

# Advancing Natural Capital Accounting

## A New GEO initiative:

# Earth Observations for Ecosystem Accounting (E04EA)

A new initiative: demand and user driven

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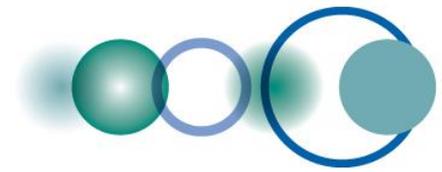




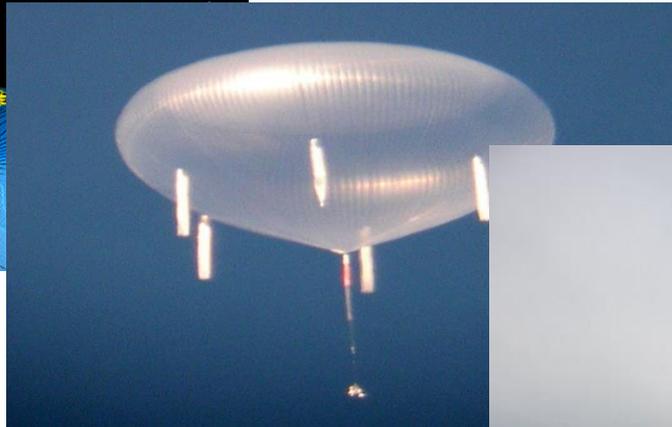
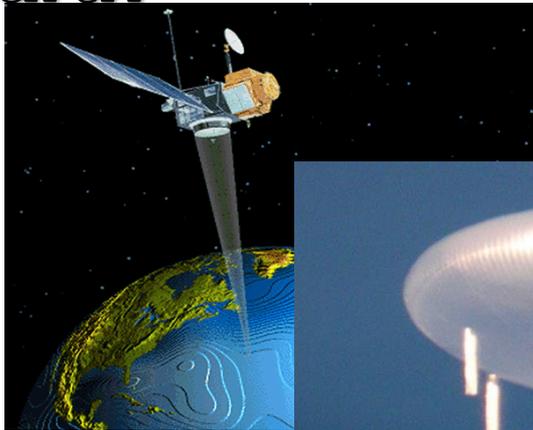
## GEO Mexico City Ministerial Declaration 2015

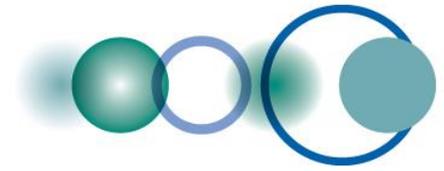
2) Affirm that GEO and its Earth observations and information will support the implementation of, inter alia, the 2030 Global Goals for Sustainable Development, the Sendai Framework for Disaster Risk Reduction 2015-2030, **the United Nations System of Environmental and Economic Accounts**, and the United Nations Framework Convention on Climate Change.

11) Resolve to sustain and develop the observing systems required to provide high-quality reference data and time-series Earth observations; address observation gaps; maintain and evolve the GEOSS common infrastructure as a public good to deliver data, information, and knowledge that responds to stakeholders' requests and informs their decision-making processes. **Further resolve to collaborate with statistical agencies and others to integrate Earth observations with social and economic data to multiply their collective value and to contribute solutions that are linked from the global to local levels.**

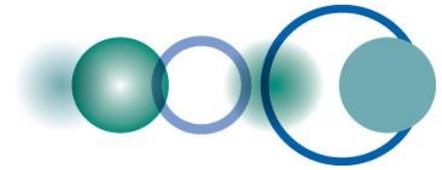


# Observations – In, On, and Around the Earth



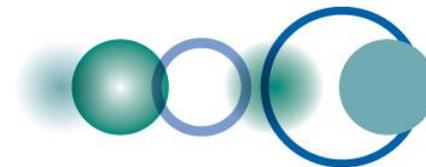


# Integrating Earth Observations Across Many Platforms to Benefit Society



# GEO Vision

**To realize a future  
wherein decisions and actions,  
for the benefit of humankind,  
are informed by  
coordinated, comprehensive & sustained  
Earth observations & information.**



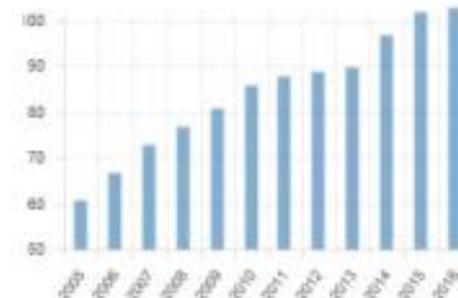
# 103 GEO Members



Number of Members (2016)

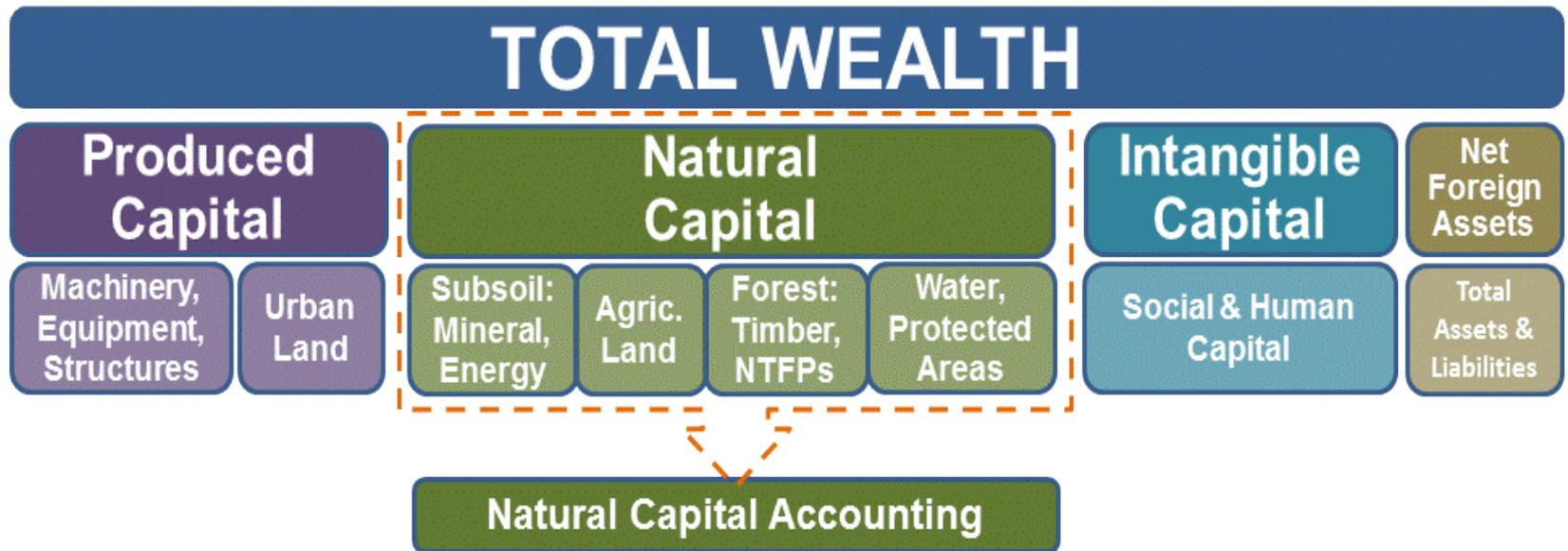
Africa:	27
Americas:	16
Asia/Oceania:	19
C.I.S.:	7
Europe:	34
<b>Total:</b>	<b>103</b>

Number of Members by year



# Where does NCA focus?

The source of income and well-being is wealth, broadly defined to include:  
Manufactured capital, Natural capital  
'Intangible' capital – net financial assets, human capital and social capital  
NCA focuses on the part of total wealth that comes from mineral, energy, agricultural, soil, timber, and water assets



# Benefits of Natural Capital Accounting ?



Better indicators for **monitoring sustainable development:**

Wealth and Adjusted Net Savings

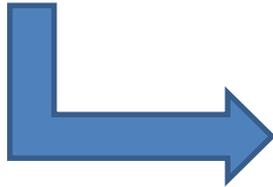
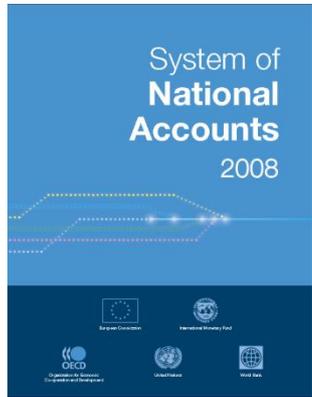
SCP - Resource Productivity and Material Consumption



Better tools for **managing natural capital to promote growth and poverty reduction**

- Weighing tradeoffs for water, land use
- Prioritizing investments in resource management, protected areas
- Impacts of current production and consumption patterns
- Effects of economic policy measures - Environmental taxes (pollution, energy, transport and resource), subsidies and expenditures

# What is the methodology for NCA?



## Part 1. SEEA-Central Framework

Adopted by UN Statistics Commission as International Statistical Standard in February 2012



## Part 2. SEEA Experimental Ecosystem 2013



## Part 3. SEEA Applications and Policy Uses 2013

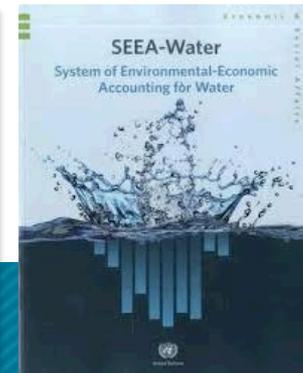
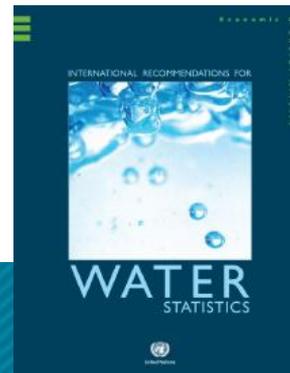
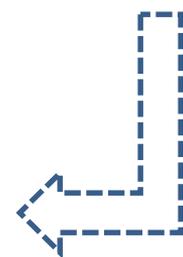
Energy

Land and Ecosystems

Forest

Fisheries

Water



## **SEEA Experimental Ecosystem Accounts**

**A measurement framework for integrating biophysical data, tracking changes in ecosystems and linking those changes to economic and other human activity**

**Which ecosystems generate which ecosystem services?**

**What is the extent of the contribution of ecosystem services to economic and other human activity?**

**Which ecosystems are in the best condition and which are the most degraded?**

**What changes have occurred over time and what has been the impact on the generation of ecosystem services?**

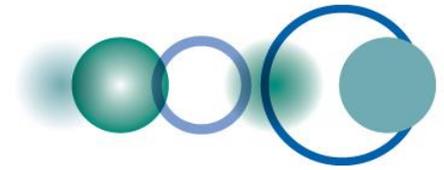
**What monetary values might be attached to ecosystems?**



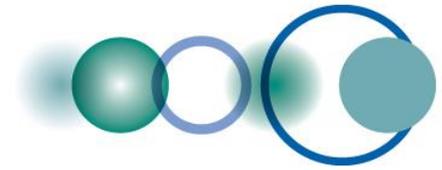
# Key differences with ecosystem services assessment

1. Uses accounting framework (opening & closing stocks) to track *stocks* and *flows*
2. Explicit focus in tracking change over time
3. Measured in biophysical & monetary terms
4. Different approaches to valuation (exchange value, not consumer surplus)
5. Direct connections to national accounts – potential to engage finance ministries that we don't often engage





To enter widespread use,  
ecosystem service assessments need to  
be  
quantifiable, replicable, credible, flexible,  
and affordable.”



# Earth Observations for Ecosystem Accounting (EO4EA) A GEO Initiative for 2017 - 2019

## Include Users in the design of the initiative

Environmental Accountants, Statisticians, Economists, Ecologists, Agronomists, Resource Managers and Policy Maker; with EO providers: Meteorologists, Hydrologists, Geographers, Soil Scientists, Chemists, Remote Sensing specialists.

### Interim Steering Committee

Statistics Canada, INEGI - Mexico, Colombia, Netherlands, US - GEO, ESA, World Bank – WAVES, Conservation International, Wageningen University and ESRI.

### Primary Work Streams:

- **Compilation and assessment of Ecosystem Accounts and their use of Earth Observation.**
- **Information needs to define ecosystem extent and condition – Biophysical (e.g. climate, hydrology, soils, topography, land cover, biodiversity); Classification of ecosystem types; sampling needs and gaps (including periodicity and scale of measurements needed).**
- **Ecosystem Services Classification Identification of EO measurements to track ecosystem services (e.g. carbon storage, water provisioning).**
- **Pilots at national and regional scales, in the US, Africa -Gaborone Declaration countries, South America and Europe.**



## **Compilation and assessment of Ecosystem Accounts and their use of Earth Observation.**

The initiative will:

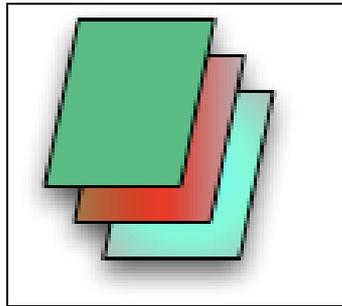
- **compile an overview on the use of Earth Observation (EO) data in existing Ecosystem Accounting efforts,**
  - **examining at various scales and for different themes, and**
  - **inventory the extent to what types of Eos are being used.**

**Examples to included:**

**Australia Victoria Parks, Great Barrier Reef; Netherlands – Limburg; Canada – MEGS; Mexico/UNSD/CBD; WB WAVES related - Himachal Pradesh (India), the Philippines, Colombia, Costa Rica and Rwanda, Peru/CI**

**Groups involved: Conservation International and the Government of Peru, the European Environment Agency, WAVES, and several of its core implementing countries developing ecosystem accounts, Statistics Canada, INEGI, and Wageningen University and the Netherlands.**

# Biophysical modeling of ecosystem services



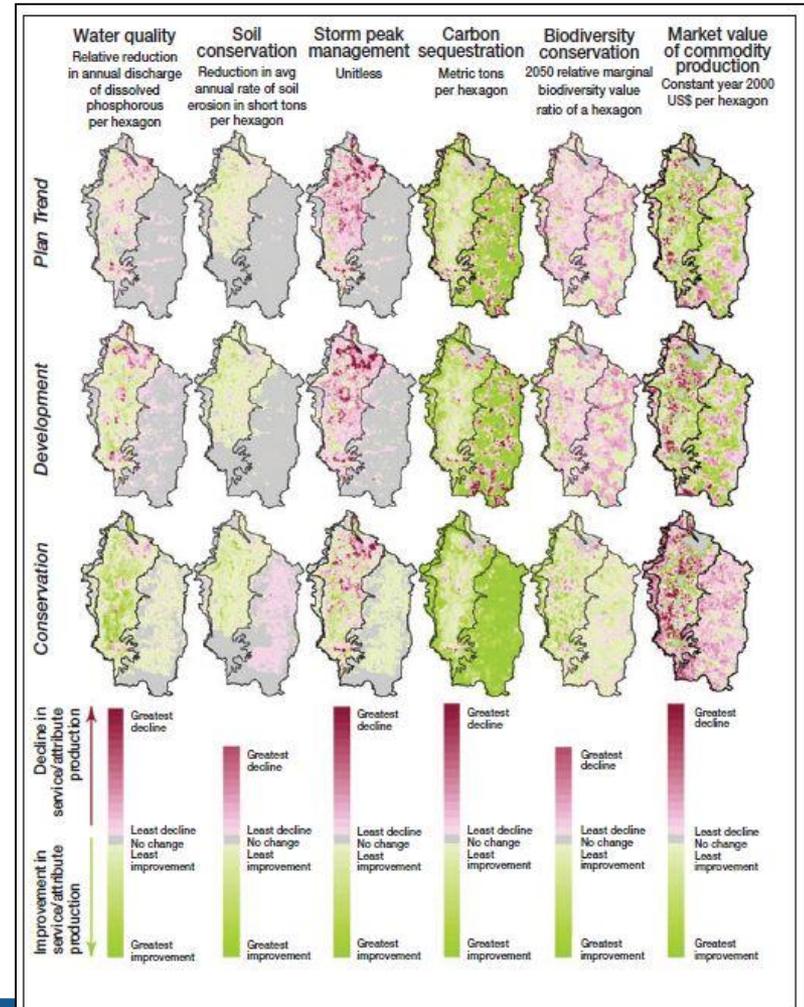
GIS database

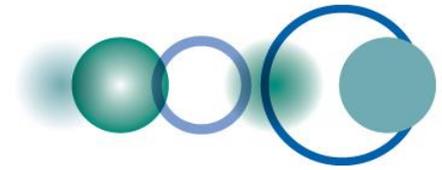


Ecological  
production  
function

E.g., Artificial Intelligence for Ecosystem Services (ARIES), Integrated Valuation of Ecosystem Service Tradeoffs (InVEST), others

Maps quantifying ES tradeoffs, hotspots, co-benefits

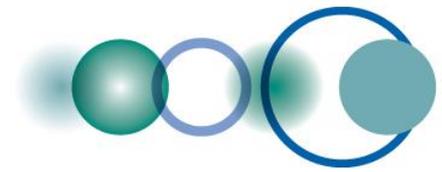




## **Information needs to define ecosystem extent and condition**

The initiative will:

- **Review the information needs to define ecosystem extent and condition – Biophysical (e.g. climate, meteorology; hydrology, soils, topography, land cover, biodiversity);**
- **Work with EO providers to facilitate mapping and monitoring ecosystem extent and condition.**
- **Develop an outline for methodological guidance on the use of EOs for Ecosystem Accounts including recommendations on definitions, indicators, scale and temporality,**
- **Review sampling regimes and the opportunities and challenges of using various types of sensors from satellite to *in situ*.**



## **Information needs to define ecosystem extent and condition**

(continued)

- **Examine ways to assess the quality and usefulness of EO data for accounting**
  - **the ability to track change over time,**
  - **the alignment between different EO datasets, and**
  - **the consistency of EO data with statistical survey data (e.g. On land cover/use including forestry statistics) and other spatial data source such aerial photography and other forms of ground truthing.**
- **The task force will look at research needs and to the development of tools to facilitate these efforts.**
- **This aims to provide input to the UN Statistical Commission’s revision of the technical guidelines for SEEA–EEA in 2017 and beyond.**

**Partners:**

- **USGS, NOAA, CI, Mexico, ESRI, ESA, EEA and others.**

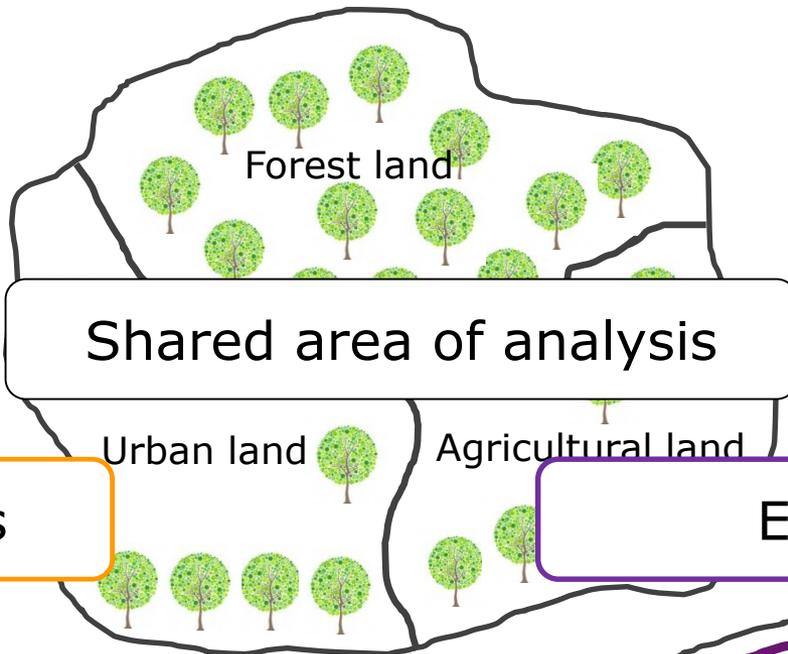


# How to do forest accounting - Setting up a framework for forest accounts

○ Land cover types

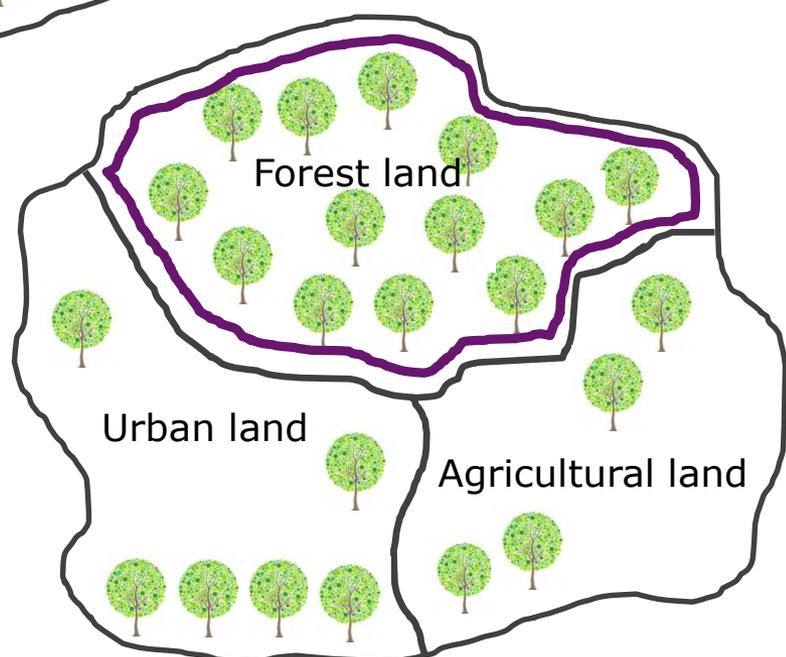
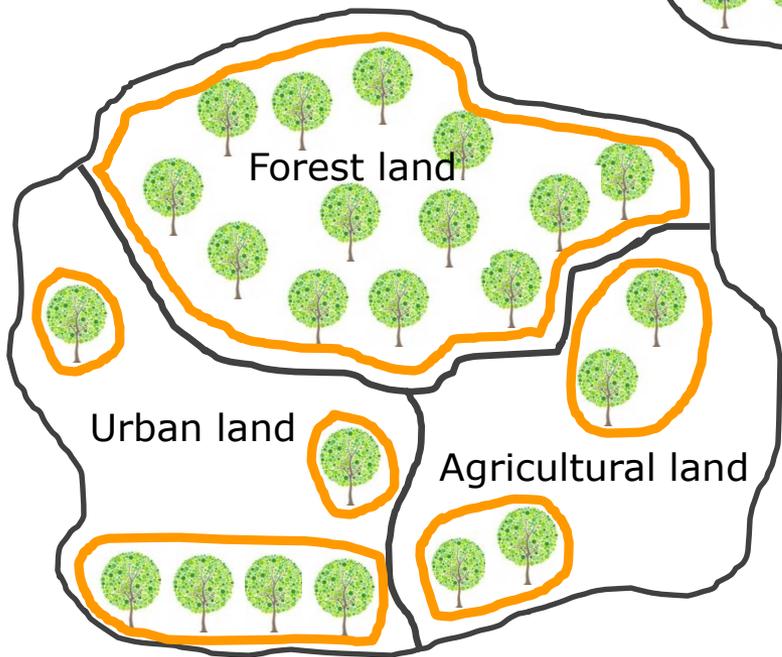
○ Scope of the ecosystem based forest account

○ Scope of the resource based forest account



Individual resources

Ecosystems



# 1. The ecosystem condition account

- Indicators that reflect the condition/state of the ecosystem
- Indicators are specific to countries and ecosystems but may include such aspects as:
- Information provided in maps, synthesised in tables

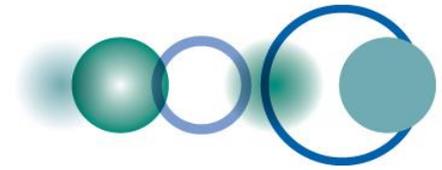
## Land cover

Physical condition,  
e.g. soil fertility,  
water table,  
(ground)water  
quality

Biological condition,  
e.g. crown cover,  
standing biomass

Processes: e.g. Net  
Primary Production  
(of the vegetation)

The presence of  
species that  
indicate ecological  
quality, e.g. species  
sensitive to pollution



# Ecosystem Services Classification Identification of EO measurements to track ecosystem services

The initiative will:

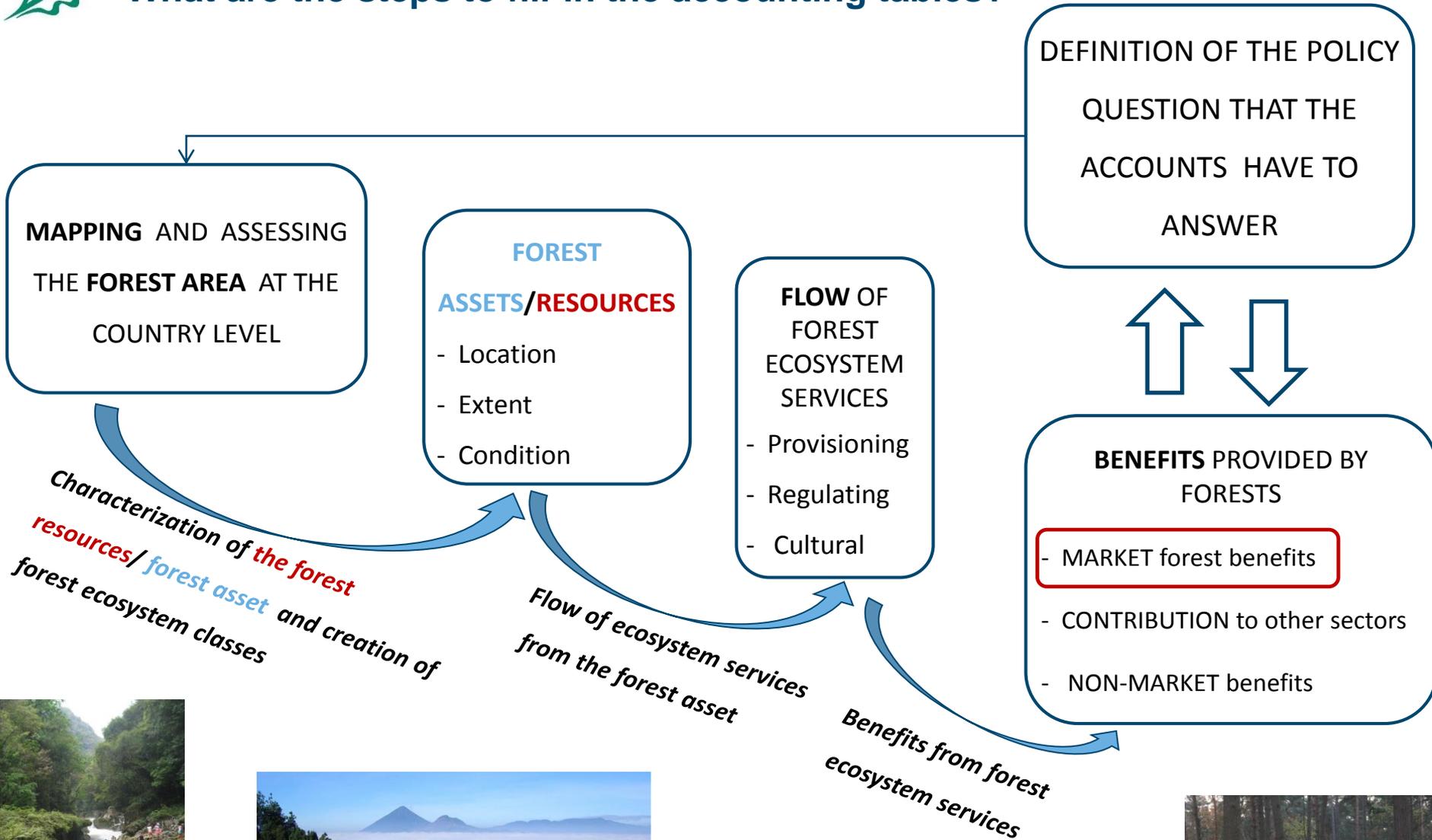
- **Examine how EOs can contribute to the identification, measurement and monitoring of ecosystem services. (e.g. carbon storage, water provisioning).**
- **Build on the efforts of the UNSD, US EPA and EEA to understand the classification and measurements of ecosystem services and the extent to which EO may be useful in tracking biophysical changes that are a component of the Ecosystem service**
- **Identify research needs, including tools and analytics needed to translate EOs into accounting frameworks and its use in valuation efforts and as a compliment to the UN Statistics Division System of National Accounts.**

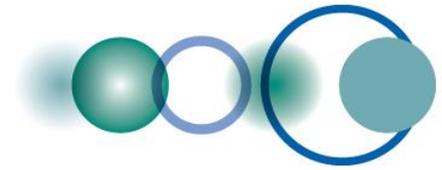
Partners include:

**US EPA, EEAStatistics Canada, Wageningen University, Conservation International, ESA and others.**



# What are the steps to fill-in the accounting tables?





## **Pilots at national and regional scales**

The initiative will:

- **Design and implement pilots to examine methodologies and scale in countries with robust data availability;**
- **Design and develop pilots in countries and regions with limited availability of data such as the countries that have signed the Gaborone Declaration on Natural Capital Accounting; and**
- **Seek other opportunities to develop accounts based wholly or primarily on EO data.**

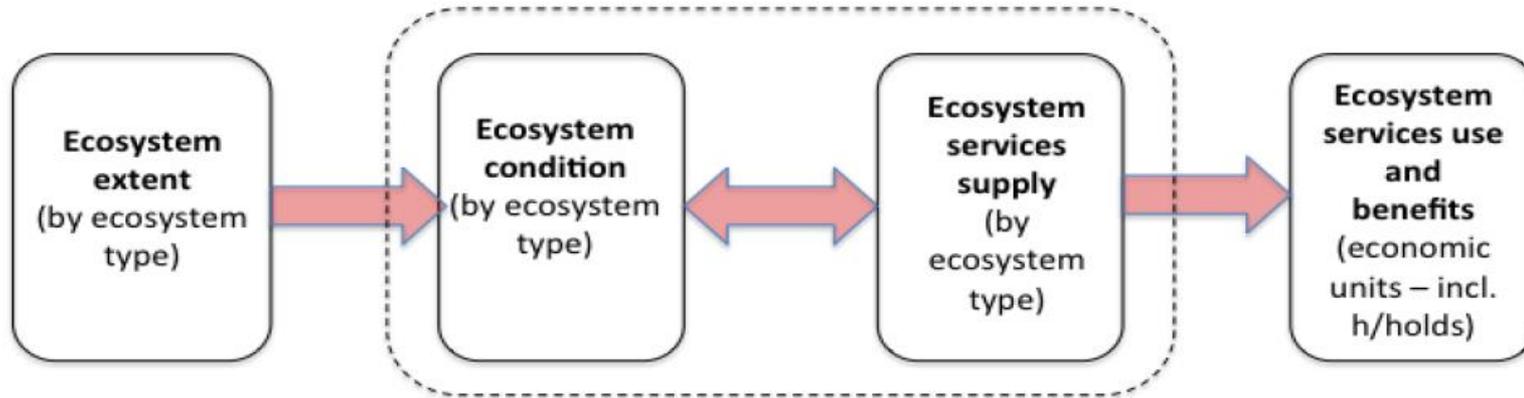
**Partners include:**

**CI, WAVES, ESA, NASA, ESRI**

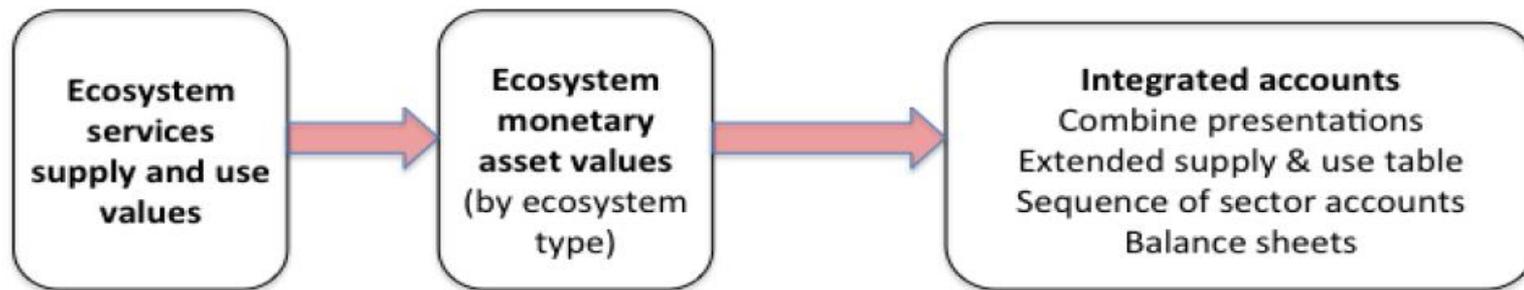
# Ecosystem accounting: concepts & components

Figure 2.2 Broad steps in ecosystem accounting

a. Steps in physical terms



b. Steps in monetary terms



UN et al.  
2015



# The ecosystem accounts

**Table 4.1: The ecosystem accounts**

Accounts for ecosystem assets	Ecosystem extent account
	Ecosystem condition account
	Ecosystem monetary asset account
Accounts for ecosystem services	Ecosystem services supply and use table – physical terms
	Ecosystem services supply and use table – monetary terms
Integrated accounts*	Combined presentations
	Extended supply and use table
	Sequence of accounts for institutional sectors
	National and sector balance sheets

\* These accounts reflect the integration of ecosystem accounting based information with information from the standard set of national accounts

Plus thematic accounts for land, water stocks & flows, carbon, biodiversity



# General structure of the forest accounts – ASSET ACCOUNTS

❖ resource by resource

Type of timber resource		
Cultivated timber resources	Natural timber resources	
	Available for wood supply	Not available for wood supply

Monetary units

Type of timber resources	
Cultivated timber resources	Natural timber resources Available for wood supply

**Opening stock of timber resources**

**Additions to stock**

Natural growth

Reclassifications

*Total additions to stock*

**Reductions in stock**

Removals

Natural losses

Catastrophic losses

Reclassifications

*Total reductions in stock*

**Closing stock of timber resources**

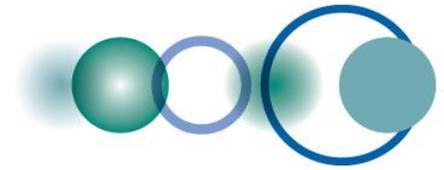
❖ Cultivated: management practices constitute a process of economic production  
 ❖ Natural: where the previous doesn't apply.

❖ forest asset (forest ecosystem unit)

Monetary units

	Changes of ecosystem condition				
	Vegetation	Biodiversity	Soil	Water	Carbon
Opening condition					
Improvements in conditions					
Reduction in condition					
Closing condition					

	EAU or LCEU
<b>Opening stock</b>	
<b>Additions to stock</b>	
Regeneration-natural	
Regeneration. human	
<i>Total additions to stock</i>	
<b>Reductions in stock</b>	
Extraction and harvest	
Catastrophic losses	
<i>Total reductions in stock</i>	
Revaluations	
<b>Closing stock of ecosystem assets</b>	



# Earth Observations for Ecosystem Accounting (EO4EA)

## Thank You

John Matuszak

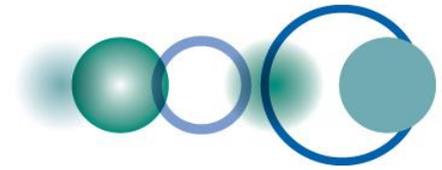
[matuszakjm@state.gov](mailto:matuszakjm@state.gov)

<https://www.earthobservations.org/index.php>

# Feasible valuation methods

Type of service	Type of service
Provisioning services	Proxy market prices
	Resource rent
Regulating services	Market prices (PES)
	Production function
	Replacement cost
	Avoided damage costs
Cultural services	Revealed preference methods (hedonic pricing, travel costs)





# Earth Observations for Ecosystem Accounting (EO4EA) A GEO Initiative for 2017 - 2019

## **Begin with Policy Demand**

- 1992 Sustainable Development Agenda 21 Chapter 8 - calls for Integrated Environmental and Economic Accounts, (Work undertaken by UN Statistics Commission, WB, EU and OECD).
- 2010 CBD Agrees Aichi targets and World Bank launches the Wealth Accounting and Valuation of Ecosystem Services partnership (WAVES).
- 2012 The Gaborone Declaration for Sustainability in Africa
- 2012 the UN Statistical Commission agreed the System of Environmental and Economic Accounts (UN-SEEA) and to work on the SEEA Experimental Ecosystem Accounts.
- 2014 revised European Strategy for Environmental Accounts
- 2015 US OMB-CEQ-OSTP Directive to US Agencies to incorporated Ecosystem Services into decision making.
- 2016 UNEP Resolution on Natural Capital Accounting (NCA)
- 2016 IUCN World Conservation Congress motion on NCA