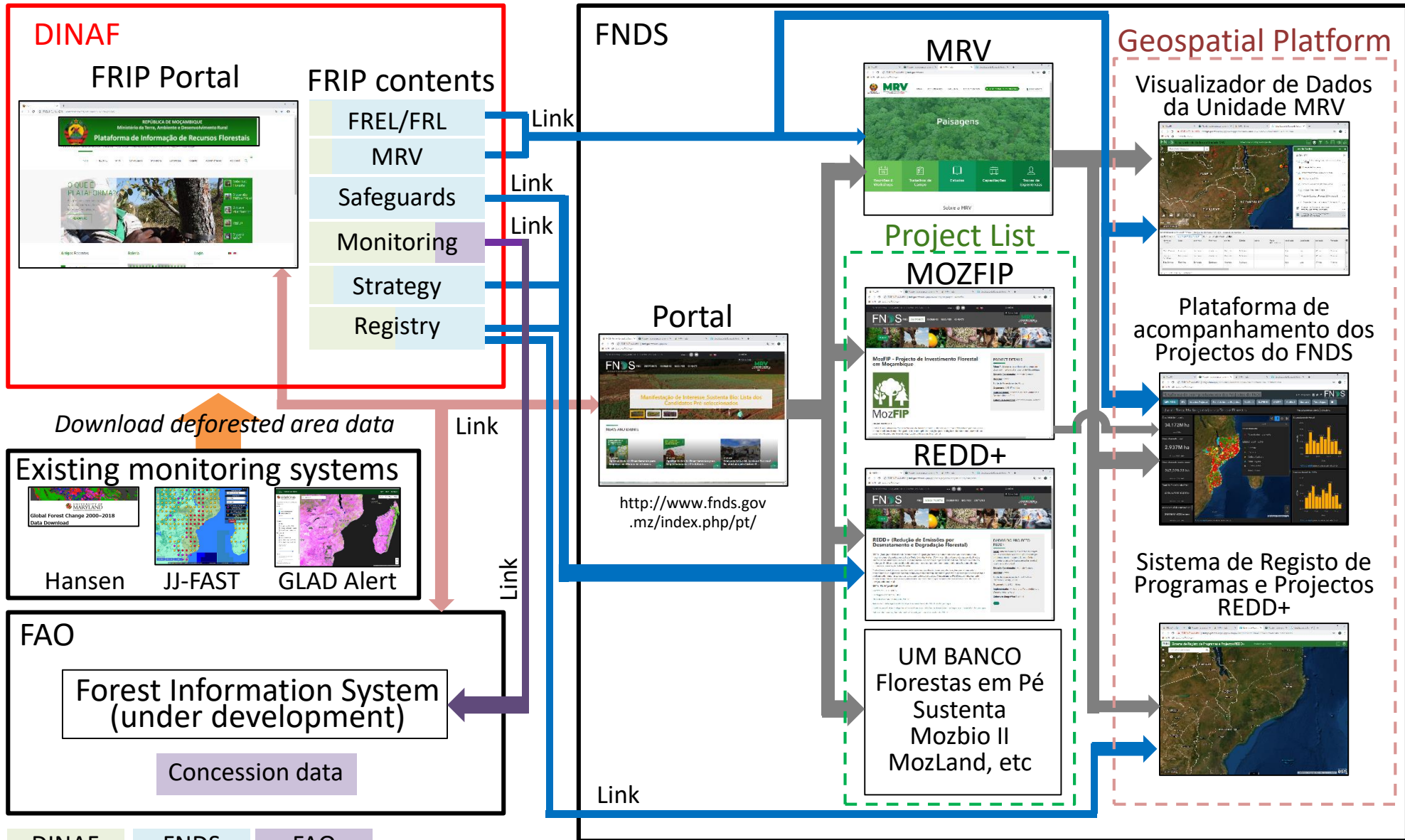
1. Effective GHG report requires fundamental decisions about data and methods, establishment of a network of contacts for accessing data and reviewing results and the design control, documentation and archiving;

2. What is needed now is to look to the existing data and build and promote a strong partnership and synergies among these system and avoid duplication and overlap;

3. Accurate maps are important for management actions;

4. Agreements on provision of high resolution satellite data to avoid discrepancy on data generation;

5. Integrated monitoring would help reporting for various conventions and commitment;

6. Develop a NFMS as an instrument that enable policy makers to improve sustainable forest management;

7. NFMS must provide, reliable, up to date and transparent information and REDD+ data;

# THANK YOU

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Department of Inventory of Forest esource