Joint FAO-INPE effort in the context of REDD+
Status and challenges

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INPE/FUNCATE Team (São Jose dos Campos, Brasil)

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Countries receiving support to National Programmes: Bolivia, Cambodia, Democratic Republic of the Congo (DRC), Ecuador, Indonesia, Nigeria, Panama, Papua New Guinea, Paraguay, the Philippines, Republic of Congo, Solomon Islands, Sri Lanka, Tanzania, Viet Nam and Zambia.

Other partner countries: Argentina, Bangladesh, Benin, Bhutan, Cameroon, Central African Republic, Chile, Colombia, Costa Rica, Ethiopia, Gabon, Ghana, Guatemala, Guyana, Honduras, Ivory Coast, Kenya, Malaysia, Mexico, Mongolia, Myanmar, Nepal, Pakistan, Peru, South Sudan, Sudan, Suriname and Uganda.

www.un-redd.org
6 UN-REDD Work Areas

- MRV and Monitoring
- REDD+ Governance
- Stakeholder Engagement
- Multiple Benefits of forests/REDD+
- Transparent Equitable Accountable Management of REDD+ Payments
- REDD+ as Catalyst of Green Economy
The IPCC’s methodological approach to calculate anthropogenic GHG emissions by sources and removals by sinks related to land area.
Information, Monitoring and MRV Development through the 3 REDD+ Phases

**Phase I**
- Readiness
- Development of P&Ms

**Phase II**
- Implementation of P&Ms and demonstration activities

**Phase III**
- Positive incentive for verified performance

- **Capacity building & development**
  - REDD+ Safeguards Information System
  - Monitoring System
  - SLRS

- **Monitoring System**
  - SLRS: AD
  - NFI: EF
  - GHG-I: CO2e

**MRV System**
To assess whether REDD+ is resulting in net positive outcomes, i.e. results-based.

- In Phase 2 of REDD+
  - To monitor the outcomes of demonstration activities

- In Phase 3 of REDD+
  - To monitor the outcomes of national policies and measures on all the national territory

- Technical requirements
  - Satellite Land Monitoring System (operational remote sensing)
  - Web-GIS interface (for transparency, open access)
Forest monitoring system: Brazil

- **PRODES** – Amazon Deforestation Monitoring Project (Annual Deforestation Assessment)
- **DETER** – Near real-time Deforestation Detection with MODIS (Support for Law Enforcement for Deforestation Control)
- **DEGRAD** – Amazon Degradation Monitoring Project
- **DETEX** – Selective logging activities
- **TerraClass** – Land use monitoring of deforested area (2008)

http://www.dpi.inpe.br/prodesdigital/prodes.php
FAO-INPE collaboration
South-south cooperation

- Development of prototypes of national satellite forest monitoring systems for developing countries: DRC, PNG, Paraguay, and Ecuador. Upcoming Zambia, Argentina, VietNam.
- Build on existing national forest monitoring experiences and algorithms.
- FAO/INPE collaboration.
- Two components: TerraX platform
  National forest monitoring portal
- Combination of open-source database, user interface, tools, and algorithms adapted according to country needs (collaboration with OpenForis).
- Free-of-charge and supported by analysis and programming teams in Brazil (INPE) and FAO HQ.
- Linkage of information from other technical partners and contributors for analysis and verification.
### Snapshot of RS data use and needs

<table>
<thead>
<tr>
<th>UN-REDD Country</th>
<th>Data use</th>
<th>Topic</th>
</tr>
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<tbody>
<tr>
<td>VietNam</td>
<td>SPOT, Landsat, RapidEye</td>
<td>Deforestation, request for degradation imagery</td>
</tr>
<tr>
<td>Ecuador</td>
<td>Landsat, RapidEye</td>
<td></td>
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<tr>
<td>DRC</td>
<td>SPOT, Landsat</td>
<td>Request for degradation imagery</td>
</tr>
<tr>
<td>Tanzania, Zambia, Argentina</td>
<td>Landsat</td>
<td></td>
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<td>Pacific island states</td>
<td>DigitalGlobe</td>
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<tr>
<td>Bhutan, Mongolia</td>
<td>SPOT, ALOS (AVNIR-2)</td>
<td></td>
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<tr>
<td>PNG</td>
<td>Landsat, RapidEye</td>
<td>HR requests</td>
</tr>
<tr>
<td>Cambodia</td>
<td>MODIS, Envisat ASAR</td>
<td>Request terrestrial lidar and radar data</td>
</tr>
</tbody>
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So not such a thing as one method fits all
Example: Democratic Republic of Congo (DRC)
Processing chain:
FRA RSS, FAO-FIN, UN-REDD

**FAO FRA RSS**
LC/LU sample sites checked by regional experts

**FAO-FIN**
Open Foris tool kit
Pre-processing
Segmentation
Supervised classification

**UN-REDD**
Edition in TA
TerraCongo project suite: data pre-processing

Example 1: correction of Landsat band 5 (atmospheric/BRDF)

GLS1990; TOA reflectance

GLS1990 + replacements to harmonise phenology; surface reflectance
TerraCongo project suite: data pre-processing

Example 2: image segmentation
TerraCongo project suite: data pre-processing

Example 3: segment classification based on existing data

Country-adopted Forest Mask

New image

New Forest Mask (vectorised)
TerraAmazon workshop
Multi-user edition
TerraCongo linkage with web-GIS portal

- Imagery stored in a separate DB
- Data dissemination with open technologies, notably GeoServer
- Only the Working DB has a Conceptual Model
Ongoing work DRC

(Slide courtesy: P. Zelazowski)

- 1st province-wide TerraAmazon project outside Brazil = 100,000 sq. km of forest = 2.5 mln segments
Ongoing work DRC
(Slide courtesy: P. Zelazowski)

NFMS Internet Portal

TerraAmazon projects

pre-classified segments within the project area

satellite images, maps, algorithms, expertise
• Integration of existing data pre-processing and change detection algorithms for different ecosystems
• Approach of ‘modules’ which allows the countries to pick and chose dependent on the country needs (data bulk downloading, preprocessing (geometric/radiometric), cloud masking, change detection, statistics, mapping)
• All open-source applications are more than welcome!
• Safeguards’ system
Dual functions of the NFMS

NATIONAL FOREST MONITORING SYSTEM (NFMS)

MONITORING FUNCTION
- Remote Sensing
- WEB Interface
- Community Monitoring
- Other monitoring systems related to forest

MRV FUNCTION
- Satellite Land Monitoring System
- National Forest Inventory
- GHGs Inventory

System to provide information on Safeguards (SIS)
Important data considerations

- For **sustainable** autonomous national systems: capacity building and technology transfer is needed in-country, especially in the field of radar/lidar, so far mainly efforts in optical domain.

- **Data availability/access** is a limiting factor for work done in-country.

- Important is to build links with **National Forest Inventories (NFIs)**.

- Important to distinguish R&D from **operational applications** ready to be implemented in Non-Annex-I countries.
Regional and pan-tropical assessment of actual and potential Landsat data availability

(Slide courtesy: P. Zelazowski)

A. Number of available Landsat scenes (1983-2012)

B. % of data not obscured by clouds

C. cloudless data as % of all data acquired by TM and ETM+ sensors (and not necessarily stored on the ground)
Links and way forward with GOFC-GOLD and GFOI

- Priorities for the scientific issues in developing countries in the context of REDD+ to be addressed (in source-book and MGD documents)?
- Protocol for data requests and delivery for FAO/UN-REDD countries: entry point in-country
- Possibility of attendance workshops, trainings
- Interest to develop modules on latest technologies
- Trainings in-country, HQ and CRA/INPE
- Forest degradation (i.e. DRC, VietNam, Cambodia)
- Main issue: coordination of activities by all partners
Thank you for your attention!

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www.rdc-snsf.org
png-nfms.org
paraguay-smf.org