

## forest carbon tracking

### TAKING STOCK OF OUR FORESTS

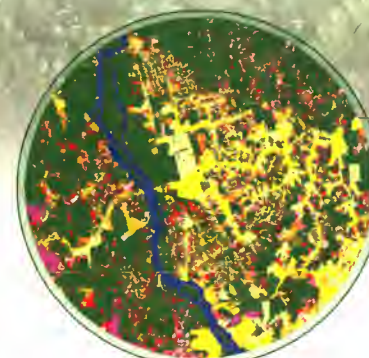


**Responding to the urgent need to reverse deforestation, the Forest Carbon Tracking initiative has been set up to provide accurate data and robust tools for countries aiming to monitor and assess their stocks of forest carbon**

Established in 2008 through the Group on Earth Observations (GEO), the Forest Carbon Tracking (FCT) initiative facilitates access to long-term satellite, airborne and *in situ* data, and provides the framework, tools and technical standards to assist countries in the development of national forest carbon tracking systems.

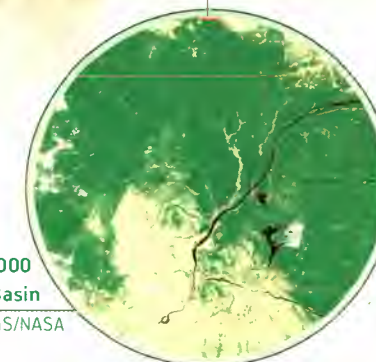
This GEO initiative follows guidelines set down by the United Nations Framework Convention on Climate Change (UNFCCC) and offers a comprehensive mechanism to support national efforts to implement the Convention.

Member governments from GEO, key UN bodies, space agencies, members of the science community and private sector have teamed up to realise the FCT initiative.



Logging and forest degradation in Brazil based on Landsat 2009 data  
© INPE/USGS/NASA

*Addressing deforestation, Brazil has one of the most advanced monitoring programmes in the world*



Multi-temporal composite of 2000 Landsat data of the Congo Basin  
© Hansen (SDSU)/USGS/NASA



## FOREST VALUES

Through their influence on carbon, water and energy cycles, forests play a vital role in regulating Earth's climate. As they also protect the land from erosion, flood and drought, yield food and medicines, and are rich in biodiversity – their value to the global and local environment is without question. Nevertheless, forests are also seen as an important economic resource, which has led to extensive deforestation.

Tackling climate change by reducing the rate at which greenhouse gases are released into the atmosphere

through human activity is arguably the greatest environmental issue we face this century. Since a significant proportion of greenhouse gas emissions are related to deforestation, there is a clear need for international action to monitor carbon stocks and emissions, and implement strategies to reduce the rate at which forests are being lost.

With monitoring carbon content of forest stocks high on the agenda for post-Kyoto Climate Convention negotiation, GEO initiated worldwide action to address Forest Carbon Tracking. The objective is to coordinate the definition, development and validation of robust Earth observation tools and

methodologies to provide evaluations of carbon stored in forests. The aim is to ensure that reliable information of suitable consistency, accuracy and continuity is generated to support a range of forest carbon assessment systems in countries that are aiming to reverse deforestation.

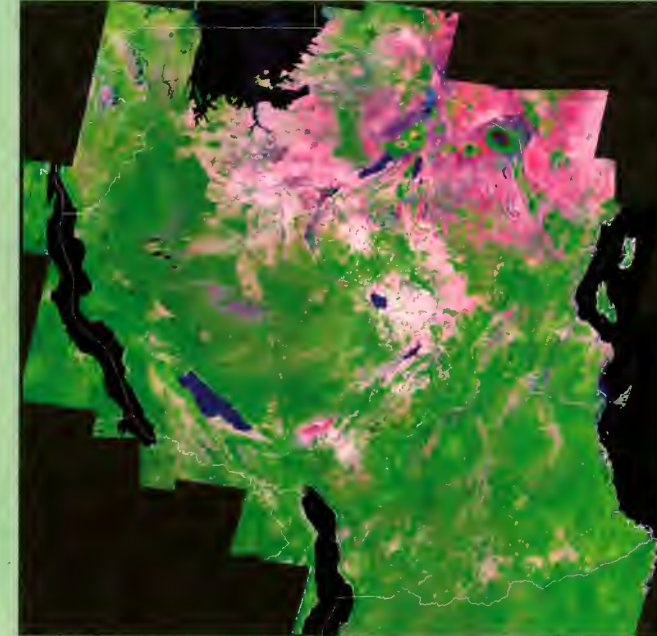
## THE APPROACH

The approach to implementing the FCT initiative involves a combination of satellite data and ground-based measurements to estimate a country's anthropogenic forest-related greenhouse gas emissions, forest carbon stocks and forest change.

Based on geographical maps that should ideally be updated annually, consistent time series of satellite images will help countries implement full 'wall-to-wall' country coverage to avoid leakage.

The idea is to establish, according to national capabilities, robust and transparent national forest monitoring systems. The initiative, therefore, relies upon easy access to a continuous supply of mid-resolution Earth observation satellite data and sufficient *in situ* forest measurements for verification.

In addition, appropriate methods for estimating and predicting



Cloud-free composite of Tanzania derived from Landsat data acquired between 2005 and 2009. The optical imagery in the Landsat archive, which goes back 30 years, provides an invaluable basis for long term monitoring of changes in forested areas.

Credits: Hansen (SDSU)/USGS/NASA

*The science is sufficiently developed that reliable reports of forest cover and forest cover change can be produced from satellite observations. Estimates of forest carbon stocks and carbon stock changes can be derived from the integration of satellite observations and ground data. Improvements in both data and methods will further reduce the uncertainties in forest cover change and forest carbon stock estimates.*

Report on the Concept Phase for developing a Global Forest Observations Initiative - 3 September 2010

These three images show an area of south Kalimantan, in the Indonesian part of Borneo. The images illustrate the complementary properties of L-, C- and X-band SAR data. They were all acquired in 2008, by ALOS PALSAR, TerraSAR-X and Envisat ASAR.

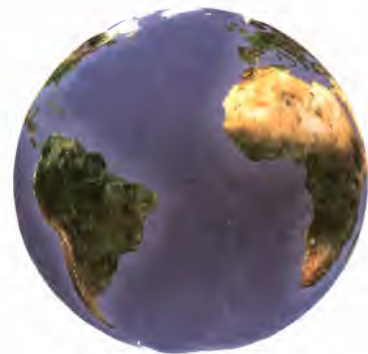
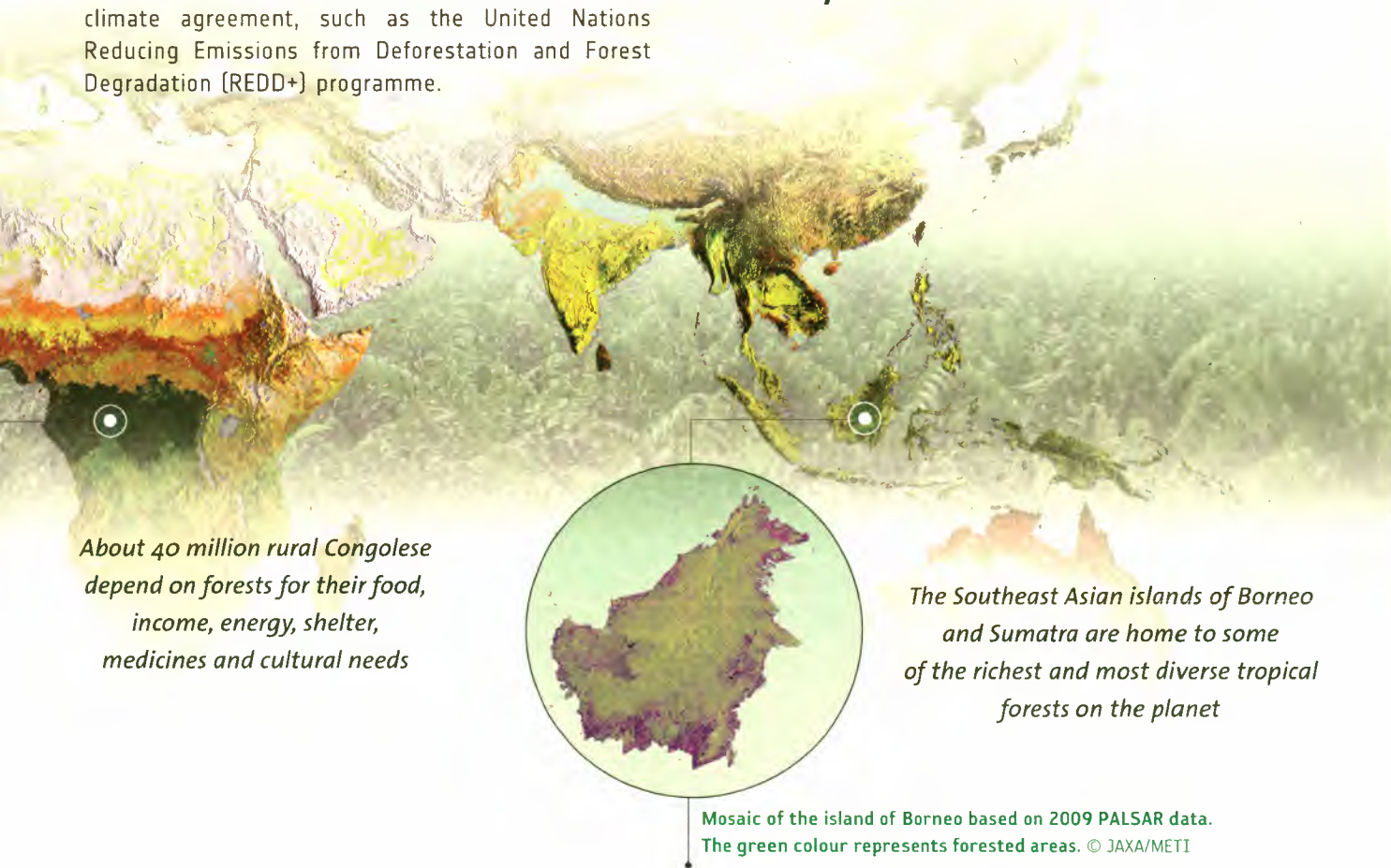


Addressing the need for a coordinated international approach to monitoring carbon stocks and emissions, the FCT initiative was conceived for countries aiming to stem deforestation and account for their forest carbon stocks.

The key to the success of the initiative is based on accurate observations from satellites, which are validated by measurements taken *in situ*, and an operational framework that allows for a range of national forest assessment systems for measurement, reporting and verification (MRV).

Such systems will be a crucial part of any post-Kyoto climate agreement, such as the United Nations Reducing Emissions from Deforestation and Forest Degradation (REDD+) programme.

**Through the first global monitoring system for producing assessments of forest carbon, changes in forest cover will be accurately monitored to ensure that assessments of stocks are credible, transparent and comparable from one country to another**



## THE FCT PARTNERSHIP

The development of the GEO FCT task is being led by governments with a strong interest in forest carbon monitoring: Australia, Canada, Japan and Norway. CEOS and the UN Food and Agriculture Organization (FAO) are two other leading partners, while institutions in GEO member countries, Global Observation of Forest and Land Cover Dynamics (GOFC-GOLD) and the EC Joint Research Centre play important roles.

CEOS has committed resources from the world's space agencies to provide a systematic contribution to the task. The European Space Agency (ESA) ensures the coordination of CEOS inputs. National space agencies engaged to date are: Brazil, Canada, Germany, India, Italy, Japan and the USA. Ten governments agreed to cooperate as 'National Demonstrators' for the project in 2009–2010: Australia, Brazil, Cameroon, Colombia, Democratic Republic of Congo, Guyana, Indonesia, Mexico, Peru and Tanzania.

[portal.geo-fct.org](http://portal.geo-fct.org)



Established in 1984, the Committee on Earth Observation Satellites (CEOS) coordinates civil spaceborne observations of Earth. Participating agencies strive to enhance international coordination and data exchange and to optimise societal benefit. Currently 28 space agencies along with 20 other national and international organisations participate in CEOS planning and activities.

[www.ceos.org](http://www.ceos.org)



The Group on Earth Observations (GEO) is coordinating efforts to build a Global Earth Observation System of Systems, or GEOSS.

GEO was launched in response to calls for action by the 2002 World Summit on Sustainable Development and by the G8 (Group of Eight) leading industrialised countries. These high-level meetings recognised that international collaboration is essential for exploiting the growing potential of Earth observations to support decision making in an increasingly complex and environmentally stressed world.

GEO is a voluntary partnership of governments and international organisations. As of September 2010, GEO's Members include 81 Governments and the European Commission. In addition, 58 intergovernmental, international, and regional organisations with a mandate in Earth observation or related issues have been recognised as Participating Organisations.

[www.earthobservations.org](http://www.earthobservations.org)



future national or sub-national carbon stocks need to be defined. Also spatial-data infrastructure, graphical information systems and web-delivery systems are being developed to produce reports according to IPCC guidelines.

## THE PATH TO IMPLEMENTATION

Paving the way for countries to establish national MRV systems, the initiative focuses on several areas.

As proof of concept, a number of countries acting as 'National Demonstrators' have been established – initially, Australia, Brazil, Cameroon, Guyana, Indonesia, Mexico and

Tanzania and in 2010 they were joined by Peru, Columbia and the Democratic Republic of Congo. The Committee on Earth Observation Satellites (CEOS) member space agencies have committed to providing systematic optical and radar satellite data over the National Demonstrator countries.

In an effort to guide countries on methods for satellite data processing and tools for producing verified information products, teams have been assigned to help each National Demonstrator country develop classification and forest change products. Validation procedures and accuracy assessments are being standardised as far as possible in the demonstration phase, which runs until 2012.

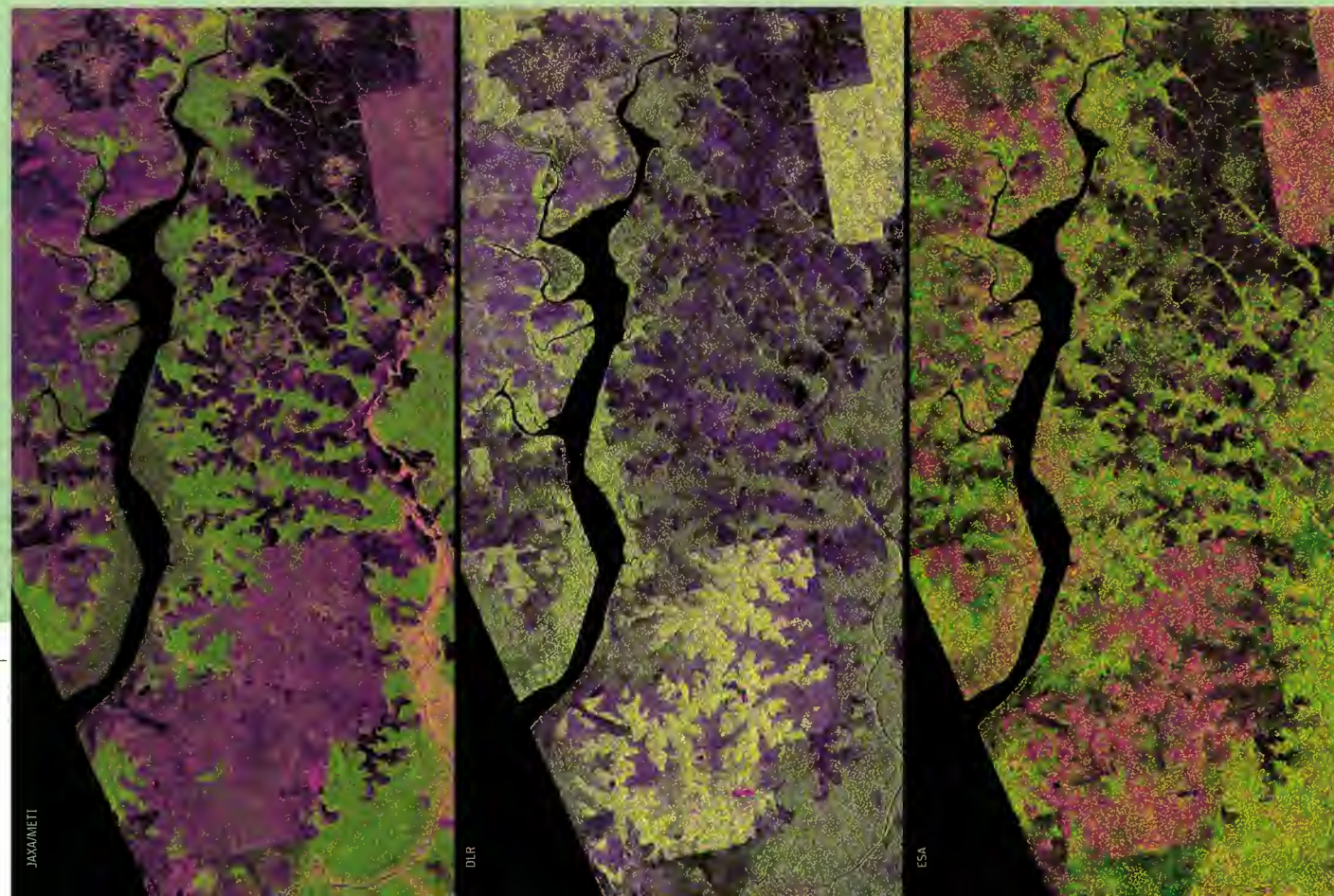
Based on a successful demonstration phase, observations should be gradually raised to a more operational and sustainable level from 2013 onwards. The Global Forest Observations Initiative aims to support the implementation and political acceptance of such systems.

## BUILDING CAPACITY

Building capacity to establish efficient and sustained forest monitoring and carbon accounting systems in developing countries is critical. It requires support for methods and procedures, institutional development, international reporting, training and educational programmes.

The FCT task aims to establish operational forest assessment systems in the following years through the complementary assistance of donor countries, UN bodies, NGOs and technical expert panels currently involved in related capacity building activities. A transition from the proof of concept period to a more operational status is envisaged for 2013.

The development of human and technical capacity in the countries involved is a critical component of the task, as an increasing number of tropical forest countries are expected to join the Global Forest Observation Initiative.



Map showing forest cover change in Central Kalimantan, Borneo, between 2005 and 2007. The areas in red indicate deforested regions. The map was generated using both optical and radar data. Products derived from multiple sensors offer improved observational capabilities. In this case, data were used from the ASAR instrument on Envisat, the PALSAR instrument on ALOS, and optical data from Landsat.

Credits: ESA/JAXA/USGS/NASA



Considerable effort is required to measure vegetation and forests to estimate biomass and validate Earth observation derived biomass maps.

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