GFZ Helmholtz-Zentrum für Geoforschung

GFOI Global Forest Observations Initiative

PLENARY 2025

Integrating EO biomass information with NFIs to enhance (sub)national biomass estimates

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22.10.2025

National Forest Inventories

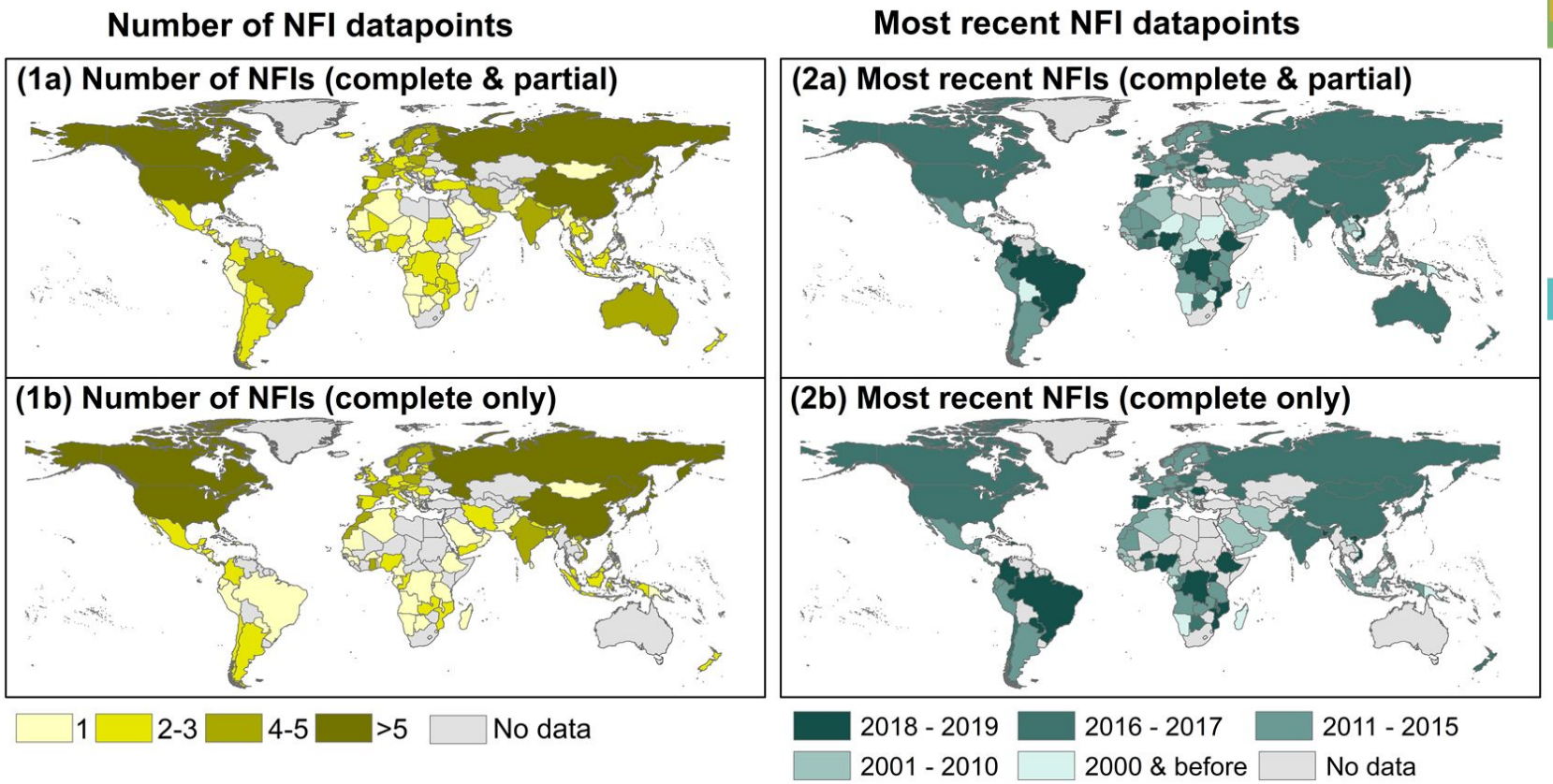
Plenary Hall

National forest inventories

Robust and timely forest biomass data enables sustainable forest management and climate action

Country progress of National Forest Inventories (NFIs)

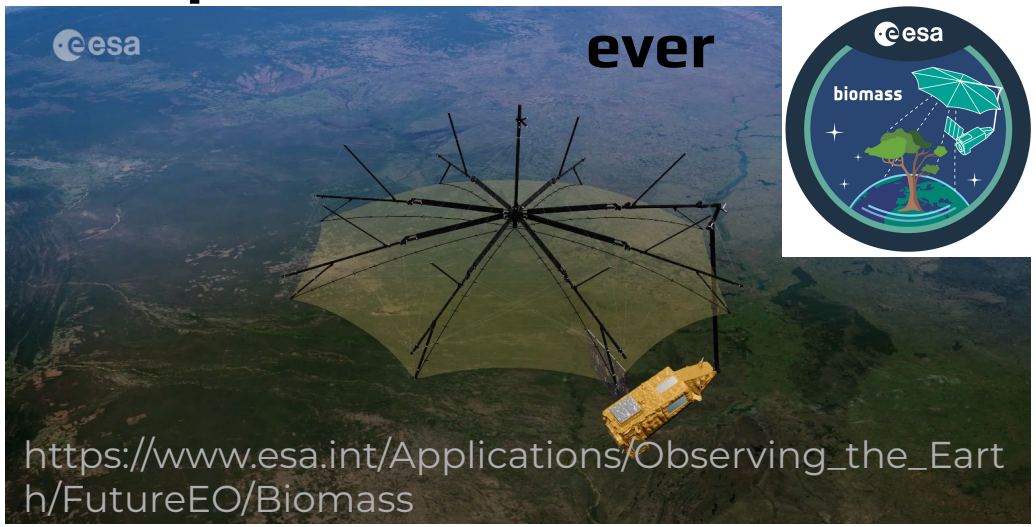
- Challenges with incomplete coverage
- Challenges with re-measurements only 1 round completed



Nesha et al., 2022. Exploring characteristics of national forest inventories for integration with global space-based forest biomass data, Science of the Total Environment

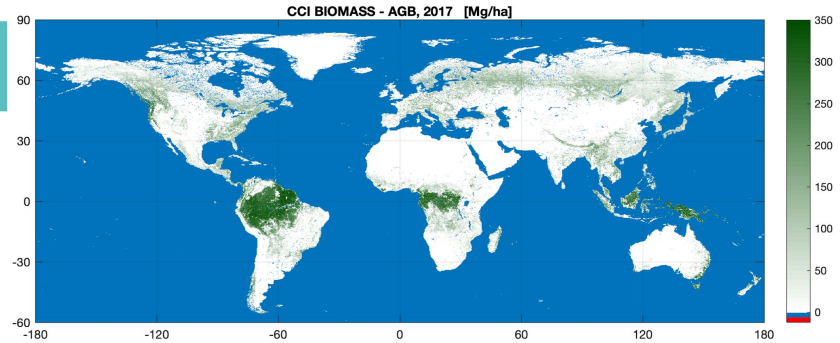
EO biomass information availability

More space based biomass information than ever

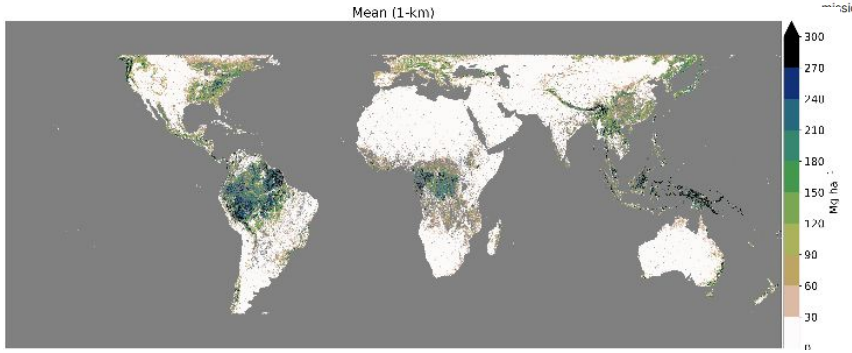


Launched on
April 2025

biomass cci

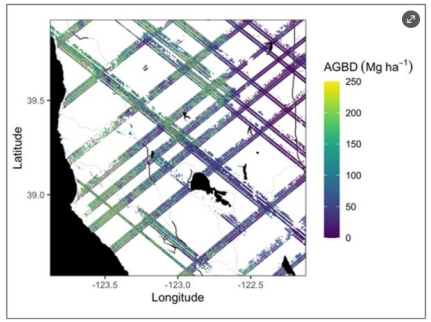


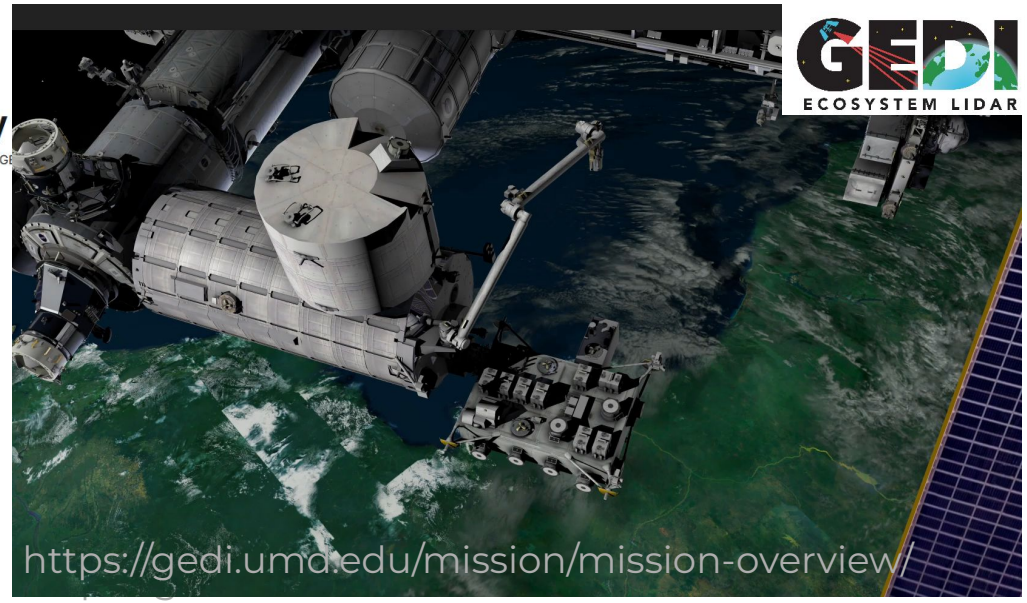
GEDI ECOSYSTEM LIDAR



GEDI Is Back Online With an Updated Release of Footprint Aboveground Biomass Density

New Level 4A data are the first from the Global Ecosystem Dynamics Investigation (GE
mission since the instrument returned to operation in 2024.



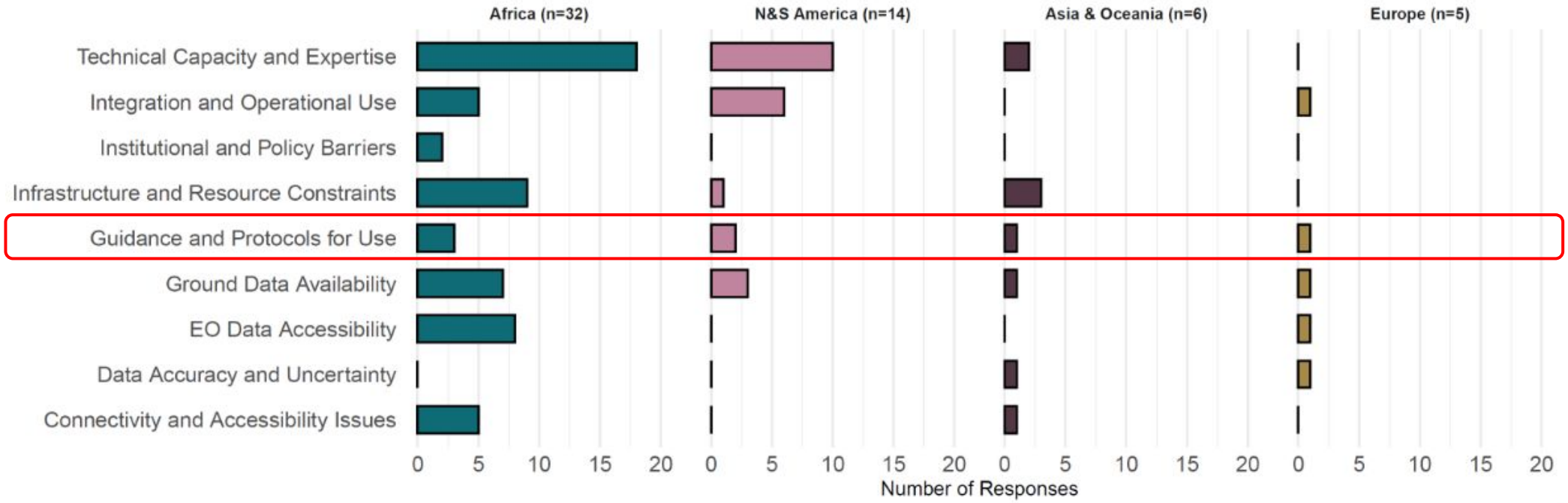


GEDI ECOSYSTEM LIDAR

What are the barriers for uptake of EO biomass products?

Internal

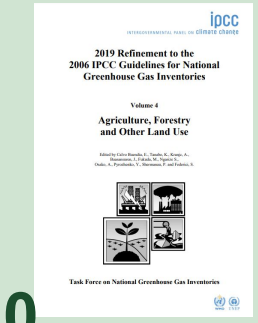
GFOI Biomass User Survey to NFMS teams and FRA National Correspondents (n=70)

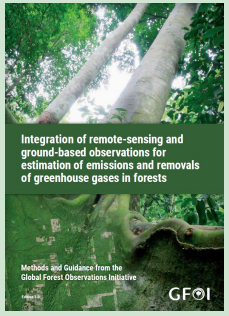


Source: GFOI Biomass User Survey

Guidance and recommendations

How can biomass maps support biomass/ biomass change estimation?





2019 -2020

Group of experts [EO, NFI, country rep.] working on a more extensive recipe in a series of workshops between 2022-2024

UMD/USGS/GFOI
USA, 2023

GFOI/ESA/GFZ
Germany, 2024

Integrating reference data and biomass maps

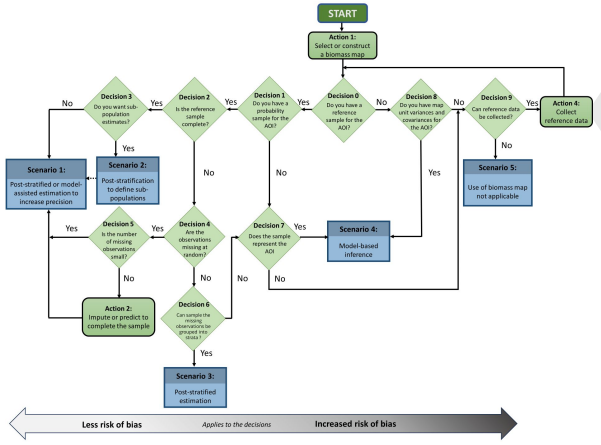
Assessing the maturity level of Potential Applications

Research

Pre-operational

Operational

Methods to enhance biomass estimates



GFOI Global Forest Observations Initiative

Download MGD Modules

Biomass Maps

Information on the potential and limitations of global or regional biomass datasets in the context of National greenhouse gas inventories.

GFOI Rapid Response Module: Guidance to inform the use of space-based forest biomass-related data in MRV procedures

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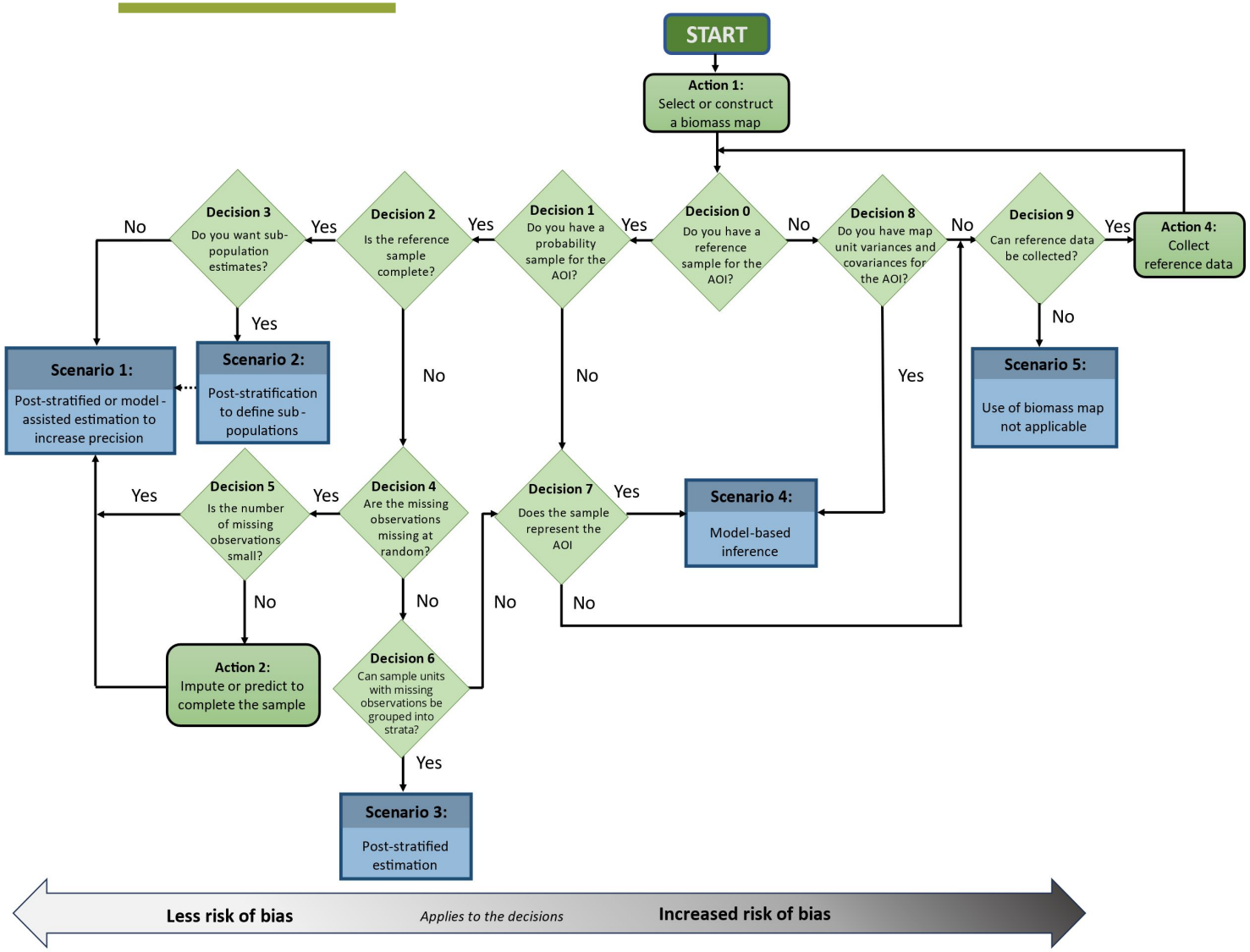
https://www.reddcompass.org/mgd

Enhancing forest biomass estimates with biomass maps



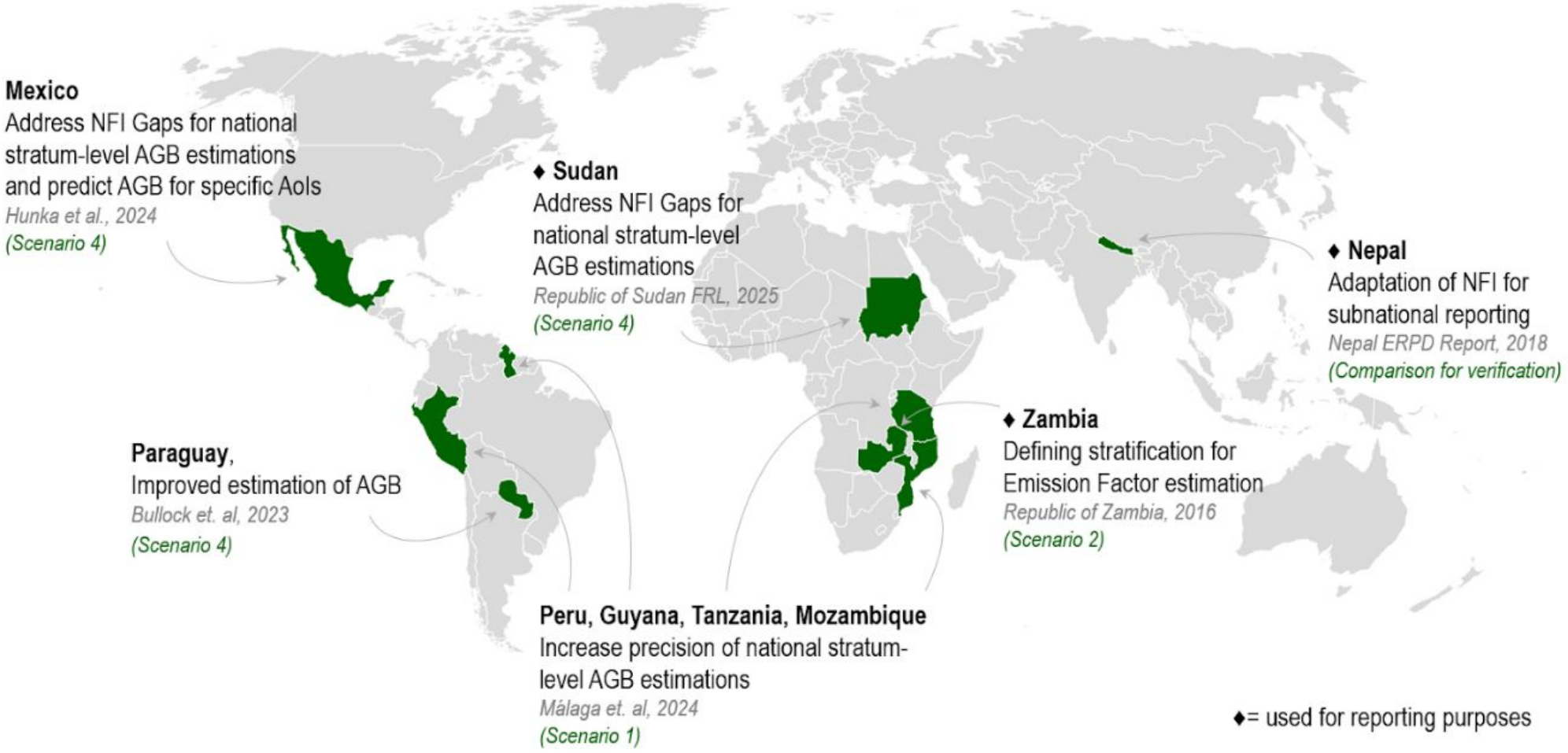
Ground reference data are **vital**, biomass products are auxiliary data

Methods are dictated by the **quantity** and **quality** of the reference data and the **sampling design** used to acquire it.

The **risk of bias** decreases toward the left side of the tree (when a probability sample –NFI- is available) and increases to the right (where reference data are limited)

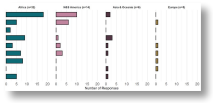
Source: GFOI Biomass Module

Existing country studies integrating EO biomass products with NFIs



Source: GFOI Biomass Module

Final remarks



There is interest by countries and increasing opportunities to integrate EO biomass products with on ground-data streams

International **coordinated efforts** to improve global biomass products

GFOI community: **channelizing guidance** and knowledge-exchange with country-counterparts on the use of biomass maps. Progressing from **research demonstrations to country-case studies**

EO biomass products as an **opportunity to enhance** (sub)national biomass estimates. Using the EO products as supporting **(not replacing)** information to NFI data **can enhance biomass estimates**.

More country cases are welcomed/ needed to put the cookbook into practice (**We need feedback from the countries to the Biomass Module**). No solution fits all and is dependent on the type of NFI information and the need to be addressed.

Explore how to best use existing data (even mono-temporal) to **estimate removal factors**

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THANK YOU

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esa

biomass cci