GEO Forest Carbon Tracking Task (CL-09-03b) – Progress Report -

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GEO FCT Team Website: www.geo-fct.org
Why Forests - Why Carbon?

- A large proportion (up to 20%) of global emissions are thought to arise from tropical deforestation

- Reduced deforestation and increased reforestation is a rapid response to reducing emissions

- For countries, there are potentially very significant environmental, social and economic benefits and implications that parallel the climate benefit (e.g. biodiversity…)

- Design of effective national forest monitoring systems that can serve UNFCCC - Climate Change negotiations, is a key decision at COP-15 (Copenhagen 2009)

- Therefore efforts on designing of operational forest monitoring systems must focus on these economic and policy drivers, not on technology
What is REDD?

The basic idea behind Reducing Emissions from Deforestation and Degradation (REDD) is simple:

“…Countries that are willing and able to reduce emissions from deforestation should be financially compensated for doing so….”
The Story so far (selected) …..

<table>
<thead>
<tr>
<th>Date</th>
<th>Event</th>
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<tr>
<td>Dec 05</td>
<td>COP-11 in Montreal - Papua New Guinea and Costa Rica table the first proposal to &quot;stimulate action to reduce emissions from deforestation&quot;.</td>
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<td>Oct 06</td>
<td>The Stern Review draws global attention to the financial impacts of climate change and the importance of curbing deforestation.</td>
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<td>Oct 07</td>
<td>The World Bank launches the Forest Carbon Partnership Facility (FCPF).</td>
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<td>Dec 07</td>
<td>COP-13 in Bali - The Bali Roadmap envisages 2 years to negotiate REDD in its final form. -&gt; Bali Action Plan for REDD.</td>
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<td>June 08</td>
<td>Congo Basin Forest Fund is set up to battle deforestation in central Africa.</td>
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<td>Aug 08</td>
<td>Brazil’s President Lula launches international ‘Forest Fund’ to raise $21 billion by 2021. Norway pledges €1 billion to the fund through to 2015.</td>
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<td>Oct 08</td>
<td>The Eliasch Review concludes that market-based mechanisms are essential to reach the levels of funding required to halt deforestation.</td>
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<td>2008/09</td>
<td>Creation of GEO Forest Carbon Team Project to address Monitoring, Reporting and Verification of REDD</td>
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Draft decision text for Copenhagen:

[Draft decision [-/CP.15]

Decision on methodological guidance for activities relating to reducing emissions from deforestation and forest degradation and the role of conservation, sustainable management of forests and enhancement of forest carbon stocks in developing countries

(c) To establish, according to national circumstances and capabilities, robust and transparent [national forest[1]] monitoring systems and, if appropriate, subnational systems as part of national monitoring systems that] [forest 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) [Ensure that these monitoring systems and their results are open to independent review as agreed by the Conference of the Parties;]
Forest Carbon Tracking Goals
(task approved during GEO-V Plenary – Budapest, November 2008)

- Closely aligned with UNFCCC policy discussions, and negotiations on post-Kyoto treatment of emissions from managed and unmanaged lands.
- Demonstrate that coordinated Earth Observations, validated by in-situ measurements, and properly linked to forest models, can provide the basis for reliable information services of suitable consistency, accuracy and continuity to support forest carbon Monitoring, Reporting and Verification (MRV); …leading to eventual establishment of a global network of national forest carbon monitoring systems
- Define a set of methods, interoperability standards and requirements that sovereign nations can adopt to provide the most accurate results, relying on the full potential of existing observational and processing capabilities
GEO Forest Carbon Task - Objectives

- **Consolidation of observational requirements** leading to delivery of annual, mid-resolution global forest-change monitoring information,
- **Demonstrate initial capability** via establishment of regional demonstration/reference test-sites,
- **Coordination of protocols** for consistent field measurement and validation
- **Coordination of data analysis tools and standard methodologies**
- **Production of reference documents and datasets**
- **Improved access to observations, datasets, tools and expertise and associated capacity building activities.**
Four key issues that can be addressed by spatially explicit MRV systems:

- **Leakage**: displacement of deforestation from one area to another—argues for complete coverage of monitoring system

- **Permanence**: requires long term, continuous time series data for monitoring, to ensure no relapse of deforestation

- **Baselines**: consistent monitoring from archival data allow historical baselines to be used: spatially explicit baselines also allows sub-national trends to be studied

- **Additionality**: proposed monitoring must show improvement (‘delta’) to business-as-usual progress and/or that activity is otherwise not economically viable
Task Organisation 1: Co-leads

- Australia (Department of Climate Change & CSIRO)
- Japan (JAXA)
- Norway (NSC)
- CEOS (ESA)
- FAO
- GTOS (GOFC-GOLD)
Task Organisation 2: Participants

- Canada (CSA & CFS)
- The Netherlands (WU)
- USA (USGS & Woods Hole Research Center)
- Brazil (INPE)
- Japan (Restec & NIES)
- Australia (Geoscience Australia; CRC Spatial Information)
- Norway (UMB & KSAT)
- Thailand (GISTDA)
- Google
- EC/JRC
- CEOS Agencies
Forest information products

A yearly, wall-to-wall, medium-resolution global ‘system of systems’ forest monitoring approach has been identified as the best suited to cover a wide range of potential outcomes of the policy-framework negotiations.

The first priority information product to demonstrate will be a wall-to-wall forest, non-forest map, produced at least annually at best available resolution (preferably <30m).

Additional products (like Annual Forest, Non-Forest trends and associated accuracy metrics, Forest Degradation & trends, etc....) will be subsequently produced in a stepped approach when moving towards an operational system.
GEO FCT task deliverables

- Establish guidelines for annual, mid-resolution global forest-change monitoring program
- Optical + SAR data acquisition strategy agreed and established via CEOS agencies
- Identifying future missions under development vital in securing data continuity
- Satellite data processing, accuracy assessment and correction methods widely agreed and documented
- Consistent field measurement guidelines and protocols implemented across National Demonstrators National Demonstrators and Verification Sites established in consultation with national governments, NGO’s and expert teams Forest reference datasets and change products agreed and routinely produced by national/regional activities
- Provision of in-country access to observations, datasets, tools and expertise and associated capacity building activities
Guidelines for Establishment of National Demonstrators

- Countries with stated intent to develop national forest carbon monitoring systems
- Large areas to demonstrate repetitive, wall-to-wall, accurate wide-area forest mapping capabilities
- Relevant national forest management authorities in ND countries being involved
- Verification sites with appropriate in-situ observations supported by representative scientific studies
- Clear management and governance arrangements being outlined
- Resources for processing and analysis of the satellite and in-situ data clearly identified
- Donor countries and/or NGO’s are clearly identified should support be required
National Demonstrators 2009

- Brazil
- Guyana
- Mexico
- Indonesia (Borneo)
- Australia (Tasmania)
- Cameroon
- Tanzania

- For 2010 and beyond, expansion of network of national monitoring systems to Colombia, Peru, DR Congo, etc., and additional sites to be defined by UN REDD & FAO
- Utilise synergy with CEOS LSI Constellation regional areas and FAO FRA 2010 sites
- Note: Final area and coverage of each verification site is being finalised in conjunction with key governmental institutions in these countries.
Documented Progress to date (1)

- Approved and initiated work Plan, including country, organisation or institute commitments

- Document on Satellite Optical/ SAR Data Requirements and systematic acquisitions strategies released (June 2009), and relevant data acquired during 2009

- Achieved CEOS Resolution on Data Acquisition in support of the task’s Forest Monitoring Objectives

- Definition of the National Demonstrators and documented National Demonstrators process (June 2009)

- Satellite Data Processing mechanisms being established (release September 2009)
Documented Progress to date (2)

- Field Measurement guidelines and protocols under establishment (Initiated, expected release October 2009)
- Document on accuracy assessment and verification (Initiated, expected release October 2009)
- Document on data and model linking and visualisation (initiated, expected release October 2009)
- Technical workshops: Brazil 09/08, Australia 04/09, Italy 05/09, Thailand 07/09, Japan 08/09, UK (10/09)
CEOS Communique - highlights:

CEOS will coordinate with the other GEO Co-leads in order to establish and deliver 5 key joint outcomes of the GEO task on Forest Carbon Tracking for 2009:

1) Agreement among willing CEOS Member agencies to ensure availability of current and future data supply on a basis adequate for the implementation and operation of continuous services;

2) Documented procedures to secure interoperability of optical and SAR sensors based on case study results;

3) Documented procedures on linking wall-to-wall, time series satellite data coverage to (1) ecosystem models and (2) traditional forest inventories, to consistently estimate carbon stocks at project and national scales;

4) Validation procedures for satellite applications in forest monitoring;

5) Visualisations of progress and demonstration results for GEO-VI and COP-15, making clear the capacity of these initiatives to support policy objectives.
GEO FCT National Demonstrators
Welcome

The GEO Forest Carbon Tracking portal provides users with the latest information on the status and progress of the GEO FCT task.

Information available includes visualisations of the GEO FCT National Demonstrator sites, the current status of satellite and in situ data acquisitions, and example Forest Carbon products.

Background

Urgent coordinated international action and monitoring has been called for by the Intergovernmental Panel on Climate Change (IPCC), in the area of mitigation of global warming driven by anthropogenic greenhouse gas emissions. Global agreement on robust and comparable national monitoring, reporting and verification (MRV) systems is needed, to increase the accuracy (i.e. in terms of robustness and consistency) in the various national forest carbon emissions estimates.

Thus GEO has formally established a new task on Forest Carbon Tracking (FCT) to demonstrate that coordinated global Earth Observation combining in-situ forest inventory, satellite observations of forests and ecosystem models, can provide robust and reliable contributions to spatially explicit national forest monitoring programs and emissions reporting schemes.
GEO FCT Portal

Early Mockup
Landsat over Borneo
Status of acquisitions by end of July, 2009

173 2009 ETM+ Scenes in USGS Archive (May – August)

No Landsat 5 TM data available from the USGS archive.

Request for Landsat 5 support to Thailand, GISTDA
FCT task forthcoming events - 2009

October 19-22 FCT  Team review and planning meeting
  • Review the progress against expected outcomes, including inter-comparison analysis of the SAR and optical results products and available in-situ data
  • Finalize presentations and exhibit for GEO VI
  • Discuss preliminary Plans for 2010 and onwards

November 3-5  CEOS Plenary
  • Discuss data management and access
  • Discuss data acquisitions Plans for 2010 and onwards
FCT task forthcoming events - 2009

November 17-18 GEO VI
- Present achievements
- Exhibition and demonstration of a prototype FCT Portal
- Define preliminary Plans for 2010, including inclusion of new Demonstrator countries and onwards

December 8-18 COP 15
- Visibility and recognition of GEO FCT task will require coordination and support from GEO Members and Participating Organizations.
- Finalization of a plan of actions at October meeting
FCT task key technical event - 2010

Spring 2010
FCT task “data summit” meeting

• Review results of first demonstration over seven countries

• Provide feedback and recommendations on the key aspects for long term approach, including data acquisition strategies, methodologies, standards, …..
Australian Contribution to Regional FCT Activities

S.E. ASIA PROJECT AREA
Map of satellite ground station reception areas for Landsat data.

- **Thailand**
- **ACRES**
- **EROS Data Centre**
- **Indonesia (Landsat 7 ETM only)**
  - Note: the full extent is not shown here - just the infill areas not covered by Thailand and ACRES.
ALOS PALSAR
Data Coverage of S.E. Asia

Acquisition Year: 2007
Radar Mode: Dual Polarisation (HH+HV)
Look Angle: 34.3 deg
Orbit Direction: Ascending
Coordination of Satellite Data Acquisition by GA LAPAN GISTDA
Initial CSIRO Processing Results: TASMANIA Demonstrator

Forest classification derived from Landsat 2007

Forest classification derived from PALSAR 2007
Work with the Netherlands on wide area SAR mapping methodology: map result

ALOS PALSAR 2007

LULC classification
Borneo

- Lowland forest
- Riverine forest
- Swamp forest
- Mangrove forest
- *Nipah* mangrove forest
- Peat swamp forest (pole)
- Peat swamp/riverine shrub
- Forest mosaics/degraded
- High shrub
- Medium shrub
- Ferns / grass
- Grassland
- Cropland (upland)
- Cropland (irrigated)
- Plantations (oil palm)
- Tree cover, burnt
- Water bodies
- Layover /Shadow
- No strip coverage
- Mountain forest
Forest Cover Change

Forest cover change
2005 - 2007
Central Kalimantan Peatlands Project

Legend:
- Forest
- Deforested
- Water bodies
  - Large settlement
  - Provincial boundary
  - Parks and reserves

Map projection: Geographic
Ellipsoid: WGS84
Datum: WGS84
Spatial resolution: 30 meters
Map produced: 30-09-2009

SatVision

Forest Carbon Tracking
GEO Task CL-05-B35

GEO S&T Committee Meeting – Melbourne, Australia - 16 Sept 2009
Extra Slides
“REDD” options and parameters:

**32 Proposals** for “REDD” mechanism:
- 19 National/regional proposals
- 13 Institutional/organisational proposals

**Characterised by:**
- Scope
- Reference Level
- Distribution
- Finance mechanism(s)
**Scope options:**

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<td><strong>RED</strong></td>
<td>Reducing Emissions from Deforestation</td>
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<tr>
<td><strong>REDD</strong></td>
<td>Reducing Emissions from Deforestation and Degradation</td>
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<tr>
<td><strong>REDD+</strong></td>
<td>Reducing Emissions from Deforestation and Degradation and enhancement of carbon stocks</td>
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<tr>
<td><strong>{AFOLU}</strong></td>
<td>Proposal to include Agriculture, Forestry and other Land Use in the REDD process (IPCC guidelines for GHG inventories)</td>
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Reference Level & Scale options:

Reference point:

- Historical baseline (demonstrate actual reductions and simplicity of the methodology)
- Historical adjusted baseline (development adjustment)
- Projected baseline (anticipate future changes)

Scale:

- Sub-national (transitional mechanism to national scale, capacity building)
- National (strong consensus)
- Global (concern on international leakage, allows benefit distribution to historically low deforesting countries)
Financing

- **Funds** are considered to be more appropriate for capacity building and demonstration activities.
- **Market-linked approaches** can be used to scale up the implementation of REDD activities.
- **Direct market** approach potentially involving both private and public sector financing.
- Many propositions favour a mixed and "**Phased**" approach (combination of above depending on maturity of beneficiary country).

Source: F. Achard, EC-JRC
Key GEO Transverse Issue: Data Management & Access Guidelines

• Task needs to provide a clear framework for providers of data and products – spanning national forestry bodies, national space agencies, commercial satellite data providers and data processing institutions – by providing them with confidence that their data will be managed in a responsible way in support of the GEO FCT objectives, and consistent with data protection requirements indicated by each provider.

• To define mechanisms for Users to access and use data and products.

• Version 2.1 circulated to CEOS space agencies on 2nd September.
GEOSS Data Sharing Principles

- Imply - “….full and open exchange of data, metadata, and products shared within GEOSS, recognizing relevant international instruments and national policies and legislation…”

- The medium to long term goal for the GEO FCT

- GEOSS data sharing principles still in development – so FCT demonstrator data management and access guidelines document has been prepared to define the arrangements for handling and process of the data and the circulation of derived products.
Institutional arrangements – coordinated by GEO

- Reliant on (beyond the different satellite and in situ data providers) two main functional elements, (i) a network of Processing Hubs and (ii) the FCT demonstration phase Portal
Network of Processing Hubs

• Interim framework responsible initially for providing consistent annual, mid-resolution ‘forest change’ map products for the NDs.
• Two types of “nodes”:

Global processing facilities, in principle related to a given satellite sensor, that will process and deliver “standardized data products” derived from level 1 image products.

Regional processing facilities (hubs), which, working with National Demonstrator countries, will process and deliver required forest and carbon information products.

• informal collaborations among regional space agencies, data management agencies and expert remote sensing groups – TOR document is in development
Data/Products Access Considerations

- Only an international partnership working in open and transparent manner can ensure that the full potential of remote sensing can be demonstrated and promoted as community effort with significant progress reported in the required timescale.

- All partners to the FCT demonstrator share data for the purpose of deriving demonstrable results, make all data and information available in a format that meet the needs for transparency and independent international verification, and agree that all results derived from the data can be disseminated and exploited without restrictions –through the FCT portal.
Data Access document

- Any comments requested from CEOS space agencies by Friday 18th September
Thank you

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The Centre for Australian Weather and Climate Research
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