GFOI Global Forest Observations Initiative | Plenary 9-11 May 2023

The role of forest information in addressing climate change

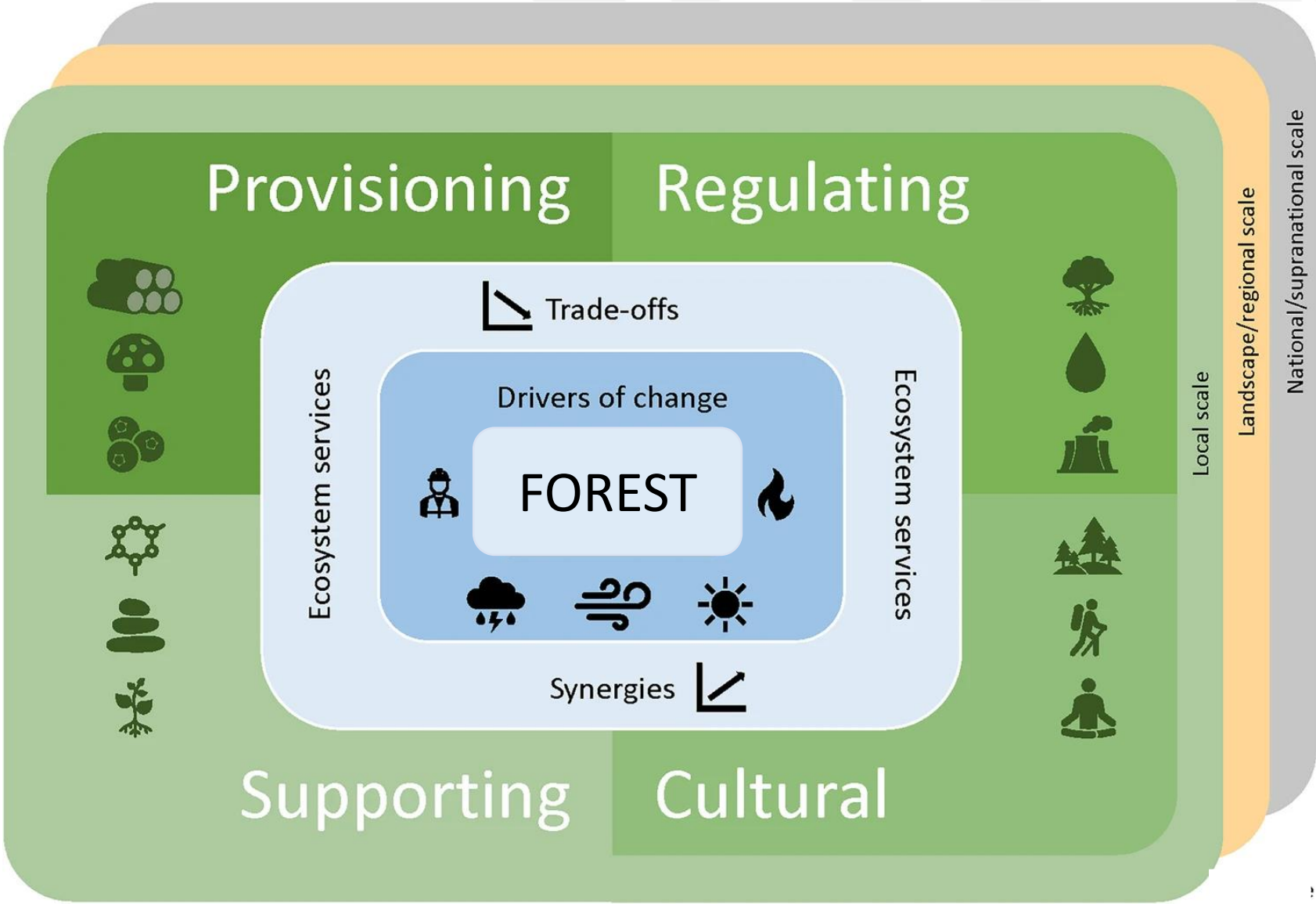
Setting the scene

María J. Sanz

Role of forest

Multifunctionality

Multiple scales

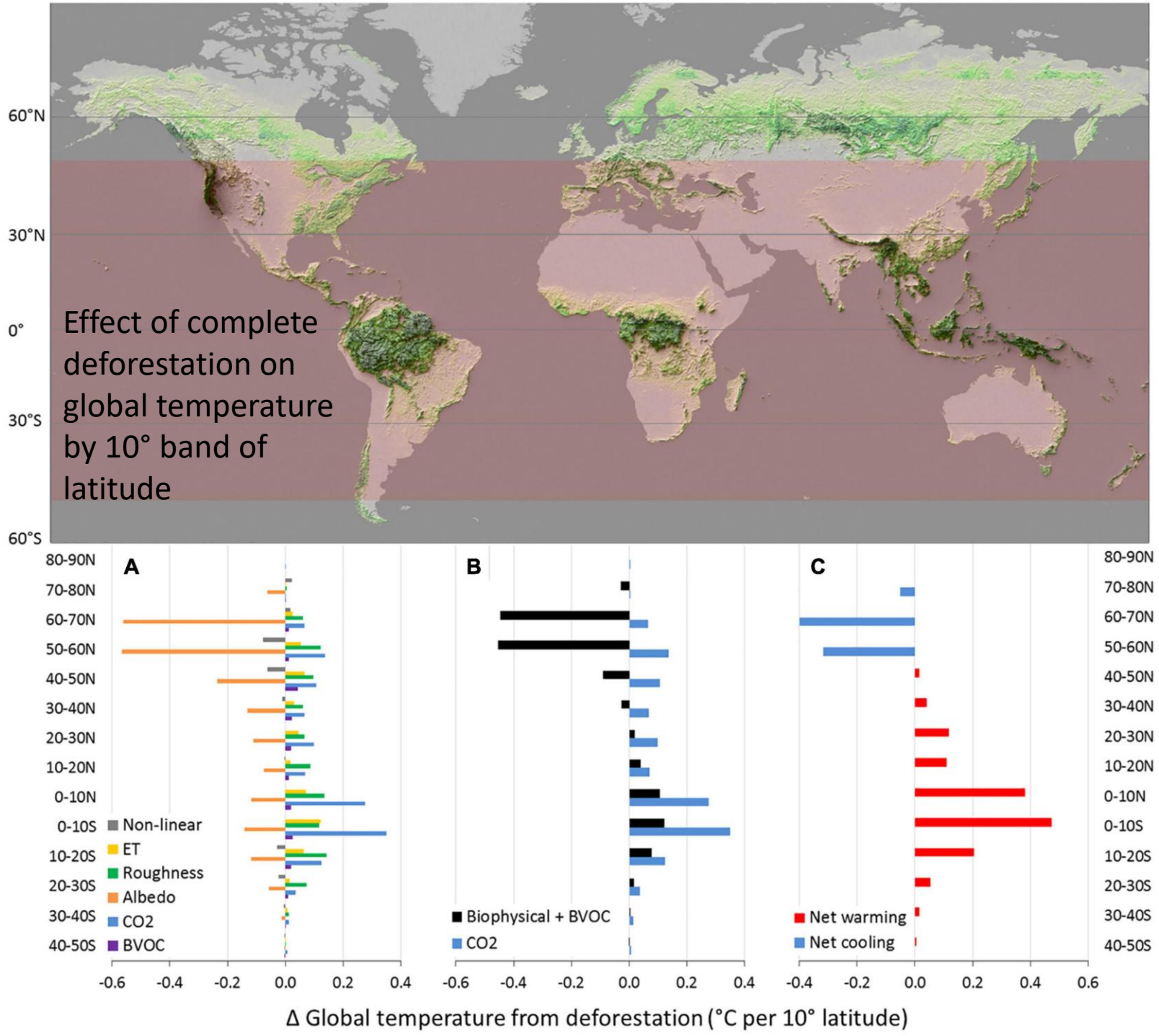


Role of forest

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

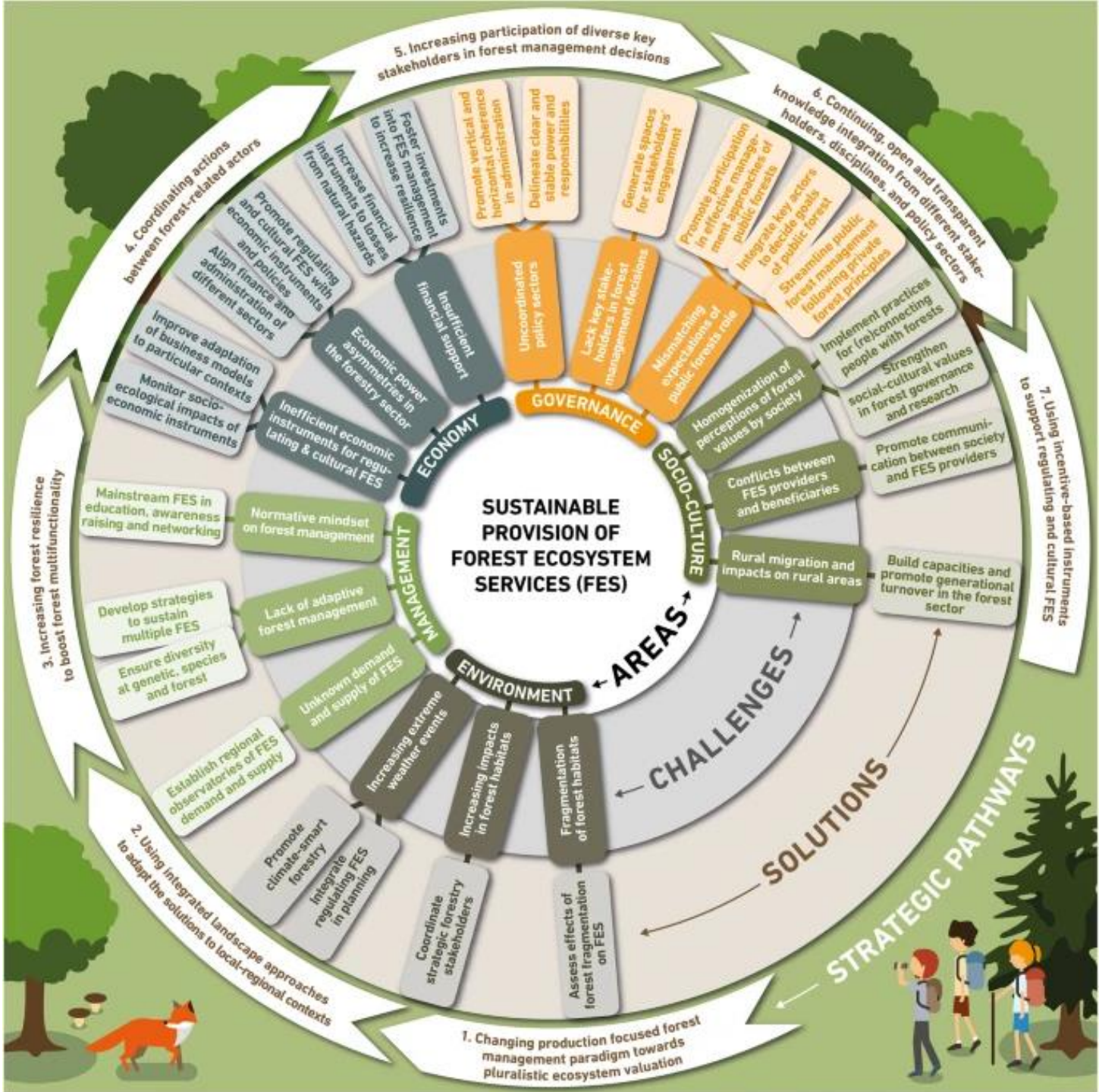
Lawrence et al 2022



Forest: Protect, restore, manage

Multiple challenges and solutions

Hernández-Morcillo et al 2022



Forest: Protect, restore, manage

Information is key

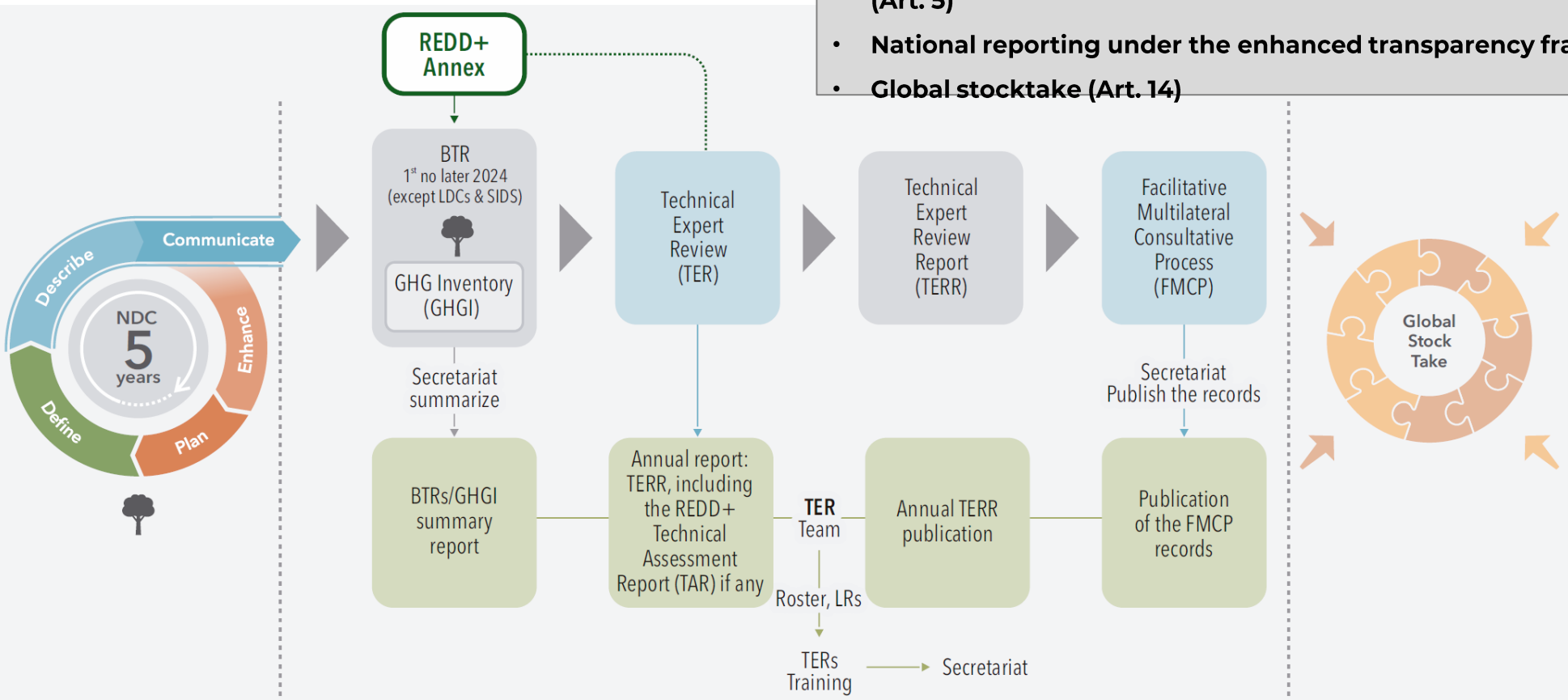
Forest monitoring

DECISIONS

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

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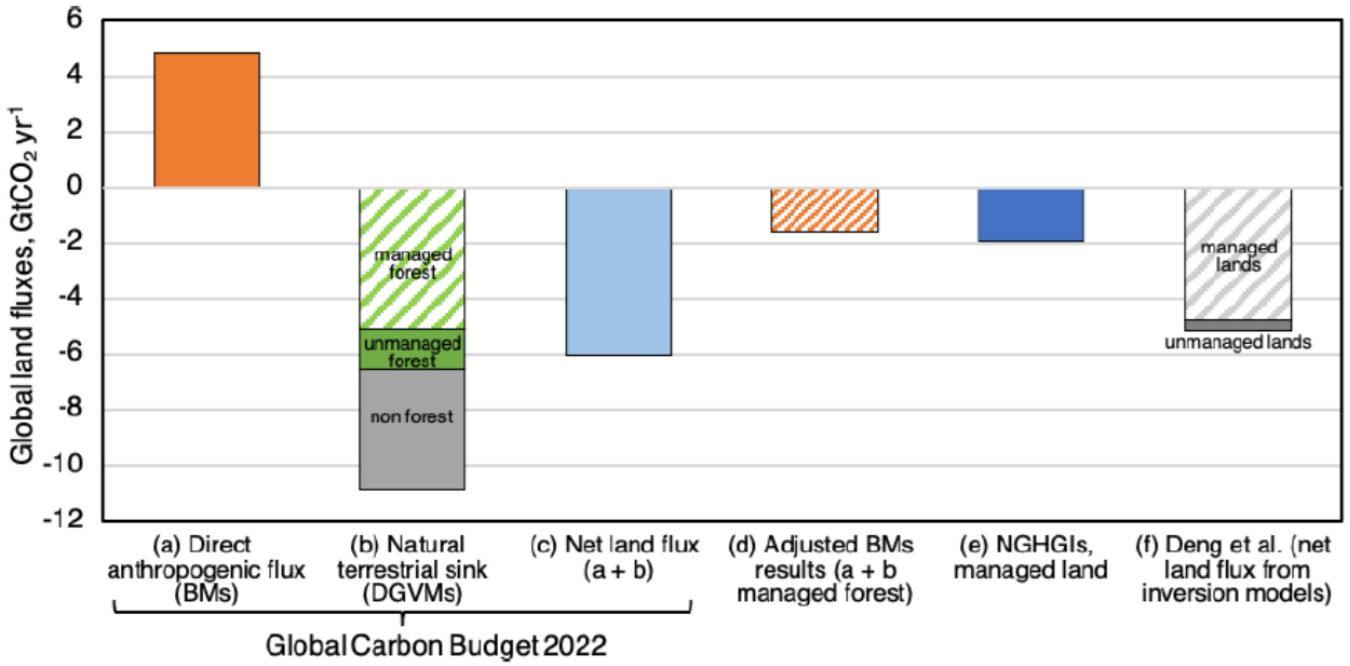
- National reporting under the enhanced transparency framework (Art. 13)
- Global stocktake (Art. 14)

- 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**

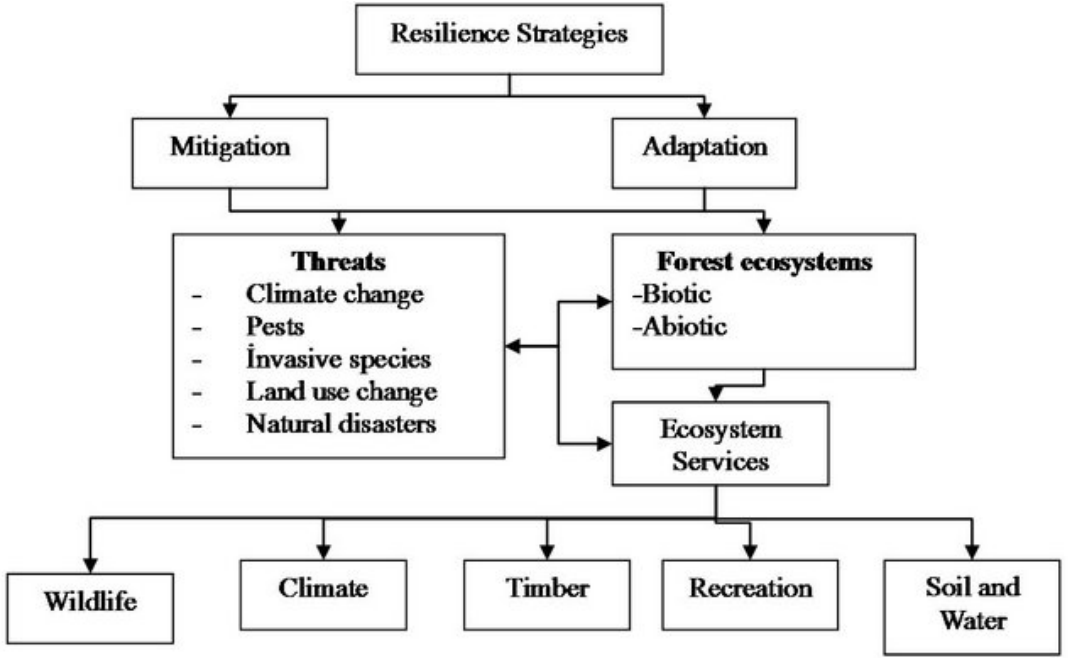


This study confirms a substantial gap in land-use flux estimates between BMs and NGHGIs, equal to 6.7 GtCO2 yr-1 globally for the period 2000–2020, with the majority of the discrepancy occurring on forest land.

Figure from Grassi et al., ESSDD 2022

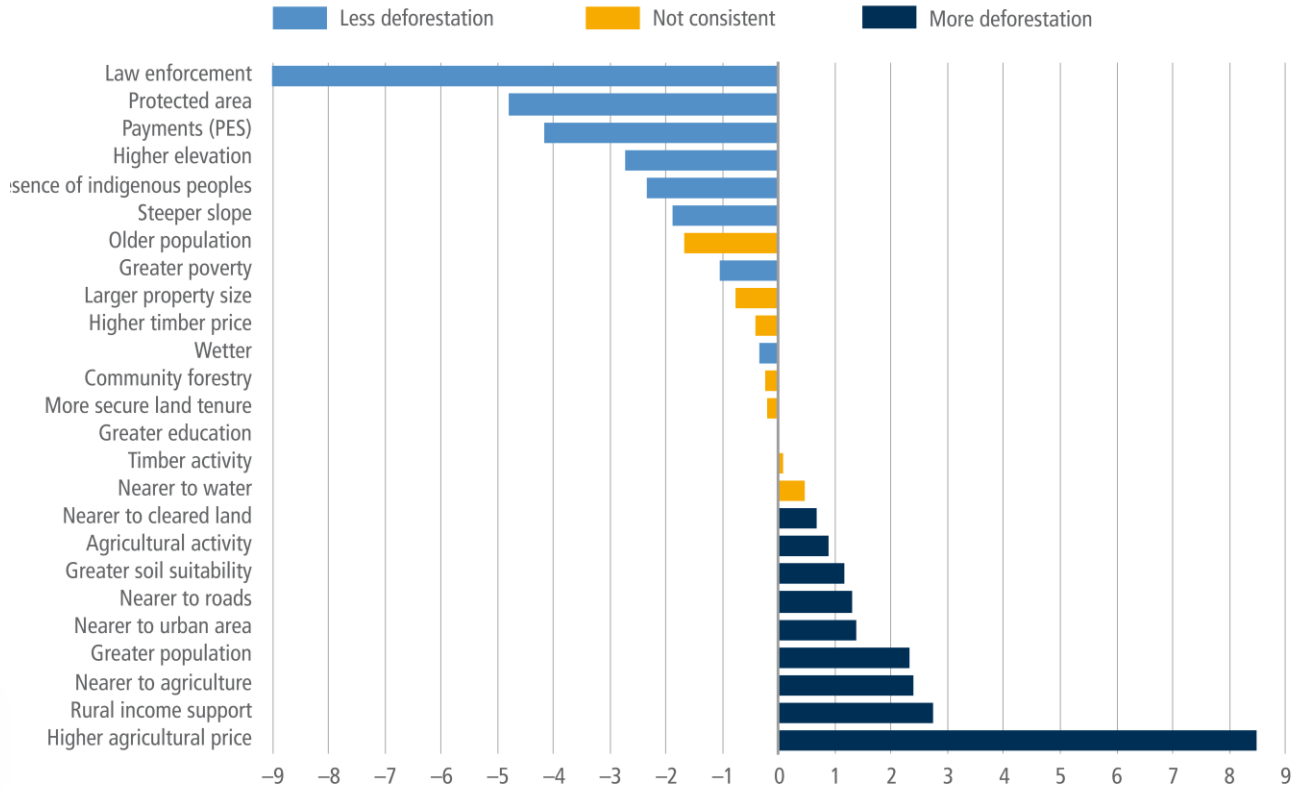
Priorities and threats – Climate Change

Threats



Rnahir & Erol (2013)

Drivers



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.

AR6 – WGIII – Ch6

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

Monitoring

Forest monitoring

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

How monitoring is define.....

Definition of monitoring	Source
Systematic observations of parameters related to a specific problem, designed to provide information on the characteristics of the problem and their changes with time	SCEP (1970)
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	Meijers (1986)
A process of detecting whether change has occurred, establishing its direction and measuring its extent	Ferris-Kaan and Patterson (1992)
Intermittent recording of the condition of a feature of interest to detect or measure compliance with a predetermined standard	Hellawell (1991)
Tracking a particular environmental entity through time, observing its condition, and the change of its condition, in response to a well-defined stimulus	Stevens (1994)
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	Yoccoz et al. (2001)
The collection and analysis of repeated observations or measurements to evaluate changes in condition and progress toward meeting a management objective	Elzinga et al. (2001)
A time series of measurements of physical/chemical/biological variables designed to answer questions about environmental change	Lovett et al. (2007)

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

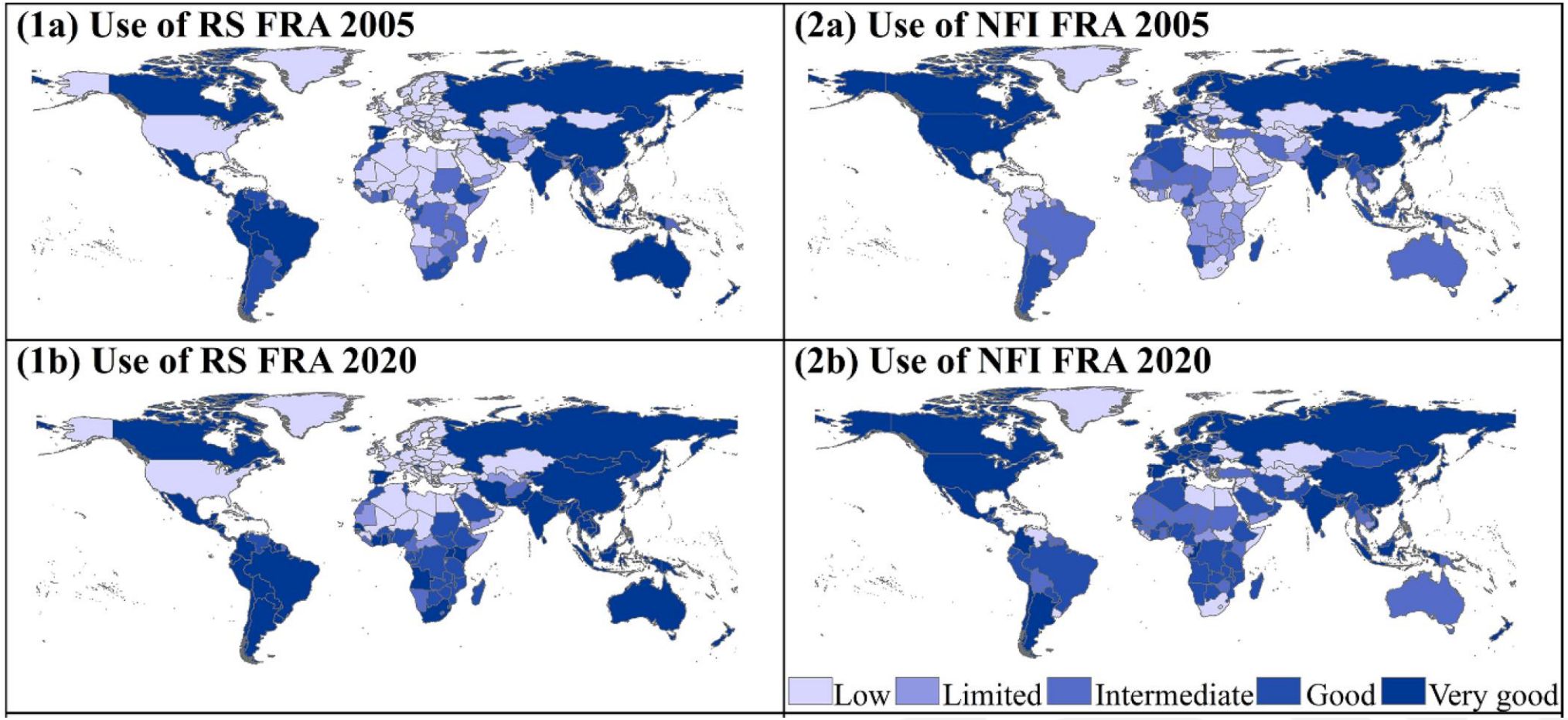
- **Models could be Part of Forest Inventory**

  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



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

Tier indicators		Number of countries in Tiers				Forest area % under Tiers			
		No data	Tier 1	Tier 2	Tier 3	No data	Tier 1	Tier 2	Tier 3
Forest area	Status	—	54	57	125	—	2	5	93
	Trend	—	71	62	103	—	2	12	86
Growing stock	Status	32	72	40	92	~4	5	7	85
	Trend	32	84	60	60	~4	8	27	61
Biomass*		30	146	—	60	<1	24		76
Carbon pool		30	22	139	45	<1	1	38	61

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

Tier indicators		Indicator criteria	Indicator value	Data source
Forest area	Status	Data from 2013 or more recent from a good data source (NFIs, sample-based RS, wall-to-wall mapping)	Tier 3	Section 1 in FRA 2020 country reports
		Data older than 2013 and good data source	Tier 2	
		Other (incl. data from registers or questionnaires, expert assessments)	Tier 1	
	Trend	Multiple consistent data points (in terms of methods and classes), all from 2013 or more recent or Tier 3 Status, incl. recent forest area change estimates (i.e. from a REDD+ FREL)	Tier 3	
		Multiple data points but limited consistency (in terms of methods and classes), and/or older than 2013, incl. 1 data point and expanded trends from the external data source	Tier 2	
		Other	Tier 1	
Growing Stock	Status	Data from NFIs from 2009 or more recent (incl. RS-based method calibrated by inventory plot data)	Tier 3	Section 2 in FRA 2020 country reports
		Data from NFIs older than 2009	Tier 2	
		Other	Tier 1	
	Trend	Data from multiple consistent NFIs, all from 2009 or more recent	Tier 3	
		Data from multiple NFIs or RS-based estimates but limited consistency, and/or older than 2009, incl. cases with one NFI and using detailed multi-date RS assessment of different forest types	Tier 2	
		Other	Tier 1	
Biomass*		Data derived from country-specific or targeted expansion factors, allometric models, etc.	Tier 3	Section 2c in FRA 2020 country reports
		Data derived from default factors or generic equations, i.e. all countries using the biomass calculator	Tier 1	
Carbon pools		Data provided for all five carbon pools (AGB, BGB, litter, deadwood, and soil)	Tier 3	Section 2d in FRA 2020 country reports
		Data provided for at least two carbon pools	Tier 2	
		Other	Tier 1	

* Only Tier 1 and Tier 3 are considered in the case of biomass indicator.

Nesha et al (2021)

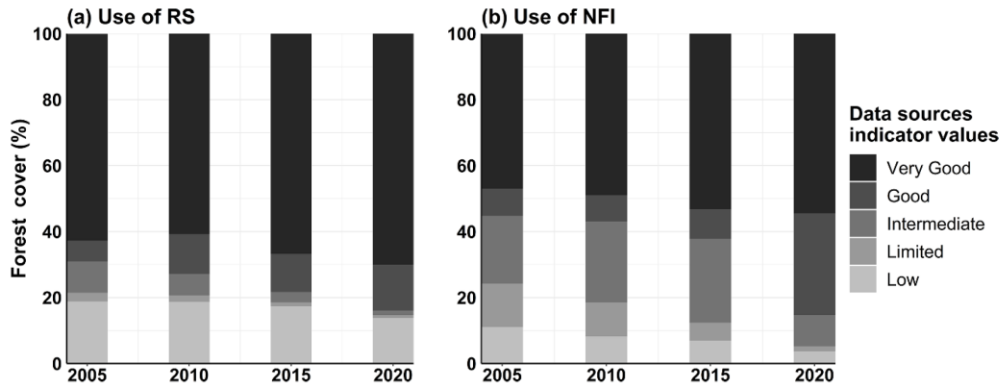


Figure 2. The percentage of total forest cover monitored by data source indicator value for use of RS for forest area monitoring (a), and use of NFI for forest monitoring (b) in 236 countries and territories from FRA 2005 to FRA 2020.

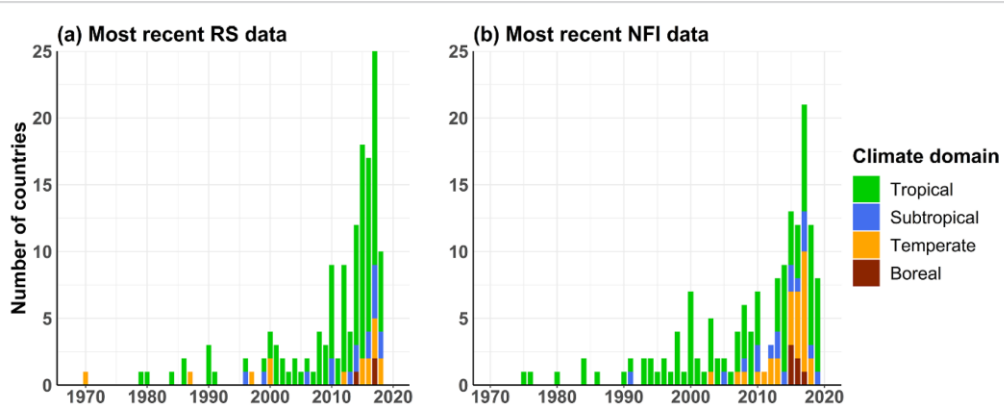
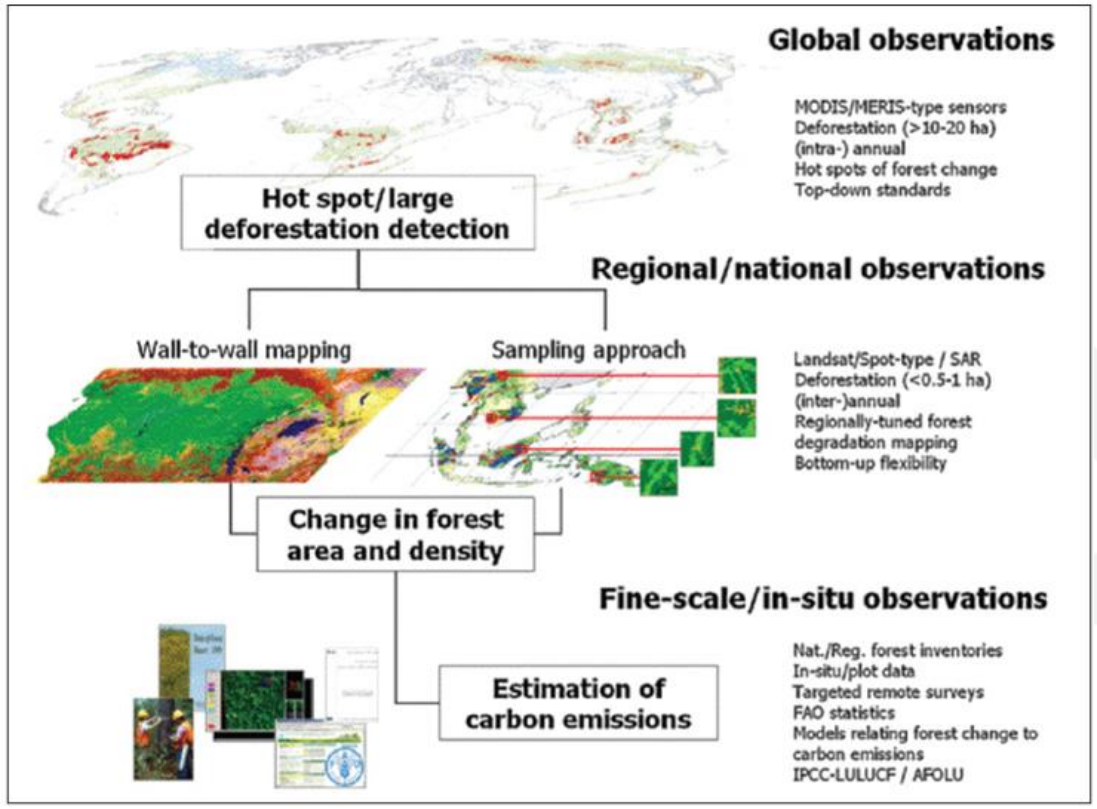
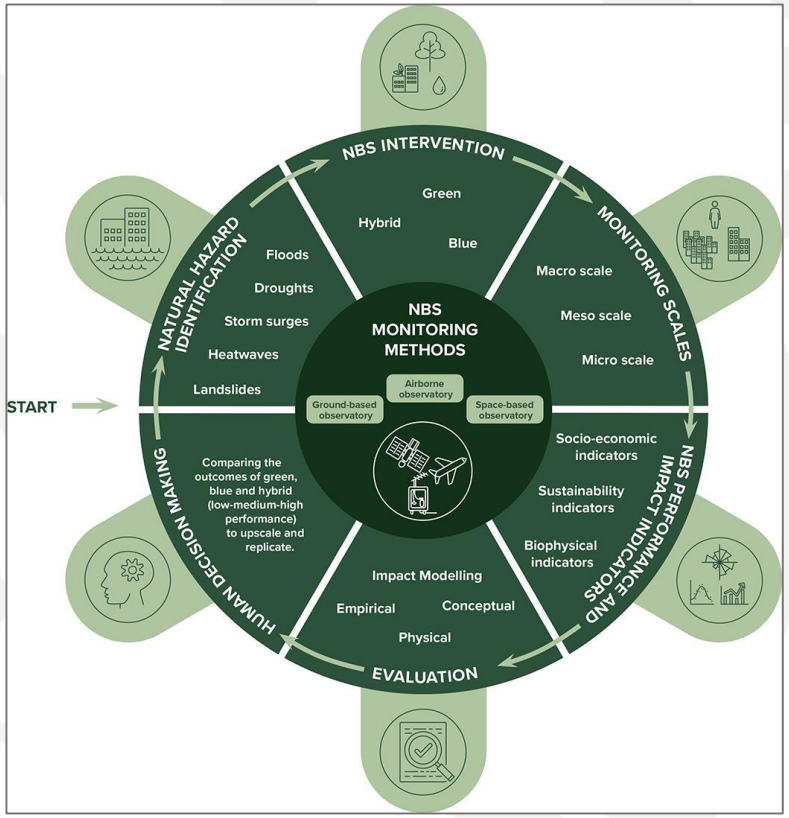


Figure 3. Temporal distribution of the most recent RS and NFI data points aggregated by climate domain; the countries and territories totaled at 145 for RS and 150 for NFI data. Here, data points mean if countries have RS and/NFI data in a particular year. The years generally refer to years in which RS and NFI data were collected.

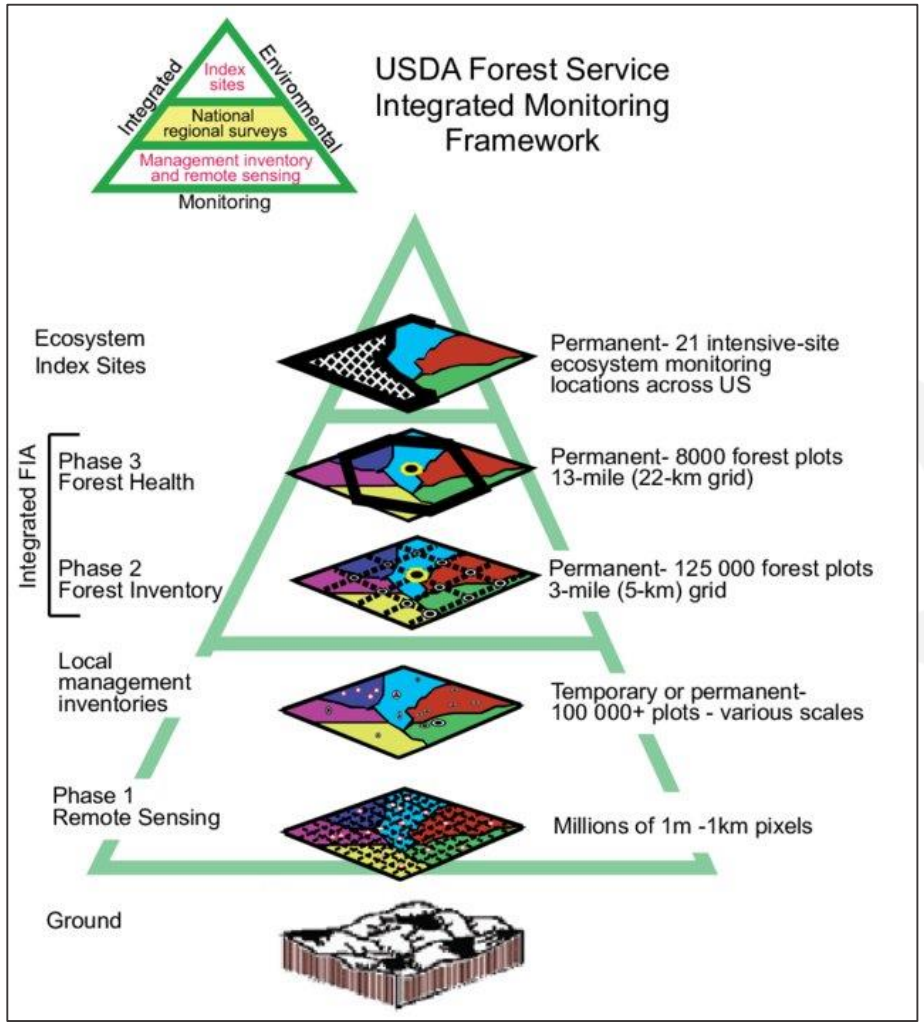
Forest monitoring: scope and scale?



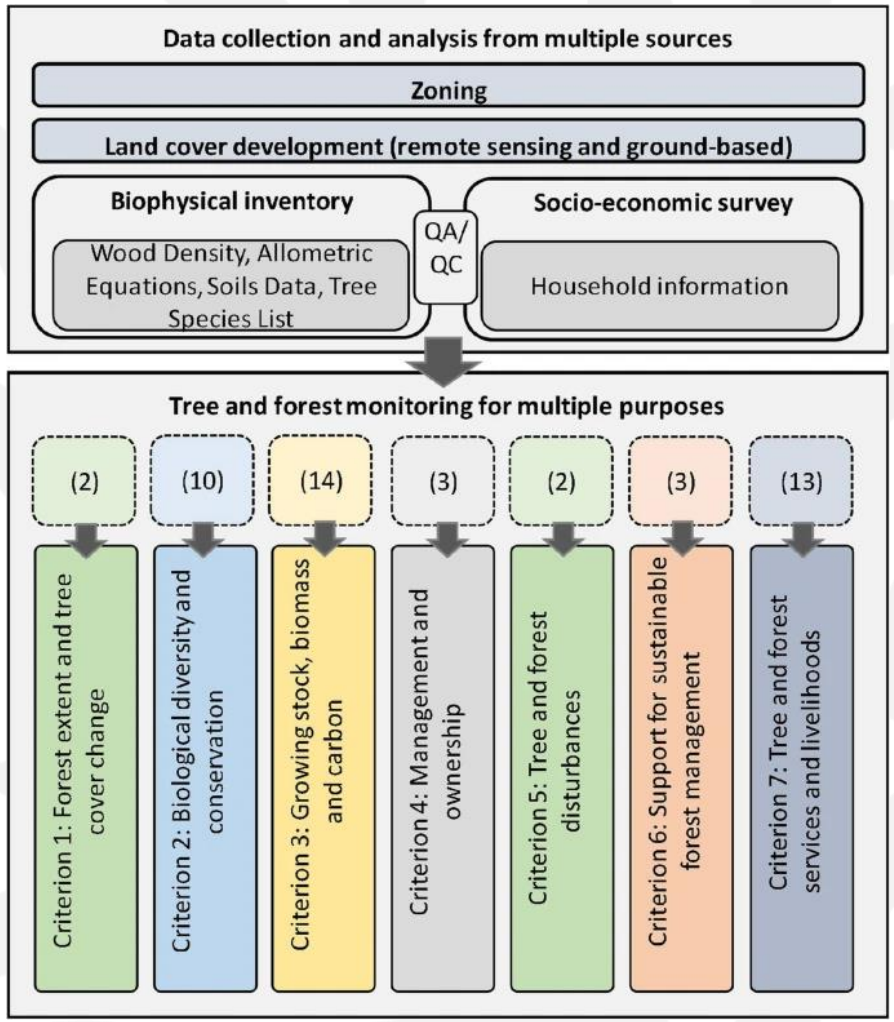


With the view of multiscale – one service

Forest monitoring: scope and scale?

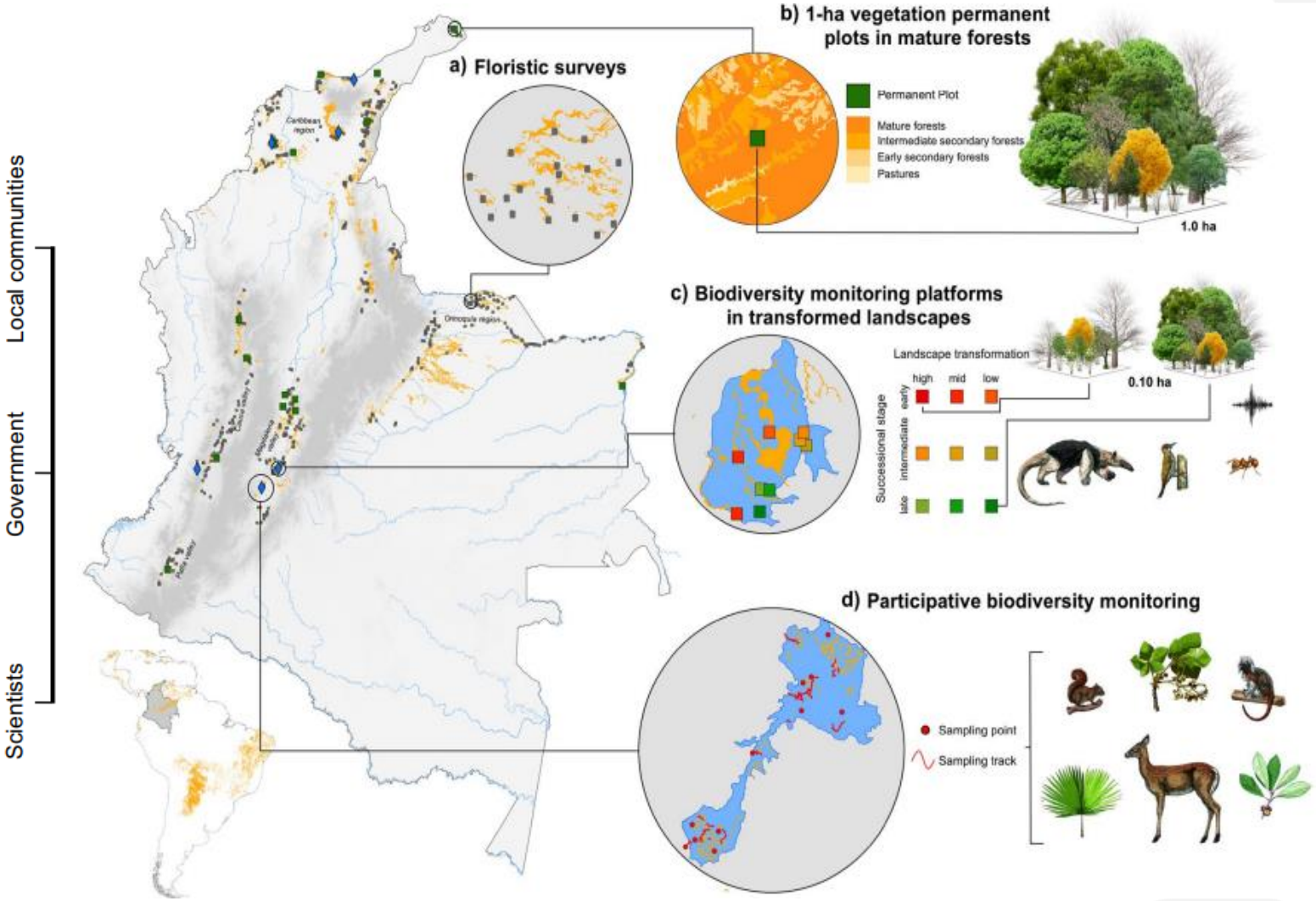


Bennett & Tkacz (2008)



Henry et al (2021) (Ex. Bangladesh)

Forest monitoring: scope and scale?



Promoting effective ecosystem restoration and preservation

Accurately assessing and managing environmental services

Improving rural livelihoods and food security

Socio-ecological platforms

Management directions

Improve knowledge of basic science

Building over time

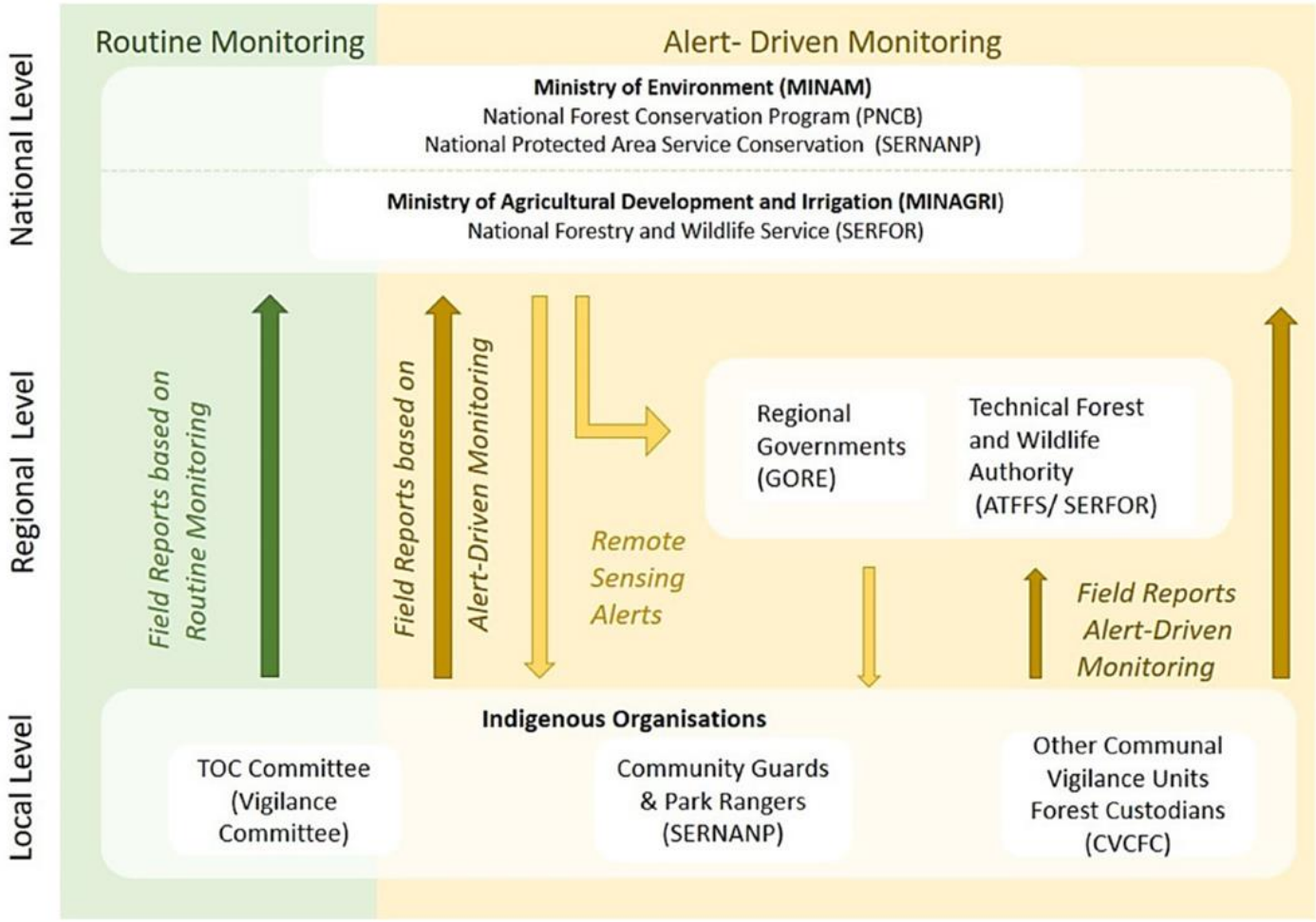
Forest monitoring: scope and scale?

Alert-Driven Community-Based Forest Monitoring: A Case of the Peruvian Amazon

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

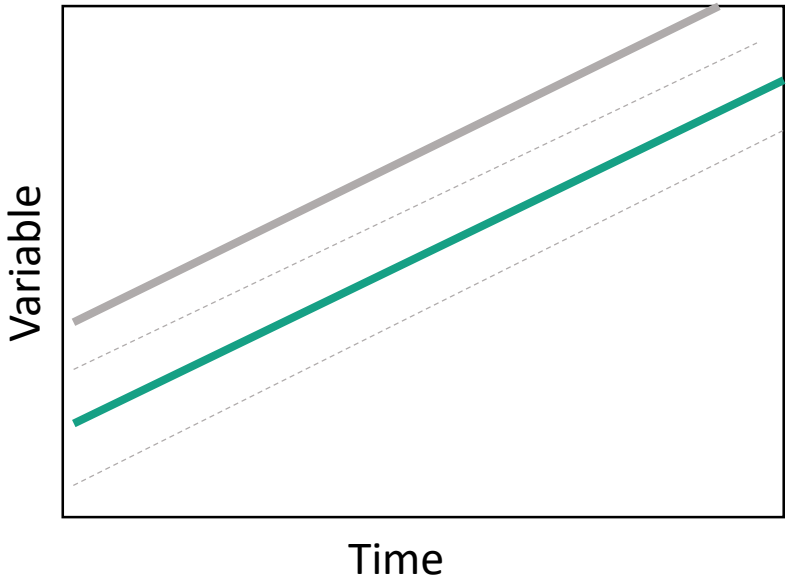
Governance and structure adapted to the scope and scale

Cappello et al 2022

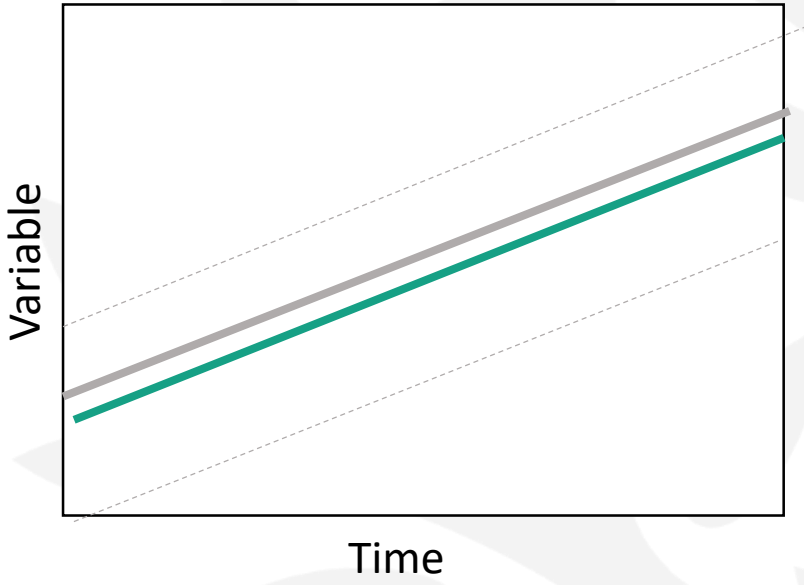


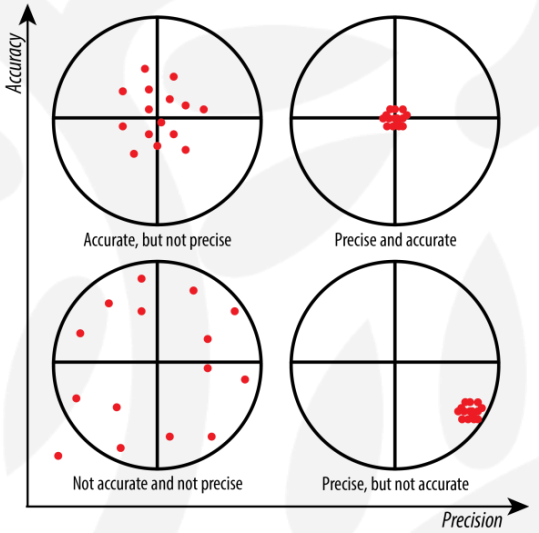
Forest monitoring: Detect changes?

More precise and less accurate (higher investment)

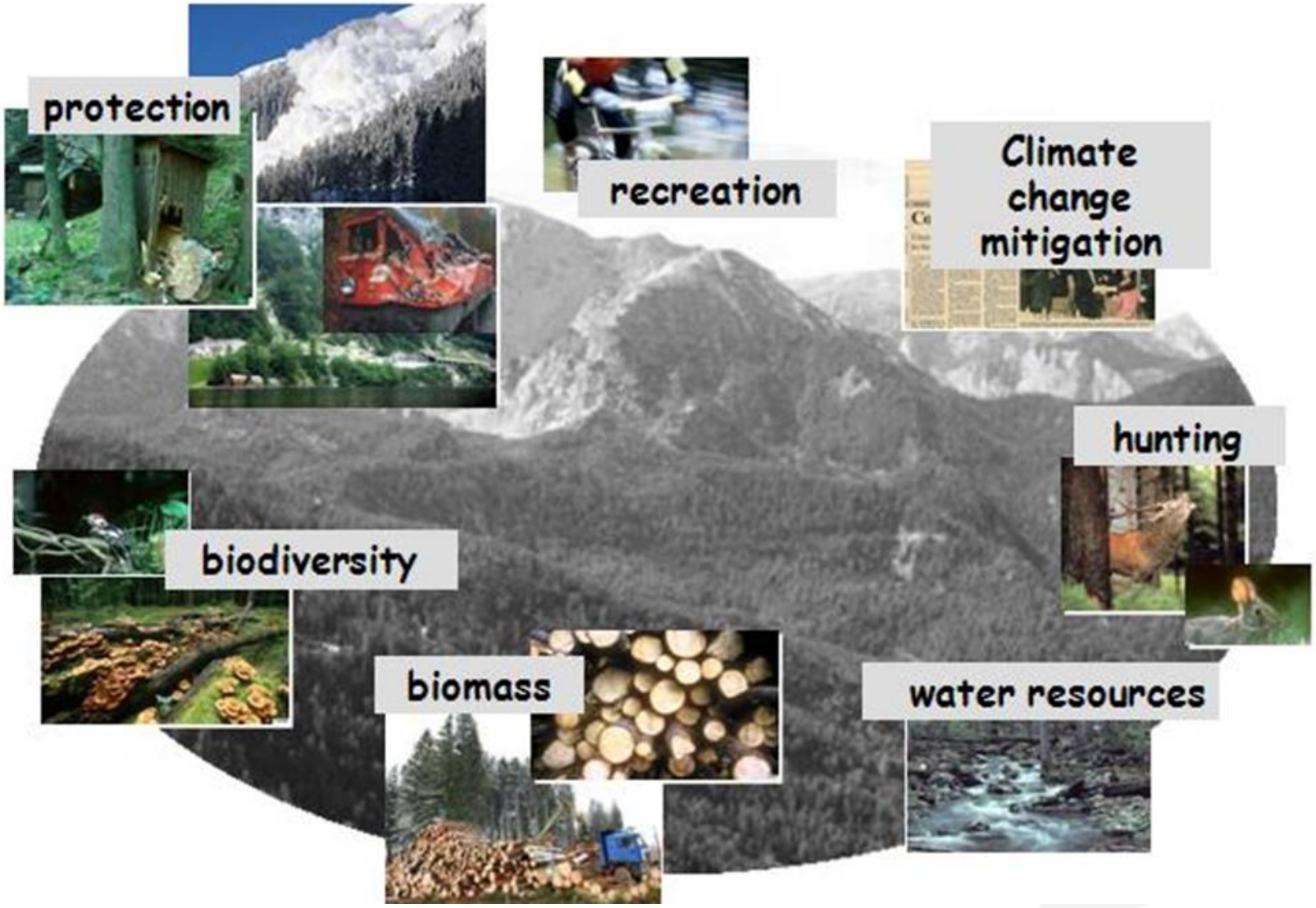


Less precise and more accurate (lower investment)





Less variables → Same cost ← More variables



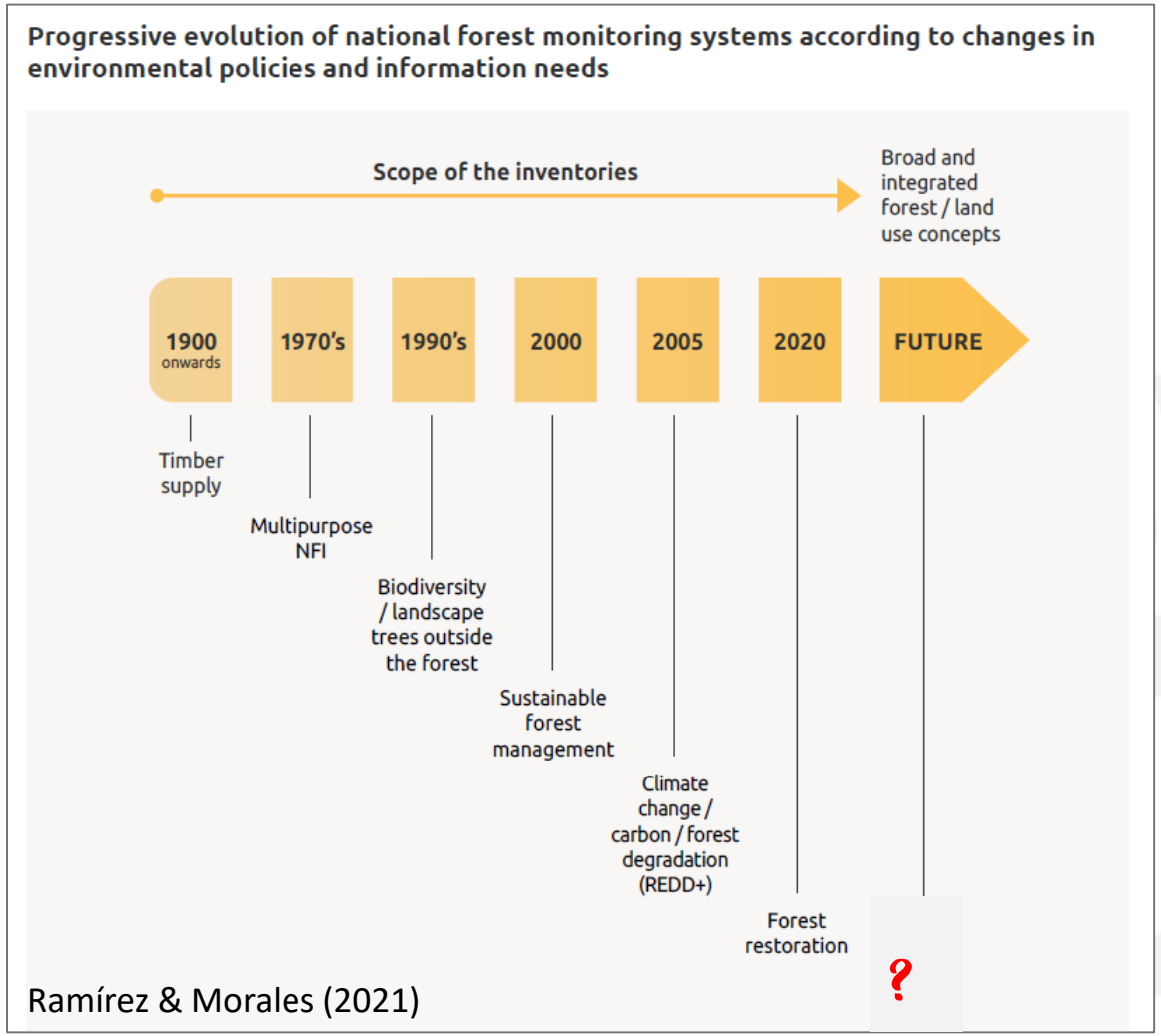
Remember…

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

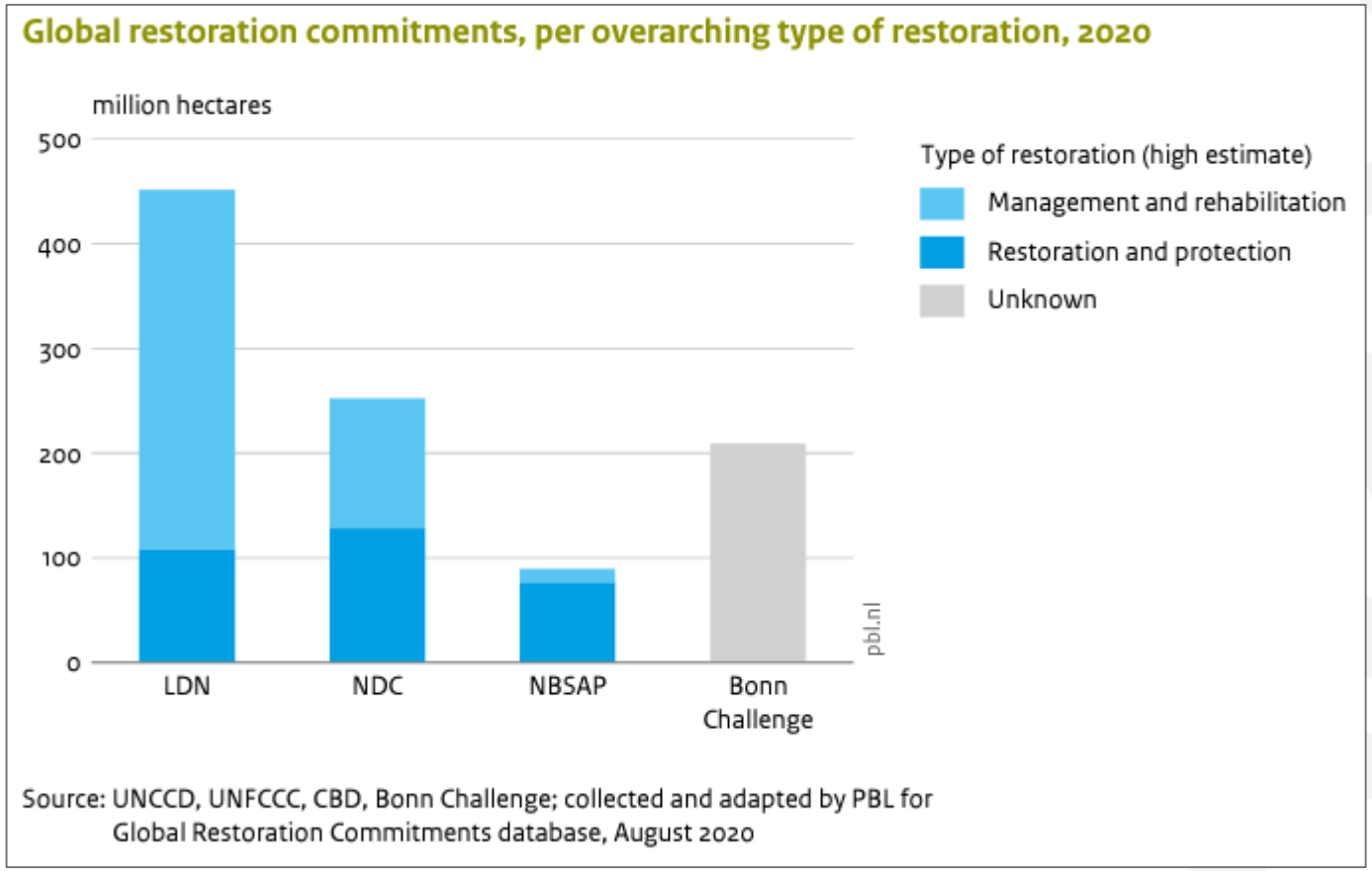
Disturbances (biotic and abiotic)
Early warning

Supply chains

Avoid reinventing the wheel or duplicating efforts

Build upon existing ….

Why forest information?... future



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