Australian Government
Department of Climate Change

The use of remote sensing in forest carbon estimation: approaches, technical and institutional issues

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The maturing of applications

- The remote sensing of vegetation by satellites has been possible for a long time
  - Recent developments move from research to operations, and forest cover to other forest attributes
- The maturing of applications has seen remote sensing become a part of forest measurement and monitoring, not just a competitor with traditional methods
  - The previous competition between measurement, modelling and remote sensing has become an integration

What data can be remotely sensed?

- There are many forms of remotely sensed data – and even more types of information that can be extracted from it
- Data may be either sampled or wall-to-wall, depending on application
- In each case data and models are needed to determine biomass – just as they are needed to estimate biomass from other (non-mass) measurements

Information types

- For carbon accounting, some relevant information is:
  - Areas of forest, and its change over time (and therefore age)
  - Changes in forest condition (eg degradation)
  - Forest classification (type etc)
  - Forest canopy density, height
  - Tree dimensions
  - Chemical attributes

What sensors are around?

- Types of sensors (nb some are airborne)
  - The most familiar optical, eg Landsat, CBERS, SPOT
  - Radar eg Envisat, Radarsat, Palsar
  - Lidar
  - Hyperspectral
- Some uses integrate multiple sensor types
- Many new sensors are emerging

How to choose a sensor

- Choice should start with the information needed, not preferred sensor/supplier
  - This should be guided by the overall system design (data and models, needed outputs) that dictate sensor information requirements
- Secondary factors (that may be critical) are:
  - Data availability
  - Forest type
  - Cost
  - Processing capacity

Are there set approaches?

- Of the few national systems that currently make use of remote sensing, no two are the same
- As the use of remote sensing matures, it is unlikely that there will be standardisation in system design
- There are no right or wrong approaches – it comes down to the quality and appropriateness of the application given the context and desired outcome

Are there applications standards within approaches?

- Research has provided some principles for application
- GOFC-GOLD and more recently GEO have provided applications guidance
- The onset of such guidance reflects a maturing and growing use, and a move from research to operations
- Quality ground data and post hoc accuracy assessment is essential

Access to data

- Both the cost and availability of data have previously limited applications – but this is changing
- Many of the major providers now supply operational data free on-line
  - Data continuity is a response to operational use
  - Better availability and certainty is encouraging greater use

Resources: human and computing

- Previously both have been a barrier to applications:
  - High capacity computer processing is now very affordable
  - More people are being trained
  - Systems are getting easier to use

Is it coming together?

- Growing understanding of use and role
- Access to affordable data, with continuity
- More people and computing

- So it is looking good from the provider end – but is the user demand and global coordination there?

Provider push or user pull?

- REDD-plus has provided impetus to improve forest measurement and monitoring
- Developing countries are showing a strong interest in using remote sensing
- Many stakeholders have remote sensing as a transparency priority

Is more global coordination needed?

- Coordination of supply, continuity, interoperability and capacity building need networked efforts
- The need (and possibly solution) is similar to that of the meteorological and oceanographic communities

Role of GEO

- The intergovernmental Group on Earth Observation (GEO) is building the Global Earth Observing System of Systems (GEOSS)
  - Forests are a core part of the values addressed in the GEOSS
- With partners, particularly the Committee on Earth Observing Satellites (CEOS) and FAO, the GEO will bring forward a plan for a *Global Forest Monitoring Facility* to the GEO Ministerial Summit in November 2010

GEO Facility Principles

- The facility will operate within GEOSS and according to the GEO Data Sharing and Interoperability Principles;
- Development of the plan will encourage country ownership by recognising, responding and adapting to country needs as they evolve;
- The initial priority for the facility will be to serve REDD+ needs;
- The facility will provide support to national MRV activities, international organisations, NGOs, scientists and others, as an information system for the world's forests;

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- The expanded task will enhance the completion of the existing suite of National Demonstrators;
- Effort shall be made to identify and coordinate with related activities and entities with relevant mandates and responsibilities;
- Attention to be given to the international context, and in particular compliance with the decisions within SBSTA, and pro-active engagement with the IPCC;
- The facility architecture must be designed such that it supports the participation of different levels of technological sophistication of users;
- The facility will be based on open source software;
- Whilst operational in nature, the facility design should have an aggressively pursued research component.

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GEO Facility Scope

- The facility will support the inclusion of forests in the emissions inventory reporting obligations of countries participating in REDD+, but is not limited by the scope (activities) or participants in REDD+.
  - A coordination function for securing global coverage of forested areas by satellite sensors and in-situ observations – for regular and routine monitoring of forest extent and state, providing transparent and robust, country-based reporting.
  - Methods and protocols for data handling, production of information from remote sensing, field inventory and modeling, and for the sharing of that information.

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- A data processing and forest information delivery system for the handling, combination and exploitation of the multi-sensor input, and large volumes of data and information.
- Technical and institutional capacity building activities in relation to all aspects of the successful uptake and application of the facility by countries with different levels of technological sophistication of users – complementing existing efforts of FAO and others.
- Support to accounting and reporting methods that are fully transparent and accessible.