Earth Observation for Forest Management

International trends & developments

How to promote earth observation applications?

How to get funding?

Capacity building

0. Introduction

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HCP international:
consulting, marketing of earth observation

Coordinator GEONetCab:
project for promotion & capacity building of earth observation applications

Earth observation applications

- On the verge of reaching new user communities
- These new user communities need to be involved
- Weakest link / last mile aspects are important
- Marketing needed: promotion & capacity building

Life cycle of products & services

Initialization

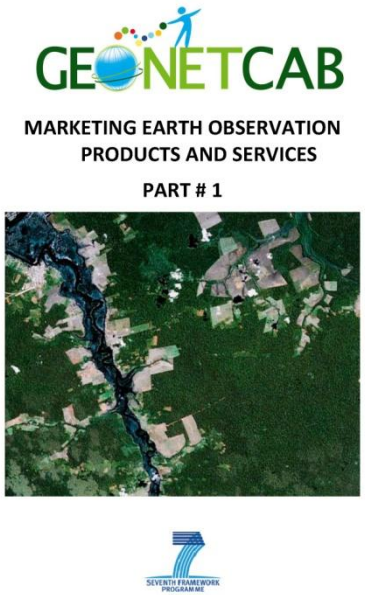
System analysis & design

Rapid prototyping

System development

Implementation

Post-implementation



Assessment of business & funding opportunities

- Categories of environmental management products & services
- Life cycle phase of product or service
- Regional context, level of technological & economic development
- Optimum marketing mix

1. International trends & developments in forest management

Forest Governance

Based on three pillars:

- Policy, legal, institutional and regulatory frameworks
- Planning and decision-making processes
- Implementation enforcement and compliance

And a number of cross-cutting aspects:

accountability, effectiveness, efficiency, fairness/equity, participation, transparency + description of subcomponents and indicators

Framework for assessing and monitoring forest governance (PROFOR, FAO)

Global Monitoring

FAO Forest Resource Assessment 2010 outcomes:

- improved knowledge on land cover and land use changes related to forests, especially deforestation, afforestation and natural expansion of forests;
- information on the rate of change between 1990 and 2005 at global, biome and regional levels;
- a global framework and method for monitoring forest change;
- easy access to satellite imagery through an internet-based data portal;
- enhanced capacity in many countries for monitoring, assessing and reporting on forest area and forest area

Example FRA sampling grid

Steps:
1. Satellite data
2. Classify and label
3. Validate

Ecosystem Management

Find your country:

Non-Legally Binding Instrument on all types of forests (NLBI): http://www.un.org/en/members/

Convention on Biological Diversity (CBD): http://www.cbd.int/convention/parties/list/

United Nations Framework Convention on Climate Change (UNFCCC):http://unfccc.int/parties_and_observers/parties/items/2352.php

Kyoto Protocol: http://unfccc.int/kyoto_protocol/status_of_ratification/items/2613.php

United Nations Convention on Combating Desertification (UNCCD): http://www.unccd.int/convention/ratif/doeif.php

Ecosystem Management

Find your country (continued)**:**

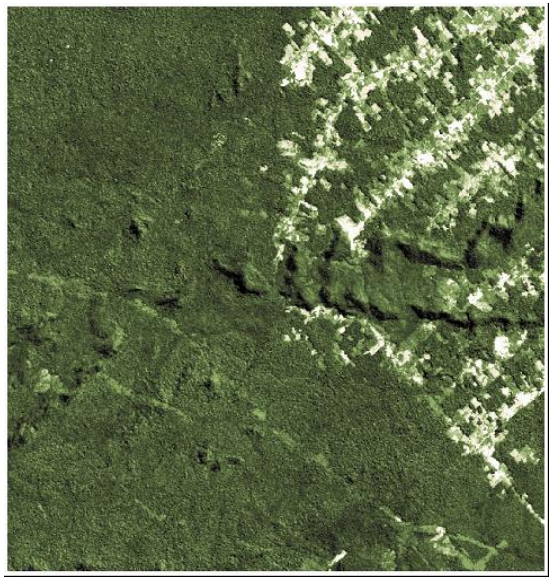
Convention on International Trade in Endangered Species of wild fauna and flora (CITES): http://www.cites.org/eng/disc/parties/alphabet.shtml

Convention on wetlands of international importance (Ramsar): http://www.ramsar.org/cda/en/ramsar-about-parties-contracting-parties-to-23808/main/ramsar/1-36-123%5E23808_4000_0__

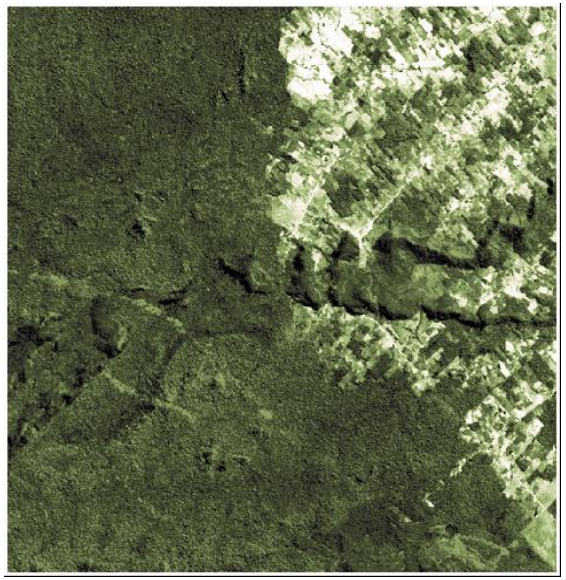
World Heritage Convention: http://whc.unesco.org/en/statesparties/

International Tropical Timber Agreement (ITTA): http://www.itto.int/itta/

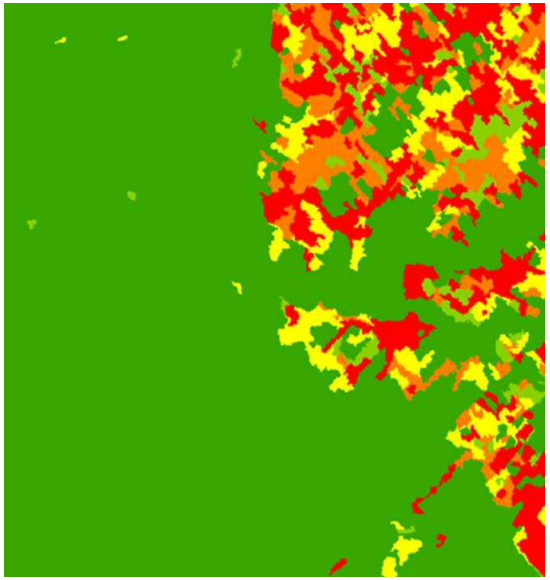
Automatic change detection



Landsat 1992



Landsat 2001



Likely areas of deforestation

Certification

The International Tropical Timber Organization (ITTO) and the Forest Stewardship Council (FSC) developed criteria and indicators for sustainable forest management and certification:

FSC label required by customers and therefore by producers

Interactivity

Increased use of social media and interactive instruments for forest cover monitoring and management.

Examples:

Interactive forest cover atlas of Cameroon (WRI)
http://www.wri.org/publication/interactive-forestry-atlas-cameroon-version-2-0

Forestracker: www.cincs.com

Marketracker: www.carboncreditcapital.com

More references:

Forest sourcebook (World Bank) *Comprehensive overview of forest management, including a discussion of remote sensing applications + cost comparison between RS and conventional monitoring*

Impact of the global forest industry on atmospheric greenhouse gases (FAO) *Calculations of the actual situation and future scenarios, suggestions for sustainable forest management*

Sustaining forests - investing in our common future (UNEP)

Global ecological forest classification and forest protected area gap analysis (UNEP)

2. Steps to promote earth observation for forest management

State-of-the-art

Earth observation is new technology.

Learn technical skills, but when back in professional practice, it has to be put to good use.

That involves ‘selling’ it.

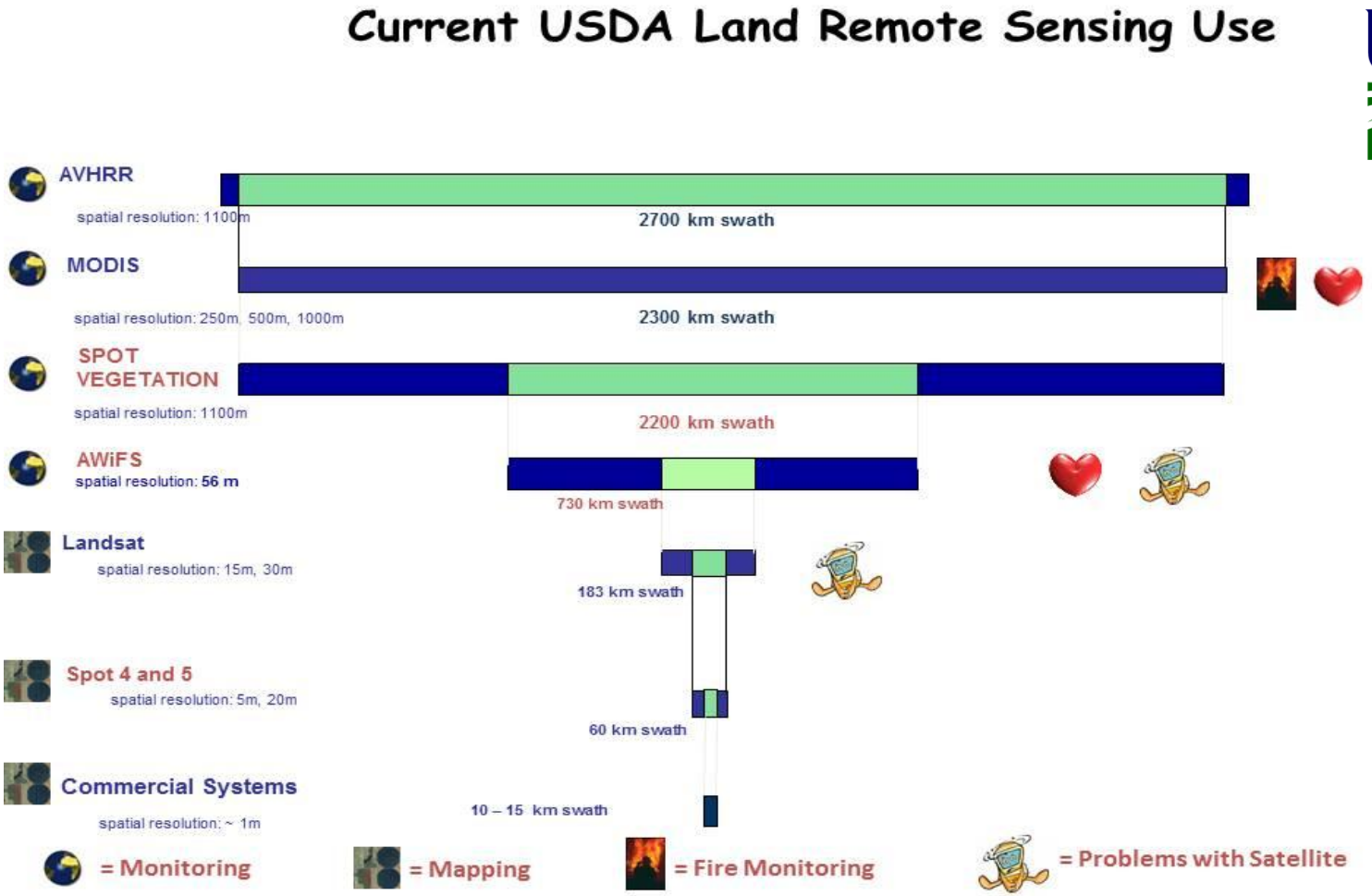
How to do that?

To whom? Could be your own boss, local authorities, communities, etc.

Categories of products and services

- Fire monitoring and prevention
  (see disaster toolkit)
- Carbon accounting
  (see climate toolkit)
- Monitoring and management
- Pest and disease control and management

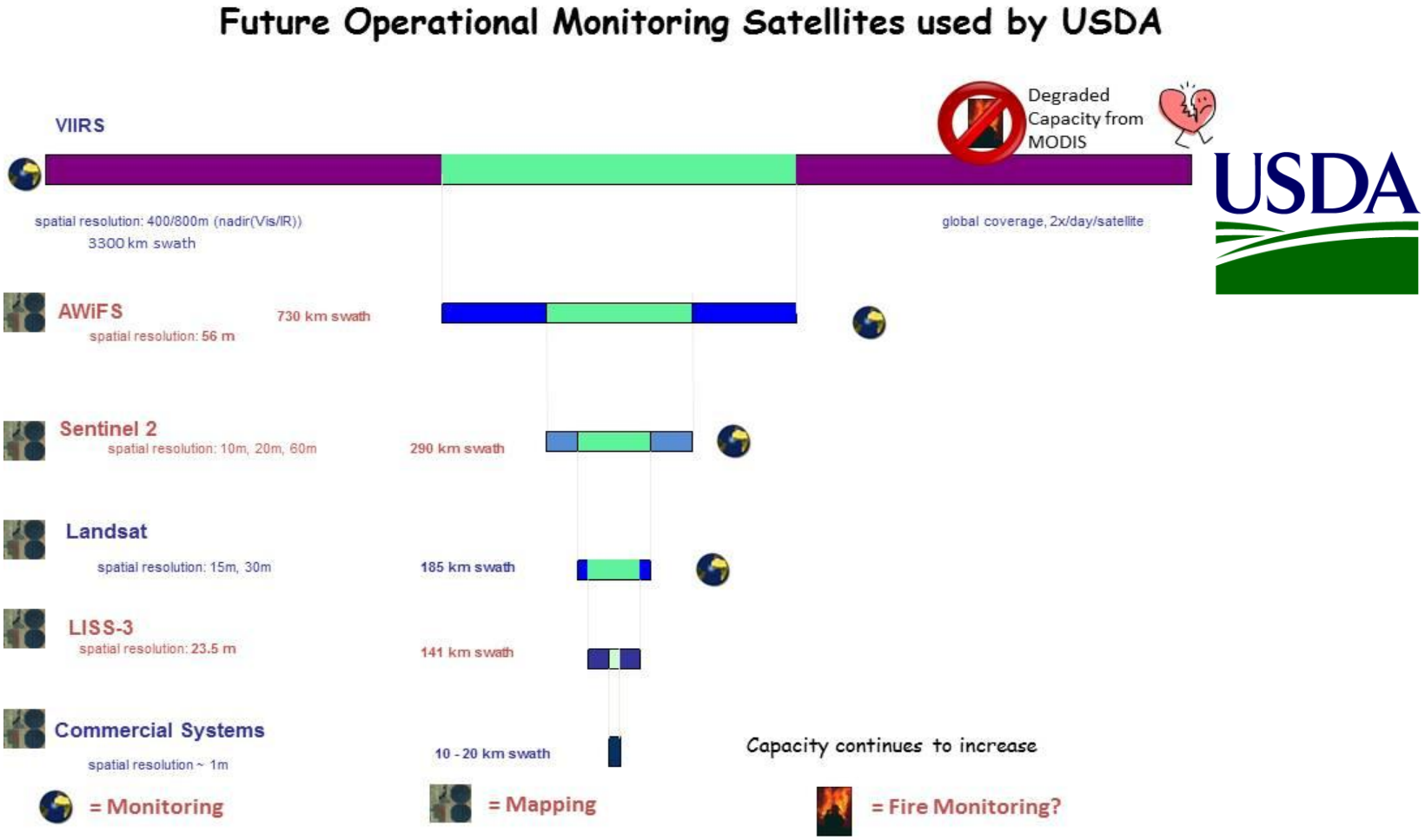
Example:
USDA use of satellite imagery for land cover (1)



USDA Remote Sensing Programs and Uses (Bethel)

Example:

USDA use of satellite imagery for land cover (2)

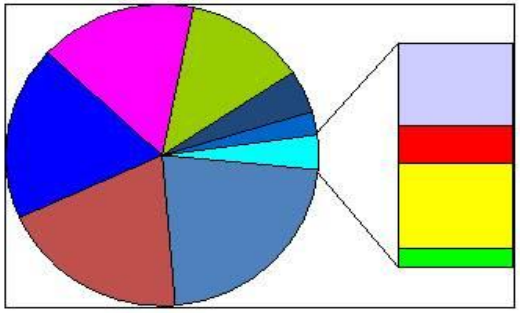


USDA Remote Sensing Programs and Uses (Bethel)

Example:

USDA use of satellite imagery for land cover (3)

Applications of Field-level* Satellite Data



- Compliance-22%
- Early Warning-19%
- Research-19%
- Cropland Data-16%
- Crop Assessment-12%
- Land Cover-5%
- Area Frame-2%
- Fire-1%
- Forest Pest-1%
- LDGS-1%
- Soil Modeling-1%

* Field-level satellite imagery allows users to distinguish fields or forest land parcels. It is typically defined by GSD of 5 to 100 meters.

Applications and Agency

- Compliance/Regulatory Use (RMA)
- Early warning of potential food supply disruptions (FSA and FAS)
- Research (ARS and other agencies)
- Cropland data layer (NASS)
- Planted area of US corn and soybean (NASS)
- Foreign crop condition assessment (FAS)
- Land Cover (USGS and other agencies)
- Area Frame (NASS)
- Fire and Forest Pest (USFS)
- Soil Modeling (NRCS)
- Landsat Data Gap Study (USGS)

USDA Remote Sensing Programs and Uses (Bethel)

What can be measured and assessed (1)?

- Area coverage + stratification
- Change detection forest land appraisal
- Timber harvest planning, monitoring, logging and reforestation
- Planning and assessing plant vigor and health in forest nurseries
- Mapping fire potential, planning fire suppression activities
- Assessing potential slope features and soil erosion
- Planning forest roads
- Inventorying forest recreation resources

From: Remote sensing applications – forests and vegetation (NRSC)

What can be measured and assessed (2)?

- Wildlife and assessing wildlife habitat
- Monitoring vegetation regrowth in fire lanes and power lines rights-of-way
- Synoptic and periodic measurements
- Forest parameters: greenness, crown closure, vegetation type, species assemblage / gregarious formations

From: Remote sensing applications – forests and vegetation (NRSC)

What is still needed?

- Improved correlation between remote sensing observations and ground-based observations
- Better algorithms to interpret and correct remote sensing data
- Validation and standardization of land cover maps
- Long time series of data and internally consistent products, and consistency of data availability
- Finer temporal and spatial resolution
- Model integration.

From: Critical earth observation priorities – agriculture societal benefit area – forests (GEO)

Pilots that work (1)

Overview of case studies for sustainable forest management (FSC), service delivery report and service operations reports – *studies of forest clearance and management in Sweden, Russia and South Africa, total land cover analysis and* ***cost estimates*** *+ accuracy analysis & validation*

Land cover mapping, mapping of broadleaved trees, timber volume, mapping of retention trees, burnt area mapping, clearfell mapping

Products: digital surface model, forest area, forest type, burnt area, clear cut and re-growth, road mapping, settlements, monitoring of protected forest areas, biophysical parameters

Pilots that work (2)

Evaluation, it works, but:

- Data calibration is the most complex and technical barrier
- Not many companies have the required skill set and technological expertise in EO, GIS and mensuration to successfully implement and use the data provided
- For optical data: processing chain is known and understood. For SAR, processing support would be required
- It is easy to have misunderstandings on very technical issues. But provided the process is carefully managed data transferability is possible.

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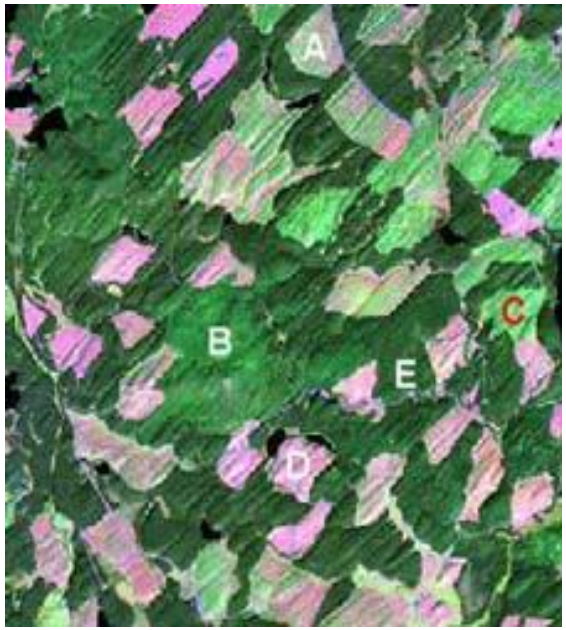
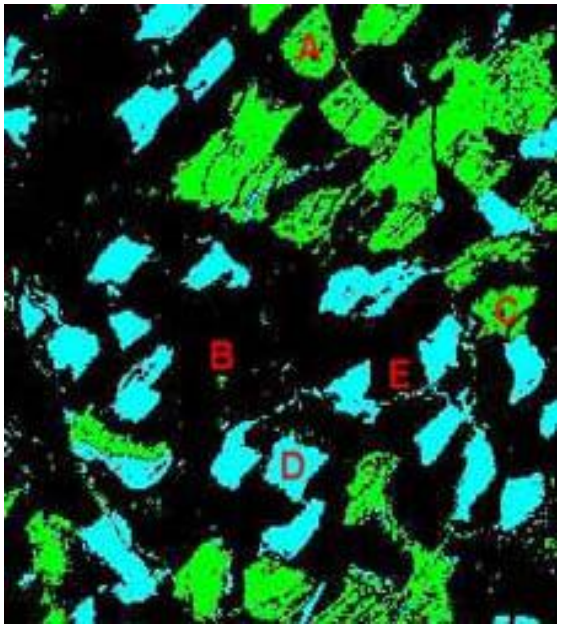
Natural Resources Canada | Ressources naturelles Canada

Example Canada: building a next generation forest management and monitoring system





This image (right) represents the differences between the 1990 and 1999 Landsat images (above). Green represents cut blocks prior 1990 and light blue indicates changes that occurred between 1990 and the 1999 image dates. The blue line at "E" is a road constructed between the image dates.

More references (1):

Forest and biomass management using satellite information and services (Eurisy) *Remote sensing for forestry applications in European regions + examples*

SERVIR: forest cover and deforestation in Belize 1980-2010 *Use of remote sensing for change detection and analysis*

Earth observation responses to geo-information drivers (ESA) *Market studies on forestry and earth observation: markets, demand, supply, opportunities, risks*

The use of remote sensing techniques in operational forestry (UK) *Description of remote sensing techniques, costs per km2 and examples of applications in the UK (tree counting, monitoring of forest stands, national inventory: automated classification of woodland acres (95% accuracy), tree heights)*

More references (2):

Global forest land-use change 1990 – 2005 (FAO)
Remote sensing analysis of global forests, comparison with FAO FRA

GEONetCab examples from the Czech Republic and Poland
www.geonetcab.eu

New European satellite imagery supports development of forest-related ecosystem services projects (ESA) *Success stories*

Application of GIS and remote sensing for conservation and management of forests in Myanmar
Overview of GIS and remote sensing for forest management in Myanmar

DMCii's detailed satellite imagery helps Brazil stamp out deforestation as it happens *Detection of forest clearing and illegal logging (complementary to MODIS)*

Marketing of earth observation

Marketing of earth observation is difficult.

New technology, few big companies, lots of small ones.

Lots of reports describing the bottlenecks, like reliability, data access, data continuity, etc.

Means that relatively a lot of effort is needed to promote EO.

Points to keep in mind:

- Look for opportunities, where can you have most success in a short time: quick-wins.
- Target the right audience to start with: who would be interested and listen to you?
- Identify the problem that they are trying to solve: is it the same as yours?
- Learn to speak the same language. Example ‘canopy’: this is a term most managers do not understand and do not care about. Use terms related to profits and losses.
- Look for examples from elsewhere (success stories): solutions that work and are affordable.

Be patient:
introduction of new technology
and / or applications takes time

3. How to get funding for your activities

Approach

- Share information on your subject (a thing you are doing) and think that is interesting for your contact, then look for the link. Could this solve a problem for your partner? Are adjustments necessary? Need other parties be involved? Take it from there.
- LEADS, LEADS, LEADS

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How?

- Establish your network.
- Look for opportunities.
- Write a good proposal.
- Promise much, but not too much.

Proposal outline

(more detailed version in separate document, see also www.geonetcab.eu)

1. Introduction / relevance
2. Objective(s)
3. Activities
4. Output
5. Management & evaluation
6. Risk assessment
7. Time schedule
8. Budget

Annexes

Other references

- Civicus: writing a funding proposal
- Michigan State University: guide for writing a funding proposal
- ESRI: writing a competitive GRANT application
- REC: project proposal writing

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Again:

- *SHARED PROBLEM*
- *SHARED LANGUAGE*
- *SHARED SOLUTION*

If all else fails, try to link with a more popular (and easy to understand) topic.

4. Capacity Building

Forest management toolkit

- Tool for forestry analysts to assist in
  - calculating and verifying areas harvested,
  - protection of conservation areas and buffer zones,
  - validating maps of infrastructure,
  - checking regeneration areas, forest types, forest inventory,
  - estimating volumes, allowable cuts and rotations based on data from earth
- Runs on QGIS platform: www.qgis.org
- Get it from www.denisalder.net/fmt/

General

Marketing is promotion + capacity building.

Especially for the introduction of new technologies capacity building is important at all levels.

Capacity building is the instrument to increase self-sufficiency and make solutions work.

Think of:

- Different instruments for different levels: workshops for decision makers and awareness raising, detailed technical training for professionals.
- Provide follow-up. Getting funding for good capacity building is difficult: everybody agrees that it is important, but nobody has time.
- Training is usually part of funding of big projects that are managed by big companies or ministries, as a consequence capacity building is forgotten (in the end).
- Aim at small budgets that are available without having to tender.

Examples & references

GEONetCab capacity building web www.geonetcab.eu
compilation of tutorials, references, open-source software, etc.

GEO Portal: www.earthobservations.org

More references

A Rough Google Earth Guide

MEASURE Evaluation Global Positioning System Toolkit (USAID)

Handbook of Research on Developments and Trends in Wireless Sensor Networks: From Principle to Practice

Further details:

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www.geonetcab.eu