The role of forest information in addressing climate change

Setting the scene

María J. Sanz
Role of forest

Multifunctionality

Multiple scales
Role of forest

Regulates climate not only by releasing GHGs...

An improved understanding of the combined effects of forest C and biophysical controls on climate is necessary to guide policy decisions that support global climate mitigation, local adaptation and biodiversity conservation

Lawrence et al 2022
Forest: Protect, restore, manage

Multiple challenges and solutions

Hernández-Morcillo et al 2022
Forest: Protect, restore, manage

Information is key

Forest monitoring

With the view to enhance its multifunctionality according to the priorities and threats
Forest information needs under the PA

- Updating nationally determined contributions (NDCs) (Art. 4)
- Reducing emissions from deforestation forest degradation in DCs (REDD+) (Art. 5)
- National reporting under the enhanced transparency framework (Art. 13)
- Global stocktake (Art. 14)
Information needs under the PA

- Updating nationally determined contributions (NDCs) (Art. 4)
- Reducing emissions from deforestation forest degradation in developing (REDD+) (Art. 5)
- National reporting under the enhanced transparency framework (Art. 13)
- Global stocktake (Art. 14)

- Enhance mitigation and adaptation, design of measures and policies to achieve NDCs
- MRV GHGs, NFMS, REDD+ strategy, Safeguards
- Emissions and removals (Forest related activities)
- Adaptation efforts, impacts
- Global data sets and aggregated bottom up national data
GST – A challenge of reconciliation?

- Global stocktake (Art. 14)
- Global data sets and aggregated bottom up national data

This study confirms a substantial gap in land-use flux estimates between BMs and NGHGIs, equal to 6.7 GtCO2 yr\(^{-1}\) globally for the period 2000–2020, with the majority of the discrepancy occurring on forest land.

Figure from Grassi et al., ESSDD 2022
Priorities and threats – Climate Change

Threats

- Climate change
- Pests
- Invasive species
- Land use change
- Natural disasters

Drivers

- Law enforcement
- Protected area
- Payments (PES)
- Higher elevation
- Seniority of indigenous peoples
- Steeper slope
- Older population
- Greater poverty
- Larger property size
- Higher timber price
- Wetter
- Community forestry
- More secure land tenure
- Greater education
- Timber activity
- Nearer to water
- Nearer to cleared land
- Agricultural activity
- Greater soil suitability
- Nearer to roads
- Nearer to urban area
- Greater population
- Nearer to agriculture
- Rural income support
- Higher agricultural price

For each category of explanatory variables (left-hand side), the meta-analysis determined whether the driver variables in that category were consistently associated with higher rates of deforestation, lower rates of deforestation, or neither (not consistent). For example, a ratio of -4x indicates that a variable is associated with less deforestation four times as often as it is associated with more deforestation.

Figure 7.9 | Association of driver variables with more or less deforestation. Source: reproduced with permission from Busch and Ferretti-Gallon (2017).
Brief History: Why forest information?

Traditionally, information about forest resources was mostly based on national forest inventories (NFIs) which were designed to collect information on the extent of forest resources in terms of, for example, cover, timber volumes, and species composition.

- Forest inventories dating back to 1500s, sample based methods developed from the late 1800s.

- Shift toward estimates of changes in the late 1950s.

- 1970s emerging environmental concerns sped up and drove new information needs in relation to forests (condition and their relationship with the environment in general, a set of biotic and abiotic stressors in particular).

- Steep increase of monitoring studies became especially evident in the 1990s.
<table>
<thead>
<tr>
<th>Definition of monitoring</th>
<th>Source</th>
</tr>
</thead>
<tbody>
<tr>
<td>Systematic observations of parameters related to a specific problem, designed to provide information on the characteristics of the problem and their changes with time</td>
<td>SCEP (1970)</td>
</tr>
<tr>
<td>The process of repetitive observing, for defined purposes on one or more elements of the environment according to prearranged schedules in space and time and using comparable methodologies for environmental sensing and data collection</td>
<td>Meijers (1986)</td>
</tr>
<tr>
<td>A process of detecting whether change has occurred, establishing its direction and measuring its extent</td>
<td>Ferris-Kaan and Patterson (1992)</td>
</tr>
<tr>
<td>Intermittent recording of the condition of a feature of interest to detect or measure compliance with a predetermined standard</td>
<td>Hellawell (1991)</td>
</tr>
<tr>
<td>Tracking a particular environmental entity through time, observing its condition, and the change of its condition, in response to a well-defined stimulus</td>
<td>Stevens (1994)</td>
</tr>
<tr>
<td>The process of gathering information about some system state variables at different points in time for the purpose of assessing system state and drawing inferences about changes in state over time</td>
<td>Yoccoz et al. (2001)</td>
</tr>
<tr>
<td>The collection and analysis of repeated observations or measurements to evaluate changes in condition and progress toward meeting a management objective</td>
<td>Elzinga et al. (2001)</td>
</tr>
<tr>
<td>A time series of measurements of physical/chemical/biological variables designed to answer questions about environmental change</td>
<td>Lovett et al. (2007)</td>
</tr>
</tbody>
</table>

Much of the corpus of (forest) monitoring concepts and studies has been developed over the past 40 years.

How monitoring is define.....
Keys to when collecting information.

Because forest information is needed at global, national and local scales, it is critical to:

• Maintain the Data and Estimates Time Series of NFIs in Changing Demands
  
  The importance of remote sensing data is increasing but the importance of field information is not diminishing

• Models could be Part of Forest Inventory
  
  Models are useful, in particular produce scenarios, but care in the assumptions and input data is critical (transparency as well)

• Maintaining the Coherence of Results in Multiple Scales and Methodologies
  
  Policies and management decisions are taken at different scales, interoperable and consistent forest information across scales will lead to more coherency on the implementation of policies and measures.
National Forest Inventories: Status

(1a) Use of RS FRA 2005
(2a) Use of NFI FRA 2005
(1b) Use of RS FRA 2020
(2b) Use of NFI FRA 2020

Use of data sources for forest monitoring and changes in 236 countries and territories from FRA 2005 to FRA 2020 (Nesha et al 2021)
National Forest Inventories: Status

<table>
<thead>
<tr>
<th>Tier indicators</th>
<th>Number of countries in Tiers</th>
<th>Forest area % under Tiers</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>No data</td>
<td>Tier 1</td>
</tr>
<tr>
<td>Forest area</td>
<td>---</td>
<td>54</td>
</tr>
<tr>
<td>Trend</td>
<td>---</td>
<td>71</td>
</tr>
<tr>
<td>Growing stock</td>
<td>Status</td>
<td>32</td>
</tr>
<tr>
<td></td>
<td>Trend</td>
<td>32</td>
</tr>
<tr>
<td>Biomass*</td>
<td></td>
<td>30</td>
</tr>
<tr>
<td>Carbon pool</td>
<td></td>
<td>30</td>
</tr>
</tbody>
</table>

Data quality assessment across the countries with the corresponding forest coverage (%) using FAO tier indicators in FRA 2020 – showed improvements

(a) Use of RS
(b) Use of NFI

Figure 2: The percentage of total forest cover monitored by data source indicator value for use of RS for forest area monitoring (a), and use of NFI for forest monitoring (b) in 236 countries and territories from FRA 2005 to FRA 2020.

Figure 3: Temporal distribution of the most recent RS and NFI data points aggregated by climate domains; the countries and territories totaled at 145 for RS and 130 for NFI data. Here, data points mean if countries have RS and NFI data in a particular year. The years generally refer to years in which RS and NFI data were collected.

Global Forest Observations Initiative
Plenary
9-11 May 2023

Nesha et al (2021)
Forest monitoring: scope and scale?

With the view of multiscale – one service
Forest monitoring: scope and scale?

Bennett & Tkacz (2008)

Henry et al (2021) (Ex. Bangladesh)
Forest monitoring: scope and scale?
Alert-Driven Community-Based Forest Monitoring: A Case of the Peruvian Amazon

<table>
<thead>
<tr>
<th>Category</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Forest change</td>
<td>Deforestation, logging, landslides, clearing due to crops, burning, etc.</td>
</tr>
<tr>
<td>Vegetation</td>
<td>Information about tree species, medicinal plants, and forest type (primary forest, dense forest)</td>
</tr>
<tr>
<td>Land use</td>
<td>Anthropogenic features found at a location, e.g., roads, camps, crops, trails, houses, and farms</td>
</tr>
<tr>
<td>Topography</td>
<td>Important topographical features such as streams, rivers, slopes, flat terrain, or waterfalls</td>
</tr>
<tr>
<td>Marking</td>
<td>Landmarks and boundary demarcation, start and end points of a tour, intersections and limits</td>
</tr>
<tr>
<td>Other</td>
<td>Categories that could either not be identified or did not fit under another category</td>
</tr>
<tr>
<td>None</td>
<td>No information available</td>
</tr>
</tbody>
</table>

Governance and structure adapted to the scope and scale

Cappello et al 2022
Forest monitoring: Detect changes?

More precise and less accurate (higher investment)

Less precise and more accurate (lower investment)

Variable

Time

Less variables → Same cost

More variables ←
Several activities coexist in many forest landscapes! And forest interact with climate in several ways...

Protect, restore, manage with the view of mitigate climate change may require more than carbon related data!

Information to make better decisions
Why forest information?... future

New activities
- Forest and landscape restoration
- Blue carbon
- Peatland and mangroves
- Agriculture and other land-based activities

Disturbances (biotic and abiotic)
- Early warning

Supply chains
- Avoid reinventing the wheel or duplicating efforts

Build upon existing ....
Why forest information?... future

Global restoration commitments, per overarching type of restoration, 2020

Forest and landscape restoration
Mitigation and adaptation (NDCs)

Same land!!!!

Other ... Natural Capital Accounts

Avoid reinventing the wheel or duplicating efforts

Build upon existing ....

Make data and tools interoperable
Why forest information?... future

An integrated forest monitoring system that can give scientists, policy makers and the public information about the multifunctionality of forests and support policy and management decisions

If it is the result of collaborative efforts and common understanding - granting access to data to create a system in a harmonized, transparent way, to bridge the gaps between different communities.

It will help to maintain the consistency of national statistics on forests and trees, avoid duplication of efforts, and reduce monitoring costs (integrated NFMS that responds to national, sub-national and local information needs).

The implementation of forest and other land use monitoring, alongside the deployment of measures (mitigation and adaptation) can further propel long-term systemic change from local to national by:

Enabling more effective decisions that increase the productivity, sustainability and resilience of ecosystem, as well providing with information required to gain better access support

Equally, strengthening the capacity of local governments to use MRV tools and data can contribute to enhancing the accuracy and transparency of reported FOLU emissions, thus supporting policy making to enhance forest and land use mitigation.
Why forest information?... future

Continuous improvements in NFMS should be implemented in short, medium and long-term phases, to provide information to address evolving needs

*Social inclusion must be ensured to raise awareness and create collective knowledge*

But...

The perfect is the enemy of the good!

Dimension the system to support your priorities (climate change is a complex interlinked challenge)

Think in how the forest and land information supports transformation and change in trends while managing the unexpected
Thank You