



GROUP ON  
EARTH OBSERVATIONS

## GEO-VI

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### The Forest Carbon Tracking Project

Document 8

for information



## **The Forest Carbon Tracking Project**

### **1 OBJECTIVES**

The Forest Carbon Tracking Project (Task CL-09-03 b) has been undertaken by the Group on Earth Observations (GEO) as part of the 2009-2011 GEO Work Plan. The objectives of the project are:

- to demonstrate that coordinated Earth observations can provide reliable information of suitable consistency, accuracy and continuity to support forest carbon monitoring, reporting and verification; and
- to define a set of standards and requirements that any methodology should adopt to provide the most accurate results relying on the full potential of existing observational and processing capabilities.

Once demonstrated, and if accepted in support of policy implementation, the medium/long term objectives would be to facilitate the implementation of an operational information system (observations, processing of relevant forest cover information, and information distribution) able to support the implementation of National Monitoring Reporting and Verification (MRV) Systems.

### **2 MONITORING APPROACH AND ISSUES ADDRESSED**

A yearly, wall to wall, medium resolution (20-30m) monitoring approach has been identified as the best suited for covering a wide range of potential outcomes from the policy framework negotiations. This is the approach that will be demonstrated.

The task addresses the following 4 key outcomes that need to be ‘secured’:

- **Data and information:** To provide an affordable, continuous and accessible supply of mid-resolution satellite data, both optical and radar, supported by processing of relevant forest cover information (areas of deforestation and degradation);
- **Interoperability of various remote sensing instruments:** To demonstrate a capability to derive comparable, agreed forest information products; to ensure continuity and consistency of historical data and methodologies; and to include new emerging sensors (SAR);
- **Ground-truthing:** To “standardise” methods and protocols for linking remote sensing to emissions estimation to the extent that users can presume robustness in technical applications;
- **Validation:** To develop procedures, associated protocols and practices for validation so that users can presume consistency and accuracy in the standards derived.

### **3 SUMMARY OF THE PLANNED ACTIVITIES (FOR 2009)**

This task builds upon existing and planned efforts in forest monitoring, associated modelling and the use of these tools for timely provision of observations required for their routine use world-wide.

In close collaboration with national governments, space agencies, and relevant technical experts, the task will demonstrate this capability initially via the establishment of robust methodologies, satellite acquisition plans and a series of national demonstration areas that, through a coordinated, iterative

process, will define a template for the roll-out of a consistent and reliable global carbon monitoring system. The task therefore includes three main interconnected phases:

- Requirements definition;
- Demonstration;
- Implementation of the operational system

Start-up activities include: (i) establishment of several national demonstration areas; (ii) consolidation of observational requirements and associated products; (iii) securing coordination of observations, including their long-term continuity; (iv) coordinated assessment of tools and methodologies at these sites; (v) coordination of the production of reference datasets; and (vi) improved access to observations, datasets, tools and expertise associated capacity building activities.

#### **4 NATIONAL DEMONSTRATORS**

The Task has established a number of reference demonstration areas – “National Demonstrators” for developing and testing approaches and methods and demonstrating the use of current Earth observation capabilities for assessing long-term, operational forest-cover change and carbon monitoring.

These national demonstrators have been selected as areas large enough to demonstrate the wall-to-wall capability. They contain several verification sites where the in situ/aerial measurement will take place and higher resolution/higher temporal frequency satellite data will be acquired.

##### **4.1 Criteria for selection:**

In order to meet the objectives, National Demonstrators need to have key characteristics to qualify in support of this task, thus leading to a number of selection criteria of a political, programmatic, technical and scientific nature:

- Sites should be located in countries with a stated intent to develop national forest carbon monitoring systems and with a need for capacity building support;
- Relevant national forest management authorities in host countries are involved;
- Clear management and governance arrangements are outlined;
- Donor countries and/or donor NGOs clearly identified (where needed);
- Countries with proposed test-sites and their government institutions committed to having the capability to support ground observations;
- Resources for the acquisition and analysis of the data are clearly identified;
- Timely and specified reporting on progress and deliverables, including specific data products, are available for each site;
- Large areas are included (to demonstrate repetitive, wall-to-wall, accurate wide-area forest mapping capabilities - e.g. Borneo, Amazon);
- Sites include representative scientific projects on forest change, with appropriate in-situ observations;
- The availability of archived satellite remote sensing data (SAR and optical) to demonstrate changes is preferred.

## **4.2 National Demonstrators for 2009**

The following countries are acting as National Demonstrators for 2009:

- Australia (Tasmania);
- Cameroon (whole country);
- Brazil (several areas);
- Guyana (whole country);
- Indonesia (Borneo);
- Mexico (forested area);
- Tanzania (whole country).

The acquisition of satellite data over National Demonstrators started in June 2009 and includes an impressive suite of optical and SAR data.

About 50 Verification Sites have been identified and activities are progressively starting in all of these sites.

Data processing has started and its completion over the seven National Demonstrators is expected in the second quarter of 2010, by means of a “data summit” meeting that will review the results of the first demonstration “cycle”. This meeting will also provide feedback and recommendations on the key aspects for the second demonstration cycle as well as for long term operational approach.

New National Demonstrators are expected to join the task in 2010, with some countries such as Colombia and Peru having already made an official request.

## **5 INFORMATION PRODUCTS, INTEROPERABILITY AND PROCESSING APPROACH**

### **5.1 Information products**

The task has defined the forest information products to be demonstrated in terms of Horizon 1 (first priority) and Horizon 2. Their definition is the following:

Horizon-1:

- Annual, wall to wall Forest/Non-Forest map and trends and associated accuracy metrics, at moderate resolution (<30m).

Horizon-2:

- Forest Degradation (& trends);
- Land-use (e.g. agriculture, shifting cultivation, plantations, native forest), Forest class: secondary forest (e.g. after fire or after agriculture); Softwood, hardwood, native, Plantation type mapping;
- Sparse woody perennial cover

### **5.2 Interoperability**

The task is also establishing a framework with standards for the integration of optical and SAR data to generate consistent time series of forest data stacks, including consistent SAR and optical data processing, classification and trend processing methods, accuracy estimates for relevant remote sensing and ground datasets and linkage with forest models and carbon stocks/carbon stocks changes.

This approach will initially be applied in support of data acquisition and processing related to the 2009 National Demonstrators that are intended to show the feasibility in generating quantitative time-series of Forest Carbon products.

These time series are expected to also include, as a function of the required forest information, comparable and interchangeable products from different sensors, products derived from combinations of sensors and, for each product, estimations of errors, as well as attribution to different error sources.

### **5.3 The Network of processing facilities**

To reach the 2009-2010 goals, the Task has established a Network of Processing Facilities. This serves as an interim framework responsible initially for providing consistent annual, mid-resolution ‘forest change’ time-series of map products for each of the National Demonstrators.

The Network is composed by two types of “nodes”:

- Global processing facilities, in principle related to a given satellite sensor (e.g. Landsat, ALOS Palsar) that will process and deliver “standardized data products” derived from level 1 image products; and
- Regional processing facilities, which, working with National Demonstrator Countries, will process and deliver required forest and carbon information products for a given region of the world.

The Network will provide support to Countries in the processing activities (totally or partially). It will ensure a coordinated review of products derived from different sensors/processing tools and provide assessment of their accuracy and “comparability”.

National Demonstrator Countries are an integral part of the relevant regional facility and bring to the partnership their in situ data and their practices for Forest monitoring.

## **6 2009 OUTCOMES**

Consistent progress will be demonstrated through the following planned outcomes:

- The definition of the vision, the architecture and the implementation approach for the establishment and long-term operation of a global network of national forest and carbon monitoring systems;
- The development of technical documentation, defining the medium and long term strategy satellite data acquisition, the protocols for ground-based forest measurement and the methodologies for analysis and production of routine forest information products;
- The establishment of well supported “National Demonstrators” (there are currently seven) to perform a first demonstration cycle.

## **7 TASK TEAM LEADERS**

- Australia, Canada, Japan, and Norway;
- CEOS (Committee on Earth Observation Satellites);
- FAO (Food and Agriculture Organization of the UN); and
- GOF-C-GOLD;

## **8 DEVELOPMENTS TO DATE**

- The project Implementation Plan, including country and organisation commitments, has been approved and initiated;
- The National Demonstrators process has been consolidated, National Demonstrators have been defined and activities have been initiated;
- A Document on Satellite Optical/ SAR Data Requirements and systematic acquisitions strategies has been released (June 2009);
- Satellite data are being acquired over the National Demonstrators, starting from June 2009;
- Satellite Data Processing mechanisms have been established and data processing has started;
- Three key documents are being finalized for release in October 2009:
  - Field Measurement guidelines and protocols;
  - Accuracy assessment and verification;
  - Data and model linking and visualisation.
- A number of Technical workshops have been held, in Brazil November '08, Australia April '09, Italy May '09, Thailand July '09 and Japan August '09.