GFOI Global Forest Observations Initiative

Joint Meeting of the GFOI Components

"Strengthening Forest Monitoring Together: Lessons, Innovations, and Pathways Forward"

Monday, 20 October 2025

Hosted by:

Food and Agriculture Organization of the United Nations

Ministry of Forestry Republic of Indonesia

Lead Partners:

Australia · CEOS · esa · Forest Carbon Partnership · Green Climate Fund · Federal Ministry for Economic Cooperation and Development · Norwegian Ministry of Climate and Environment · UK Government

Event Summary and Agenda

Date and Location

Monday, 20 October 2025, 9-5PM; Nusa Dua, Indonesia

Context

Since its establishment in 2011, the GFOI has supported countries in developing National Forest Monitoring Systems (NFMS) and strengthening their capacity to measure, report, and verify (MRV) forest-related greenhouse gas emissions and removals. Over the years, the Capacity Building (CB), Research & Development (R&D), Methods and Guidance (MGD), and Data Coordination (DC) Components have worked closely with national forest monitoring institutions to identify technical gaps, co-develop solutions, and support the development of robust approaches to fill those gaps. This has been carried out through training activities, dedicated support for developing operational approaches, as well as research collaborations.

Guided by the theme *"Strengthening Forest Monitoring Together: Lessons, Innovations, and Pathways Forward"*, this Joint Component meeting brought together NFMS representatives, MRV specialists and the forest monitoring research community to take stock of progress in diverse national forest monitoring systems, reflect on the lessons learned since the start of the GFOI forum, and reflect on how GFOI-supported activities have strengthened independent decision-making in the development of national forest monitoring systems. Participants also discussed persisting and emerging challenges, exploring how cross-component collaboration can be enhanced to address current gaps and unmet monitoring needs.

A key focus was placed on the future of GFOI's Components in light of recent developments, including changes in the level of engagement from the US government. The meeting provided space to consider options for the way forward, identifying critical gaps that require reflection, and explored how the operations and expectations of the GFOI Components may need to evolve.

This meeting also presented one of the latest Joint Component collaboration outputs: the Biomass Rapid Response Module, which provides good practice considerations, operational pathways, and a decision tree to guide countries in applying space-based biomass data to address MRV needs. This module has been developed as a product of several training sessions, expert meetings, dedicated support activities and research collaborations in the last years.

Objectives

1. Exchange on the contributions of GFOI training and capacity building activities, identifying lessons learned, success stories and areas for improved collaboration.
2. Familiarize participants with the recently-launched Biomass Rapid Response Module, collect feedback and identify information needs on forest biomass estimation.
3. Discuss research and training needs in a larger sense, from emissions factors to activity data, as well as emerging reporting needs, and identify avenues in which the Components can jointly target these under changing policy contexts.

Organizers

Daniela Requena Suarez (GFZ/R&D Component), Erik Lindquist (FAO/CB Component), Sylvia Wilson (Wilpacd/R&D Component), Thomas Harvey (GFOI)

Format: In-person with an option to join online via Zoom

Detailed Agenda

Time	Topic	Speaker/Moderator
Morning Session 1		Moderator: Erik Lindquist
09:00-09:20	Introduction Round and Meeting Objectives	Sylvia Wilson, Daniela Requena
09:20-10:30	Contributions of GFOI activities, identifying success stories Country presentations - Colombia, Paraguay	Erik Lindquist, Edersson Cabrera and Patricia Insfran
10:30-10:50	Coffee Break	
Morning Session 2		Moderator: Sylvia Wilson
10:50-11:40	Country presentations (cont.) - Mozambique, Vietnam, Suriname (recorded contr.)	Aristides Muhate, Hai Pham, Consuela Paloeng
11:40 -12:30	Open discussion session, incl. adapting of GFOI Components to emerging policy contexts	Erik Lindquist, Daniela Requena
12:30-13:30	Lunch	
Afternoon Session 1		Moderator: Natalia Málaga
13:30-13:45	Introduction to Biomass Module and Biomass User Survey	Daniela Requena
13:45-14:15	High level overview of ways to integrate biomass data with ground data for MRV needs	Natalia Málaga, Neha Hunka and Chad Babcock
14:15-14:40	Dynamic session: Addressing biomass/EF needs using the Rapid Response Module	Natalia Málaga and Javier García-Perez (Moderators), supported by Biomass Module Authors
14:40-14:50	Feedback from dynamic session	All
15:20-15:30	Open discussion	All
15:30: 15:50	Coffee Break	
Afternoon Session 2		Moderator: Daniela Requena
15:50-16:20	Survey results for refining GFOI R&D priorities and country needs	Sylvia Wilson
16:20 – 16:40	Discussion session: Adapting to emerging policy contexts and needs (updates and discussion)	Erik Lindquist
16:40-17:00	Discussion Round, Wrap-up and next steps	Erik Lindquist / Daniela Requena Suarez

Participant List

Participant		Institution	Participation
1	Erik Lindquist	FAO	In person
2	Daniela Requena Suarez	GFZ	In person
3	Sylvia Wilson	Wilpa CD	In person
4	Natalia Málaga	GFZ	In person
5	Javier García-Perez Gamarra	FAO	In person
6	Neha Hunka	ESA	In person
7	Chad Babcock	UMin	In person
8	Robert Kennedy	OsU	In person
9	Alexs Arana	SERFOR (Peru)	In person
10	Larlyn Faith Aggabao	FMB (Phillipines)	In person
11	Aristides Muhate	FNDS (Mozambique)	In person
12	Muri Soares	FNDS (Mozambique)	In person
13	Hout Naborey	GDKI (Cambodia)	In person
14	Ederson Cabrera	IDEAM (Colombia)	In person
15	Gustavo Galindo	IDEAM (Colombia)	In person
16	Hai Pham	FIPI (Vietnam)	In person
17	Kenset Rosales	Independent	In person
18	Patricia Insfran	INFONA (Paraguay)	In person
19	Gabriela Huttemann	INFONA (Paraguay)	In person
20	Aldo David Ozuna	INFONA (Paraguay)	In person
21	Naikoa Aguilar	World Bank	In person
22	Ashley Leman	Independent	In person
23	Sara Goeking	Utah State Univ.	Online
24	Inge Jonckheere	ESA	In person
25	Thomas Harvey	GFOI	In person
26	Ellen Bruzelius-Backer	NICFI (Norway)	In person
27	Marieke Sandker	FAO	In person
28	Carly Green	GFOI	In person
29	Sandro Federici	IPCC TFI TSU	In person
30	Theresa Chen	UMin	In person
31	Remi d'Annunzio	FAO	In person
32	Consuela Paloeng	SBB (Suriname)	Online contribution
33	Valentien Moe Soe Let	SBB (Suriname)	Online contribution

Summary of discussions and presentations

Morning Session

- The objectives of the meeting were introduced to all participants, as well as a brief summary of the cross cross-component collaboration activities of the GFOI. This was followed by a round of introductions.
- E. Lindquist introduced the morning sessions, explaining the background of the discussions related to the contribution of capacity building activities to national forest monitoring teams since the start of GFOI. The importance of compiling country experiences, in relationship to GFOI support was highlighted.
- E. Cabrera and G. Galindo presented the experience of Colombia's Forest and Carbon Monitoring system, introducing the framework, progress and challenges regarding its implementation. Key highlights of the support from GFOI include:
    - Advancement for international reporting and national information needs (e.g. BUR/BTRs, FRELs). For example, exchanges with GFOI and other research groups has supported the elaboration of algorithms for detecting change (documented in https://github.com/SMByC)
    - These advancements have always been orientated by guidance documentation. Furthermore, some of these guidance materials have also been jointly elaborated with Colombia NFMS's input.
    - Capacity building component activities have allowed for the elaboration of a NFMS through effective knowledge and technology transfer. Tools adopted include Collect Earth (for NFI), SEPAL (for SMByC),
    - Data coordination allows access to data and tools for forest monitoring. Research and Development component targets knowledge gaps to progress forest monitoring, such as the scalability challenges of aligning national and local reporting.

  Persisting challenges and emerging needs were also discussed, including: the following challenges in maintaining cloud processing infrastructure; the need to establish and update a registry to avoid double accounting between government programs with voluntary carbon initiatives; the need to assure a frequent flux of remote sensing data to support the monitoring process, a point related to the stop of the Planet/NICFI programme); the need for preparation for reporting to new funding programmes such as TFFF, the challenge of establishing interoperability mechanisms with non-carbon policy frameworks (such as the Convention of Biological Diversity); and the challenge to adapt and articulate their NFMS to local and private sectors, in light of the Article 6 of the Paris Agreement.
- P. Insfram and G. Hutteman shared the experience of Paraguay's National Forest Monitoring System, including its progress after over a decade since its start. They introduced the components of Paraguay's NFMS, the underpinning legal framework, as well as the main Satellite Land Monitoring System (SLMS) products and their National Forest Inventory (NFI) progress. Originally, the data acquired by Paraguay's NFMS was designed for reporting activities, but now this data is being used for national policy and planning activities. However, there are still challenges for making the most out of their data. They highlighted the impact of GFOI Capacity Building activities, namely:
    - The training on use of open access methods and platforms (i.e. Google Earth Engine, CODED, Alerts, SEPAL training)
    - Strengthening capacities for area estimation and accuracy assessments.
    - Improved understanding of space-based biomass datasets, improvement and updating of NFI methodology, and deforestation alerts through the Silvacarbon/CEOS workshops.

  Persisting challenges related to (1) the generation and use of activity data, particularly for the detection of forest degradation and regrowth, (2) ensuring robust and multi-purpose national forest inventory data, and (3) cross-cutting challenges related to

integrating EO and ground data sources, ensuring the sustainability of their NFMS, accessing near-real time EO data.

- M. Soares and A. Muhate presented on the experiences of Mozambique's NFMS within the MRV Unit of the Fundo Nacional de Desenvolvimento Sustentável (FNDS). They introduced the country's institutional context, as well as the chronological sequence of establishment, from the adoption of the National REDD+ Strategy in 2016 to their contributions to national and regional reporting activities (FRELs, BURs, FCPF-ERP). Future priorities for FNDS include updating their FREL, supporting a new round (5th) of their NFI, and developing a Mangrove Monitoring subsystem. In relation to the Impact of GFOI Capacity Development activities, the following were highlighted:
    - Participation in GFOI Plenaries (2019, 2021, 2023 and now 2025), with the 2019 one being held in Maputo.
    - Participation in 2017 REDD+ Compass MRV Action Plan and 2019 Country Needs Assessment for NFMS.
    - Participation in the R&D/MGD Biomass Rapid Response Module workshop in Potsdam, 2024.
    - Collaborations for mapping biomass, namely with Sylvera, GeoVille and University of Wageningen.

  Persisting challenges consisted of (1) response to rising deforestation rates, particularly related to technical assistance to surrounding communities, (2) sustainability of EO data sources to ensure continuity in reporting and (3) maintaining technical capacities to support gradual improvements to their NFMS.
  Highlighted needs related to the development of a locally-calibrated national biomass map, improvement in their monitoring of emissions from burned areas, and continued ground monitoring and expansion of their permanent sampling plot network.
  Recommendations to GFOI included further guidance on estimating emissions from fires (area estimation) and estimating degradation through the integration of different sources of data of degradation (e.g. partial deforestation, fires, timber extraction).
- H. Pham presented on behalf of FIPI-MAE the recent advances in Vietnam's NFMS. This included a presentation of the NFMS overview and main architecture and core functions, which consist of forest change detection, carbon stock estimation, and MRV for REDD+ Policy and decision support. Key achievements were also highlighted which ranged from institutional and policy achievements, to technical achievements, as well as examples for which NFMS data enabled REDD+ emission reductions as well as access to result-based payments (ERPA, FCPF).
    - Vietnam has benefited from multiple GFOI-related capacitu-building activities since 2015, by receiving support from FAO, World Bank, and Silvacarbon.
    - Capacity Building activities focused on cloud processing (SEPAL), MRV data integration, small area estimation, as well as institutional and technical training.
    - Capacity Development activities supported a national shift from project-based training to institutionalized learning, integration of open source tools, and enhanced cooperation between MAE, universities and various agencies for continuous development.

  Challenges identified included (1) technical barriers in data integration, change detection, and uncertainty analysis, (2) Institutional barriers for developing a unified NFMS, for improving data governance, and lack of long-term funding, and (3) Policy and coordination gaps, namely the limited integration of NFMS outputs into national policy planning, absence of data sharing policies and aligning NFMS indicators with NGHGI and transparency frameworks.
  Future priorities for MAE identified were (1) continue to strengthen technical capacities, related to software, access to EO data, biomass estimation, and regional knowledge exchanges; (2) Improve institutional and governance support; and (3) Pursue policy and financial sustainability.
- (*Online contribution*) K. Paloeng and V. Moe Soe presented the experience of Suriname's National Forest Monitoring System (NFMS), implemented by the Foundation for Forest Management and Production Control (SBB) under the Ministry of Land Policy and Forest Management. They introduced the system's development,

beginning with the ACTO project over a decade ago and subsequently strengthened during Suriname's REDD+ readiness phase.

- The NFMS is composed of several core subsystems: the Satellite Land Monitoring System (SLMS), which produces annual deforestation data and biennial post-deforestation land-use/land-cover maps; the Sustainable Forestry Information System (SFISS) for tracking all legal logging operations; a Near-Real-Time Monitoring (NRTM) module to detect unplanned logging from Sentinel imagery; and ongoing efforts toward a National Forest Inventory (NFI) and community-based monitoring. All NFMS data support consistent national and international reporting (e.g. FAO, UNFCCC).
- Key achievements included the use of NFMS data for Suriname's Forest Reference Emissions Level (FREL) and REDD+ reporting, with ongoing work toward Article 6.2 reporting for 2021. Updated forest-cover statistics reaffirm that the main drivers of deforestation are gold mining, infrastructure and agriculture. Methodological advances were highlighted, especially the integration of a national systematic sampling approach (~26,000 points) into SLMS production through post-stratification methods, with strong alignment between sampling results and wall-to-wall mapping. Progress toward establishing an NFI includes a growing database of forest and mangrove plots.
- Suriname credited early capacity building under the ACTO project, as well as sustained FAO support for QA/QC processes and, more recently, for training national stakeholders in systematic sampling and field–satellite data calibration.
- Persisting challenges include institutionalizing the Forest Cover Monitoring Unit within government, ensuring financial sustainability of NFMS operations, human-resource constraints and expert outflow, as well as methodological difficulties for estimating land-cover change associated with small-scale gold mining and infrastructure.
- Future priorities centre on continued methodological strengthening of SLMS (including uncertainty analysis), exploring remote-sensing-based forest carbon mapping, and fully establishing the NFI to improve carbon estimates. Institutional strengthening, improved retention of technical staff, and long-term technical and financial support were stressed. Suriname emphasised that sustained collaboration, both nationally and internationally, is essential for advancing NFMS implementation.

Afternoon Session

Afternoon discussions focused primarily on advancing National Forest Monitoring Systems (NFMS) through improved integration of Earth Observation (EO) data and field data, identifying key R&D priorities, and presenting the methodological framework of the new Biomass Rapid Response Module.

- A significant portion of the meeting introduced and elaborated on the **GFOI Biomass Rapid Response Module**, developed to provide guidance on the agreed-upon practices for using space-based biomass data with existing ground data.
  - The module responds to the surge in publicly available space-based aboveground biomass (AGB) estimates and the increasing interest from governments in using this data for National Greenhouse Gas Inventories (NGHGIs) and Measurement, Reporting, and Verification (MRV).
  - A fundamental principle highlighted is that forest biomass ground data is key. Biomass products derived from EO should be used as an auxiliary data source for AGB estimation. Remote sensing is acknowledged as measuring biomass via proxy estimates, not directly.
  - The module features a Methodological Decision-Making Framework (decision tree) intended to help users identify approaches for integrating space-based data and ground data. The methods described are dictated by the quantity and quality of the reference data and the sampling design used.

- The decision tree uses inferential strategies, including Design-Based, Model-Assisted, and Model-Based approaches.
- A crucial point for reporting purposes is that the risk of bias decreases toward the left side of the tree (where a probability sample, such as a National Forest Inventory (NFI), is available) and increases to the right (where reference data becomes limited). For UNFCCC reporting, the general recommendation is always to reduce uncertainties as far as practical and do not over- nor underestimate as far as can be judged.
- **Applications and User Feedback:**
  - Potential applications span from research (e.g., direct estimation of biomass change) to fully operational uses (e.g., comparison-verification purposes).
  - Specific scenarios discussed included using biomass maps as auxiliary data to increase the precision of forest-related biomass stock estimates and even contribute to change estimation.
  - Country representatives confirmed strong interest in using biomass maps for various purposes, including enhancing NFI sampling designs, direct estimation of biomass change, and addressing concerns around scalability (including nesting), such as having biomass estimates or predictions at different geographical levels (form national and subnational for reporting purposes and within smaller area estimations, like concession or district level). Other topics of interest related to biomass estimation include the harmonisation of ground- and EO-derived biomass information, as well as how to account for uncertainties from such data integration.
  - External barriers to using space-based biomass data include the need for transparency and understandability of methods from data producers and better accessibility to datasets for different levels of expertise. Internal barriers include technical capacity, the need for continued funding for ground data availability, and improved coordination for capacity building.

- **Research & Development Priorities and Survey Findings**
  - S. Wilson presented preliminary results from a 2025 Global Survey across 34 countries highlighting current challenges and R&D needs. The following preliminary results were highlighted:
    - Only 8% of NFMS achieved full EO–field integration.
    - The high cost of data or processing was cited as a barrier by 61 respondents.
    - Access to consistent high-resolution, multi-sensor data was cited as the top barrier, with 58 respondents reporting a lack of access to high-resolution EO data.
    - Underutilized datasets include LiDAR (57 respondents), Radar (44), and VHR Optical (41).
    - 72% of respondents confirmed the use of Planet or commercial imagery for validation, and the loss of Planet mosaics increased technical burden for validation processes.
    - Barriers to full integration include siloed institutions, outdated software, and lack of calibration data. Critical data gaps exist for peat carbon, mangrove soils, and degradation.
- Discussions emphasized strategic planning and sustainability beyond immediate technical issues.
  Short-term recommendations include institutionalizing EO–MRV integration and supporting open-access data and donor-subsidized licenses.
  Medium-term recommendations include establishing regional R&D hubs, suggested as beneficial for countries with similar complexities, such as countries in Latin America, which share similar forest monitoring challenges.

- Strategic pathways include building interoperable, open NFMS platforms, linking EO directly to GHG inventories, and focusing on long-term institutional learning.
  NFMS sustainability requires funding end-to-end MRV systems for transparency and carbon credibility.
- Attendees reflected on the need for countries to take the lead in capacity building, but acknowledged that international support remains crucial, especially for research and guidance, as national academia may not always provide the necessary support or alignment with NFMS needs.
- For least developed countries (LDCs), the responsibility lies in maintaining a transparent MRV system, but noted that external support is needed due to competing national priorities like health and education.
- The importance of engaging in the R&D process was highlighted, noting that the most capable NFMS teams often participate directly in academic processes rather than waiting for solutions from research.
- Discussions pointed out that high expectations for certain technologies (like LiDAR) might stem from a lack of understanding regarding their practical limitations, complexity, and cost. There is a continuous need to manage expectations regarding R&D funding and the scope of GFOI's mandate.
- The meeting confirmed that the Capacity Building and R&D components continue to provide value by focusing on the GFOI community, with the motivation of curating research to meet country implementation needs.