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The Global Forest Observations Initiative: fostering the use of satellite data in forest measurement, reporting and verification

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Multilateral organization incentives and emerging carbon credit markets could benefit national governments, which can demonstrate reduction of emissions from deforestation and forest degradation. Such demonstration requires a credible national forest monitoring system. The Global Forest Observations Initiative was developed to foster the sustained availability of satellite Earth observations for national forest monitoring systems and assist countries to make the best use of these observations in multinational framework reporting or for improved management of their natural resources.

Background

▪ Policy perspectives

Emissions from deforestation, forest degradation and associated land use change may amount to as much as 17% of all global GHG emissions. Since the 11th COP of the UNFCCC – when in 2005 Costa Rica and Papua New Guinea requested a new agenda item called ‘Reduction of Emissions from Deforestation’ – subsequent COPs have provided further guidance and scope to addressing this important element of climate change.

COP15 requests developing countries to develop a national forest monitoring system to estimate emissions and removals associated with REDD+, following the methodological recommendations issued by the IPCC, and COPs 16 and 17 provide additional guidance including on social and environmental safeguards and establishing reference benchmarks for assessing a country’s performance in implementing REDD+ activities [1].

The UN REDD Programme articulates the integral role of satellite Earth observation in its advice to developing countries on the methodology of developing a national forest monitoring system [1].

▪ Financial implications

Against these international policy backdrops, national governments are making significant investments to reduce forest-related emissions. Multilateral frameworks such as the REDD+ Partnership, the Forest Carbon Partnership Facility of the World Bank and various bilateral agreements underpin many of these national investments, with some US\$4 billion dedicated to supporting developing countries in their efforts to reduce forest-related emissions.

Besides these programs, international carbon markets are creating further incentive to reduce forest-related emissions. In 2011, forest carbon project developers reported the highest overall value ever attributed to the global marketplace for forestry offsets – totaling \$237 million, with an increase in carbon market value of some 33% from 2010 to 2011. The reported afforestation/reforestation transacted volume more than doubled in the same period [2].

▪ The role of user-friendly Earth observation

Determining the effectiveness of framework programs and national investments requires credible national forest monitoring systems, and this in turn requires a national satellite land monitoring system [1].

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As COP requirements began to emerge, the Group on Earth Observations (GEO [101]; a voluntary partnership of 88 governments and 64 international organizations with a mandate in satellite Earth observation) announced in 2008 a pilot demonstration to facilitate the supply and use of satellite observations of forest and land cover: the Forest Carbon Tracking (FCT) task.

The FCT worked with 11 National Demonstrator countries, mostly countries with significant tropical rainforest area, to demonstrate the feasibility of coordinating the supply of satellite data for a participating country and working with the demonstrator countries to build capacity to utilize the satellite data in concert with conventional ground observations. The FCT also performed research to determine best approaches to land characterization in the 11 countries using different remote sensing tools. In support of this activity, the space agencies of the Committee on Earth Observation Satellites [102] established a Space Data Coordination Group (representing 12 space agencies) to coordinate the acquisition and provision of satellite data. **Figure 1** shows the application of a time series of remote sensing to show changes in forest cover in Indonesia.

The commitment of so many space agencies to providing data for an ongoing program with such potentially high fiscal stakes was unprecedented. The successes of the FCT gave the GEO confidence to move toward an operational program: the Global Forest Observations Initiative (GFOI). While the FCT will continue capacity building, research-oriented demonstration and testing functions, the 2012 start-up phase of the GFOI represents the creation of a sustained provision of satellite observations for forest status and change measurement [3].

▪ **The GFOI**

In its fledgling year of 2012 GFOI identified four core areas of endeavor and corresponding courses of action.

Space data supply

The Committee on Earth Observation Satellites Space Data Coordination Group continues to coordinate with its membership of satellite data providers to acquire data for the National Demonstrators. In parallel it is also developing a baseline global data acquisition strategy – the background coverage guaranteed to provide necessary data supply to all countries in need. The GEO–FCT portal is the foundation for an information system to serve as a metadata base on availability of geospatial information in support of national forest information systems, including satellite data acquisitions [103].

Capacity building in forest countries

The fundamental objective of GFOI is to help nations develop a capacity to utilize Earth observation data in a credible national forest monitoring system. The FCT–GFOI will broaden its capacity-building activities from its initial focus on the National Demonstrator regions to priorities coordinated with GFOI participating countries and multinational framework organizations.

Methods & guidance documentation

The GFOI has assembled an international team of experts in remote sensing, forestry, IPCC methodology and multinational framework perspectives to produce a single user-friendly reference document that provides national governments with end-to-end guidance in use of remote sensing and ground observation data to derive the information required for rigorous measurement, reporting and verification. The methodology will be presented in logical progression and accessible language, and will draw on accepted practices and related work, notably that of Global Observations of Forest and Land Cover Dynamics. It will also be used as a reference for future capacity building training and workshops and will have an online presence with linkages to relevant materials.

Research & development

The main objective of the R&D activities is to promote further integration of the current and near-future observation systems and to progress integration of satellite data into carbon models. For example, the emerging need to characterize forest degradation over large areas could be addressed using remote sensing once methodologies currently under development have been rigorously demonstrated.

Future perspective

Achieving GFOI's goals requires coordination with multilateral organizations such as the FAO, the World Bank, UN REDD+ and UNFCCC; coordination of data acquisition with the world's leading space agencies; development of guidance in methodology and procedure; assurance that the development of a methodology is consistent with IPCC guidelines; and ensuring that it is accessible and user friendly so as to assure it will be useful in a developing capacity to utilize the data in recipient countries. These requirements have led to a wide range of stakeholders in GFOI and a promising start.

The GFOI's future effectiveness will be a function of its coordination and engagement with its intended

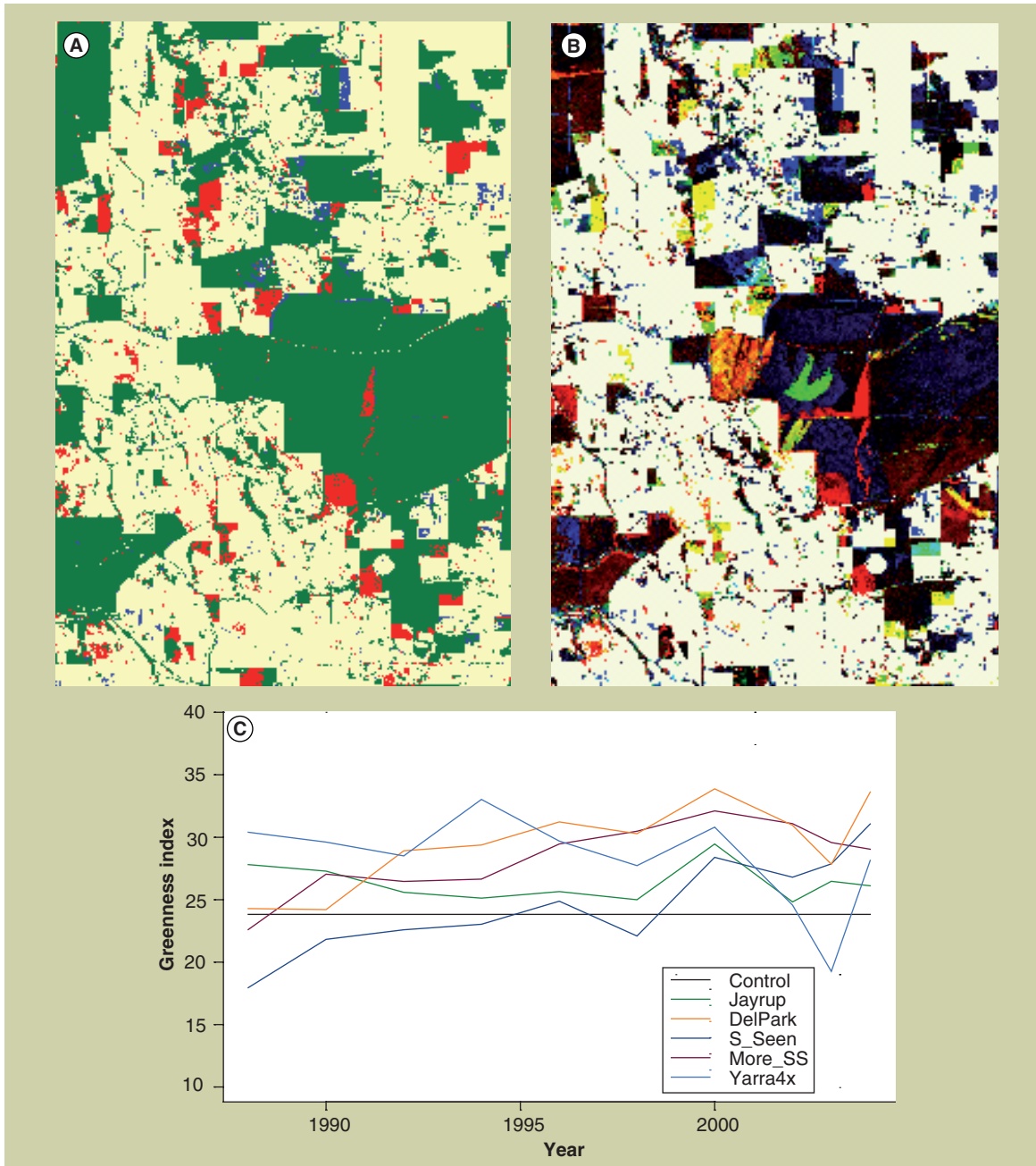


Figure 1. The use of satellite data to document trends in time series of forest presence/absence. (A) Time series forest presence/absence map. Forest presence/absence is represented in a given time epoch as forest or nonforest. Given a time series of forest presence/absence, the presence/absence information may be summarized as green: stable; red: cleared; blue: regrowth; and beige: agriculture. **(B)** Within each forest area, the forest trend for a particular area can be graphically depicted as hot colours (e.g., red and orange) representing degradation and improvement as cool colours (e.g., green and blue). **(C)** Trends in particular sites or areas can be depicted relative to a unitless index (e.g., a greenness index) giving an ordination from forest to nonforest [4]. Greenness index trends adjusted for control area mean.

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beneficiaries; that is, the multinational organizations and the participating developing countries we wish to serve.

The ability of space agencies to assure regular wall-to-wall national coverage will derive from the global acquisition strategies that many Space Data Coordination Group space agencies are currently implementing. The challenges to GFOI lie in putting this data to work by assuring the acquired data is available to participating countries; providing a clear methodology guidance reference for direct use by national governments or for use by capacity building trainers to the same end; and broadening the suite of participating countries apace with their capacity to utilize GFOI's services.

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Executive summary

- Emissions from deforestation, forest degradation and associated land use change may amount to as much as 17% of all global GHG emissions.
- Since 2005 the UNFCCC has requested of, and provided guidance to, developing countries in their development of a national forest monitoring system to estimate emissions and removals associated with the REDD+.
- National governments are making significant investments to reduce forest-related emissions. Multilateral frameworks such as the REDD+ Partnership, the Forest Carbon Partnership Facility of the World Bank and various bilateral agreements underpin many of these national investments, with billions of dollars pledged.
- International carbon markets are creating further incentive to reduce forest-related emissions.
- Determining the effectiveness of framework programs and national investments requires credible national forest monitoring systems, and this in turn requires a national satellite land monitoring system.
- The Global Forest Observations Initiative (GFOI) was developed to foster the sustained availability of satellite Earth observations for national forest monitoring systems, and to assist countries in using these observations in multinational framework carbon emissions reporting or for improved management of their natural resources.
- In support of this activity the space agencies of the Committee on Earth Observation Satellites established a Space Data Coordination Group (representing 12 space agencies) to coordinate the acquisition and provision of satellite data.
- In pursuit of its fundamental objective to help nations develop a capacity to utilize Earth observation data in a credible national forest monitoring system, the GFOI will broaden its capacity building activities to priorities coordinated with the GFOI participating countries and multinational framework organizations.
- The GFOI has assembled an international team of experts in remote sensing, forestry, IPCC methodology and multinational framework perspective to produce a single user-friendly reference document, which provides national governments with end-to-end guidance in use of remote sensing and ground observation data to derive the information required for rigorous measurement, reporting and verification.
- GFOI R&D activities aim to promote further integration of the current and near-future observation systems and to progress integration of satellite data into carbon models.
- Achieving the GFOI's goals requires coordination with multilateral organizations such as the FAO, the World Bank, UN REDD+, UNFCCC and with its intended beneficiaries – the participating developing countries we wish to serve.
- The challenges to the GFOI lie in integrating its component elements: assuring the ongoing acquisition of data; assuring the acquired data is available to participating countries; providing a clear methodology guidance reference for direct use by national governments or for use by capacity building trainers to the same end; and broadening the suite of participating countries apace with their capacity to utilize the GFOI's services.



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