



GROUP ON  
EARTH OBSERVATIONS

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GEO Global Forest Observations Initiative (GFOI)-  
Implementation Plan

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## **GEO Global Forest Observations Initiative (GFOI) Implementation Plan**

### **1 EXECUTIVE SUMMARY**

Emissions from forests amount to almost 20% of all global greenhouse gas (GHG) emissions. National governments are therefore making significant investments to reduce emissions from deforestation, forest degradation and associated land use change. Multilateral frameworks such as the REDD+ Partnership, the Forest Carbon Partnership Facility (FCPF) of the World Bank and various bilateral agreements underpin many of these national investments; in total they have dedicated approximately US\$ 4 billion to supporting developing countries in their efforts to reduce emissions from forests.

Determining the effectiveness of these actions and investments depends on the capabilities of national forest monitoring systems. Robust national forest monitoring based on objective observations and measurements is widely accepted as a pre-requisite for countries to participate in international agreements and incentive mechanisms related to forest carbon. Improved monitoring will also enhance the existing reporting frameworks of the United Nations Framework Convention on Climate Change (UNFCCC) and the periodic Global Forest Resource Assessments of the UN's Food and Agriculture Organization (FAO). To operate efficiently and sustainably, national forest monitoring systems require a continuous, timely and affordable supply of observations. The Group on Earth Observations (GEO) seeks to facilitate this supply and use of forest observations through its Global Forest Observations Initiative (GFOI).

The GFOI will:

- foster the sustained availability of observations for national forest monitoring systems and assist countries to make the best use these observations;
- support governments that are establishing national systems by:
  - *providing a platform for coordinating observations*: in order to assure the systematic, sustained and worldwide acquisition and supply of forest observations the GFOI will work with the space agencies of the Committee on Earth Observation Satellites (CEOS), commercial data providers and researchers collecting relevant ground data;
  - *providing assistance and guidance on utilizing observations*: the GFOI will collaborate with national institutions and international bodies such as the FAO and the Intergovernmental Panel on Climate Change (IPCC) to ensure that countries are able to utilize the available data;
  - *developing methods and protocols*: the GFOI will offer guidance on the acquisition and use (including collection, processing and integration) of data for national forest monitoring systems, consistent with and complementary to the work of the IPCC; and

- *promoting ongoing research and development*: the GFOI will seek continuous improvements in the use of observations and the uptake of current forest carbon science;
- work with national governments that report into international forest assessments, such as the Global Forest Resource Assessments of the FAO and the national GHG inventories reported to the UNFCCC using IPCC methods.

## **2 RESOURCES AND PARTNERS**

The GFOI will serve as a platform for (i) coordinating observations of the world's forests, and (ii) connecting the supply and processing of observations with the needs of various national systems. The resources for operating the GFOI will be provided through existing multilateral and bilateral channels. Although the GFOI needs to be resourced, its activities will reduce the overall costs of forest monitoring while improving efficiency and ensuring sustainability.

The GFOI will work through many partners, including: governments that are implementing national forest monitoring systems, UN entities (e.g., UNFCCC, IPCC, FAO/UN-REDD), other intergovernmental bodies (e.g., CEOS), scientific bodies, donor governments, financial and technical assistance bodies (e.g., World Bank), philanthropic organizations, and non-government organizations. FAO is a key partner for the GFOI given its active role in generating information and building capacity. The IPCC, given the synergy between the guidance it provides and the methods and protocols of the GFOI, is also a key partner.

## **3 IMPLEMENTATION SCHEDULE**

The GFOI will be implemented through a phased approach:

- *2012 Start-up Phase* – development of the platform will take place through a GFOI Linkages Forum in 2012. Preparations for the Linkages Forum will take place in the early part of the year following a program of discussions with national governments, partners and potential data suppliers. The GEO Secretariat will lead preparations with guidance from the GFOI Task Force;
- *2013 Commencement of operations* – a funded GFOI project office will be in place at an appropriate host institution and an operational basis will be established for the main GFOI components;
- *2014+ Operations Phase* – the development of methods and protocols, research, user assistance etc., will continue, as will the coordinated delivery of observations and measurements under the long-term strategy.

GFOI activities will evolve from and draw on the foundations of the technical and demonstration activities initiated by the GEO Forest Carbon Tracking (FCT) task and link with other relevant GEO activities. The Start-up Phase will be managed through the GEO Secretariat, with the later Commencement and Operations Phases implemented by a host agency with an appropriate technical and operational focus.

Estimates for the GFOI's annual budget are shown below. The budget foresees four full-time experts (FTE) at the GEO Secretariat during the Start-up Phase, with a reduction to two FTE envisaged in the future indicative budgets. The direct costs contained in the GFOI operating budget include the Linkages Forum, staff, facilities, travel, developing country support, etc. Indirect costs, including for data that space agencies and other suppliers provide to users via the GFOI coordination mechanisms, are not included here.

Year	Total Annual Budget \$	Key Component 1 Budget: Observations Supply & Use	Key Component 2 Budget: Guidance & Science Development	
2012	1,502,000	1,050,000	452,000	
2013	1,150,000	805,000	345,000	The 2013-15 budget is indicative only – to be confirmed in 2012
2014	975,000	683,000	292,000	
2015	1,025,000	718,000	307,000	

Administration of the GEO Secretariat budget dedicated to the GFOI will be the responsibility of the GEO Secretariat Director and managed under the same administrative arrangements as the GEO Trust Fund.

#### **4 RECOMMENDATIONS TO THE GEO-VIII PLENARY**

The GFOI Task Force recommends that the GEO Plenary:

- Note that the GFOI Task Force has brought forward a *GFOI Implementation Plan* as requested by the GEO-VII Plenary in November 2010;
- Accept the Task Force report entitled *GFOI Implementation Plan*;
- Agree to accept contributions to the GFOI from Members and Participating Organizations for the Start-up Phase, which will support dedicated staff and operating costs within the GEO Secretariat for work on the GFOI in 2012;
- Support the holding of the proposed GFOI Linkages Forum;
- Request the Task Force to develop proposals for long term GFOI hosting, governance and future budgets for the GEO-IX Plenary, and to facilitate the preparation of an applications development plan and an observations acquisition strategy.



## PART A

### Context and Approach

#### 1 INTRODUCTION

There is limited understanding of the changing state and dynamics of the world's forests, and therefore high uncertainty in the amount of greenhouse gases (GHG) they release to the atmosphere. The Intergovernmental Panel on Climate Change (IPCC) Fourth Assessment Report (2007) suggests that deforestation, forest degradation and land use change contribute almost 20% of global GHG emissions.

The Parties to the United Nations Convention on Climate Change (UNFCCC) are committed to providing national inventories of greenhouse gas emissions from human activities, including land use, land use change and forestry (LULUCF). The UNFCCC is also considering policy approaches and positive incentives specific to the forest sector (the so-called REDD+ activities) as a way to reduce global GHG emissions. In that regard, the 16<sup>th</sup> Session of the Conference of the Parties (COP 16) to the UNFCCC, via Decision 1/CP.16 (Cancun, December 2010), affirmed that:

*“...in the context of the provision of adequate and predictable support for developing country Parties, Parties should collectively aim to slow, halt and reverse forest cover and carbon loss in accordance with national circumstances, consistent with the ultimate objective of the Convention”*

The need for robust forest monitoring systems to underpin the mechanism is widely accepted. UNFCCC Decision 4/CP.15 requested developing country Parties to:

*“...establish, according to national circumstances and capabilities, robust and transparent national forest monitoring systems and, if appropriate, sub-national systems as part of national 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) Are transparent and their results are available and suitable for review as agreed by the Conference of the Parties;”*

Many developing countries have made clear their intentions to develop national forest monitoring systems and many have already begun. Forest monitoring systems require access to cost effective, timely and appropriate observations. The Global Forests Observations Initiative (GFOI) of the Group on Earth Observations (GEO) has been developed to foster a sustained flow of observations to countries and to assist them in their use.

The GFOI extends the current GEO Forest Carbon Tracking (FCT) task which has been underway since 2008. The GEO FCT focuses on a series of national demonstrators, and on developing methods and protocols for the use of observations in national forest monitoring systems. GEO undertook a concept development phase for the GFOI in 2010, defining the roles that GEO could most usefully

play in forest monitoring. The concept also considered how GEO would work with other global and national institutions with established roles in forest monitoring and reporting. GEO recognized the GFOI can aid data supply coordination and analyses, develop methods and protocols, and build national analytic capacity.

The GFOI will build on the GEO FCT science and demonstration projects. It will focus on the observations supply and methods needed for GHG inventory development and in the future will seek to work with national governments and other relevant bodies to broaden both the supply of observations and their utilization for other forest-related issues such as biodiversity. As the observations used for GHG inventories may also be relevant to biodiversity and other issues, the GFOI will provide wider benefits from improved access to observations.

The GFOI will operate in accordance with the GEO Data Sharing Principles, and the resulting improved access to observations will contribute to most of the societal benefit areas addressed by GEO's Global Earth Observing System of Systems (GEOSS). In particular, the GFOI will contribute directly to the GEO Global Carbon Analysis and Information System. The robustness and utility of methods and protocols developed for the GFOI through the GEO FCT-linked science and demonstration activities will be ensured through peer (expert and government) review.

The GFOI will maintain strong links to the science community, both within and beyond the GEO FCT. Although largely a platform for coordinating observations, the GFOI is science-based and may sometimes commission science projects. The principal inputs to the GFOI will be through the voluntary contributions of the GEO Members and Participating Organizations. The GFOI will maximize its usefulness by seeking to align its approaches, methods and protocols with the emerging international requirements of the UNFCCC, the IPCC inventory methods and the activities of the United Nations Food and Agriculture Organization (FAO). The UNFCCC and FAO reporting mechanisms are the key means by which national governments report into global forest assessment frameworks.

GEO will not directly fund the development of national government systems as other existing multilateral and bilateral arrangements already provide for this. Similarly, the GFOI will not provide forest assessments independent of national governments. Sources of support for GFOI could be broad, potentially including governments, development banks and philanthropic organizations.

While the GFOI will initially be set up from within the GEO Secretariat in 2012, the commencement of operations would logically see a move to a host (or hosts) currently performing like activities. This would be consistent with the normal process of GEO tasks being undertaken as contributions by GEO Members and Participating Organizations. Specific governance arrangements for the GFOI will need to be established for the period after the initial GEO Secretariat hosted start-up activities in 2012.

The GFOI will serve as a platform to link national data needs with the supply of observations. The mission of the GFOI is to:

- foster sustained availability of satellite and ground observations for national forest monitoring systems; and
- assist countries to use the observations for their national systems.

To realize the mission of the GFOI, GEO will engage with other key users, in particular the FAO and the IPCC.

The science is sufficiently developed to enable periodic estimates of forest cover and forest cover change from satellite observations. Estimates of forest carbon stocks and carbon stock changes can be derived from the integrated analysis of satellite observations and ground data. Improvements in both systematic data collection and the methods will, over time, reduce the uncertainties in estimates of forest cover and forest carbon stocks. Continued development of the science and methods, particularly



around estimating emissions from forest degradation, will be important to further reducing these uncertainties.

To define the mission and role for the GFOI, a GFOI Concept Plan was prepared in 2010. The Concept Plan recommendations were accepted by the 2010 GEO-VII Plenary in 2010 and the GFOI Implementation Plan process was established (Box 1).

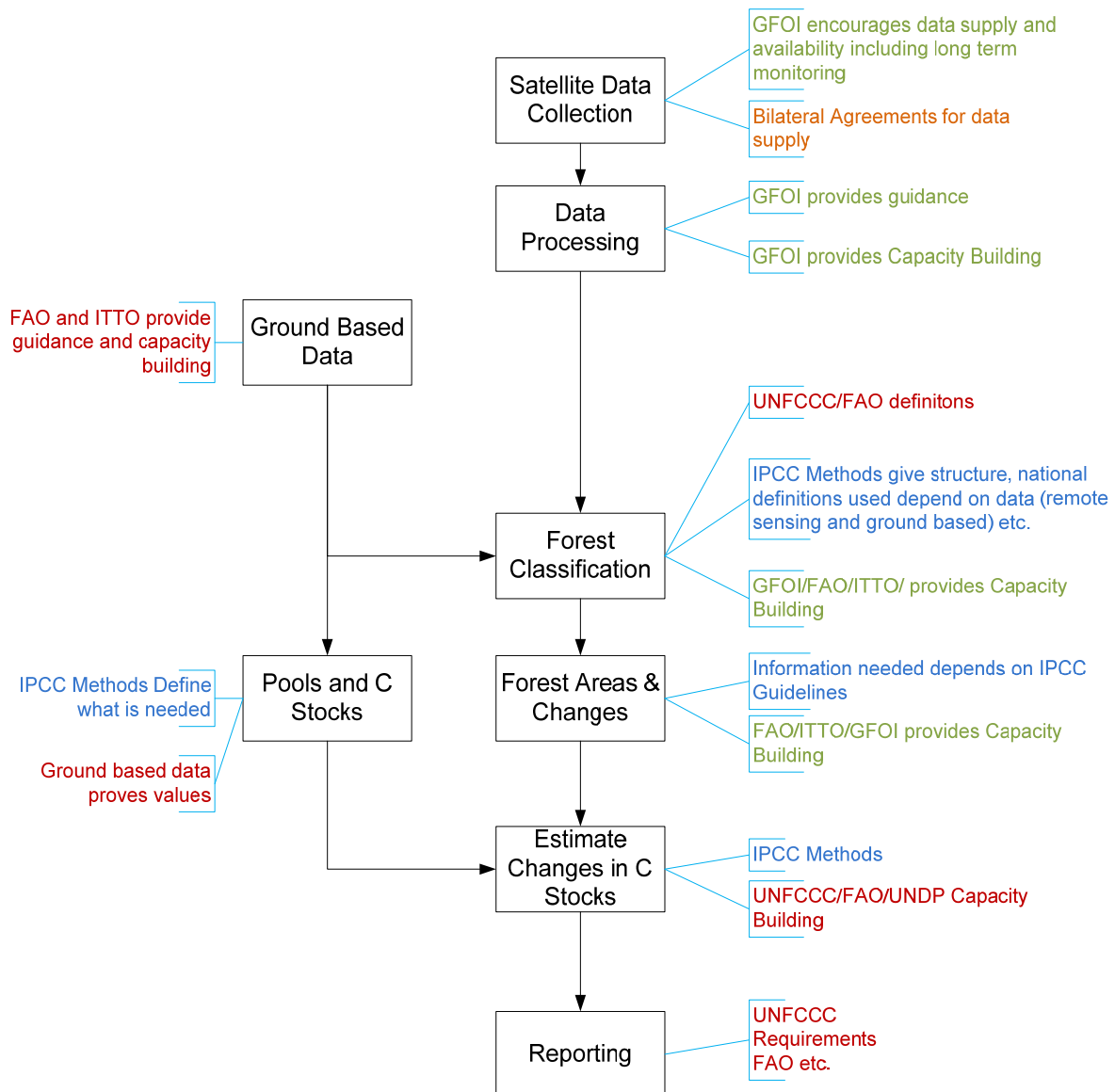
**Box 1: GFOI Concept Plan Plenary Recommendations Establishing the GFOI Implementation Plan Process.**

In 2010 the GEO-VII Plenary was invited to:

1. Take note of the significant progress made in the GEO FCT Task during 2010;
2. Support the strengthening of the GEO FCT Task and development of a Plan for the Global Forest Observation Initiative in 2011;
3. Support the establishment of a GFOI Task Force; and
4. Recommend that the Plan for the Global Forest Observation Initiative be submitted to the GEO-VIII Plenary in 2011.

The GFOI Concept Plan was built around the experiences of the GEO FCT (Task CL-09-03b) which was established at the 2008 GEO-V Plenary in 2008. The Concept Plan was prepared as part of the GEO FCT activities by a broadly based Planning Team (Annex B) to consider how the GEO FCT activities could be taken from an *ad hoc* research-driven basis to a systematic framework of support for national governments developing forest monitoring systems. The GFOI Task Force members (Annex B) reflect expertise and knowledge across a range of relevant activities and processes including technical and policy experience in a range of developed and developing countries. Together they have a familiarity with the roles of the key related organizations, including the FAO, CEOS, IPCC and UNFCCC.

A key finding in the Concept Plan was that the GFOI should be a bottom-up national approach rather than a global top-down information system. Key to the preference for a bottom-up approach is that typically the ground data used in forest information systems are collected by national governments and often not generally available. Also, different national circumstances and national choices of definitions and approaches need to be recognized. National government ownership is also essential as they are responsible for reporting into the key international forest assessments. These include the Global Forest Resource Assessments of the FAO and the national GHG inventories reported to the UNFCCC using IPCC methods. Both of these processes are worldwide compilations of national government reports. Figure 1 below shows the flows of data from acquisition, supply, use and eventual reporting.



**Figure 1 Flow of Observations**

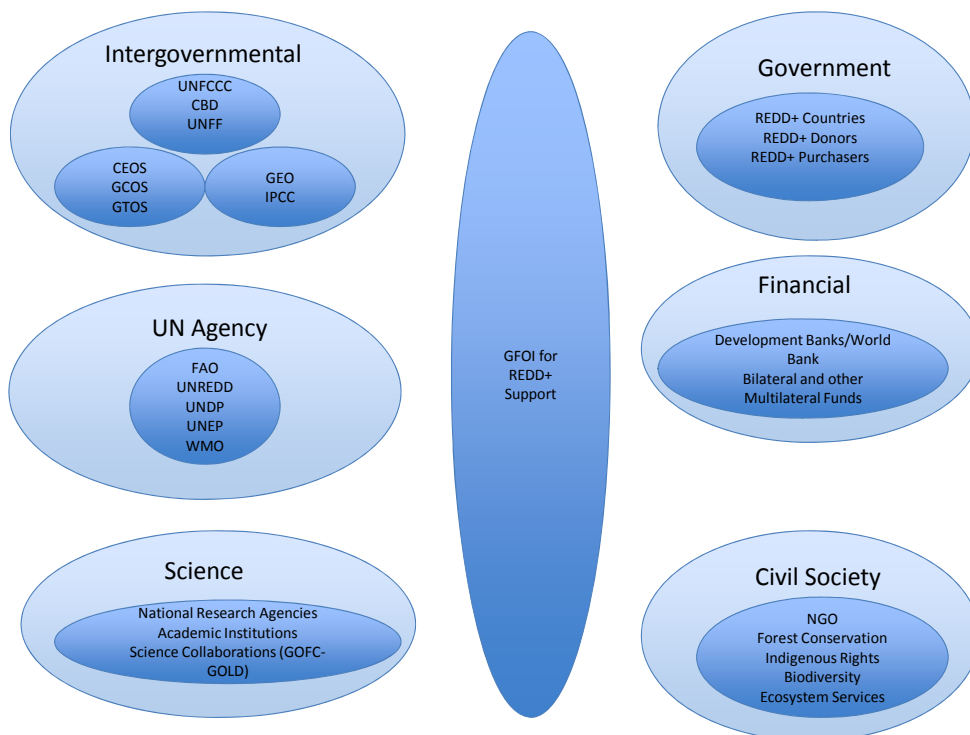
The Concept Plan recommended the Implementation Plan be a “... *detailed, realistic technical and management proposal that should inter alia:*

- *assess national capabilities for producing national forest information;*
- *identify strategies needed to improve national capabilities;*
- *identify potential sources of observations (satellite and in situ) and associated data policies;*
- *provide a work plan with time lines and deliverables for the GFOI;*
- *identify recommendations to GEO Plenary 2011 and its participants for future action to implement the work plan; and,*
- *describe proposals for measuring success.”*

The external environment for the GFOI has several dimensions including:

- international demand for information on the changing condition of the world’s forests, and their contribution to global GHG emissions;
- scientific demand for information;
- interest by forest communities;
- civil society more widely in the social, ecological and social value of forests; and,
- economic interest in forest resources and their sustainability.

These interests are expressed in many different forms and can be assigned to generalized clusters as set out in Figure 2 below.



**Figure 2: GFOI Operating Environment**

Figure 2 shows the diversity of organizations with which the GFOI needs to work. The main types of organizations involved are; the governments operating national forest monitoring systems, intergovernmental organizations (UNFCCC, IPCC, GEO, CEOS), UN agencies (FAO/UNREDD), various science organizations, donor governments and philanthropic organizations, and non-government organizations. The interests of each of these and how the GFOI will interact with them is outlined below.

## **1.1 Governments**

Governments in all forested countries will potentially benefit from the GFOI, depending on their decision to access the data or methods of the GFOI framework. Particular interest will come from countries that are either developing or upgrading national forest monitoring systems as part of their participation in the REDD+ mechanism. The REDD+ Partnership which involves governments from developing and developed countries exists to share information about REDD+, including information related to monitoring, reporting and verification (MRV). Many governments are making donations, either bilaterally or through multilateral funds to support developing country readiness for REDD+, and for REDD+ activities. The GFOI will assist as appropriate in these activities.

## **1.2 Intergovernmental**

*UNFCCC*: the Parties to the UNFCCC have a common interest in each being able to deliver robust estimates of annual greenhouse gas emissions in their national greenhouse gas inventories using methods developed by the IPCC National Greenhouse Gas Inventory Programme (NGGIP). Inventory reports already cover forests, but the developing REDD+ mechanism is placing added demand on the robustness of reports from participating countries. The UNFCCC Parties will benefit from improved national forest monitoring systems that will help them to fulfill their present and future obligations.

*IPCC*: better and more systematized access to data, particularly from remote sensing, is of great interest to the IPCC NGGIP which provides the methodologies that countries have agreed to use under the UNFCCC for estimating GHGs. The work of the GFOI is also potentially of interest to the IPCC's periodic Assessment Reports as forests are a key part of the global carbon cycle, and are therefore an important factor in climate change modeling.

*FAO*: the FAO periodically produces Global Forest Resource Assessments, which are compiled from national government submissions. The FAO runs national capacity building programs, and also sponsors a global sample-based approach to remote sensing. The FAO is the UNREDD partner responsible for the MRV component of REDD+. The GFOI will support the FAO in its forest assessments and its REDD+ MRV work, which is also linked to the IPCC NGGIP. Given the active role the FAO plays in generating information and capacity building, it is a key partner institution to the GEO in the GFOI.

## **1.3 Science Organizations**

There are many research-based organizations, both governmental and non-government that use forest information as a basis for their research. At a global scale, robust information on forests has been limited. The GFOI will expand on the information available for these purposes.

## **1.4 Civil Society**

Many organizations from the non-government community have taken an interest in the condition of the world's forests. Their focus is mainly the rights of indigenous peoples and local communities, and on biodiversity and ecosystem services.

## **1.5 Financial Institutions and the Private Sector**

Multilateral funding bodies, such as the World Bank, and private sector financial organizations are already involved or interested in REDD+ financing. This may entail payment for performance approaches. The World Bank has a focus on readiness, which includes the development of MRV systems. MRV systems are also a critical element of project assurance, for both project investors and buyers of credits.

## **2 NEED FOR ACTION**

The GFOI Concept Plan considered the requirements for GEO to develop the GFOI from the current research-driven approaches of the GEO FCT. This policy demand is principally from countries engaged in the FAO Global Forest Resource Assessments, the IPCC Climate Change Assessments, the National GHG Inventory processes of the UNFCCC, and other international agreements such as the conventions on biodiversity and desertification. The increasing international focus on REDD+ underlines the need to develop the GFOI.

### **2.1 Global Capability**

At the global scale the key issues are around the availability of observations (remotely sensed and ground), the methods to process and analyze those observations, and the global capacity to support countries in the supply and use of data. Although there are well understood limitations associated with archival satellite data governments and agencies holding the data have recently made significant advances in making them more freely available. However, instrument failures are currently reducing the supply of data from ‘public good’ satellites. Although funding support from governments for data sourced from government corporations and commercial providers is filling some of this gap, servicing the full worldwide demand for annual monitoring would not be achievable with current satellite, data transfer and storage capacities. New satellite missions such as the NASA Landsat Continuity Mission, the Brazil-China CBERS-3 and the European Space Agency GMES, along with others will make worldwide support possible within the 2012-2013 timeframe. However, this will need coordination.

Global and regional scale data storage, distribution and processing centers exist, with the USGS global network, and the Brazilian and Australian regional centers as examples. However, there is no coordinated framework that links acquisition, supply and processing of data to national demands. The GFOI will aim to create a platform through which this coordination can occur.

Ground observations are usually handled at the national level by countries and tend to be sparse. Many countries do systematic ground sampling for national forest inventories but these data are rarely made available outside the national forest monitoring systems. As national scale data collection is necessary for this work, it is anticipated and desirable that these activities will almost always be pursued and maintained within national governments. The GFOI will help reduce costs by providing increasing access to international experience and showing how the link to remotely sensed data can effectively be made.

Similarly, other forms of ground measurement, such as calibration/validation and site biomass measurements are often implemented by national research agencies, universities, land managers and NGOs. Defining the global pool of data will add significantly to national, regional and global capabilities.

The GEO FCT has made significant contributions to the development of methods for acquiring and processing satellite observations, the integration of ground and satellite data, and methods for assessing accuracy. This work will continue to contribute to the GFOI applications development program. A key task will be to interface this GFOI work with the IPCC inventory methods.

In broad terms of global capability, however, the essential elements needed for developing a worldwide system largely exist. The absence of a coordination platform means that maximum efficiency is not extracted from available capabilities. It is in the provision of the platform that the GFOI will be most important.

### **2.2 National Capability**

Countries will need to make choices when designing their national forest monitoring system for estimating carbon stocks, and changes in carbon stock (and potentially other greenhouse gases). The items to be reported, the bio-physical conditions, land use and management, data availability and

institutional capacity will all influence the design of the system, and the data needs. Box 2 provides an overview of the decisions likely to be required, and the issues that influence them.

### Box 2: National Reporting Choices

**Pools and Gases:** Guided by the decisions of the parties to the UNFCCC and agreed inventory methods from IPCC methods, countries will need to determine which carbon pools and greenhouse gases they will report as part of their emissions inventories. The models and data applied in national systems will be affected by these decisions.

**Land Use and Management (activities):** Since the primary goal in regard to greenhouse gas reporting is to determine changes due to various land uses and management activities, the choices of data and models will need to be consistent with the nature of the activities. For example, the forms of remote sensing used to determine areas of deforestation may not be able to monitor forest degradation.

**Remote Sensing Data:** There are a number of influences on the choice of remote sensing data. These include:

- Availability and consistency of historical data (to establish trends);
- Likely future continuity of supply;
- Cost;
- Ability to analyze the data, or to secure services to analyze the data;
- Nature of the forests;
- Types of activities affecting the forests (e.g., high or low impact per unit area, large or small area);
- Requirements the of model to be used to estimate emissions;
- Atmospheric conditions (especially cloud cover that may obscure optical sensors).

**Ground Data:** The availability of various forms of ground data will determine what new ground data may be required, which in turn affects the nature of models to be applied and subsequently the remote sensing data requirements.

**Models:** Models are a central part of the inventory design, and the form and functions of the models is a key determinant of data need, albeit that the choice of model form is much affected by what data is likely to be available. The main forms of models are; an inventory (growth and yield increment based) model, a process/ecosystem model that typically simulates the carbon (or both carbon and nitrogen cycles), and a remote sensing based model that estimates emissions by relating ground conditions directly to satellite data interpretations.

**Supplemental Data:** Various forms of data may be required, such as climate data for process models, and elevation data if landscape position is applied in models.

The GFOI will refine and collate needs assessments based around the national system designs. National capabilities and needs are highly variable from country to country. Many countries are now advancing their capability for satellite data processing and analysis. The rapid progress being made by many developing countries shows the feasibility of national processing for most countries.

Organizations like the FAO and International Tropical Timber Organization (ITTO) already provide capacity building programs for national ground forest inventory programs. While these can be linked with GFOI activities by national governments, it is not anticipated that the GFOI would play a significant role in building in-country capacity for the utilization of observations.

Should the GFOI not provide a platform for collaboration the data support would remain *ad hoc*, and not efficiently delivered to countries. Similarly, the absence of a coordination framework for support leads to overlap and omissions in initiatives supporting individual national governments.

### 3 THE GEO FCT

The Forest Carbon Tracking (FCT) Task Co-leads comprise representatives from government agencies in Australia, Canada, Japan, Norway and the United States as well as from CEOS and FAO. Additional partners contributing space and forest research data and expertise are Brazil, France, the Netherlands, United Kingdom, European Commission and GOF-C-GOLD. A growing number of early adopter countries (11 as of mid-2011) are serving as National Demonstrators, they are Australia (Tasmania), Brazil (part of the Amazon), Cameroon, Colombia, DR Congo, Guyana, Indonesia (Borneo and Sumatra), Mexico, Nepal, Peru and Tanzania.

The main activities to date within the task are addressed in turn below:

*Establishment of National Demonstrators:* In 2009, the GEO FCT Task initiated the first seven National Demonstrators (NDs) in collaboration with respective government counterparts, as large-scale trials and proof-of-concept. The NDs were initially serving to demonstrate the coordinated acquisitions and processing of satellite data for these countries in the years leading to GFOI operational phase. The NDs are increasingly becoming engaged in the activities underlying the testing and application of the GEO FCT methods and protocols relating to national practices for use of satellite and in situ data, and their linkage to carbon models for the derivation of emissions estimates. As more countries indicated their interest in joining the task the number of NDs was increased in 2010 and again in 2011 with the inclusion of Colombia, DR Congo, Nepal and Peru – plus the inclusion of Sumatra within the existing Indonesia ND.

*Satellite acquisition coordination and data supply:* The Committee on Earth Observation Satellites (CEOS) has provided a commitment to provide, as possible, cost-effective satellite data, tools and training for national wall-to-wall forest carbon tracking. A Satellite Data Coordination Group was formed in 2009 to define and coordinate acquisition strategies and national-scale wall-to-wall datasets using multiple sensors and satellites have subsequently been on a semi-annual basis over NDs since mid-2009. In addition, various other satellite datasets including very high-resolution satellite data have been acquired over selected verification sites in the NDs, including data provided by commercial operators. Commercial providers have also shown interest to participate in FCT and other satellite datasets including very high-resolution satellite data have been acquired over verification sites and provided to the NDs. CEOS agencies have undertaken to provide continued coverage of the NDs in support of FCT activities, and to increase annual coverage area in anticipation of the sustained global coverage required by GFOI – starting with REDD+ countries.

*Product Development and Technical Assistance:* To provide technical assistance to ND countries in need, Product Development (PD) teams have been assembled to help develop forest information product datasets. These teams work closely with national institutions in the NDs. They should progressively take over the responsibility and operations of the product development.

*Development of methods and protocols:* These include the following;

- *Satellite Forest Information Product Specification* - specifying products to be routinely derived from satellite (optical and radar) data acquired for the GEO FCT task - such as annual mid-resolution wall-to-wall time series for forest change assessments and information on areas undergoing forest degradation;
- *Satellite Interoperability & Processing Methods* – to guide countries on methods for satellite data processing and tools and standards for producing verified forest information products including the potential for interoperable use of various satellite sensors;

- *In Situ Forest Measurements Standards and Protocols* – which outlines basic measurement standards, protocols and methodologies for in situ forest assessments and sampling schemes, with a view for these datasets to be integrated with satellite data and forest carbon models;
- *Linking of In Situ Forest Measurements, Remote Sensing and Carbon Models* – providing guidance by describing options available to countries in the combination of remotely sensed and in situ data through carbon models to derive national carbon accounting information;
- *Methods on Validation of Remote Sensing Data Products and Accuracy Metrics* - providing a set of principles and conceptual approaches for verification of map products produced by image processing methodologies that will have been accepted by a country for carbon accounting.

The FCT should continue into the operational era of GFOI, as a science-driven activity in support to evolution of the GFOI. It will gradually be scaled down as GFOI gains recognition, momentum and strength. In particular it is foreseen that FCT will continue for now its assistance and collaboration with NDs supported by the Guidance Documents and Product Development Teams, covering satellite data utilization, integration with ground data and carbon modeling. In this respect FCT will establish stronger interfaces with organizations such as FAO, IPCC and leading experts in carbon modeling.

A Space Data Coordination group currently serves the 11 FCT NDs, but is envisaged to progressively expand this as a long-term goal for the GFOI to cover globally all forested areas. With the GFOI in operation, the number of countries can be expected to expand beyond what is possible to support on a direct basis in a way that is currently done within the FCT. The first task to be taken over by GFOI is data coordination.

The present ND countries should continue to be supported by the FCT Product Development teams and serve as test-beds for the approaches and methods developed and described in the Guidance Documents. The Guidance Documents would be continuously improved and complemented as applications in new environments are developed by the FCT PD teams and the technical and scientific understanding of handling multiple data sources and in new environments progresses.

#### 4 THE GFOI ACTIVITIES

This Implementation Plan defines the tasks to set up and operate the GFOI. It points to the key suppliers of observations and services, but it does not allocate specific tasks. Actual arrangements will reflect national government's choices of observations and preferred service supplier. It would be inappropriate for the GFOI to attempt to supersede current arrangements or impose any new ones. However, the GFOI can help outline the options that are available to national governments, and to ensure that at least one source of observations is available to every country.

The GFOI can also help to define options for technical guidance, propose model license forms and related documentation, and provide a platform to link national governments with data suppliers and processors. An agreement between a national government and a supplier would remain a matter between them. The supplier could be a national, regional or global supplier; a public or private entity; or a data supplier or processor.

The GFOI's role as a platform for coordination, as distinct from a role as a data supplier or processor, will reduce the demand for resources for operating the GFOI. The resources needed for the supply and processing of remotely sensed data, for relevant ground data collection, and for building the national capacity to integrate these into national forest monitoring systems will largely continue to be provided directly by donor countries and other organizations.



The challenge for the GFOI is to align its activities with those of others and to catalyze activity without being prescriptive. The GFOI cannot be systematic to the point of being an end-to-end global service or product. GFOI is to help national governments meet their goals and obligations, and therefore it must respect national circumstances and choices. National choices make the challenge of supporting a bottom-up worldwide network of forest information and reporting systems much more complex than simply taking whole of system top-down approach to implementing a global system.

Weather and oceans already have monitoring systems similar to the GFOI. The central idea is to provide worldwide support through a mix of coordination of data supply (largely satellite data), and providing methodological guidance on processing and analysis, national and regional processing support, and guidance on the integration of locally sourced (largely ground) observations with satellite data.

The main GFOI elements based on the GFOI Concept Plan are:

- *Support and capacity building for national governments:* apply consistent and comparable methods to help governments build individually developed yet comparable national forest monitoring systems, and in collaboration with providers such as the FAO that can help with data utilization;
- *Observations and measurement:* regular and routine (systematic) observations and measurements for effective reporting. Data acquisitions need to include satellite, periodic ground, and other measurements. Continuity of data supply is needed to ensure maintenance of time series and consistent reporting. Achieving interoperability between observations from different satellite sensors over time is crucial to ensuring time series consistency;
- *Methods and protocols for data collection, processing and integration:* promote and encourage the strengthening and further development of methods and protocols for satellite and in situ data collection, processing, calibration and validation, and integration with carbon models;
- *Continuing research and development:* promote coordinated research and development needed for continuous improvement of national forest information systems.

The key components of the Concept Plan above have been organized into two areas of (i) *Observations Supply and Use* which includes supporting national governments in accessing and utilizing observations, and (ii) *Guidance and Applications Development* which deals with applications development and methods documents.

## 4.1 Key Component 1: Observations Supply and Use

### 4.1.1 Observations and measurements

A difficulty often encountered by national governments is identifying existing data and options for future supply. This applies to both satellite and ground data. The GFOI is intended to provide greater transparency and understanding on these issues through providing a structured process for existing and planned data acquisitions, and by linking national needs with potential suppliers so that new acquisitions can be targeted. The two key mechanisms for this will be the development of a metadata library that can assist in the discovery process, and the GFOI Linkages Forum that provides the central coordination mechanism between suppliers and users of observations and services.

Observations and measurements are at the heart of the GFOI and these and related activities will represent the single largest area of endeavor. The GFOI is not a creator, acquirer or supplier of data *per se*. Instead it will:

- define requirements for data in support of national forest monitoring systems;

- coordinate the global acquisition of observations and measurements to help ensure the necessary supply of data;
- facilitate linkages between suitable data suppliers and national governments if requested; and,
- ensure a clear understanding by users as to the availability of suitable data and appropriate methods for the data used in national forest monitoring systems.

Forest monitoring systems require both satellite and ground data and the GFOI will address both of these. Satellite data acquisition and supply is a truly global endeavor and GFOI will engage both governmental (through the CEOS) and commercial data providers in support of the planning and operation of a coordinated satellite data acquisition strategy. This should include a background global satellite data acquisition strategy, such that any government requiring the support of the GFOI can access the necessary data coverage over the relevant space and time scales.

The GFOI should support comprehensive national satellite data acquisition strategies that respond to national needs assessments. These strategies should seek to accommodate countries that have specific technical requirements, or experience on working with a particular data source or type, as well as the numerous intergovernmental arrangements that may exist or emerge for the supply of certain data to one or more countries. GFOI efforts should also address satellite data supply in support of continuing applications development activities, such as methods and protocol documents for GFOI, interoperability studies, testing, and use of new observing and measurement technologies.

Coordination of satellite data acquisition and supply has been tested under the GEO FCT ND program in collaboration with CEOS.

Ground data of interest to national forest monitoring systems include:

- routine forest inventory data;
- biomass data; and,
- calibration and validation data, for use with satellite observations.

In many cases, national governments already have access to required ground data and GFOI may have no involvement in the coordination of acquisition or supply. Routine forest inventory data are typically collected by national/provincial government forest agencies and private forest companies. The GFOI will have a limited role in the acquisition and access arrangements for these data, but it will play an active role in defining and promoting methods for ground data acquisition and for their integration with remotely sensed (satellite and airborne) data. In many countries additional sub-national data are created by scientists, local authorities and land managers which, if brought together, would enhance the understanding of forests. Facilitating the discovery and use of these data will strengthen the GFOI.

Biomass data generates information on whole tree or forest-stand mass, in contrast to the limited measurements taken in routine forest inventories (e.g., basal area and height). These data are usually collected by research agencies, sometimes in collaboration with government forest agencies. There is a potential role for the GFOI in providing methods for the collection of these data, and in identifying potential sources of data that could have broader utility as part of the data discovery processes for GFOI users.

Calibration and validation data are used to associate satellite observations with ground conditions. The availability and application of such data is of global interest for supporting the continued improvement and application of satellite observations. This will likely involve space data suppliers as well as national agencies. GFOI will have a key role in brokering awareness of, and access to, all available calibration/validation data, in support of both national forest monitoring systems and the continuing applications development needs of the GFOI.

Many different types of observations and measurements will contribute to the supply and use of data (space-based, airborne and in situ) supported under the auspices of the GFOI. Where appropriate, the GFOI will seek to establish standard agreements governing access to and use of these data by GFOI users, with a view to simplifying and expediting the arrangements between data suppliers and data users and allowing new partners to benefit from the experience of existing arrangements.

National monitoring systems are operational in nature, and therefore the support mechanisms that surround them must be effective and efficient. The supply of data needs to be better coordinated and sustainable, and delivered more efficiently.

#### **4.1.2 Support for Utilisation**

Utilization support will primarily address the supply and utilization of observations. GFOI's data needs assessments will supplement those carried out by UNREDD and the World Bank, and needs identified during the ongoing GEO FCT NDs. The needs assessments will initially cover the GEO FCT NDs and then other countries identified as receiving inadequate assistance under the current global, regional or bilateral umbrellas.

Work on readiness for forest monitoring under the UNREDD and World Bank processes has developed focused national needs assessments. In some instances, these elaborate on systems and approaches for ongoing observations and services, but in others these needs are not so clearly outlined. To ensure the success of the GFOI Linkages Forum, this existing work needs to be built on so that clear needs assessments can guide supply to best affect. An outline for these needs assessments is contained in Annex E.

The development and acceptance of GEO methods and protocols is aimed at supplying national governments with:

- access to up-to-date methods; and,
- confidence that the methods adopted have been vetted through an intergovernmental process.

Capacity building will comprise one or more of the following elements:

- support for the acquisition, installation and operation of technical hardware/software for processing of satellite, in situ and airborne forest and forest-related data; and,
- country-specific training in the selection, assessment, use and combination of different types of data for forest and carbon accounting, including model development.

Training courses and workshops will comprise:

- global and regional workshops/meetings such as those arranged for NDs under GEO FCT; and,
- training courses in selected issues.

## **4.2 Key Component 2: Guidance and Applications Development**

### **4.2.1 Methods & Protocols**

The IPCC has developed guidance that countries have agreed to use in the estimation of GHG emissions for reporting to the UNFCCC and this guidance anticipates that remotely sensed data will be used. This guidance discusses remote sensing but there is no international agreement on how to acquire and interpret remotely sensed data, and confusing claims are often made concerning this rapidly developing field.

While the GEO data processing methods do not claim to be an exclusive or obligatory suite of approaches, governments using them should have confidence that they would meet with broad

international acceptance. The development of method and protocol documents by the GFOI will fulfill two important roles:

- to inform countries about how to acquire, process and analyze data. This is an important part of the technology transfer process; and,
- to make available to countries methods that have been rigorously developed, reviewed and vetted.

Achieving (1) is a matter of making sure that the applications development programs of the GFOI are operated in an open intellectual property environment. Achieving (2) will be via the GEO document review and acceptance process.

The focus of the methods documents currently under preparation as part of the GEO FCT, work that will continue under the GFOI, will be to complement existing processes such as GOFC-GOLD. In particular, the methods will largely address detailed technical applications that complement and contribute to, but do not duplicate, the guidance for greenhouse gas inventories provided by the IPCC.

Many existing methods are being tested as part of the GEO FCT. These methods, once appropriately tested, could also be added to the suite of possible methods. The key to this inclusion will be robust testing and considered peer-review, and not the origin or newness of a particular method.

A key role for the GFOI methods and protocols documents will be to interface with the IPCC guidance and guidelines for national GHG inventories. This interface will have a focus on the applications of remote sensing. As GEO outputs will be delivered in the same environment as the IPCC guidance, it should go through an equally robust peer-review process. The IPCC uses sequential expert and government reviews, overseen by review editors, in the lead-up to adoption. A similar process should be applied to the GFOI documents. IPCC experts should be engaged in this process to ensure compatibility.

#### 4.2.2 Applications Development

The GEO FCT has successfully fostered a test-bed for research, providing unprecedented volumes of earth observation data to the NDs. It has also encouraged multi-national researchers to investigate issues such as satellite data pre-processing (compositing, atmospheric and radiometric correction), and to explore various algorithms and data fusion techniques using optical, radar and LiDAR to model forest distribution and status. The GEO FCT has brokered data for the NDs through collaboration with CEOS, commercial data providers, space agencies and others.

Research and development activities will continue in the GFOI, with the GEO FCT becoming the main research provider. Because of the significant investment in data and analyses in the ND test sites, GFOI will continue to promote research in those countries and at those sites.

The GFOI's relationship with national space agencies, both directly and through CEOS, will allow it to promote research data systems and data availability. Being a component of GEO, it will continue to work with other GEO groups specifically active in technological capacity building. The GFOI leads and contributors also include research institutions, and the GFOI will actively work with these institutions to identify research gaps and priorities. The GFOI will promote the GEO FCT activities through workshops on relevant applications development and forums on topics relating to earth observation and forest science. Applications development to be facilitated by the GFOI will include, but not necessarily be limited to the following:

- *Satellite Data Pre-processing:* Improving atmospheric and radiometric calibration will result in better quality of primary data products and allow for better data inter-operability and integration;
- *Sensors:* As new sensors and products come on-line, research will continue to be needed into their utility for forest assessment and monitoring. The principal classes of sensors are:

Optical; Multi-spectral; Hyper-spectral; radar- X, C and L-band; and, LiDAR. Multi-sensor data integration and fusion, such as coupling optical and radar data, can also improve our ability to determine forest structure and composition;

- *Radiative Transfer*: Multi-angle remote sensing and bidirectional reflectance including bidirectional distribution function (BDRF) shows significant potential for improving forest measurement;
- *Biogeochemical and Biometrics*: Advances in computational power, better processing streams and new efficient new algorithms are now allowing the creation of moderate-resolution (<50m) essential climate variables such as vegetation index (VI), leaf area index (LAI), photosynthetically active radiation (PAR, fPAR and fAPAR) and net primary productivity (NPP);
- *Forest Structure*: The measurement of tree and forest structure are fundamental to determining volume, biomass and ultimately carbon. Measures of forest height are foreseeably achievable from radar and/or LiDAR data, and would serve as a tool for change detection, tracking changes in canopy height and gaps;
- *Image Processing and Pattern Recognition*: Remote sensing research will also focus on extracting information from high-resolution satellite imagery and modeling and visualizing change and related uncertainty;
- *Geodesy/Geodynamics*: Research interests in environmental geodesy include the use of space geodetic tools such as satellite altimetry to measure tree heights;
- *Photogrammetry*: Forest photogrammetry is the use of digital photogrammetry, airborne laser scanning and satellite data to discern forest and tree properties. Research in close-range photogrammetry could be used to assess tree structure and volume.
- *Surveying and Instrumentation*: Research topics include the development of specialized instruments and techniques for measurement of forest, environmental and physical parameters. Research in surveying and instrumentation includes digital video, laser and optical measurement systems, as well as sensor webs;
- *In situ Data*: Efficiencies in field data collection are required to allow for sensor calibration and validation, for linking field/plot data to aerial and satellite sensors for algorithm training and testing, and for model parameterization. A specific requirement is allometric data from both destructive and non-destructive sampling;
- *Geographical Information Science*: Geographical Information Science and Geoscience includes the development and use of geographic information systems. A topic of particular interest is the development of temporal GIS to track changes in the landscape over time;
- *Integration*: Linking in situ measurements, remotely sensed observations and models. This would include the integration of remote sensing data, in situ data and models; comparison of the practicality/functionality of implementation various carbon models, and their outputs versus available input parameter data at the different countries; and clarification of what input data are required to run the carbon emission models.

#### 4.2.3 Phasing

The GFOI will be iteratively developed and implemented from 2012 to 2015 with flexible and adaptive processes around a phased approach under which the initial Start-up (2012) Phase continues to develop implementation approaches under the guidance of the Task Force. The phasing, the outcomes and activities for each phase, and the consequences for the development of protocols and methods and availability of ground and satellite data are presented in the tables that follow.

Part B includes a summary description of the tasking required to deliver these. This section provides a year-by-year description of the approach to delivering the phased implementation of the GFOI. The phasing builds incrementally toward an operational GFOI from 2014.

### Phasing

*A phased approach, defined over the period from 2012 to 2015, is proposed for the implementation of the main components of the GFOI:*

**2012 Start-up Phase** – with a kick-start to implementation activities and coordination through a GFOI Linkages Forum in 2012 to outline potential collaborations, and initiate the framework operation; 2012 will take preparatory steps for a coordinated and institutionalized framework.

**2013 Commencement of operations** – with a GFOI project office and a move to an operational basis for the key components.

**2014+ Operations Phase** – with continued maintenance of the methods and protocols, applications development, national capacity building etc., and continued coordinated delivery of observations.

#### 4.2.4 2012 Start-up Phase

The 2012 Start-up Phase of the GFOI will require a shift from the research-driven NDs to the preparatory steps for an institutionalized platform. The Implementation Plan sets out the GFOI design, but it will be further elaborated through steps to put it in place during 2012.

There is a need for a mechanism that can bring interested parties together, be put in place relatively quickly, and effectively link observation supply with the various national needs. The proposed mechanism is a GFOI Linkages Forum (Annex D) that should be held back-to-back with another relevant REDD+ readiness forum. The Linkages Forum will bring together the various users and suppliers around the proposed GFOI platform to confirm and record arrangements for how the support and services framework can be underpinned and supplied to nations. These arrangements would be guided by the FCT experiences in the NDs and various other national and global efforts such as SilvaCarbon and the World Bank FCPF.

The experience in other similar activities has shown that such forum can catalyze the evolution of a program from a research-driven base to a globally coordinated framework. The Linkages Forum would aim to help countries make the connections needed to reach the sustainable national operational level (complete coverage and integration of ground and satellite data into a national reporting system), thus facilitating the important transition from one-off research focused projects to ongoing operations.

Both the meteorological and oceanographic communities have used such catalytic/galvanizing meetings with success (e.g., Commitments meeting for the Global Ocean Observing System, Intergovernmental Oceanographic Commission, 1999). The Linkages Forum as proposed is a comparatively low-key and conservative event. Other initiatives have sought either commitments from governments or to launch new intergovernmental bodies. The Linkages Forum will be limited to cataloguing comprehensively and fine tuning an array of pre-negotiated arrangements.

Key Component	Tasks in 2012
Set-up and administration	<ul style="list-style-type: none"> <li>Establish a small working group to support the Task Force on the Linkages Forum and various other actions such as progressing the applications development plan:</li> </ul>

Key Component	Tasks in 2012
	<ul style="list-style-type: none"> <li>○ principal areas of focus on the needs assessments (Task ADM.1) to underpin discussions at the Linkages Forum (Task ADM.4) and to follow-up actions arising.</li> <li>● Establish interfaces with other international forest-related initiatives and institutions (Task ADM.2);</li> <li>● Establish and resource the GFOI project office (Task ADM.3);</li> <li>● Establish reporting and guidance mechanisms between the GFOI Task Force to the GEO Plenary;</li> <li>● Establish GFOI Communication and Information Systems (Task ADM.5);</li> <li>● Develop a management plan and schedule for an effective transition of FCT achievements and processes to GFOI and for ongoing interaction (Task ADM.6);</li> <li>● Define program office staff including statement of work, job descriptions and assignment of responsibilities.</li> </ul>
Support & capacity building for national governments	<ul style="list-style-type: none"> <li>● Continuation of engagement under the GEO FCT ND program (precursor to Task CB.1);</li> <li>● GFOI Data Coordination Strategy (Task CB.2) should identify data coverage requirements for specific countries based on national needs assessments;</li> <li>● Engage with other organizations and governments providing capacity building in related areas to build a comprehensive plan for GFOI partnering and what services and support (related to Task ADM.2 on establishing interfaces).</li> </ul>
Observations and measurements	<ul style="list-style-type: none"> <li>● Definition of long-term, high-level observation and processing needs (Task OBS.1);</li> <li>● GEO-endorsed model for GFOI data access, use and reuse conditions (Task OBS.2);</li> <li>● Continued facilitation of observations provision and access through GEOSS (in Task OBS.3);</li> <li>● Early delivery of data support outcomes from the Linkages Forum (from Task ADM.4);</li> <li>● Space Data Coordination Group established by CEOS.</li> </ul>
Methods and protocols	<ul style="list-style-type: none"> <li>● Progress the priority methods and protocols documents for acceptance at the 2012 GEO Plenary (Task M&amp;P.1).</li> </ul>
Science and applications development	<ul style="list-style-type: none"> <li>● Finalize the GFOI Applications Development Plan (Task SA.1).</li> </ul>

#### 4.2.5 2013 Commencement of Operations

Though start up activities will continue, by 2013 work will be operating under the framework of the GFOI instead of the research-driven NDs, and it will be guided by the outcomes of the Linkages

Forum. The GFOI will become the principal means of support by 2013, with the GEO FCT ND program able to focus on continued science development. The interface between the GFOI and the GEO FCT will be important to set up arrangements, particularly around areas like method development, method documentation, technical training and technology transfer. Close management cooperation between the FCT and the GFOI will be important.

Key Component	Tasks in 2013
Set-up and administration	<ul style="list-style-type: none"> <li>• The new hosting arrangements for the GFOI project office will need to be in place by early 2013 to commence this early phase of operational implementation (Task ADM.3);</li> <li>• The working team will need to be in a position to begin providing coordination and taking relevant actions against the key components and the delivery of services and support;</li> <li>• Prepare reporting to the GEO Executive Committee and GEO Plenary.</li> </ul>
Support & capacity building for national governments	<ul style="list-style-type: none"> <li>• By this stage of development the GFOI should have clearly defined processes and activities that can assist national governments with the nature of the activities and potential suppliers (Task CB.1);</li> <li>• Work with partners and procure resources to deliver the GEO contribution to partnered national capacity building activities – including training course delivery (Task CB.3), data discovery tools and services (Task CB.4) etc.</li> </ul>
Observations and measurements	<ul style="list-style-type: none"> <li>• Continued supply under the FCT and making progress on outcomes of the Linkages Forum (Task OBS.3);</li> <li>• Define the long term coordination and acquisition strategy arising from the 2012 Linkages Forum – and implement for the 2013 requirements (Task OBS.3);</li> <li>• Provide discovery and awareness services on biomass estimation data (Task OBS.4) and cal-val (Task OBS.5).</li> </ul>
Methods and protocols	<ul style="list-style-type: none"> <li>• Prepare new and additional methods and protocol documents for 2013 Plenary (Task M&amp;P.1).</li> </ul>
Science and applications development	<ul style="list-style-type: none"> <li>• Put in place coordination mechanisms and identify funding sources and suppliers that could deliver on the GFOI applications development plan (Task SA.1).</li> </ul>

#### 4.2.6 2014/15 Operations

By 2014 the main focus of activity should be on maintenance rather than development. However, for many years countries will likely continue to join the GFOI framework. The actions set out below reflect the maturing of the GFOI.



Key Component	Tasks in 2014/15
Set-up and administration	<ul style="list-style-type: none"> <li>Continued support for GFOI and FCT activities (Task ADM.3)</li> </ul>
Support & capacity building for national governments	<ul style="list-style-type: none"> <li>Deliver on the clearly defined processes and activities designed to assist national governments, including the scoping of activities and potential suppliers (Task CB.1)</li> <li>Work with partners and procure resources to deliver the GEO contribution to capacity building programs</li> </ul>
Observations and measurements	<ul style="list-style-type: none"> <li>Facilitate delivery of observations and measurements under the outcomes of the needs assessments and according to the long term data acquisition plan (Task OBS.3)</li> </ul>
Methods and protocols	<ul style="list-style-type: none"> <li>Prepare new and additional methods and protocol documents for 2014/15 Plenary acceptance (Tasks M&amp;P.1 and M&amp;P.2)</li> </ul>
Science and applications development	<ul style="list-style-type: none"> <li>Operate coordination mechanisms and identify funding sources and suppliers to deliver on the GFOI applications development plan</li> </ul>

## 5 INSTITUTIONALISING THE GFOI

### 5.1 Governance issues

The proposed governance for the GFOI follows the processes and procedures for the administration of GEO. At the top level, the GFOI should report to the GEO Plenary.

The day-to-day operation and administration of the Start-up Phase (2012) of the GFOI should be organized from within the GEO Secretariat, with a dedicated staff under the direction of the GEO Secretariat Director. The administration of the GFOI budget for 2012, while within the administration and expenditure reporting of the GEO Trust Fund, should be capable of independent monitoring. The GFOI budget should be managed under the same administrative arrangements as the current GEO Trust Fund and be the responsibility of the GEO Secretariat Director.

During the 2012 Start-up Phase the GFOI Task Force should remain in place to guide the early development of the GFOI. The Task Force should make recommendations to the GEO-IX Plenary on the future governance, including hosting and oversight arrangements, and a budget for forward years. The Task Force should also facilitate the preparation of an applications development plan and observations strategy.

### 5.2 Funding

The budget presented in the table below outlines the direct GFOI operating budget for the GEO Secretariat (Linkages Forum, staff, facilities, travel, developing country support etc.) for 2012. Further indicative budgets for each annual phase of the GFOI implementation to 2015 are also presented. Indirect costs, such as those for data commitments between users and suppliers are coordinated, but not funded by the GFOI (e.g., a space agency supplying to a developing country), are not included. This is because no funds, goods or services will flow through the GFOI. The costs borne by a future host institution are not considered in the budget presented. The capacity building costs are significant, although limited to assistance in the use of observations, because of the long-term intensive and often country-specific commitment needed.

The funds proposed for method development are modest, reflecting the expectation that most method development will arise from voluntary contributions through the GEO FCT. The funds sought are for supplemental methods for specific GFOI implementation issues otherwise not available, and for the review and publication of methods. Research and development will not be directly supported and will come through voluntary contributions and coordination will be funded through overall staff costs.

#### Annual GEO Secretariat Managed Budgets

Year	Total Annual \$	Staff	Meetings	Facilities	Travel	National Capacity Building	Methods and Protocols	Research
2012	1,502,000	4 FTE (662,000)	250,000	70,000	150,000	320,000	50,000	0
2013	1,150,000	2 FTE (395,000)	25,000	35,000	250,000	320,000	125,000	0
2014	975,000	2 FTE (395,000)	25,000	35,000	100,000	320,000	100,000	0
2015	1,025,000	2 FTE (395,000)	25,000	35,000	200,000	320,000	50,000	0

### 5.3 Staffing

It is proposed that the GFOI have staff within the GEO Secretariat for 2012. The GFOI staff should be dedicated and accountable to the GFOI program, and will interact frequently with other GEO Secretariat staff working on related GEO activities. The future indicative budgets allow for two FTE within the Secretariat.

The funding and secondment of staff should be sought from GEO Member countries and Participating Organizations. Where contributions to the GFOI are proposed from non-GEO affiliated organizations, such as industry, interest or philanthropic, these should be 'hosted' by a proponent GEO Member country or Participating Organization.

### 5.4 Staying relevant

Forest monitoring is characterized by rapid evolution in both the policy and technical approaches and in organizational change (e.g., the formation of UNREDD). The policy fluidity is largely caused by the evolving discussions on the international frameworks for land use, land use change and forestry, including REDD+. The ongoing negotiations for REDD+ mean that there is not yet certainty about the eventual reporting requirements. The GFOI will need to be responsive to the evolving requirements and to ensure that its outputs are directly relevant to needs.

The technologies of forest management are changing quickly and the GFOI will need to remain informed, responsive to change, and able to distinguish between the scientific potential of new approaches and operational readiness.

The technology changes can be fundamental, and can impact on the way that information is sourced, the coverage and frequency of collection, and the organization of the data collection approaches.

Similar shifts are occurring with satellite land cover observations, with complete national annual coverage now feasible for most countries, with cloud penetrating technologies providing opportunities for even better access to data in tropical countries. GFOI will interact with the GEO FCT and other science providers to remain abreast of new information on the readiness of emerging approaches to be used in the operational domain.

### **5.5 Self assessment**

Through the GFOI Concept Plan and this Implementation Plan the case has been made for the GFOI and the roles it will fulfill. However, need alone does not ensure success and the GFOI must institute processes for continual review and self assessment. The scope of these processes should include both the ongoing relevance of the GFOI activities and the quality of their delivery. The information sought should provide insights into how the GFOI can continuously improve.

The assessment processes should include both external inputs and internal performance assessments. The scope should therefore cover all aspects of the GFOI from the performance of the GFOI GEO Secretariat staff and the systems they work in, to the overall quality and usefulness of GFOI delivery.

External reviews should include using the GEO Principals as focal points for engaging with the various interested parties in each GEO Member country and Participating Organization. The GEO Principals should be provided with an annual assessment pro-forma that can be used to compile subsidiary inputs into a consolidated report. These “health-checks” and guides to the continuous improvement of the GFOI should be compiled as part of the GFOI reporting to the GEO Plenary.

## **Annex A**

### **ACRONYMS AND ABBREVIATIONS**

EO	Earth Observation
CEOS	Committee on Earth Observation Satellites
DEM	Digital Elevation Model
FAO	Food and Agriculture Organization
FCT	GEO Forest Carbon Tracking Task
FTE	Full-time expert
GEO	Group on Earth Observations
GEOS	Group on Earth Observations System of Systems
GFOI	Global Forest Observations Initiative
GOFC-GOLD	Global Observation of Forest and Land Cover Dynamics
IPCC	Intergovernmental Panel on Climate Change
ITTO	International Tropical Timber Organization
MRV	Monitoring, reporting and verification
ND	GEO FCT National Demonstrator
NGGIP	IPCC National Greenhouse Gas Inventories Programme
PD	GEO FCT Product Development Team
REDD+	Reducing Emissions from Deforestation and Forest Degradation
SBA	Societal Benefit Area
TBC	To Be Confirmed
TBD	To Be Determined
UN	United Nations
UNFCCC	United Nations Framework Convention on Climate Change

## Annex B

### PLANNING TEAM AND TASK FORCE MEMBERS

The Concept Plan was prepared by an *ad hoc* Planning Group that was established after the 2009 GEO Plenary. The Planning Group members were:

Australia:	Gary Richards (Convenor)
Brazil:	Gilberto Camara
Canada:	Mike Wulder
COMIFAC:	Martin Tadoum
EC-JRC:	Alan Belward
ESA:	Stephen Briggs
FAO:	Mette Loyche Wilkie
GOFC-GOLD:	Martin Herold
Guyana:	Andrew Bishop
Japan:	Yoshiki Yamagata, Toshihide Fukui
Norway:	Per-Erik Skrovseth
USA:	Peter Colohan
USGS:	Bryant Cramer

This GEO Implementation Plan was prepared under the more formal arrangement of a Task Force established by the 2010 GEO Plenary. The Task Force had responsibility for the oversight of the Implementation Plan preparation. The members of the Task Force are:

Australia:	Gary Richards (Chair)
Brazil:	Gilberto Camara
CEOS/ESA:	Stephen Briggs
China:	Liangyun Liu
FAO:	Mette Loyche Wilkie
GEO SEC:	Jose Achache
GOFC-GOLD:	Martin Herold
IPCC:	Simon Eggleston
Japan:	Toshihide Fukui
Norway:	Andreas Tveteraas
Tanzania:	Erik Mugurusi
UK:	Jim Penman

UNFCCC: María José Sanz-Sánchez

USA: Len Hirsch

World Bank: Alex Lotsch

## Annex C

### DATA TYPES AND TYPICAL USES

A number of frameworks have examined the data needs of countries wishing to develop national forest information systems. These data needs typically span:

**Low Resolution Satellite Data for Early Alert Systems:** Repeat wall-to-wall low-medium resolution (500-1000m grid resolution, e.g., NOAA's AVHRR, NASA MODIS, ESA MERIS, SPOT-VEG sensors) repeat series on a 1 to 3 day cycle. The sensors are typically optical, and rely on compositing frequent repeat observations to obtain cloud free images. Such observations generally support early detection applications serving as alert systems for unusual trends or potentially illegal activity. The data are often used to determine forest canopy characteristics (leaf area index, canopy density or normalized difference vegetation index) and biomass estimates are modeled from these.

**Annual Medium Resolution Satellite Data for Annual Change Detection:** repeat wall-to-wall medium-high resolution data on an annual basis (6-30m grid resolution, e.g., SPOTs 4 and 5, LANDSATs 5 and 7, CBERS 2B, RapidEye, DMC and IRS – the optical sensors; ALOS PALSAR, ENVISAT, ASAR, RADARSAT – the cloud penetrating radar sensors). These data can typically provide robust estimates of forest cover and associated annual rates of change. The optical data are two dimensional and do not provide forest height or structure, but as with lower resolution optical, canopy characteristics can be related to biomass. Radar instruments can, depending on forests types and radar wavelength, provide a backscatter capable of being interpretative of forest structure. Forest structure can be associated with biomass content. Being insensitive to clouds and haze radar sensors can be used for rapid detection of deforestation.

**Very High Resolution Satellite and Airborne Data for Sampling and Cal-Val:** very high resolution (20cm to 5m) optical (e.g., IKONOS, QUICKBIRD, WorldView, SPOT), radar (TerraSar-X, TanDEM-X, COSMO/SkyMed, RADARSAT-2) and various airborne lidar and stereo photography. These data are typically used in samples (as opposed to wall-to-wall) and either used for structural assessment or calibration and validation of lower resolution data. Lidar can be used to interpret forest structure, and stereo optical can provide estimates of forest height as well as canopy characteristics. Both structure and models of height/canopy density can be used to estimate forest biomass. If applied wall-to-wall this is usually for the purpose of a one-off carbon stock assessment, rather than for change monitoring.

**Forest (Ground-plot) Inventory Data:** these data are typically readily measurable forest parameters (basal area, height, canopy density, tree species etc.) at sample plots. Collections may also include forest floor litter (coarse and fine) and soil characteristics. Models are used to estimate tree stem volume (taper functions) and biomass (allometric equations).

**Biomass Data:** these data are typically derived from destructively sampling representative trees in field plots, and may include both above- and below-ground biomass measures. The information yielded can then be used to determine allometric equations (and root to shoot ratios) to either apply to forest plot measurements or to calibrate models used to estimate forest biomass and soil carbon.

**In -situ Calibration/Validation Data:** these are ground measurements of standard forest parameters used to for calibration and validation of data collected from satellites, and will typically obtain measures similar to those for biomass data as described above.

The above represent the most common core data that can be used when national systems are formed from an integration of ground and satellite data. Other data may be required, depending on the design (mostly model form) of various national system approaches. For example, systems using process (ecosystem) models also require climate data. All of the above data have possible uses beyond carbon

stock and stock change analysis. For example, the distribution of forest cover and how it is changing is an important biodiversity consideration.



## Annex D

### GFOI LINKAGES FORUM

The FCT NDs show that most countries are still developing national forest monitoring system designs and trialing potential data options and methods. They have not yet decided on the supply arrangements needed for operational monitoring. The absence of needs specifications does not provide the certainty for data suppliers to optimize their collection, pre-processing and supply arrangements. The GFOI Linkages Forum is intended to encourage countries that are in a position to do so to outline their specific needs - so that this can be best linked to potential supply arrangements and plans. The GFOI Linkages Forum will assist in this by providing a focal point where the cumulative needs and potential for supply can be considered in a uniform and consolidated manner.

The Linkages Forum represents the next steps in the development of the GFOI, serving as a platform for the coordinated supply of observations against specified national needs. Given existing readiness activities, enough countries should in 2012 be in a position to participate so that the Forum can achieve a sufficient mass to establish the GFOI as *the* platform for coordination of observations issues into the future.

The Linkages Forum will record issues related to both: data users and their national needs: and data suppliers and their plans, capabilities and constraints. Observations requirements can vary significant from country to country – depending on geography, forest type, climate conditions, and national management practices. The Linkages Forum will include inputs from a number of national needs assessments, considering the observation requirements of the relevant national forest monitoring systems. It will provide a means to explore how these national needs and choices might be satisfied based on known plans for data supply, and the related conditions of supply – including cost, capacity and technical characteristics of the data.

The Linkages Forum will start to make the necessary connections between national forest information systems and potential data suppliers. It can also start to develop an understanding of the regional and global scale efficiencies that should be understood in planning acquisition strategies for the key data sources. As more countries are engaged the clearer these trends will become.

## Annex E

### NEEDS ASSESSMENT

Many research-driven applications entail comparisons of various one-off data acquisitions and their analysis by research institutions, but the needs of an ongoing sustainable operational reporting mechanism of government are quite different. Work on readiness for forest monitoring under the UNREDD and World Bank processes has developed focused national consideration of these issues. In some instances, these descriptions of systems approaches and technical methods elaborates on ongoing observations and services needed, while in others these needs are not so clearly outlined.

A **GFOI Needs Assessment** is a systematic comprehensive evaluation of top-to-bottom requirements to develop robust, efficient and sustainable national forest monitoring systems. Key components include satellite, aerial and in situ data, sampling and inventory procedure, and mapping and modeling. Their purpose is to evaluate the specific technical, institutional, and capacity needs and gaps.

Several activities are being undertaken to take stock of national capacities and situation, most notably the REDD Preparedness Plan mechanism. The GFOI Needs Assessments are meant to enhance and complement these activities, and in fact, to develop efficiencies by coupling GFOI assessments with on-going activities.

The following is a description of key areas for the needs assessments and gap analyses building from fundamental capacities and services to more specific components of a functioning forest assessment and monitoring capability. The national Needs Assessments should be undertaken by a team of appropriate technical personnel as appropriate for specific countries. The Assessment should be performed in consultation with the countries and the Needs Assessment reported in the following format.

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### 1 IDENTIFICATION OF INSTITUTIONS

In many countries, the responsibility for specific data may be divided amongst different Ministries and organizations. It is therefore important to identify who are the lead institutions.

### 2 NATIONAL SPATIAL DATA INFRASTRUCTURE (NSDI)

National Spatial Data Infrastructure has been defined as the technologies, policies, and people necessary to promote sharing of geospatial data throughout all levels of government, the private and non-profit sectors, and the academic community (FGDC; <http://www.fgdc.gov/>). A robust NSDI provides the backbone for forest monitoring systems. Though GFOI is not designed to build NSDIs, there are certain elements that are critical to its functioning, especially data inter-operability, data standards, access and sharing, and data quality. There are also potential legal and data security issues. There are many efforts to assess the status of NSDIs that can be used to support the GFOI Needs Assessments. The NSDI assessment will include:

- Status of NSDI;
- Determine national data standards as to projections, projection parameters and file formats for various categories of geospatial data (documents, images etc.).

### **3 NATIONAL FOREST INVENTORIES**

The principal objective is to determine the current status of national forest inventories including:

- Sampling design: permanent and temporary plots, calibration and validation sites;
- Field inventory protocols;
- NFI information systems;
- Current use of satellite and aerial data;
- Status of allometric data;
- Classification systems and definitions;
- Availability of flora and dendrology data.

While the development of NFIs is not the domain of GFOI, there is significant overlap considering the use of satellite, aerial and in situ data for monitoring forest distribution and status, especially for estimating and modeling forest volume, biomass and carbon.

### **4 PHYSICAL AND THEMATIC DATA**

A principal objective of the needs assessments is to take stock of the existing spatial data. These data are needed to support forest monitoring. GFOI will maintain a metadatabase of country data and standards, and textual information:

- Status of topographic map series: In many nations, the topographic maps are quite out-of-date and may not be in digital format. Lack of up-to-date topographic maps significantly inhibits the ability to navigate to field plots. Where in adequate, GFOI would recommend options for updating these maps or creating new ones;
- Status of forest cover, vegetation, ecosystem, and land cover and land use maps and data;
- Compilation of all relevant documents on mapping and monitoring conducted in the country.

### **5 SATELLITE DATA**

Each country has their own particular data requirements, influenced by terrain and atmospheric conditions (cloud and dust primarily), and their definitions of forests and land cover as well as their assessment and reporting plans. Some countries look toward bi-annual reporting, while others annual. There are varying needs for real or near-real time assessments on a continuing basis to monitoring forest clearing, fire, and insect and pathogen damage.

GFOI will conduct an inventory of available satellite data resources in-country, and develop plans to acquire, pre-process and archive data held at various institutions. An ultimate goal is to develop robust archives of data that is currently archived in various receiving stations and data centers. There are global data products such as the Landsat Global Land Survey (GLS) data that have been produced for the epochs 1990, 2000 and 2005. 2010 data are currently being assembled. These data, as well as other global products can readily be delivered to nations, as the GEO FCT Task has demonstrated.

### **6 NATIONAL GREENHOUSE GAS INVENTORIES**

The use of forest inventory, physical, thematic and remote sensing data to produce estimates of greenhouse gas emissions and removals associated with LULUCF, national GHG inventories use

methods developed by the IPCC and agreed for international reporting under the UNFCCC. The GFOI will work with the IPCC to ensure compatibility of advice so that GFOI outputs complement and reinforce IPCC methodologies.

## Annex F

### STAFF ACTIVITY TABLE

		Observations supply and use															Guidance and science development					Totals
		ADM. 1	ADM. 2	ADM. 3	ADM. 4	ADM. 5	ADM. 6	CB. 1	CB. 2	CB. 3	CB. 4	OBS. 1	OBS. 2	OBS. 3	OBS. 4	OBS. 5	M&P. 1	M&P. 2	RD. 1	RD. 2	RD. 3.	
2012	Effort (man months)	12	5	3	8	2	3	3	4	3		5	4	4	3	2	24		6	6		97
	GFOI PO Mgr		0.2	0.2	0.2				0.1								0.2		0.1			1
	CB & needs staff	0.6			0.2					0.1		0.1										1
Staff FTEs	PO staff 1					0.2	0.1		0.2			0.3	0.3	0.2	0.25	0.25						1
	PO staff 2																0.2					1
	Linkages contractor				0.3																	0.3
	Other	0.4		0.2				0.2	0.1	0.1				0.1			1.6		0.4	0.5		3.6
	Notes	SilvaCarbon, Norway, Australia and other programmes contribute		GEOSEC or other host body support				FCT co-lead support	Significant support from CEOS SDCG	SilvaCarbon, Norway, Australia and other programmes contribute	From 2013			CEOS SDCG will support			Significant support required from steering committee and contracted authors		External support, FCT co-leads	FCT agencies	From 2013	
2013	Effort (man months)	4	5			1	1	6	1	12	4	1	1	3	3	2	16	8	2	6	3	79
	GFOI PO Mgr		0.25					0.2	0.1								0.25		0.1	0.1		1
	PO staff 1							0.3			0.25											1
Staff FTEs	Other (inc host agency)	0.4				0.1	0.1			1	0.1	0.1	0.1	0.2	0.25	0.1	1.1	0.7	0.1	0.4	0.25	4.65
	Notes	SilvaCarbon, Norway, Australia and other programmes contribute		GEOSEC or other host body support		Host agency	FCT co-lead support		Significant support from CEOS SDCG	SilvaCarbon, Norway, Australia and other programmes contribute	Host agency support	Significant support from CEOS SDCG		CEOS SDCG will support	Donor arrangement	Donor arrangement	Significant support required from steering committee and contracted authors	Significant support required from steering committee and contracted authors	External support, FCT co-leads	FCT agencies		
2014	Effort (man months)	4	3			1	1	6	1	12	4	1		5	3	2	16	8	2	6	3	78
	GFOI PO Mgr		0.25					0.2	0.1								0.25		0.1	0.1		1
	PO staff 1							0.3			0.25											1
Staff FTEs	Other (inc host agency)	0.4				0.1	0.1			1	0.1	0.1	0.1	0.2	0.25	0.1	1.1	0.7	0.1	0.4	0.25	4.65
	Notes	SilvaCarbon, Norway, Australia and other programmes contribute		GEOSEC or other host body support		Host agency	FCT co-lead support		Significant support from CEOS SDCG	SilvaCarbon, Norway, Australia and other programmes contribute	Host agency support	Significant support from CEOS SDCG		CEOS SDCG will support	Donor arrangement	Donor arrangement	Significant support required from steering committee and contracted authors	Significant support required from steering committee and contracted authors	External support, FCT co-leads	FCT agencies		
2015	Effort (man months)	4	3			1	1	6	1	12	4	1		5	3	2	16	8	2	6	3	78
	GFOI PO Mgr		0.25					0.2	0.1								0.25		0.1	0.1		1
	PO staff 1							0.3			0.25											1
Staff FTEs	Other (inc host agency)	0.4				0.1	0.1			1	0.1	0.1	0.1	0.2	0.25	0.1	1.1	0.7	0.1	0.4	0.25	4.65
	Notes	SilvaCarbon, Norway, Australia and other programmes contribute		GEOSEC or other host body support		Host agency	FCT co-lead support		Significant support from CEOS SDCG	SilvaCarbon, Norway, Australia and other programmes contribute	Host agency support	Significant support from CEOS SDCG		CEOS SDCG will support	Donor arrangement	Donor arrangement	Significant support required from steering committee and contracted authors	Significant support required from steering committee and contracted authors	External support, FCT co-leads	FCT agencies		



## Part B

### Task Descriptions

#### 1 GFOI TASK DESCRIPTIONS SUMMARY

The following table contains the list of high-level tasks to be undertaken during the GFOI.

<b>Set-up &amp; Administration</b>	<b>Support &amp; Capacity Building for National Governments</b>	<b>Observations and measurements</b>	<b>Methods and protocols</b>	<b>Science and Applications Development</b>
<b>“ADM” tasks</b>	<b>“CB” tasks</b>	<b>“OBS” tasks</b>	<b>“M&amp;P” tasks</b>	<b>“SA” tasks</b>
<b>ADM.1:</b> National needs assessments	<b>CB.1:</b> Support and advice to governments building national forest monitoring systems	<b>OBS.1:</b> Definition of long-term, high-level observation & processing strategy in response to users’ needs	<b>M&amp;P.1:</b> Develop methods & protocols related to GFOI  1. Data Acquisition & Interoperability Issues  2. Data Processing & integration  3. Calibration, Validation & Accuracy  4. Forest Carbon Estimation	<b>SA.1:</b> Prepare an Applications Development Plan for GFOI, covering:  1. Critical operational matters  2. Technical questions in support of guidance (methods and protocols)
<b>ADM.2:</b> Establish interfaces to other international forest-related initiatives and institutions	<b>CB.2:</b> GFOI Data Coordination Strategy in response to national needs	<b>OBS.2:</b> GEO model for GFOI data access, use and reuse conditions	<b>M&amp;P.2:</b> Maintain, evolve and promote GFOI methods & protocols	<b>SA.2:</b> FCT technical & scientific studies, fundamental research
<b>ADM.3:</b> Establish GFOI Project Office & resource	<b>CB.3:</b> GFOI Training Courses on aspects of utilisation of observations in national forest monitoring systems	<b>OBS.3:</b> GFOI Data Acquisition Strategy design and implementation		<b>SA.3:</b> Evaluation of new observations and measurement technologies

<b>Set-up &amp; Administration</b>	<b>Support &amp; Capacity Building for National Governments</b>	<b>Observations and measurements</b>	<b>Methods and protocols</b>	<b>Science and Applications Development</b>
“ADM” tasks	“CB” tasks	“OBS” tasks	“M&P” tasks	“SA” tasks
<b>ADM.4:</b> Organise 2012 GFOI Linkages Forum & agreement on GFOI coordination role	<b>CB.4:</b> Data awareness & discovery tools & services	<b>OBS.4:</b> Biomass data & information portal		
<b>ADM.5:</b> Establish GFOI communication & information systems & undertake outreach		<b>OBS.5:</b> Cal-val data compilation and portal		
<b>ADM.6:</b> GEO Forest Carbon Tracking task transition plan and interface				



## 1.1 Set-up & Administration

<b>TASK ADM.1: National needs assessments</b>				
<i>Objective</i>	To prepare needs assessments for NDs and other selected countries considering assistance/products delivered by GEO FCT/GFOI, including observations, processing needs, models/methods development and other support (e.g., capacity building) to governments.			
<i>2011 Status</i>	Needs of some of the FCT ND countries are well known. Other readiness reviews (e.g., by FCPF or UNREDD) will contribute to needs assessments for others.			
<i>Expected outcome</i>	Consolidated needs assessments and matching support plans based on inputs from governments and other stakeholders. Basis for data suppliers' acquisition and delivery plans. Basis for assistance to model/method development. Basis for capacity building support to governments.			
<i>Activities (A), activity lead &amp; timelines</i>	<p><b>ADM.1-1 (Lead: GFOI):</b> Establish which countries are to be included in the needs assessments (based on requests by national governments and plans for assistance to them by other international agencies).</p> <p><b>ADM. 1-2 (Lead GFOI):</b> Prepare a questionnaire on national needs to be sent to selected national governments (at least 1 month in advance of visits by GFOI representatives to the countries).</p> <p><b>ADM 1-3 (Lead GFOI):</b> Visits to each country by GFOI experts to establish contact and complete questionnaire (at least 2 months ahead of the 2012 GFOI Linkages Forum).</p> <p><b>ADM.1-4 (Lead: GFOI):</b> Coordinate and consolidate the needs assessments. Prepare a preliminary report on planned support to be discussed and finalized at the Linkages Forum.</p> <p><b>ADM.1-5 (Lead: GFOI):</b> Assess needs with the main potential GFOI data suppliers – possibly including a meeting with CEOs. Iterate with national governments as necessary. Produce a final report on national needs assessments.</p>		<p>End December 2011.</p> <p>End January 2012.</p> <p>End March 2012 (assuming the 2012 GFOI Linkages Forum takes place in May 2012).</p> <p>April/May 2012.</p> <p>June 2012.</p>	
<i>Output/deliverables (D)</i>	<i>Deliverable title</i>		<i>Lead</i>	<i>Delivery date</i>
	ADM.1D1	National needs assessment questionnaire.	GFOI	Jan 2012.
	ADM.1D2	Consolidated report of national needs.	GFOI	May 2012 (finalized after linkages forum).
<i>Indicators</i>	Number of national governments engaged. Linkage of data needed and data suppliers.			
<i>Means of verification</i>	Further iterations with national governments, in particular at 2012 GFOI Linkages Forum.			
<i>Assumptions/risks</i>	Risk of poor engagement with new GFOI framework. Importance of relationship with FCPF and UNREDD.			
<i>Team:</i>	GFOI, government agencies, data suppliers, international experts.			
<i>Related Tasks</i>	The task is a prerequisite for all work to be carried out by GFOI in 2012 and 2013 and feeds directly into Task ADM.2 and ADM.4.			

<b>TASK ADM.2: Establish interfaces to other international forest-related initiatives and institutions</b>				
<i>Objective</i>	To optimize and coordinate the GFOI efforts with other international initiatives (e.g., UNREDD, FCPF) and institutions (e.g., FAO, IPCC, World Bank, REDD+ Partnership etc.) – establishing formal agreements where necessary.			
<i>2011 Status</i>	<ul style="list-style-type: none"> <li>The current GEO FCT team already involves FAO and UNREDD staff.</li> <li>The GFOI Task Force includes representatives from key institutions and initiatives – including FAO, World Bank, IPCC.</li> </ul> No formal agreements exist between GEO FCT/GFOI and other institutions on interfaces and division of labour, including support to national governments.			
<i>Expected outcome</i>	Universal understanding and acceptance of the role for the GFOI in the context of existing activities and frameworks. Suitable linkages and points of contact within these related efforts and their engagement as appropriate on GFOI tasks. Agreements on interfaces and division of labor, including which countries are priority for GFOI/other institutions.			
<i>Activities (A), activity lead &amp; timelines</i>	<b>ADM.2-1 (Lead: GFOI):</b> Develop an engagement strategy document – identifying all related initiatives and institutions, their relationship with GFOI. <b>ADM.2-2 (Lead: GFOI):</b> Ensure representation of related institutions at the Linkages Forum. <b>ADM.2-3 (Lead: GFOI):</b> Develop working relationships and lines of communication, information exchange, and participation in GFOI tasks.		Begin January 2012.  May 2012.  During 2012.	
<i>Output/deliverables (D)</i>	<i>Deliverable title</i>		<i>Lead</i>	<i>Delivery date</i>
	ADM.2D1	GFOI Interfaces & Engagement Strategy Document.	GFOI	Begin January 2012 – updated later.
<i>Indicators</i>	Number and health of interactions with other international forest-related initiatives and institutions, and their engagement within GFOI tasks.			
<i>Means of verification</i>	Participation in the Linkages Forum. Engagement Strategy Document.			
<i>Assumptions/risks</i>	Risk of lack of cooperation between various international forest-related initiatives and institutions.			
<i>Team:</i>	GFOI, international forest-related initiatives and institutions.			
<i>Related Tasks</i>	TASK ADM.1: National needs assessments. Task ADM.4 Organization of 2012 GFOI Linkages Forum.			

<b>TASK ADM.3: Establish GFOI Project Office &amp; Resource</b>				
<i>Objective</i>	Establish a project office to manage and coordinate GFOI tasks. Ensure sustainable funding of staff and operation is supported by governments.			
<i>2011 Status</i>	GEO FCT and GFOI activities are already supported within the GEO Secretariat by dedicated staff paid for by the governments of Norway and Australia. Other governments are supporting the activities in-kind. No long-term financing has been secured and tasks within GEO FCT are often done on a voluntary basis. No strong project office exists for GEO FCT.			
<i>Expected outcome</i>	Staffed and equipped project office – potentially co-located with the GEO Secretariat – with operational budget committed by national governments and administered via a dedicated Trust Fund.			
<i>Activities (A), activity lead &amp; timelines</i>	<b>ADM.3-1 (Lead: GFOI):</b> Formal establishment of GFOI Project Office. Development and agreement of management, administrative and financial arrangements and their oversight. Initial operation of office focusing on needs assessments and interfaces with other international organizations.  <b>ADM.3-2 (Lead: GFOI):</b> Conclude donor arrangements in support of financial & staffing requirements for GFOI project office. Recruit as necessary.		December 2011.  August 2012.	
<i>Output/deliverables (D)</i>	<i>Deliverable title</i>		<i>Lead</i>	<i>Delivery date</i>
	ADM.3D1	Statement of project office financing and staffing requirements.	GFOI	February 2012.
<i>Indicators</i>	Funds secured. Staff and office in operation.			
<i>Means of verification</i>	Technical and financial reports.			
<i>Assumptions/risks</i>	The post 2012 (Start-up Phase) location of the GFOI project office could be a matter for debate. Lack of demand by national governments for support by GFOI. Lack of funding.			
<i>Team:</i>	GFOI, GEO Secretariat.			
<i>Related Tasks</i>	TASK ADM.1: National needs assessments. Task ADM.4 (Organization of 2012 GFOI Linkages Forum) is an integral part.			

<b>TASK ADM.4: Organize 2012 GFOI Linkages Forum</b>				
<i>Objective</i>	There is a need for a mechanism that can bring interested parties together, be put in place relatively quickly, and effectively links support arrangements with the various national needs. The GFOI Linkages Forum will implement this.			
<i>2011 Status</i>	Preliminary discussions undertaken within GEO ExCom and with key governments and related institutions.			
<i>Expected outcome</i>	It will coordinate and consolidate needs for support with actual and potential supply assisting in facilitating and optimizing development of forest observations.			
<i>Activities (A), activity lead &amp; timelines</i>	ADM.4-1 (Lead: GFOI): Draft program for the Linkages Forum.		March 2012.	
	ADM.4-2 (Lead: GFOI): Linkages Forum arrangements, content development and participation.		May 2012.	
<i>Output/deliverables (D)</i>	<i>Deliverable title</i>		<i>Lead</i>	<i>Delivery date</i>
	ADM.4D1	Linkages Forum Prospectus.	GFOI	January 2012.
	ADM.4D2	Draft report.	GFOI	March 2012.
	ADM.4D3	Final report.	GFOI	May 2012.
<i>Indicators</i>	Level of participation at Linkages Forum and contribution to coordination.			
<i>Means of verification</i>	Agreement on GFOI coordination role leading to better alignment of need and supply.			
<i>Assumptions/risks</i>	Risk of inadequate participation or contributions.			
<i>Team:</i>	GFOI.			
<i>Related Tasks</i>	TASK ADM.1: The questionnaire developed in ADM-1 will be collected and discussed ahead of the GFOI Linkages Forum.			

<b>TASK ADM.5: Establish GFOI communication &amp; information systems and undertake outreach</b>				
<i>Objective</i>	On-line information and communication systems will play a major role in the promotion and operation of the GFOI. This task will determine the requirements for these systems in support of the GFOI objectives and establish them. The systems will aid effective and efficient communication and information dissemination with partners and stakeholders.			
<i>2011 Status</i>	A prototype portal has been developed in support of the GEO FCT data acquisition strategy. Working document archives also exist for early versions of methods and guidance documents. Annual ND seminars are being conducted under the GEO FCT. All systems would need significant redefinition and development if they are to serve as the basis for GFOI.			
<i>Expected outcome</i>	Operational information and communication systems in support of GFOI.			
<i>Activities (A), activity lead &amp; timelines</i>	<b>ADM.5-1 (Lead: GFOI):</b> Information system architecture requirements study  <b>ADM.5-2 (Lead: GFOI):</b> GFOI systems implementation (e.g. web, workshops, Linkages Forum, documents, presentations in international fora, satellite data meta-database).  <b>ADM. 5-3 (Lead: GFOI):</b> Start regular communication and information dissemination using Linkages Forum as “kick-off”		January - August 2012  From September 2012. Basic systems like a web presence can be realized much earlier.  May 2012.	
<i>Output/deliverables (D)</i>	<i>Deliverable title</i>		<i>Lead</i>	<i>Delivery date</i>
	ADM.5D1	GFOI web-site.	GFOI	January 2012.
	ADM.5D2	GFOI Information System Architecture Requirements.	GFOI	May 2012.
	ADM.5D3	GFOI Operational communication and information dissemination.	GFOI	From late 2012.
	ADM.5D4	Operations & Maintenance of the GFOI Information System.	GFOI	2013 onwards.
<i>Indicators</i>	Availability of information systems in support of core functions of GFOI. Number of communication and information dissemination activities carried out, response from national governments and international organizations.			
<i>Means of verification</i>	GFOI progress reports, web-site visits, records from workshops, use of meta-database.			
<i>Assumptions/risks</i>	As with all IT projects, there is an implementation risk and complexity should be avoided. Keeping the information system alive and up to date will be a key task for sharing information and data relevant to the GFOI.			
<i>Team:</i>	GFOI.			
<i>Related Tasks</i>	Related to some CB tasks like CB.4 and possibly to OBS.4 (Biomass portal).			

<b>TASK ADM.6: GEO Forest Carbon Tracking task transition plan and interface</b>				
<i>Objective</i>	Ensure a smooth transition from the current arrangements and activities within the GEO FCT to GFOI.			
<i>2011 Status</i>	The GEO FCT has a fledgling ND program in place with 11 governments around the world. An effective relationship with CEOS exists in support of space data acquisition coordination. Early drafts of possible methods and guidance documents exist - in key areas such as satellite data products, and interoperability of satellite data types. A GEO-FCT portal also exists.			
<i>Expected outcome</i>	A clear transition management plan, which has agreement among existing GEO FCT participants and the GFOI Task Force, should be available to guide the transition of GEO FCT in support of the new GFOI framework. Roles and responsibilities should be clear and a schedule provided for the process.			
<i>Activities (A), activity lead &amp; timelines</i>	<b>ADM.6-1 (Lead: FCT Co-leads and GFOI Task Force):</b> Establish a clear transition plan to guide the transition of GEO FCT to GFOI.		January 2012	
	<b>ADM.6-2 (Lead: GFOI):</b> GEO FCT transition to GFOI.		During 2012	
<i>Output/deliverables (D)</i>	<i>Deliverable title</i>		<i>Lead</i>	<i>Delivery date</i>
	AND.6D1	GEO FCT Transition Plan.	GFOI	January 2012.
	ADM.6D1	GEO FCT Transition Plan.	GFOI	January 2012.
<i>Indicators</i>	Effective transition of existing FCT activities, systems and relationships. Tasks transferred and managed by GFOI.			
<i>Means of verification</i>	Integration of NDs into GFOI. Progress towards formal GFOI Methods and Guidance. CEOS engagement in space data coordination for GFOI.			
<i>Assumptions/risks</i>	More formal arrangements will be necessary for many of the activities started by FCT - including the methods and guidance documents, and the relationships with national governments. Considerable resources and expertise will be needed to make this happen. For some FCT NDs, the processing of the data was performed by a third-party and not by the NDs themselves. Full integration of those NDs into the GFOI will require specific effort.			
<i>Team:</i>	GFOI, FCT.			
<i>Related Tasks</i>	TASK ADM.2: Establish interfaces to other international forest-related initiatives and institutions. TASK ADM.3: Establish GFOI Project Office & Resource. TASK ADM.6 is a prerequisite for SA.3 FCT technical & scientific studies.			

## 1.2 Support & Capacity Building for National Government

TASK CB.1: Support & Advice to Governments building national forest information systems				
<i>Objective</i>	Assist countries to develop technical capacity to utilize observations in national forest monitoring systems, through application of recognized methods and sustained access to the necessary observations. Initial emphasis will be on communicating the scope, scale and nature of the GFOI support.			
<i>2011 Status</i>	The existing 11 National Demonstrators of GEO FCT are a small scale demonstration of the larger GFOI ambition in the main areas of support (data supply, methods and guidance etc). A phased approach will be required – identifying priorities for initial country engagement based on their interest and relevance to GFOI objectives (needs assessment). A process for initiating and developing national engagement will be required.			
<i>Expected outcome</i>	National government engagement template – mapping out how GFOI will engage a typical country and develop the relationship, specifying the support and services provided at each stage. Support to governments for development of national forest information systems.			
<i>Activities (A), activity lead &amp; timelines</i>	<b>CB.1-1 (Lead: GFOI):</b> National government engagement plan – assessing GFOI capacity and identifying priorities. <b>CB.1-2 (Lead: GFOI):</b> National government engagement template – mapping out how GFOI will engage a typical country and develop the relationship, specifying the support and services provided at each stage. <b>CB.1-3 (Lead: GFOI):</b> National government engagement – based on the needs assessments, interfaces with other international organizations and the outcome of the Linkages Forum. GFOI will engage directly with national governments included in its “portfolio” to further establish needs and specify assistance to be provided.		May - August 2012.  August 2012.  From September 2012.	
<i>Output/deliverables (D)</i>	<i>Deliverable title</i>		<i>Lead</i>	<i>Delivery date</i>
	CB.1D1	National government engagement plan & priorities.	GFOI	August 2012.
	CB.1D2	National government engagement template.	GFOI	September 2012.
	CB.1D3	Support plans for each national government engaged.	GFOI	From September 2012.
<i>Indicators</i>	Progress of supported countries towards national capacity and institutional arrangements for national forest monitoring systems. In-country technical and human capacity growth and less need for expatriate expertise assistance.			
<i>Means of verification</i>	Feedback survey for engaged countries.			
<i>Assumptions/risks</i>	Careful planning will be needed to manage expectations about the level and nature of GFOI support, including the number of countries that can be supported. Main suppliers must be engaged early to ensure that significant capacity is behind the GFOI coordination efforts.			
<i>Team:</i>	GFOI, with engagement of UNREDD, FAO, FCPF to understand existing activities and capacities in different countries.			
<i>Related Tasks</i>	TASK ADM.1: National needs assessments. TASK ADM.2: Establish interfaces to other international forest-related initiatives and institutions. TASK ADM.4 (organization of 2012 GFOI Linkages Forum) is an integral part.			

<b>TASK CB.2: GFOI Data Coordination Strategy in response to national needs</b>				
<i>Objective</i>	To define a strategy for coordination of all available observation and data sources, including commitments by the data providers – securing sustainable arrangements for participating countries.			
<i>2011 Status</i>	Draft CEOS data strategy available – focusing on the satellite remote sensing data sets required by GFOI.			
<i>Expected outcome</i>	Security of the key observations and datasets needed by participating governments.			
<i>Activities (A), activity lead &amp; timelines</i>	<b>CB.3-1 (Lead: CEOS):</b> CEOS data strategy development for GFOI.		During 2011 Following the Linkages Forum in 2012.	
	<b>CB.3-2 (Lead: GFOI):</b> GFOI data coordination strategy development.			
<i>Output/deliverables (D)</i>	<i>Deliverable title</i>		<i>Lead</i>	<i>Delivery date</i>
	CB.3D1	CEOS Data Strategy for GFOI.	CEOS	Late 2011 – to be updated in 2012 following national needs assessments.
	CB.2D2	GFOI data coordination strategy.	GFOI	Late 2012.
<i>Indicators</i>	Engagement key providers in the data strategies and commitments for their participation in the GFOI strategy.			
<i>Means of verification</i>	Adequacy of data supply for GFOI priority countries will be a measure of data strategy success.			
<i>Assumptions/risks</i>	Many different types of data and observations are of interest, including considerable amounts of in situ information. Coordination will be necessary, including with FAO.			
<i>Team:</i>	GFOI, CEOS, FAO, data donors, engage with IPCC			
<i>Related Tasks</i>	OBS.1			



<b>TASK CB.3: GFOI Training Courses on the utilisation of observations in national forest information systems</b>				
<i>Objective</i>	Define and deliver training courses on utilization of observations in national forest monitoring systems.			
<i>2011 Status</i>	Various workshop activities are underway for the FCT (e.g., via Silva Carbon).			
<i>Expected outcome</i>	Materials and procedures supporting GFOI training courses. Trained national experts.			
<i>Activities (A), activity lead &amp; timelines</i>	<b>CB.2-1 (Lead: GFOI):</b> Training course planning and development.		Late 2012. From 2013.	
	<b>CB.2-2 (Lead: GFOI):</b> Training course delivery.			
<i>Output/deliverables (D)</i>	<i>Deliverable title</i>		<i>Lead</i>	<i>Delivery date</i>
	CB.2D1	GFOI Training Course Plan & Materials.	GFOI	Late 2012.
	CB.2D2	GFOI Training courses conducted and number of people trained.	GFOI	From 2013.
<i>Indicators</i>	Delivery of GFOI Training Courses and people trained.			
<i>Means of verification</i>	Feedback survey for engaged countries. Number of people trained.			
<i>Assumptions/risks</i>	Will require awareness of training activities underway within current frameworks and acceptance of a role for the GFOI. A realistic plan for the scale of the activity and for prioritization of key topics and countries will be important.			
<i>Team:</i>	GFOI, training delivery experts.			
<i>Related Tasks</i>	TASK ADM.1: National needs assessments. TASK ADM.2: Establish interfaces to other international forest-related initiatives and institutions OBS tasks. Related to CB.1 and CB.2 as they relate to governments designing & implementing their national systems.			

<b>TASK CB.4: Data awareness &amp; discovery tools &amp; services</b>				
<i>Objective</i>	To establish awareness within national governments about the data available for their national forest monitoring systems. Provide tools and services to assist in the discovery of specific data and to make the connections between suppliers and users.			
<i>2011 Status</i>	Early methods for linking governments with data providers have been pioneered by GEO FCT.			
<i>Expected outcome</i>	National governments should be informed about possible sources of data for their national activities. GFOI will routinely provide up to date information on current data availability as part of the coordination activities. The information system developed in TASK ADM.5 will be used for sharing information, lessons learnt, etc.			
<i>Activities (A), activity lead &amp; timelines</i>	<b>CB.4-1 (Lead: GFOI):</b> Data availability audit and upkeep. Key datastreams will be identified and measures taken to connect GEO information systems to the data supplier catalogues.		From 2013.	
<i>Output/deliverables (D)</i>	<i>Deliverable title</i>		<i>Lead</i>	<i>Delivery date</i>
	CB.4D1	Annual GFOI data availability report.	GFOI	Annual from 2013.
	CB.4D2	Data supplier catalogues connected to GEO Common Infrastructure for data discovery by users.	GFOI	From 2013.
<i>Indicators</i>	Awareness of participating governments about the availability of data – and access to them.			
<i>Means of verification</i>	Consultation with national governments as to adequacy of data supply.			
<i>Assumptions/risks</i>	The GFOI Data Coordination Strategy will have to bound the extent of the data under consideration within the GFOI process.			
<i>Team:</i>	GFOI, CEOS, FAO.			
<i>Related Tasks</i>	ADM.5 – Establish GFOI Communication and Information Systems – implement the online systems to be utilized by GFOI and participating national governments. TASK OBS.3: GFOI Data Acquisition Strategy design and implementation.			

### 1.3 Observations & Measurements

<b>TASK OBS.1: Definition of long-term, high-level observation &amp; processing strategy in response to users needs</b>				
<i>Objective</i>	To develop a strategic understanding of the scale and nature of the observation and data needs of the key international frameworks and their reporting regimes. One of the main objectives of the strategy will be to ease the access and use of data. Another key objective will be to ensure that there are no critical gaps in terms of data provision in the future.			
<i>2011 Status</i>	GEO FCT has insights about the global data acquisition challenge through its ND program. CEOS agencies, including key public good data supply agencies have been anticipating the global data needs in defining their draft GFOI data coordination strategy.			
<i>Expected outcome</i>	An appreciation of the data volumes and data characteristics that will be required by the GFOI and its participating governments – individually and in combination. This should allow assessment of the coordination which will be required in acquisitions.			
<i>Activities (A), activity lead &amp; timelines</i>	<b>OBS.1-1 (Lead: GFOI, CEOS):</b> Strategic assessment of GFOI-related data and information needs.		During 2012.	
<i>Output/deliverables (D)</i>	<i>Deliverable title</i>		<i>Lead</i>	<i>Delivery date</i>
	OBS.1D1	Strategic assessment of observation & processing needs.	GFOI, CEOS, FAO	Late 2012.
<i>Indicators</i>	Agreement of key data providers on the global data needs.			
<i>Means of verification</i>	Strategic assessment report.			
<i>Assumptions/risks</i>	The GFOI strategic assessment will be required to make various assumptions as to the trajectory of future intergovernmental agreements and reporting requirements.			
<i>Team:</i>	GFOI, CEOS, FAO.			
<i>Related Tasks</i>	TASK ADM.1: National needs will be consolidated during the GFOI Linkages Forum (see TASK ADM.4). They will be assessed in ADM.1. The outcomes of ADM.1 will form the basis for elaborating the long-term strategy.			

<b>TASK OBS.2: GEO-endorsed model for GFOI data access, use and reuse conditions</b>				
<i>Objective</i>	To facilitate optimal conditions for availability of data in accordance with GEO Data Sharing Principles.			
<i>2011 Status</i>	Space data for the FCT NDs is from a range of different sources. The provision of data is governed by the data policies of the various space agencies.			
<i>Expected outcome</i>	Suitable data policies within the GFOI framework to ensure maximum participation by the data supplier community, including commercial suppliers.			
<i>Activities (A), activity lead &amp; timelines</i>	<b>OBS.2-1 (Lead: GFOI, CEOS):</b> Develop GFOI data access, use and re-use conditions. <b>OBS.2-2 (Lead: GFOI, CEOS, Commercial Data Distributors):</b> adoption by data suppliers of the GFOI data access, use and re-use conditions.		During 2012.  From late 2012.	
<i>Output/deliverables (D)</i>	<i>Deliverable title</i>		<i>Lead</i>	<i>Delivery date</i>
	OBS.2D1	GFOI Data Access, Use and Re-use Conditions.	GFOI & Data Suppliers	Late 2012.
<i>Indicators</i>	Ability to satisfy concerns of a range of different types of data supplier (from public good through to fully commercial).			
<i>Means of verification</i>	Number of data suppliers participating and adopting the GFOI data access, use and re-use conditions.			
<i>Assumptions/risks</i>	Restrictions on the use and re-use of observations and data of interest to GFOI vary enormously from data supplier to data supplier. Although the assumption is that public good satellite data systems can broadly satisfy the requirements of most countries for annual coverage, commercial data sources may be required or preferred by some countries and GFOI processes and regulations should be suitably supportive to allow effective participation of all kinds of data supplier.			
<i>Team:</i>	GFOI, CEOS and other key data suppliers.			
<i>Related Tasks</i>				

<b>TASK OBS.3: GFOI Data Acquisition Strategy design and implementation</b>				
<i>Objective</i>	To provide an operational service linking user needs with supplier capacity – to ensure that requirements for reporting and information are satisfied.			
<i>2011 Status</i>	CEOS has developed an early draft data coordination document for satellite data that proposes a formal Space Data Coordination Group in support of GFOI operations.			
<i>Expected outcome</i>	An effective coordination body to undertake coordinated acquisition strategies. This will ensure national needs are addressed.			
<i>Activities (A), activity lead &amp; timelines</i>	<b>OBS.3-1 (Lead: CEOS):</b> Establish CEOS Space Data Coordination Group.		Early 2012 From mid-2012.	
	<b>OBS.3-2 (Lead: CEOS):</b> GFOI Data Acquisition Strategy design.			
<i>Output/deliverables (D)</i>	<i>Deliverable title</i>		<i>Lead</i>	<i>Delivery date</i>
	OBS.3D1	GFOI Data Acquisition Strategy.	GFOI & Data Suppliers	Early 2013 – following completion of Task OBS.1 – the strategic needs.
<i>Indicators</i>	Ability to satisfy the statement of needs.			
<i>Means of verification</i>	Annual review of data coverage outcomes versus requirement.			
<i>Assumptions/risks</i>	Adequate support from data suppliers will be essential to ensure capacity is available to meet national needs.			
<i>Team:</i>	GFOI, CEOS and other key data suppliers.			
<i>Related Tasks</i>	TASK OBS.1: Definition of long-term, high-level observation & processing needs – needed to design the acquisition strategy. TASK CB.4: data acquired in the scope of the current OBS.3 Task will be discoverable through the tools & services made available in CB.4.			

<b>TASK OBS.4: Biomass data &amp; information portal</b>				
<i>Objective</i>	Support the compilation of available application guidance and data, and maintain an on-going source of information of on-line biomass estimation for national governments.			
<i>2011 Status</i>	Recognizing the ultimate goal of future intergovernmental agreements is the reduction of GHG emissions from deforestation, the GFOI must stay abreast of developments supporting the estimation of GHG emissions from forest maps with the application of carbon models.			
<i>Expected outcome</i>	GFOI will become a recognized information portal and appropriate methods and guidance documents provided.			
<i>Activities (A), activity lead &amp; timelines</i>	<b>OBS.4-1</b> Compile biomass data for GFOI portal. <b>OBS.4-2</b> Operate Biomass Data Portal. <b>OBS. 4-3</b> Organize a biomass estimation workshop - assembling best available scientists in this domain.		From 2012 onwards - ongoing. Late 2012. 2013.	
<i>Output/ deliverables (D)</i>	<i>Deliverable title</i>		<i>Lead</i>	<i>Delivery date</i>
	OBS.4D1	GFOI Biomass Portal.	GFOI	Early 2013.
	OBS.4D2	GFOI Biomass Estimation Methods Workshop.	GFOI	Annual from 2013.
<i>Indicators</i>	Visits on Portal Recognition by IPCC and FAO as to the utility of GFOI methods and guidance on biomass estimation.			
<i>Means of verification</i>	GFOI Annual Reports. Feedback from national governments and international agencies. Dialogue with IPCC.			
<i>Assumptions/risks</i>	Biomass estimation from observations remains an area of scientific interest and considerable uncertainties. It may be some time before robust and intercomparable techniques are available.			
<i>Team:</i>	GFOI.			
<i>Related Tasks</i>	TASK M&P.1: Develop methods & protocols related to GFOI. TASK CB.4: the outcomes of the current OBS.4 task will be made available for capacity building purposes.			

<b>TASK OBS.5: Cal-val data compilation and portal</b>				
<i>Objective</i>	Ensure effective exchange of calibration and validation (cal-val) techniques and information. GFOI will seek to accumulate knowledge so that it is broadly available for common benefit.			
<i>2011 Status</i>	Cal-val is currently done by individual governments with little of the experience gained shared. A portal with cal-val data, experiences and recommendations would assist national governments in this respect.			
<i>Expected outcome</i>	A portal for exchange of experiences and results on the calibration and validation of observations in support of forest monitoring. Potential synergy with the CEOS cal-val portal will be investigated.			
<i>Activities (A), activity lead &amp; timelines</i>	<b>OBS. 5-1</b> Establish Portal. <b>OBS.5-2</b> Compile cal-val data for GFOI portal. <b>OBS.5-3</b> Operate portal.		From 2012 onwards - ongoing. Late 2012. Ongoing.	
<i>Output/deliverables (D)</i>	<i>Deliverable title</i>		<i>Lead</i>	<i>Delivery date</i>
	OBS.5D1	GFOI Cal-Val Info and Data Portal.	GFOI	Early 2013.
<i>Indicators</i>	Population of GFOI Cal-Val Info and Data Portal.			
<i>Means of verification</i>	Review of portal contents. Use of the portal.			
<i>Assumptions/risks</i>	Filtering and presenting the multitude of data in a way that facilitates ease of discovery and application by users will require considerable planning.			
<i>Team:</i>	GFOI, CEOS (WG on Cal/Val - WGCV).			
<i>Related Tasks</i>				

## 1.4 Methods & Protocols

<b>TASK M&amp;P.1: Develop and endorse methods &amp; protocols related to GFOI</b>				
<i>Objective</i>	To develop a suite of methods & protocols to guide countries on the utilization and application of observations in support of national forest monitoring systems.			
<i>2011 Status</i>	Early drafts of several methods documents have been developed on a volunteer basis within the FCT.			
<i>Expected outcome</i>	The GFOI methods and protocols should provide guidance for countries making decisions on the types of data they require for their national forest monitoring systems, and guidance on the processing, integration, calibration and validation of observations.			
<i>Activities (A), activity lead &amp; timelines</i>	<b>M&amp;P.1-1 (Lead: GEOSEC):</b> Define and establish GEO methods and protocols documentation process. <b>M&amp;P.1-2 (Lead: GEOSEC):</b> GFOI methods and protocols development. <b>M&amp;P.1-3 (Lead: GEOSEC):</b> Peer-review process. <b>M&amp;P.1-4 (Lead: GEO Plenary):</b> Adoption of V1 GFOI Methods & Protocols.		Commencing 2011  2012.  Late 2012. GEO-X (late 2013).	
<i>Output/deliverables (D)</i>	<i>Deliverable title</i>		<i>Lead</i>	<i>Delivery date</i>
	M&P.1D1	GFOI Methods & Protocols Documentation Process.	GFOI	Early-2012.
	M&P.1D2	GFOI Methods & Protocols: Data Acquisition & Interoperability Issues.	GFOI, CEOS	Late-2012.
	M&P.1D3	GFOI Methods & Protocols: Data Processing & Integration Issues.	GFOI	Late-2012.
	M&P.1D4	GFOI Methods & Protocols: Calibration, Validation & Accuracy.	GFOI, CEOS, WGCV	Early-2013.
	M&P.1D5	GFOI Methods & Protocols: Forest Carbon Estimation.	GFOI	2013.
<i>Indicators</i>	Uptake of GFOI Methods & Protocols by national governments in support of their forest monitoring systems.			
<i>Means of verification</i>	Survey of key REDD+ countries on the uptake of GEO methods.			
<i>Assumptions/risks</i>	Current volunteer arrangements under FCT will need to be enhanced by donor arrangements for contracted expert authorship and contributions to the methods and protocols. Suitable peer-review must be in place to ensure a rigorous approach. Suitable expert peer-review panels will be required.			
<i>Team:</i>	GFOI, CEOS (including WG Cal-Val), and expert authors, linkages to IPCC.			
<i>Related Tasks</i>	TASK M&P.2: Maintain, evolve and promote GFOI methods and protocols.			



<b>TASK M&amp;P.2: Maintain, evolve and promote GFOI methods and protocols</b>				
<i>Objective</i>	To ensure that GFOI methods and protocols documents are kept up to date with the latest science and are used by national governments.			
<i>2011 Status</i>	Early drafts of several methods documents have been developed within the FCT. More formal GFOI guidance versions have not yet started.			
<i>Expected outcome</i>	New types of observations (LiDAR, P-band SAR, hyperspectral) will emerge and the science of their interoperability and information extraction will continue to evolve and the GFOI methods and protocols should stay current and informed. This task will ensure that processes are put in place for routine, periodic review and revision of the GFOI methods and protocols documents.			
<i>Activities (A), activity lead &amp; timelines</i>	<b>M&amp;P.2-1 (Lead: GEOSEC):</b> GFOI methods and protocols maintenance and outreach.		Upon completion of the documents in 2013.	
<i>Output/deliverables (D)</i>	<i>Deliverable title</i>		<i>Lead</i>	<i>Delivery date</i>
	M&P.2D1	GFOI Methods & Protocols Maintenance Plan.	GFOI	Late 2013.
	M&P.2D2	GFOI Methods & Protocols Outreach Plan.	GFOI	Throughout 2013.
<i>Indicators</i>	Uptake of GFOI methods & protocols by national governments in support of their forest information systems and reporting. Version updates of the documentation per the maintenance plan.			
<i>Means of verification</i>	Survey of key REDD+ countries regarding their uptake of GEO methods a year or two after their publication.			
<i>Assumptions/risks</i>	GEO will need to establish a reputation that will encourage national adoption. Good linkages with IPCC processes and experts will be important as documents must also stay in sync with relevant IPCC methods and guidance.			
<i>Team:</i>	GFOI, Linkages to IPCC.			
<i>Related Tasks</i>	TASK M&P.1: Develop methods & protocols for GFOI.			

## 1.5 Science and Applications Development

<b>TASK SA.1: Develop an Applications Development Plan for GFOI</b>			
<i>Objective</i>	To develop an applications development plan for the GFOI.		
<i>2011 Status</i>	Government of Norway is sponsoring an early scoping of an R&D plan for the FCT task.		
<i>Expected outcome</i>	The GFOI Applications Development Plan will identify the range of issues to be addressed in support of critical operational matters and technical support of methods and protocols. The plan will identify activities, roles and responsibilities for each activity, a schedule, and funding requirements.		
<i>Activities (A), activity lead &amp; timelines</i>	<b>SA.1-1 (Lead: GFOI):</b> GFOI Applications Development Plan.	Commencing late 2011.	
	<b>SA.1-2 (Lead: GFOI):</b> GFOI Applications Development Plan Annual Update.	Annually to reflect latest science and available observations and measurements.	
<i>Output/deliverables (D)</i>	<i>Deliverable title</i>	<i>Lead</i>	<i>Delivery date</i>
	SA.1D1	GFOI Applications Development Plan.	Late 2012.
<i>Indicators</i>	Availability of GFOI Applications Development Plan.		
<i>Means of verification</i>	Annual testing of alignment between the GFOI applications development activities and the methods and protocols guidance required by users.		
<i>Assumptions/risks</i>	It is assumed that the FCT will provide supporting applications development activity. Applications development activity funds should be prioritized in accordance with identified needs for methods and guidance.		
<i>Team:</i>	GFOI, national experts.		
<i>Related Tasks</i>	ADM.6: GEO Forest Carbon Tracking Task transition plan and interface.		

<b>TASK SA.2: FCT technical and scientific studies</b>			
<i>Objective</i>	Continuity of current support activity underway within the FCT task.		
<i>2011 Status</i>	FCT task supports a number of technical and scientific studies in relation to data interoperability and validation.		
<i>Expected outcome</i>	Continuity of the activities initiated under FCT, with additional applications development being done under SA1 in support of GFOI objectives.		
<i>Activities (A), activity lead &amp; timelines</i>	<b>SA.2-1 (Lead: FCT):</b> Ongoing FCT technical and scientific studies.		
<i>Output/deliverables (D)</i>	<i>Deliverable title</i>		<i>Lead</i>
	<b>SA.2-1</b>	Research Plan for the FCT.	FCT
			<i>Delivery date</i>
			Late 2012.
<i>Indicators</i>			
<i>Means of verification</i>	Annual review of resources, researcher participation and progress against the plan.		
<i>Assumptions/risks</i>	Availability of resources, intellectual property restrictions.		
<i>Team:</i>	FCT Co-leads, research community.		
<i>Related Tasks</i>	TASK SA.1: Applications Development Plan for GFOI. ADM.6: GEO Forest Carbon Tracking task transition plan and interface.		

<b>TASK SA.3: Evaluation of new observations and measurement technologies</b>			
<i>Objective</i>	To ensure that the latest observation and measurement technologies are employed by GFOI users.		
<i>2011 Status</i>	-		
<i>Expected outcome</i>	New types of observations (LiDAR, P-band SAR, hyperspectral) and measurements will emerge and the science of their use will continue to evolve. The methods and protocols must stay current and informed. This task will put in place activities to evaluate the utility of these new capabilities in support of national forest monitoring systems.		
<i>Activities (A), activity lead &amp; timelines</i>	SA.3-1 ( <b>Lead: FCT</b> ): Evaluate new observations. This task will be undertaken as part of the annual FCT Research Plan review and activities defined for the coming year.		Starting with the first annual review of the FCT Research Plan - likely from 2013.
<i>Output/deliverables (D)</i>	<i>Deliverable title</i>		<i>Lead</i>
	SA.3-1	FCT Research Plan.	2012.
<i>Indicators</i>	Inclusion of latest observation and measurement capabilities within FCT Research Plan and ultimately in the methods and protocols documentation.		
<i>Means of verification</i>	Annual Review of progress against the plan.		
<i>Assumptions/risks</i>	An annual FCT Research Plan review should assess new observation and measurement capabilities.		
<i>Team:</i>	FCT.		
<i>Related Tasks</i>	TASK SA.1: Develop Applications Development Plan for GFOI. TASK SA.2: Develop a Research Plan for FCT.		