EO for Monitoring, Reporting, and Verification of Carbon Removals

Copenhagen, 8-11 October 2024

Second Forum on EO for Carbon Markets Breakout Groups Introduction

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Breakout groups 2nd floor

09:00-12:30

- **BOG1 - Enhancing Earth Observation Monitoring Capabilities**
- BOG2 – Monitoring Sustainability of CRCF

13:30-17:00

- BOG 3 - Data needs in Support of baseline definition
- BOG 4 – Addressing Uncertainties and Benchmarking in EO-based MRV for Carbon Removals
- BOG 5 – Blue Carbon

+ Demo and Meeting Area

Breakout Group 1 - Enhancing Earth Observation Monitoring Capabilities v

Chairs: Nathalie Morin (Geoville) and Michelle Hermes (EARSC)

This session will delve into advanced monitoring techniques and various data sources to track and verify carbon activities. We will explore different methodologies and tools that can contribute to enhanced accuracy and efficiency of monitoring. The session will include presentations and Q&A sessions with stakeholders, followed by an interactive discussion format to gather best practices and address remaining challenges from breakout group participants.

Questions to be addressed:

•How can EO-based data and methodologies can be leveraged to comply with the TACCC principles of Transparency, Accuracy, Completeness, Consistency and Comparability in support to monitoring and verification of carbon removals?

• What are the main challenges to address for the operationalization and standardization of an EO-based MRV system of carbon removals in Europe?

•How can we bridge the gap between the different stakeholders (policymakers, researchers, service providers, financial institutions, carbon rating agencies, farmers) across the entire carbon market value chain?

•Who will set the standards taken as a baseline for the subsidies of the new ETS based on LULUCF?

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Breakout Group 1 - Enhancing Earth Observation Monitoring Capabilities

Detailed Agenda

1. Introduction by Michelle Hermes, EARSC

~~2. New EU-ETS2 focusing on the requirements from policy side for emission monitoring by François Schmitt, DG CLIMA~~

3. Towards an Operational EO-integrated LULUCF and Carbon Removal MRV Service at Pan-European level by Nathalie Morin, GeoVille (Austria)

4. MARVIC project - MRV system for carbon removals in European agriculture by Eric Ceschia, Irstea (France)

5. ESA SCORE project - EO-based carbon rating system by Federica D'Acunto, Up to Earth (Germany)

6. EO for carbon rating by Johannes Hansen, Sylvera (UK)

Breakout Group 1 - Enhancing Earth Observation Monitoring Capabilities

Questions addressed:

1. How can EO-based data and methodologies can be leveraged to comply with the TACCC principles of Transparency, Accuracy, Completeness, Consistency and Comparability in support to monitoring and verification of carbon removals?

2. What are the main challenges to address for the operationalization and standardization of an EO-based MRV system of carbon removals in Europe?

3. What are the user requirements for an EO-based carbon removal MRV system?

4. How can we bridge the gap between the different stakeholders (policymakers, researchers, service providers, financial institutions, carbon rating agencies, farmers,…) across the entire carbon market value chain?

~~***5. Who will set the standards taken as a baseline for the subsidies of the new ETS based on LULUCF ?***~~

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Breakout Group 1 - Enhancing Earth Observation Monitoring Capabilities

1. ***How can EO-based data and methodologies can be leveraged to comply with the TACCC principles of Transparency, Accuracy, Completeness, Consistency and Comparability in support to monitoring and verification of carbon removals?***

- Focus of discussion more on **TRANSPARENCY** and **ACCURACY** of EO data and derived information products
- **Lack of transparency of AI Deep Learning methods** compared to Machine Learning which enables more control over model parameters or other traditional statistical approaches
- **Good input expert data** is required for training of the models => *"rubbish in is rubbish out"*
- Key message of the **lack of in-situ national forest inventory (NFI) data** made publicly accessible in most EU Member States guarant of scientific robustness of the Above-Ground-Biomass (AGB) models and carbon removal estimates
- Need for more information on the **accuracy of both mapping products and training data** to avoid cumulative bias
- What is the **cost effectiveness** of remote sensing AI algorithms, computing time?
- Use of multiple scale data: satellite, airborne, terrestrial laser scanning, field sample plots for different purposes.
- Best practice examples of EO-Enhanced NFI combining the different data sources.

Breakout Group 1 - Enhancing Earth Observation Monitoring Capabilities

2. What are the main challenges to address for the operationalization and standardization of an EO-based MRV system of carbon removals in Europe?

- **Lack of in-situ NFI data**
- Need for **Activity Data at a local scale** (farm or plot level) for carbon farming
- **What needs to be standardized?**
- Need for more **accuracy** and **uncertainty** assessment, **validation**
- **Different scales and aims of the compliance market (national inventory compilers) and voluntary private carbon market**
- Need to harmonize the MRV approach and decision-tree in answer to the end users
  => hence the **importance of user engagement**
- **Who are actually the end-users** of an EO-based carbon removal MRV system??
  - **EC DG CLIMA, etc.**: independent proxy tool for verification of MS GHG LULUCF NIR at pan-European level
  - **Countries**: EO-enhancement of the inventory method at national scale by integrating geospatially explicit data and Copernicus data products in compliance with the new revision of the LULUCF regulation (2023)
  - **Farmers, carbon certification agencies** for carbon rating at local scale?
- Can the **methodological approaches** be **shared for the compliance and voluntary carbon markets**?
- How to deal with constant change in technologies and ecosystems by setting some standards

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Breakout Group 1 - Enhancing Earth Observation Monitoring Capabilities

3. 5. What are the user requirements for an EO-based carbon removal MRV system?

- Before setting-up an MRV framework, we need to define:
  - **Who is the user ?**
  - **What is required?**
- Highlight which of these technical specifications are according the **requirements from the Carbon Removal Certification Framework (CRCF)**
- The EO community tends to focus on **Monitoring**
- Introduce the **Verification** component in our pipeline in compliance with the CRCF FWC
- Idea of **a country workshop to gather the user requirements and technical specifications** for an EO-based carbon removal MRV system at pan-European level
  - Define a **list of variables** needed by the user and the ones which the EO community can fulfill and identify the gaps
  - Table of parameters: data, spatial and temporal resolution, consistency, quality, KPIs,…
- Key measurements of AGB & SOC stock changes
- **Need for a better overview of the current state-of-the-art on the use of EO in countries** (e.g. CLC, CLCplus, other Copernicus products, satellite data processing, etc.)

Breakout Group 1 - Enhancing Earth Observation Monitoring Capabilities

4. How can we bridge the gap between the different stakeholders (policymakers, researchers, service providers, financial institutions, carbon rating agencies, farmers,…) across the entire carbon market value chain?

- **Chaotic** situation
- **Fast-growing** blooming field of **carbon market => many remaining open questions…!**
- Challenge of gathering 3 different communities in a single event: national inventory compilers, remote sensing community and stakeholders from the private carbon market

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Breakout Group 2 - Monitoring sustainability of CRCF

Chairs: Frank Martin Seifert (ESA) and Basanta Gautam (South Pole)

Carbon removals will play a growing role and become the focus of action after climate neutrality is achieved. Solutions from resilient natural ecosystems and industrial carbon capture and storage (CCS) need to be both efficient and sustainable. This session will focus on how EO can support monitoring to ensure high-quality carbon removals from ecosystems and technological solutions, as well as the sustainability and permanence of the sequestered carbon.

Questions to be addressed:

- How can we believe the NbS projects will last long (over 100 years)?
- What should the project lifetime/commitment period threshold be?
- What are the risk drivers (e.g., natural hazards, anthropogenic factors, perverse incentives)?
- How much is obligatory and how should it be related to the risks assessed (variability across registries)?
- Will we have sufficient technology, EO data, and tools to adequately determine permanence (e.g., non-permanence hot spots analysis)?

Breakout Group 2 - Monitoring sustainability of CRCF

Conclusions and recommendations to be included

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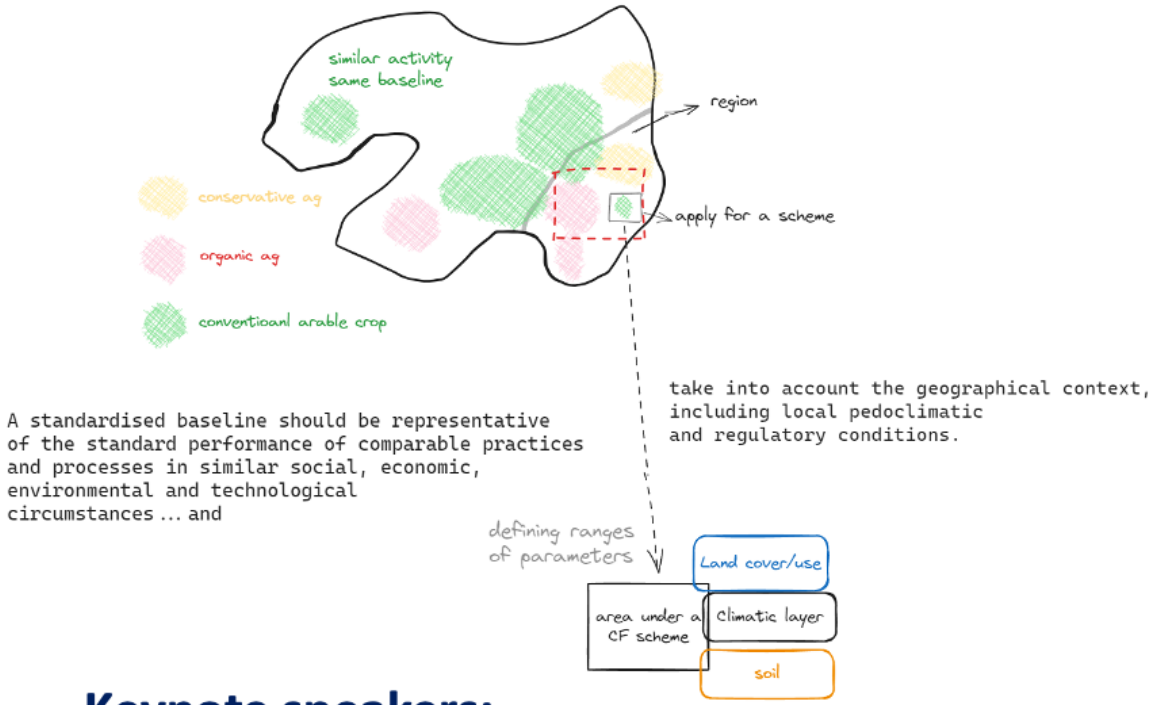
Breakout Group 3 - Data needs in support of baseline definition

Chairs: Mirco Migliavacca (JRC) and Lucia Perugini (EEA)

*The CRCF regulation foreseen the use of **baselines** (standardized or project-specific);*
*The CRCF envisages a **strong use of remote sensing technologies** in this process;*
*Breakout session on **data needed** to establish baselines for carbon farming.*

Permanent net carbon removal benefit = $CR_{baseline} - CR_{total} - GHG_{associated} > 0$



Questions to be addressed:

- What are the EO data available for baseline calculation and main limitations?
- What are data gaps and what to prioritise to reduce uncertainties?
- How measurement networks (NFI, ICOS, ICP Forest, LUCAS) can improve satellite monitoring of carbon fluxes?

Keynote speakers:

Eric Ceschia,
Marta Gómez Giménez


Agroforestry

Jukka Miettinen
Ruben Valbuena

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Breakout Group 3 - Data needs in support of baseline definition

Conclusions and recommendations to be included

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Breakout Group 4 - Addressing Uncertainties and Benchmarking in EO-based MRV for Carbon Removals

Chairs: Antonella Succurro (CinSOIL) and Michelle Hermes (EARSC)

This breakout session will explore the critical role of benchmarking and uncertainty assessment in Earth Observation-based Monitoring, Reporting, and Verification (MRV) for carbon removals. Through presentations and interactive "speed-dating" brainstorming sessions, participants will discuss key challenges and solutions, with the aim of defining critical requirements for a potential data challenge framework for EO MRV services in Carbon Farming and Carbon Removals. A multi-actor and multi-disciplinary approach will be encouraged.

Questions to be addressed:

- Why should we care about uncertainties and benchmarking?
- What are the main challenges to achieve reliable MRV systems?
- Which groups of stakeholders must come together to address specific obstacles?

Format of the session:

- Intro + 4 experts' short presentations, with examples from different LU cases.
- "Speed-dating" brainstorming session – discuss with the speakers in small groups.
- Wrap-up of ideas and plan for the Carbon Farming Summit 2025.

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Breakout Group 4 - Addressing Uncertainties and Benchmarking in EO-based MRV for Carbon Removals

Conclusions and recommendations to be included

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BG5 – High-Quality Blue Carbon Credits at the EU Level - Dream or potential reality?

Chairs: Marie-Aude Sévin (BlueSeeds) and Antony Delavois (ESA)

For Blue Carbon ecosystems (coastal wetlands, including tidal marshes , mangroves, seagrasses…) the pace of progress on carbon accounting and removal has been slow. Despite their small surface area, BC ecosystems have the potential to sequester a large amount of carbon. Yet, **these ecosystems are critical to achieving carbon removal goals**

Role of BC ecosystems in the evolving landscape of **carbon markets**

- Potential of coastal and marine ecosystems in **carbon sequestration and storage**
- **Methodologies** for quantifying and monitoring these carbon sinks, and **role of EO**
- Challenges and opportunities in integrating Blue Carbon projects into existing **carbon market frameworks and policy developments** such as within CRCF

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BG5 – High-Quality Blue Carbon Credits at the EU Level - Dream or potential reality?

Conclusions and recommendations to be included

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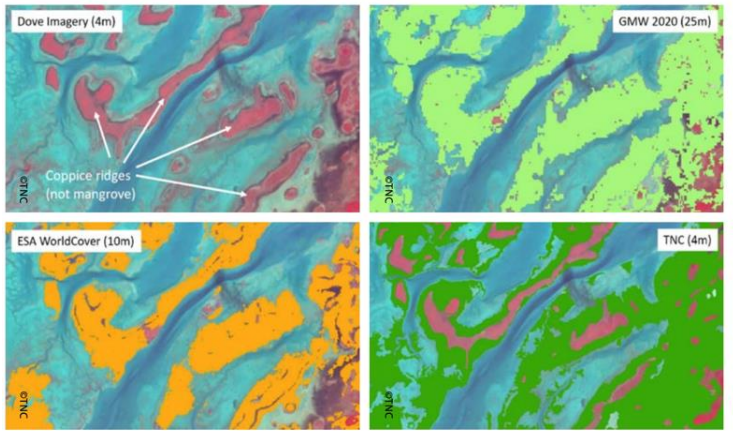
BG5 – High-Quality Blue Carbon Credits at the EU Level - Dream or potential reality?

State of the Art - 1st baseline of blue carbon stock

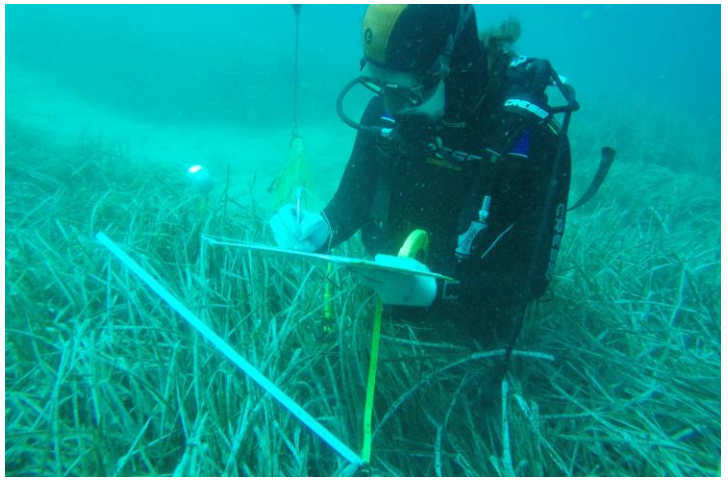
Key challenges : difficulty of **mapping submerged ecosystems** like seagrasses and the limitations in **assessing soil carbon pools**.



Schill et al.

Moving Forward: Action Now Is Better Than Perfection!

Focus here is on understanding the urgency: **what should be protected**, in what priority order, and within what timeframe to prevent carbon loss and ecosystem degradation? **Make BC ecosystem accountable for EU and national climate plan**



Investment needs for scaling Blue Carbon projects

Investment is needed in advanced EO tools to **track both above and below-ground** carbon stocks and detect early signs of ecosystem degradation.

Investments should also focus on **ground calibration sites and training to ensure the accuracy of EO data**

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