

Challenges to feed the world: Role of satellite data for emergencies and early warnings

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Food and Agriculture Organization (FAO) of the UN

- FAO HQ, (sub)regional offices, and +130 country offices
- 194 member nations
- Budget 2014-2015: 2.4 Billion USD
- Departments (6): **Agriculture** and Consumer Protection; **Economic** and Social Development; **Fisheries** and Aquaculture; **Forestry**; **Corporate Services, Human Resources**; and **Technical Cooperation**
- Three main goals: **eradication of hunger**, food insecurity and malnutrition; the **elimination of poverty**; and, the **sustainable management of natural resources** (including land, water, air, climate and genetic resources)



Forestry

FAO

- **Lead UN agency on agriculture & forests**
- **>60 years** track record
- **Strong technical expertise**
- **Network of national focal points**
- **Existing projects and partnerships**
Belgium, Norway, EU, Finland, Germany, Sweden, Japan, France, AfDB, Denmark, Spain, Luxembourg, Brazil
- + **Great potential to streamline normative work**

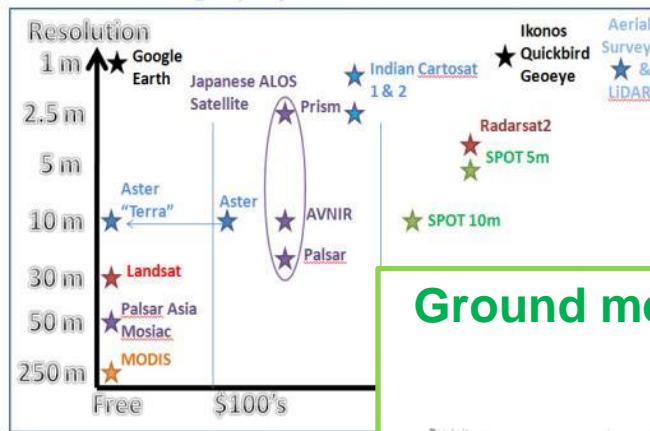
Biodiversity

AGRICULTURE FORESTRY Disease (malaria)

Meteorology

Remote sensing

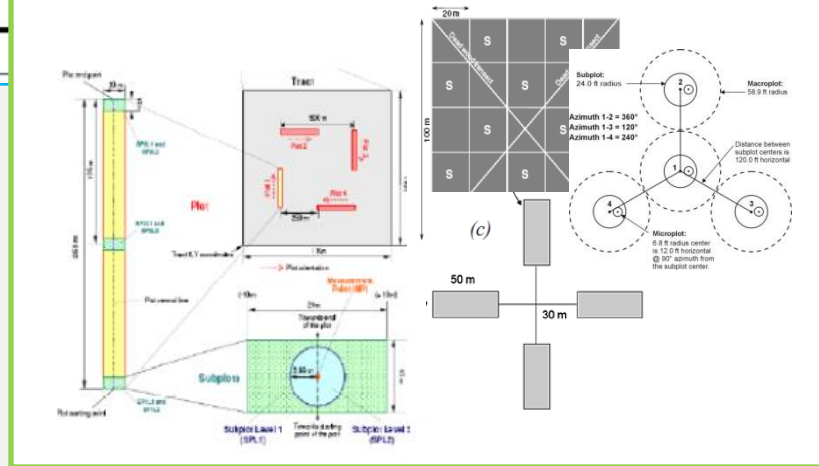
Satellite Imagery Options "Cost vs. Resolution"



POPULATION CENSUS

Urban & Landuse Planning

Ground measurements



FLOOD RESPONSE

Border Mapping National Defense

Integration ground field measurements and remote sensing into one system



Forestry

FAO EXPERIENCES IN EARLY WARNING SYSTEM CAPACITIES

FAO: comparative advantages in information system and early warning systems, primarily through following:

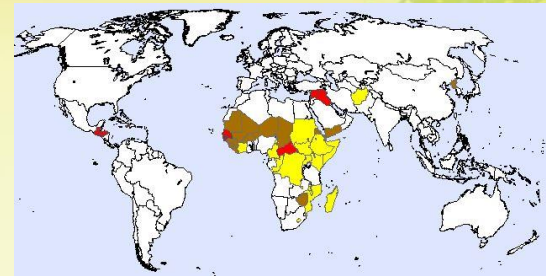
GIIEWS: Global Information and Early Warning System on **Food and Agriculture**, which monitors and reports on agricultural production and commodity markets,

<http://www.fao.org/gIEWS/english/index.htm>

EMPRES: Under its Food Chain Crisis Management Framework, FAO manages EMPRES for **transboundary animal and plant pests** and diseases and food safety hazards. >> detect, prevent, contain and control food safety hazard + most serious transboundary livestock and plant pests and diseases

<http://www.fao.org/foodchain/empres-prevention-and-early-warning/en/>

e.g. Countries requiring external assistance for food





FAO EXPERIENCES IN EARLY WARNING SYSTEM CAPACITIES

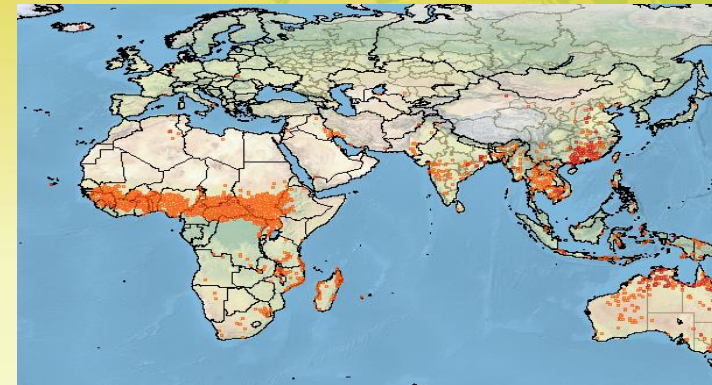
Forestry

GFIMS: Global Forest Fire Information Management System, which provides real-time monitoring of forest fires worldwide
<http://geonetwork4.fao.org/alerts/alerts.phtml>

GLEWS: Global Early Warning System builds on the added value of combining and **coordinating the alert and disease intelligence** mechanisms of **OIE, FAO and World Health Organization (WHO)** for the international community and stakeholders to assist in prediction, prevention and control of animal disease threats <http://www.glews.net/>

UN-REDD: Country specific **web-platforms** to monitor **REDD+** activities and provide information to support national forest monitoring systems (e.g. agricultural drivers, field inventory etc.)

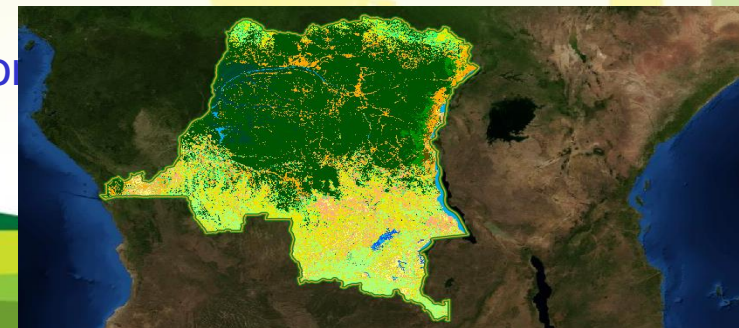
Worldwide fires in the last 48 H



GLEWS Disease Events



National Land Cover DRC





Forestry

UN-REDD
PROGRAMME

- Supports 60 countries benefit from REDD+ (UNFCCC)
 - National REDD+ Strategies and Readiness
- Established in 2008 by FAO, UNDP & UNEP
 - Response to UN Framework Convention Climate Change (UNFCCC) Bali Action Plan 2007
- Offers UN Joint Program: Delivering as One UN
- Agreed delivery platform with Forest Carbon Partnership (FCPF) and Forest Investment Programme (FIP)
- Current contributions: US\$ about 200 million (without pledges) from donors Norway, Denmark, Spain and Japan

FAO and its role in REDD+

- ❑ **FAO's key role in REDD+ readiness is to help countries develop, implement and operationalize their National Forest Monitoring System (NFMS)**
- ❑ **FAO also assists countries in conceptualizing and implementing REDD+ activities and in the development of policies and measures**

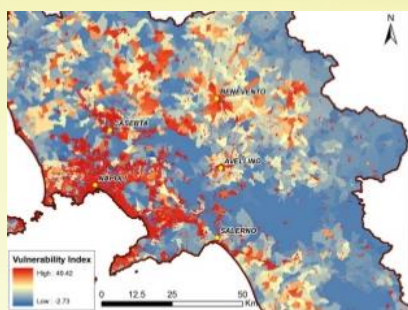
Key principles of FAO's support

- National ownership
- Alignment with the UNFCCC process
- Step-wise approach that allows for improvement over time
- Builds upon existing capacities, available data and systems in place
- Use of open-source, freely available data and tools as much as possible
- Strengthening of national capacities (learning-by-doing)



Forestry WHAT DO WE OFFER DEVELOPING COUNTRIES?

EARLY WARNING
Spatial data



DATA DOWNLOAD
Easy data access



EMAIL ALERTS
Community involvement



Principles for its applicability and adoptability:

- Simple
- Country specific data (Tier 2 for UNFCCC)
- Open-source
- Tailored to country needs

STATIC DATA

DEM 30m

Administrative

HYDROLOGICAL MODEL

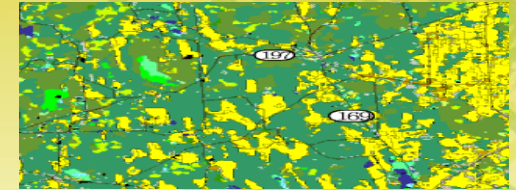


ANNUAL

Land Cover

Population

WALL TO WALL LAND COVER MAP

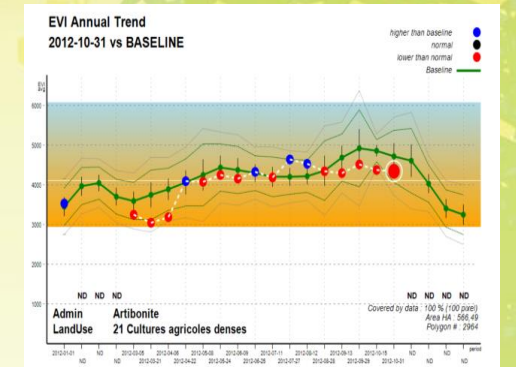


DYNAMIC

Satellite images (coarse resolution) > 10 years

Meteo

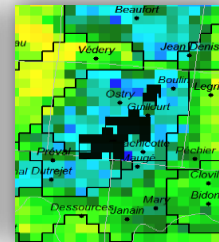
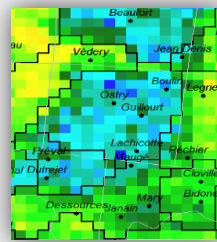
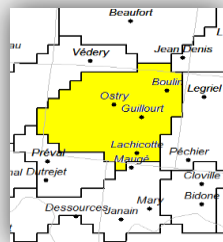
SPATIAL PROXY INDICATORS



Epidemiological data (hospital resolution ~10 years)

WSETD MODEL

Geo-spatial Early Warning System





Forestry

UN-REDD and Space Data Management System (SEPAL)

System for Earth Observation Data Access, Processing and
Analysis for Land Monitoring





Problem

- **13 M ha** deforested annually
- **17%** of global GHG emissions are caused by deforestation and related land use change
- **45 countries** able to assess changes in forest area through systematic NFMS
 - Poor access to satellite data, limited expertise and computing power
 - Uncoordinated support
 - Impact on indigenous people and food security



Possible solutions

Incentives:

REDD+ under UNFCCC (Bali, Cancun & Warsaw)

Data & tools:

GFOI (Norway, Australia, USA, Committee on Earth Observation Satellites (CEOS), FAO)

Country support:

FAO (UN-REDD, NFM, FRA)

World Bank (FCPF)



- *Requests developing country Parties, on the basis of work conducted on the methodological issues set out in decision 2/CP.13, paragraphs 7 and 11, to take the following guidance into account for activities relating to decision 2/CP.13, and without prejudging any further relevant decisions of the Conference of the Parties, in particular those relating to **measurement and reporting**:*
- **Par. 1 (d)** 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:
 - (i) 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;
 - (ii) Provide estimates that are transparent, consistent, as far as possible accurate, and that reduce uncertainties, taking into account national capabilities and capacities;
 - (iii) **Are transparent and their results are available and suitable for review as agreed by the Conference of the Parties;**



Solution

- FAO already supplies data from space centers and commercial satellite companies to “forest countries”, supporting/guiding them to process the data further;
- FAO makes relevant satellite data and processing tools available over internet (through a portal to a server in the cloud);
- Countries can be trained to use data platform;
- Data access is a political issue - countries have to be able to control it fully
- Data algorithms should be adapted to each land type / purpose (public / private data sources)
- Countries can process data themselves, or they can get FAO assistance
- Countries only need to download the “desired level of satellite data product”



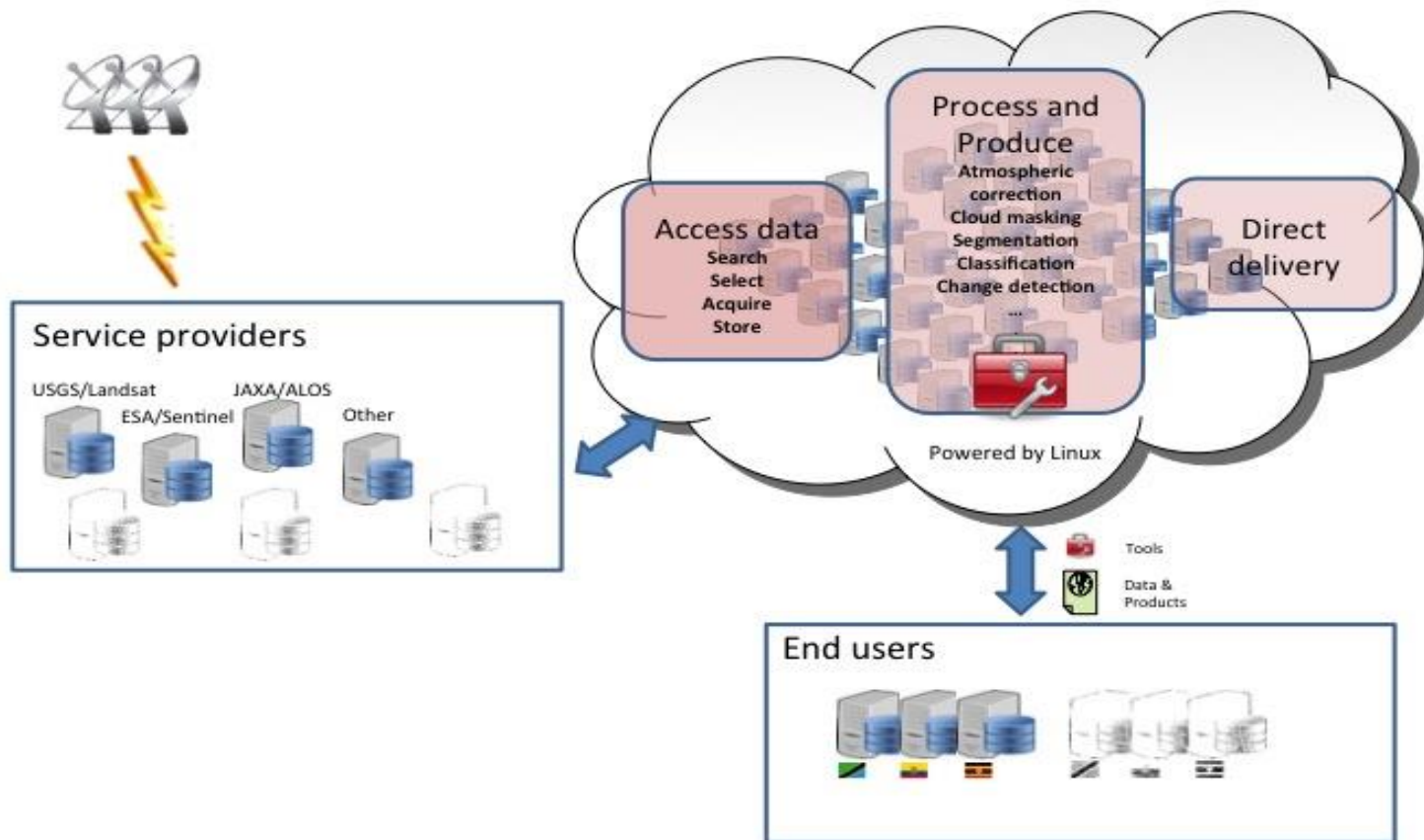
Project Objectives

- To directly support the UNFCCC REDD+ readiness process in selected developing countries: to deliver satellite data and develop free tools for forest monitoring that can be used by developing countries.
- The project has two main components: 1) **training (capacity building and technical assistance/help desk)** and 2) the development of a **cloud computing infrastructure**.
- The overarching project goal: allow developing countries to build the autonomous capacity to monitor their forest-related REDD+ activities by guaranteeing **data access and delivery of (pre)processed satellite data**. This data will allow the country to get information on forestry related subjects to report regularly to the different international conventions and agreements.



Cloud computing structure

FAO Space Data and Product management System
(SEPAL)





Open source tools developed by FAO

The screenshot shows the openforis website with a navigation menu (Home, Tools, Events, Partnership, Support) and a main banner for 'Free open-source solutions for forest monitoring'. Below the banner are five tool cards: Collect, Collect Earth, Calc, Collect Mobile, and Geospatial Toolkit. The Geospatial Toolkit card is highlighted with a black border.

openforis
Home Tools Events Partnership Support

Free open-source solutions for forest monitoring

[What is openforis?](#)

- Collect**
A fast, easy, flexible way to set up a survey
- Collect Earth**
A user-friendly, Java-based tool that draws upon a selection of other software to facilitate data collection
- Calc**
The modular browser-based tool for NFI results calculation
- Collect Mobile**
User-friendly and powerful data collection in field-based inventories
- Geospatial Toolkit**
A collection of command-line utilities for processing of geographical data

Why is SEPAL different from other initiatives?

What does this initiative offer to developing countries different than what Global Forest Watch / Google Earth Engine & other online mapping services already provide?

- Provides access to open and commercial data (HR) **optical** and **radar**;
- Provides **support for data processing**, training in the use and programming (if needed);
- Provides **countries access** / insight / control over data and image processing;
- **Hosted by FAO**: representing the countries' interest;
- Data made available on request based on demonstrated **need and project results**;
- More efficient processing for FAO and for the countries;
- Enables FAO to use the data for other purposes (e.g. agriculture)
- Countries can download the final product stage (or raw data)
- All methods / tools developed will be made available



Project implementation

- Management and staffing by FAO (incl. set-up of Advisory group)
- SEPAL: joint project/ strengthening of existing efforts in FAO's existing programs in Forestry: FAO-FIN, FRA, UN-REDD and BMU
- Existing FAO training program for developing countries will be used
- Rental of space/ computing power in dataplatform / cloud
- Collaboration with space agencies/centers to develop user interface
 - Cooperation in SDMS-pilot with NASA / AMA for the current demonstration / development of user interfaces for SEPAL platform
 - Part of ESA TEP for direct link to Sentinel archives
- Existing KSAT consortium with FAO and Norwegian/ German SAR for ESA-supported development of computer platform and development tools for processing SAR data
- FAO could transfer negotiation of data access, as well as processing needs that can not be done in the computer platform



Forestry



FAO-INPE collaboration

Implementation and training of national forest monitoring systems in UN-REDD countries:

- Free-of-charge and supported by analysis and programming teams in Brazil (INPE/Funcate) and FAO HQ
- Early warning system of INPE for fires and forest degradation
- Training on software utilities and Brazilian national forest monitoring techniques at INPE CRA Amazonia, Belem, Brazil
- Close collaboration BMU ICI and INPE
 - Planned plug in for LCCS in TerraAmazon
- Training material for radar training
- Follow-up and country implementation in FAO-HQ/country
- Close links with Belgian universities for in-country research (University of Ghent, Xylaredd projects, VLIR projects in Africa)



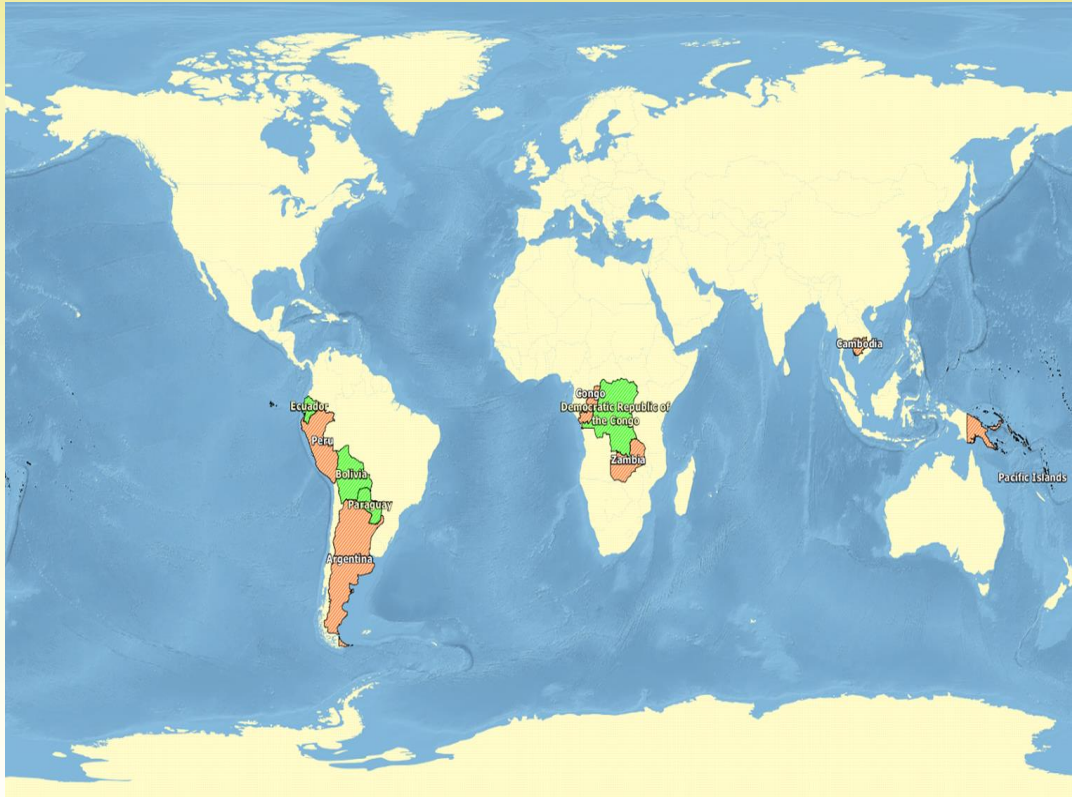
What we've learned

- **A few dedicated individuals can make all the difference**
- **Need to see capacity building in broader terms**
 - Training of resilient national institutions and consultants
 - Mandate of institutions should be clear
- **Integration NFI, RS and existing portals/sites**
- **On-the-job training is key**
 - Trainings are geared towards producing results
 - Essential to get faster delivery
- **Sharing data and data access is crucial and key for the portal**
- **Near-real time monitoring for early warning (e.g. Global Forest Watch), not for UNFCCC reporting**
- **Resilience is often at risk**
 - Easy to develop quickly elements of SLMS or NFMS, but resilience will be lacking
 - Long-term commitment is required by government and partners in order to secure sustainability

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 with FAO support
- **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

Supported countries



See more at <http://slms4redd.org/>

- Democratic Republic of Congo
 - <http://www.rdc-snsf.org>
- Paraguay
 - <http://84.33.1.31/>
- Ecuador
 - <http://geoportal.ambiente.gob.ec/portal/>
- Zambia
 - coming soon
- Argentina
- Bolivia
- Peru
- Congo
- Cambodia
- Pacific Islands States (Solomon, Palau, Fiji)
 - <http://178.33.8.113/portal/>
- Papua New Guinea
 - <http://png-nfms.org/>



NFMS Sample Portal

UN-REDD
PROGRAMME



2010

Feedback

Statistics

Español

English

Français

FA FOREST COVER 2010



Layers

Selected layers

Base Layers

Administrative Areas

Land cover maps

FA Forest Cover (2010)

LCCS

LCCS Changes 1975-1990

LCCS Changes 1990-2000

LCCS Changes 2000-2005

Vegetation Map

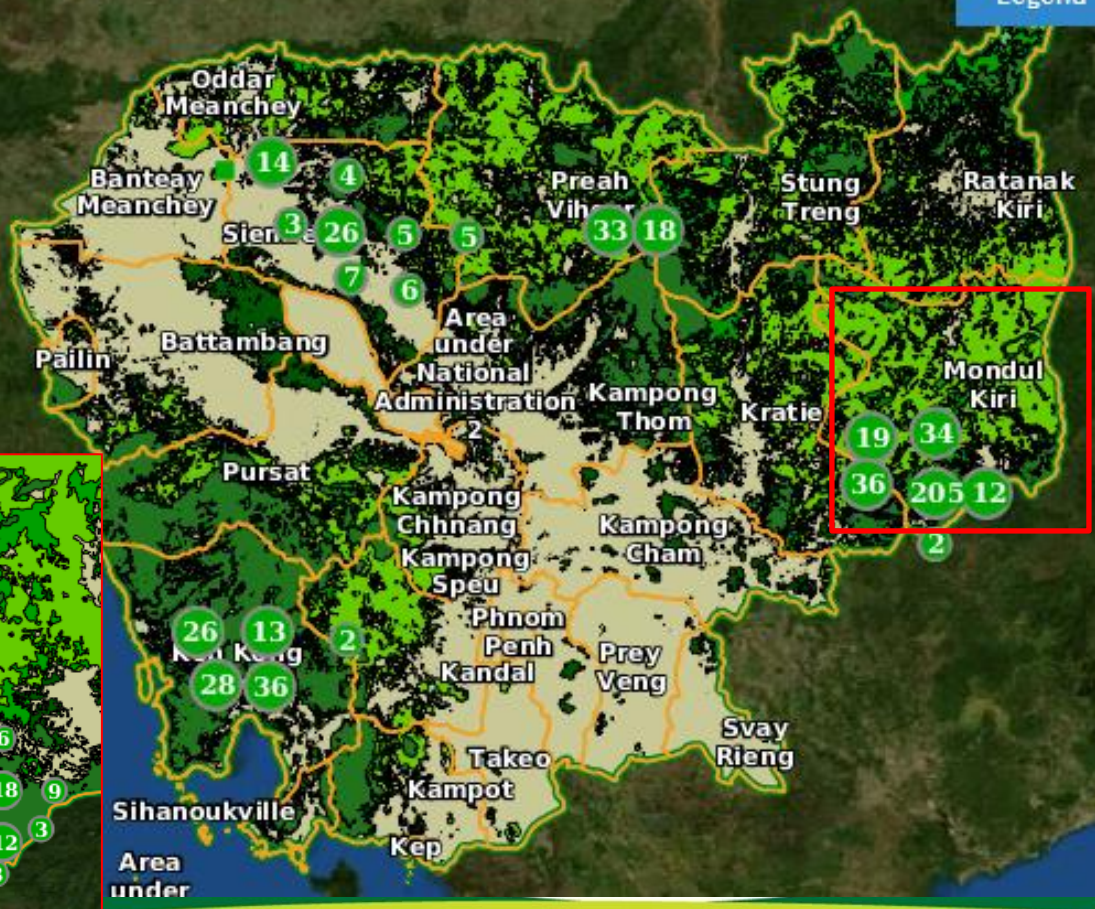
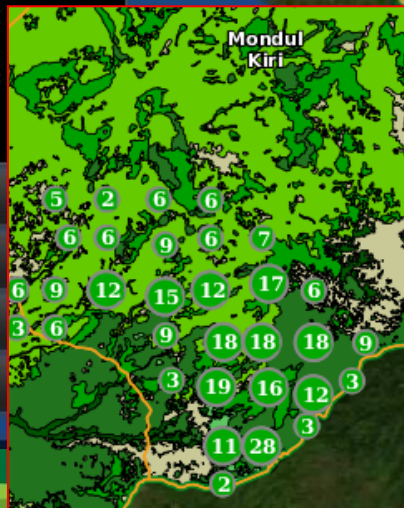
Land use maps

National Forest Inventory

Imagery Data

Other

Legend





Contact: inge.jonckheere@fao.org

www.un-redd.org
www.slms4redd.org

www.openforis.org