EO for Monitoring, Reporting, and Verification of Carbon Removals

Copenhagen, 8-11 October 2024

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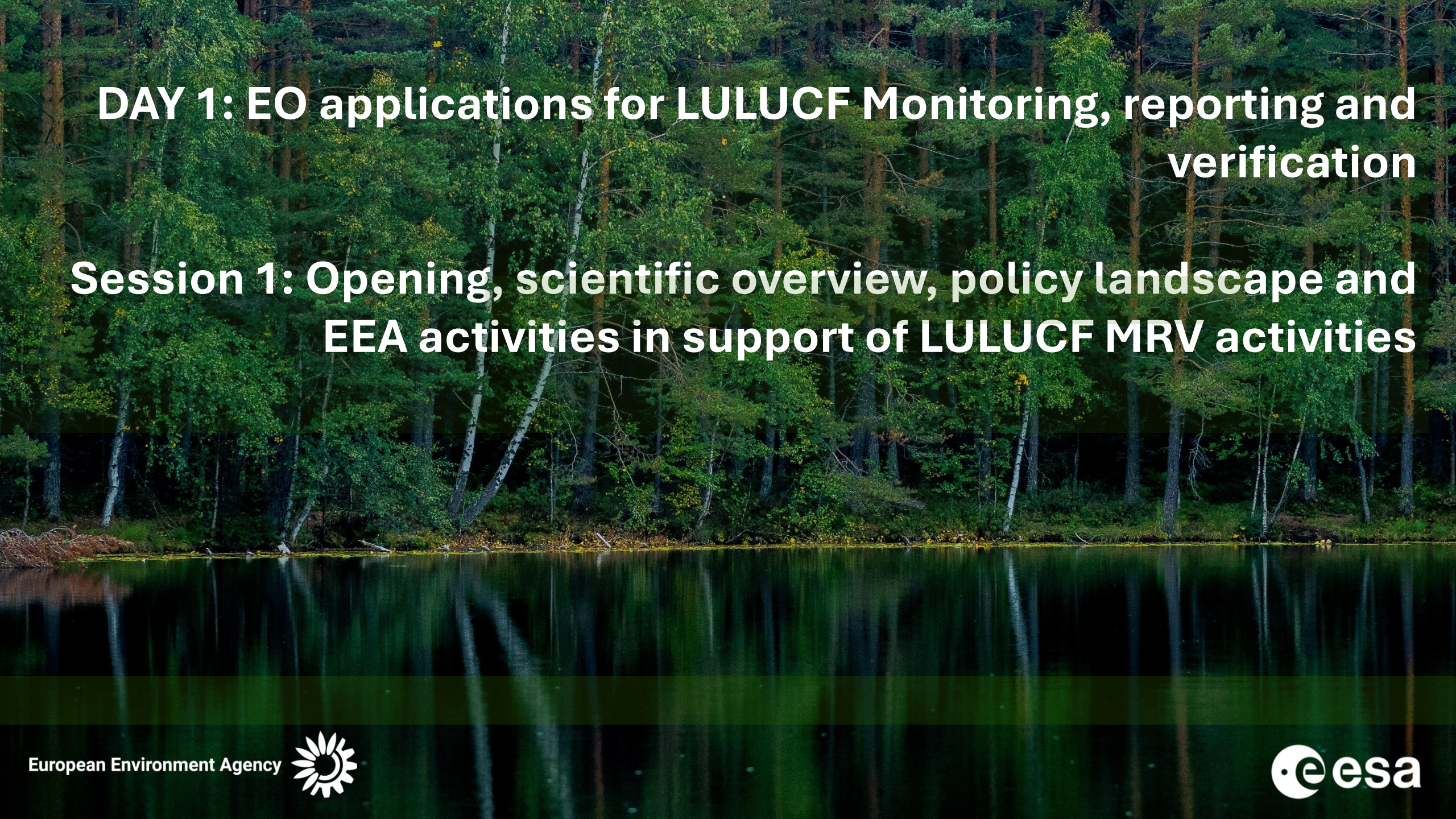

DAY 1: EO applications for LULUCF Monitoring, reporting and verification

Session 1: Opening, scientific overview, policy landscape and EEA activities in support of LULUCF MRV activities

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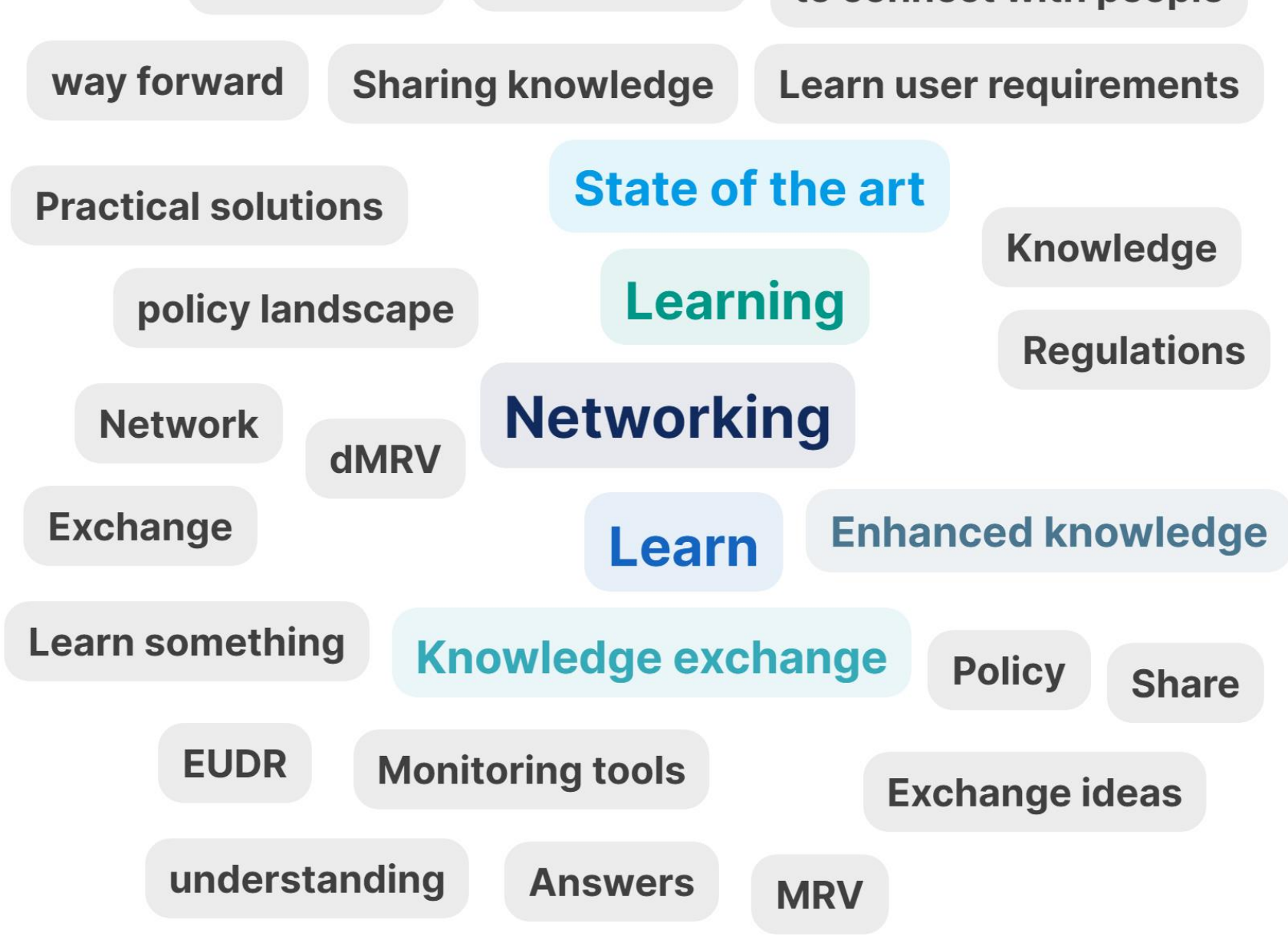
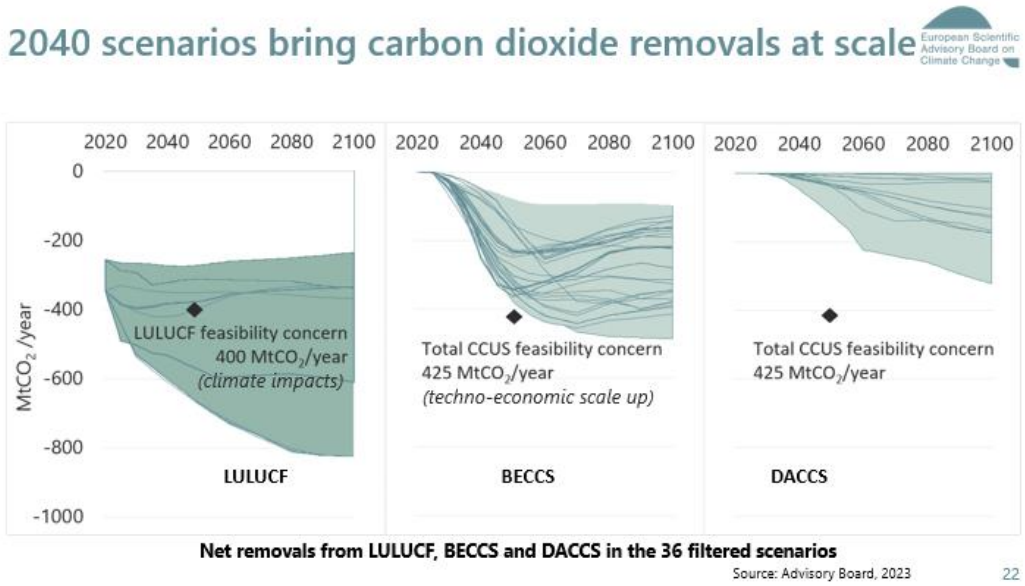
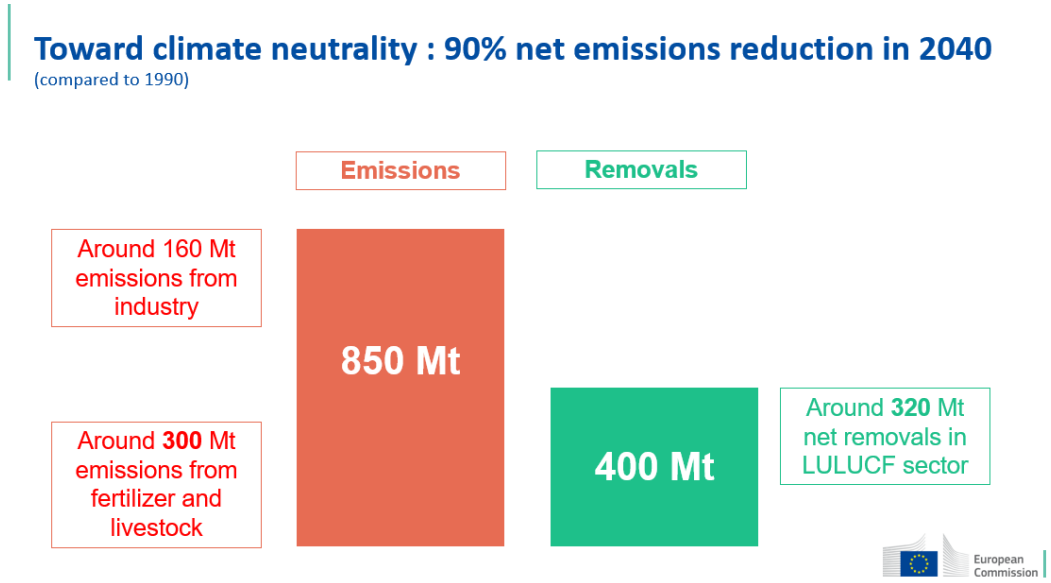

way forward
Sharing knowledge
Learn user requirements
Practical solutions
State of the art
Knowledge
policy landscape
Learning
Regulations
Network
dMRV
Networking
Exchange
Learn
Enhanced knowledge
Learn something
Knowledge exchange
Policy
Share
EUDR
Monitoring tools
Exchange ideas
understanding
Answers
MRV

CONTEXT

- The EU is committed to reach emission neutrality by 2050
- There are different pathways to reach to this target and should be done in a fair way and combining all measures available





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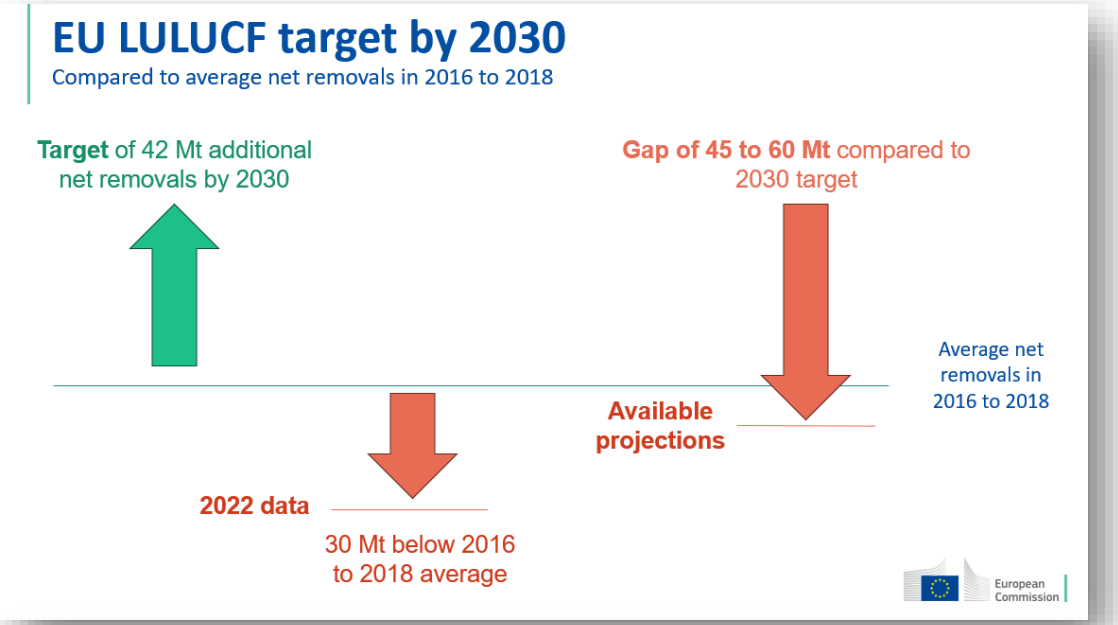
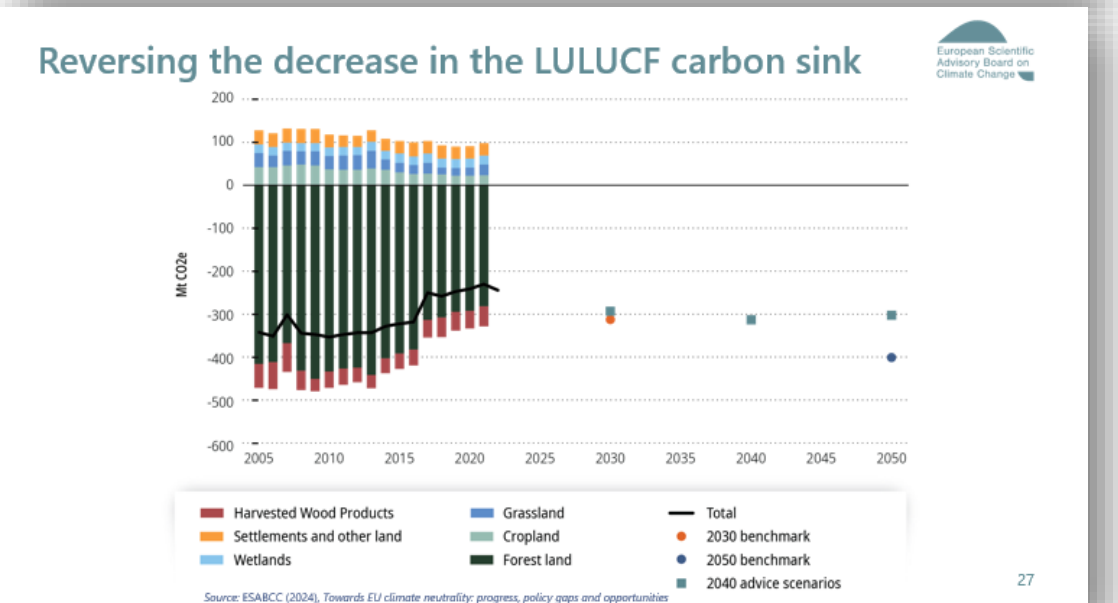
Are we there yet?



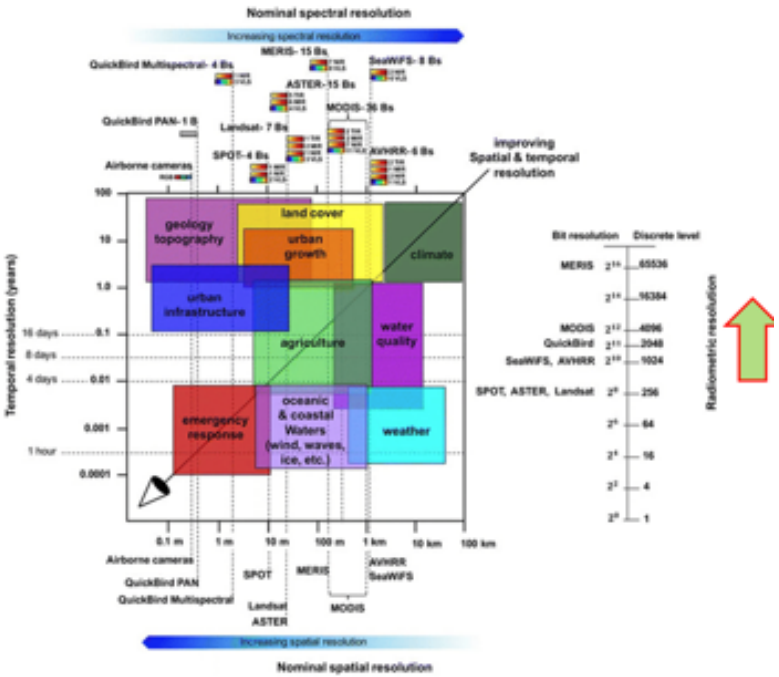


- We are not there (yet)
- What are the policy and measures to be implemented and how to track them?
- During this process, inventories are the nuts and the bolts to reach the target and will play a crucial role. Ensuring the quality of inventories is on the benefit of all.

Different communities – different language – let's find common ground

- *Transparency →* Clear description of dataset
- *Completeness →* Temporal scale: annual
Spatial scale: country
- *Consistency →* Repeated consistent product across time
- *Comparability →* EO based GHG inventory can increase comparability
- *Accuracy →* Uncertainties level of data should be provided

GHGI community EO community



What about us?
(farmers, foresters, policy makers)

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DAY 1: EO applications for LULUCF Monitoring, reporting and verification

Session 2 - EO and LULUCF MRV: spatially explicit monitoring

Chairs: Lucia Perugini (EEA) + Bradley Matthews (UBA AT)

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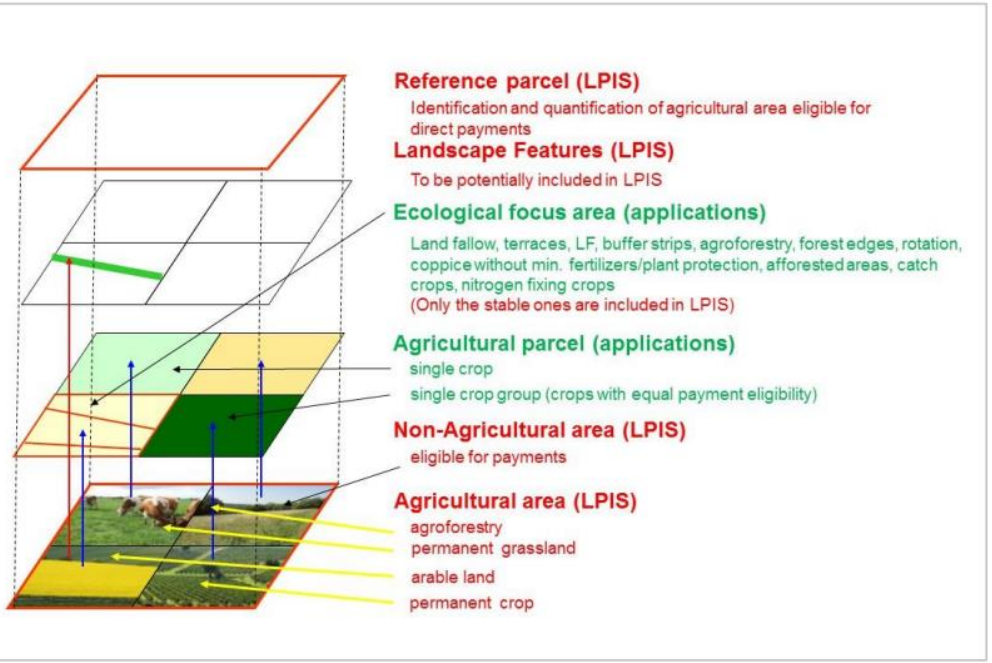
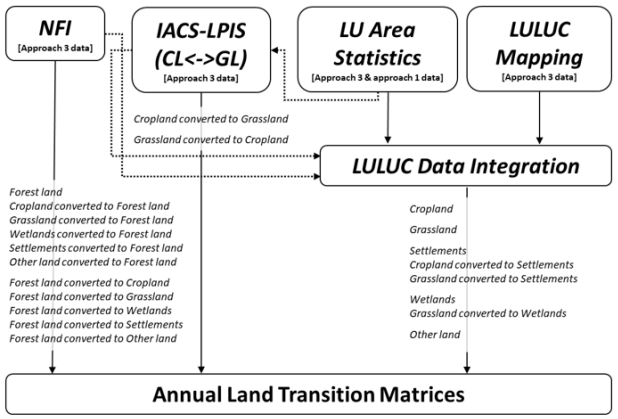


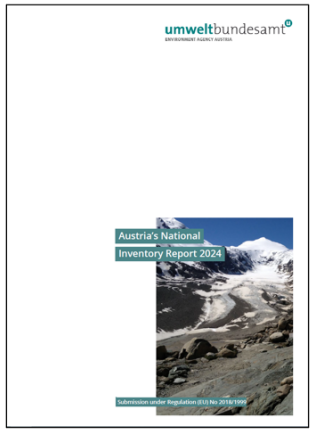
Note: Elements of the LPIS datasets are sown in red, while that of GSA in green.

- **IACS data provide** validated information about agricultural sector.
- **For LULUCF→there is still work to be done** (spatial data harmonisation, semantics and interoperability)

Country's examples

Austrian System for Land Representation

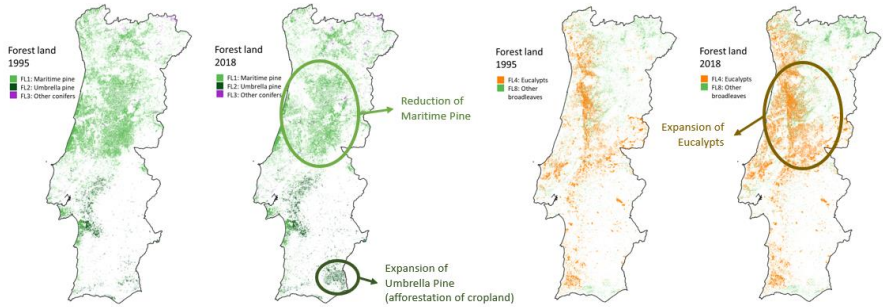




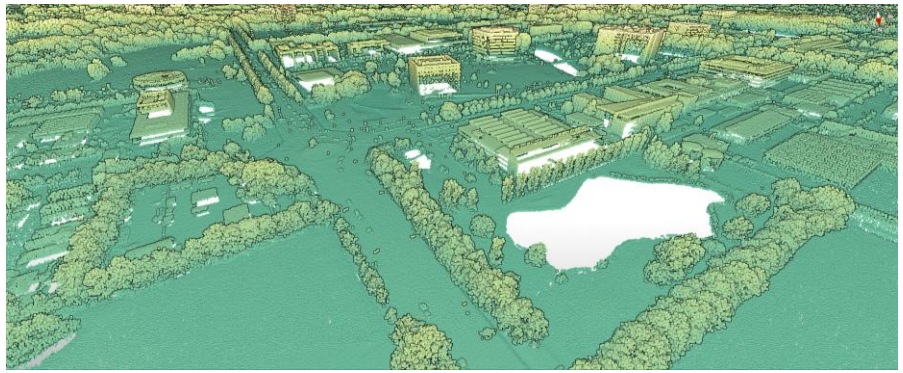
(c) Umweltbundesamt

- **Combination of different datasets** for gap filling
- **Data harmonization** with statistical information (back to 1990)

Country's examples



Challenges in defining the right number of classes
Consistency across time series
Not easy to detect **<u>and report changes over time</u>** in very detailed categories
6 classes = 36 transitions; 60 = 3600 transitions



Not only question of earth observation
Need new model to process this
    Grid based?
Lots of pre-processing to make maps ready
Other stocks/fluxes than biomass?
Back to 1990?

EXAMPLE 1 – ORGANIC SOILS KOLINDSUND, JUTLAND

New data and updated methodology

One important new parameter:
EO with soil color

Use of EO may increase the accuracy but may also do the opposite

(OBS: Many of the new pixels OC level are just above 6 % OC)

2010 mapping

2022 mapping

We do not have the C stock data for the detailed resolution
Forest: Area with organic soils and emission factors from these
Wetlands: Ground water table and emission factors
Sentinel data may create noise

Key messages

- **LPIS/IACS as a rich source of frequently updated and reliable information** on the agricultural part of LULUCF. Encouragement and support for increasing use of these data as part of the national move to geospatial explicit improvement of the LULUCF monitoring and reporting
- **Very different solutions on country level possible**, but some bottlenecks and open issues preventing use of EO data are still apparent
- **Some interest and significant potential in use of LIDAR** data (e.g. on trees outside the forest or in urban context), but both Sentinel and CLMS data are also directly used.
- **Confirms the need to synergistically combine NFI and EO derived** (plus modelling) data sources to make progress
- Strong focus in country presentations **on improvements in in situ reference data and on necessary improvements in emission factors**. Suggestion to create a European level emission factor database

Letter to Santa Claus

What is the present from the EO community that you wish for?

Not only activity data (areas) but also emission factors associated to the land uses and their changes

Reliable product repeated consistently across time (no perfect one off maps)

CLMS+: repeated throughout time

Run all surface in a pixel level in 2032 (EF for organic soils and Wetland)

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Day 2 – EO applications for LULUCF Monitoring, reporting and verification

Session 3 - EO derived products in support of MRV activities, with current and potential application in the inventory

Chairs: Frank Martin Seifert (ESA) + Tobias Langanke (EEA)

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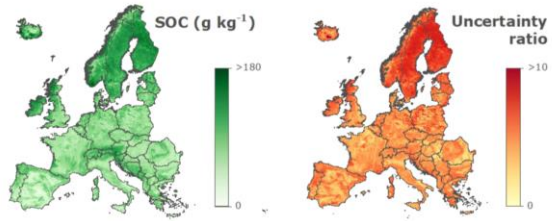
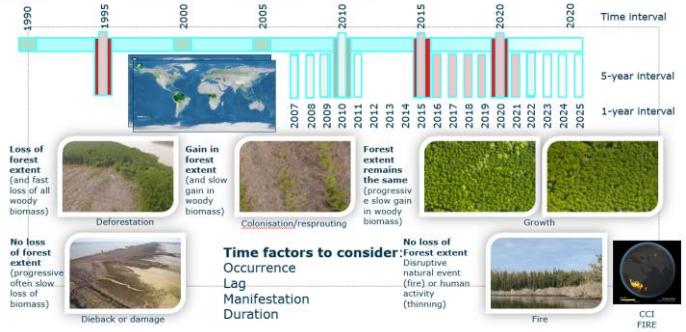
Phase 3 – OUTCOMES & VALIADTION

European Topsoil SOC

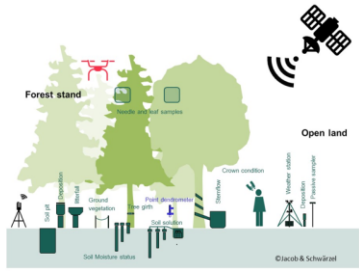


ESA-EEA Conference "EO for Monitoring, Reporting, and Verification of Carbon Removals", 8-11 October 2024, Copenhagen

The Importance of Time



Link with in-situ monitoring and near-sensing



- Integrated on-the ground and remote sensing
- Expanding upon the ICP forest networks
- Linking disturbances with changes on the ground and related impacts and processes
- Developing complementary data streams

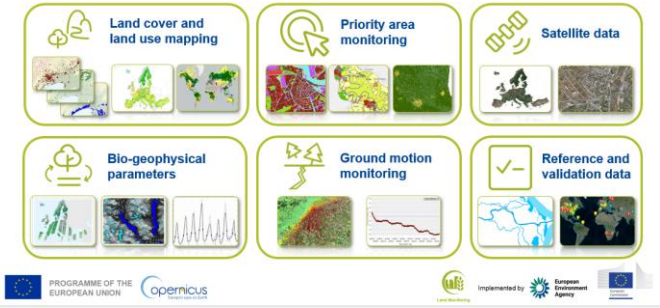
Credit: EC FORWARDS project super site concept

HELMHOLTZ

What could be the role of EO to support peatlands MRV?

Assimila

CLMS portfolio: Categories of products

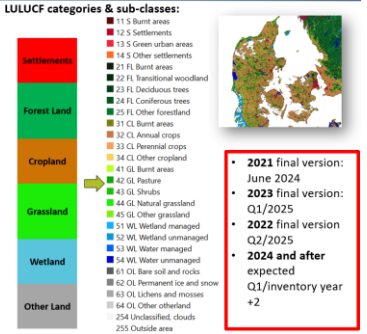


LULUCF instance example 2021

Input datasets for LULUCF 2021:

Product Category	Product Name	Reference year	Data format
CLMS HRL-VLCC			
Forest	Tree Cover Density	2021	Raster
Forest	Dominant Leaf Type	2021	Raster
Cropland	Crop Type	2021	Raster
Grassland	Grassland	2021	Raster
Herbaceous	Herbaceous	2021	Raster
Water and Wetness	Water and Wetness	2018	Raster
CLMS HRL-NVLCC			
Imperviousness	Degree of Imperviousness	2021	Raster
CLMS CLC / CLC+ Backbone			
CLC+ Backbone	CLC+ Backbone	2021	Raster
CLC	Corine Land Cover	2018	Raster/Vector
CLMS Local Components			
Urban Atlas	Urban Atlas LC/LU	2018	Vector
Riparian Zones	Riparian Zones LC/LU	2018	Vector
Natura 2000	Natura 2000 LC/LU	2018	Vector
Coastal Zones	Coastal Zones LC/LU	2018	Vector
Other products			
Burned Areas	EFFIS	2021	Raster

LULUCF categories & sub-classes:



- **2021** final version: June 2024
- **2023** final version: Q1/2025
- **2022** final version Q2/2025
- **2024 and after** expected Q1/inventory year +2

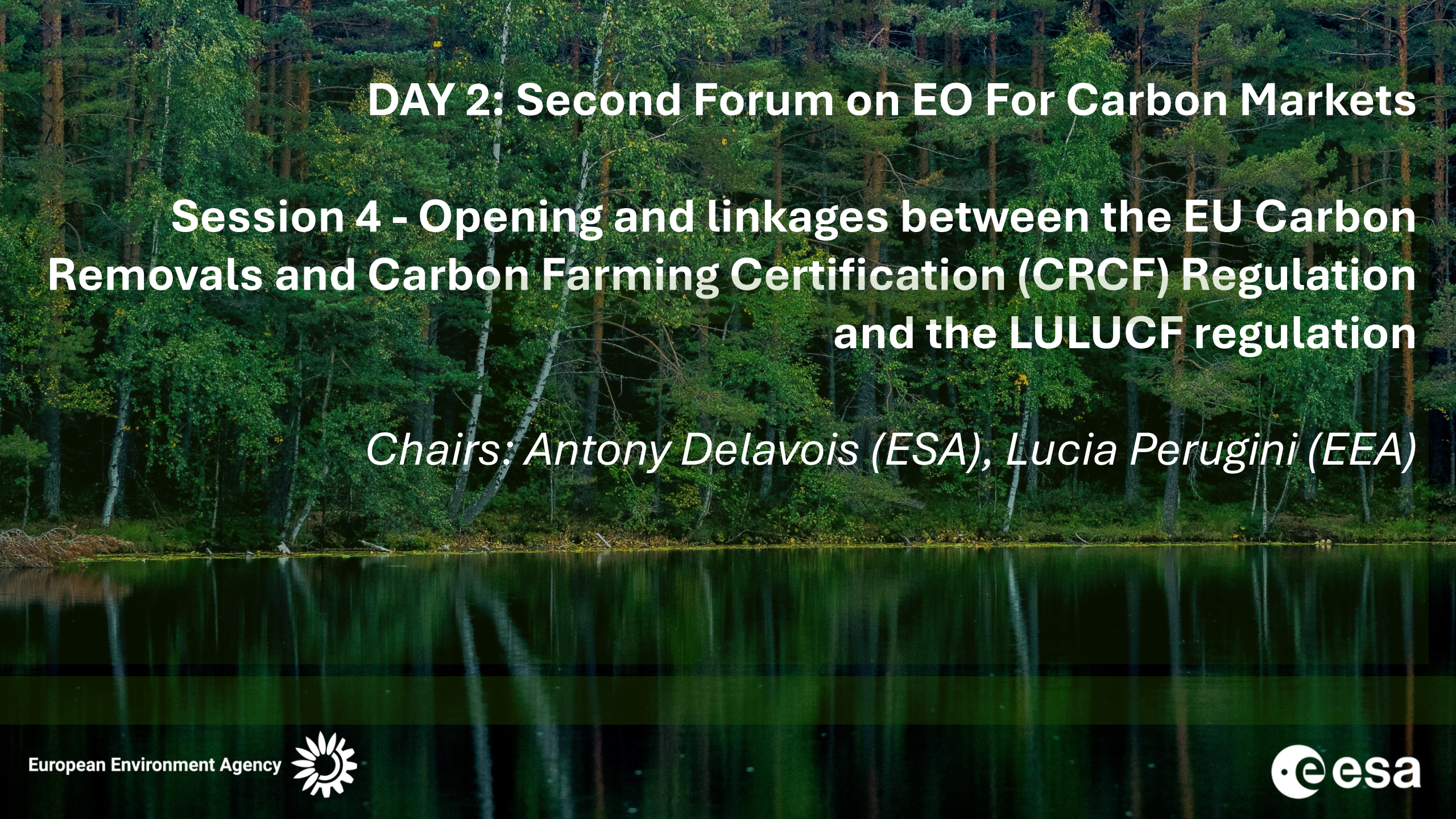
Key messages

The EO is **needed for policy implementation**, but requires:

- **tailored solutions**, is time critical delivery,
- **different policies require specific approaches** (LULUCF vs CRCF)
- solutions that are spatially adequate, accurate with transparent and repeatable methodology
- The **development of EO products is moving fast forward and there are opportunities for better use of these products for GHG inventories**, but it requires that the different communities improve communication and understanding of the needs and opportunities.

Key messages

- **Continuity, comparability and operability of Copernicus products** has been highlighted. Claims for new operational products by the audience were also proposed i.e. Biomass, wetland
- **The need of stablishing pipelines to share data**, access to reference datasets was mentioned in different presentations. The role of Copernicus In situ component could perhaps help to bridge this gap.
- Regarding ESA products, a lot is going on and good progress shows a bright future, however, we are not there yet when it comes to **pixel accuracy what has to be taken carefully for MRV activities**.
- The implementation of **research products into operational datasets/tools** should be improved



DAY 2: Second Forum on EO For Carbon Markets

Session 4 - Opening and linkages between the EU Carbon Removals and Carbon Farming Certification (CRCF) Regulation and the LULUCF regulation

Chairs: Antony Delavois (ESA), Lucia Perugini (EEA)

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Session 4 - Opening and linkages between CRCF and LULUCF

Principles in the framework

QU.A.L.ITY criteria

- **QU**antification
- **A**dditionality
- **L**iability
- Sustainabil**-ITY**

Credible certification

- **Third-party** verification
- **Reliable** certification schemes
- **EU Registry**

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Session 4 - Opening and linkages between CRCF and LULUCF

- **Existing and upcoming missions from ESA**, in addition to other international initiatives, focus and will continue delivering data and information about land dynamics, including land use and change, carbon stock (biomass) and fluxes (photosynthesis).

- **Moving from data and measurements to information and operational use for policy implementation** (under LULUCF or carbon markets) is also relevant and deserve attention.

- At EU level, **LULUCF and CRCF have similar objectives of monitoring and increasing CO2** removals in the land sector. Clear **differences exist for the scale and precision requirements** but also in the conceptual development of MRV systems. MRV systems should account for actual emissions or removals under LULUCF and additionality under CRCF.

- **Synergies exist, and opportunities to reuse data and knowledge** developed under both initiatives in terms of emission coefficients, activity data, etc.

- **EO data will play a relevant role in monitoring carbon removals**, but the operational applications will require the combination of ground data, modelling and information from the land manager.

Organizing committee

Antony Delavois
European Space Agency – ESA

Basanta Gautam
South Pole

Bradley Matthews
Environment Agency Austria –UBA

Christian Retscher
ESA / Seconded Expert to DG CLIMA

Frank Martin Seifert
European Space Agency – ESA

Ivan Martinez
DG CLIMA C.3 - European Commission

John Van Aardenne
European Environment Agency - EEA

Lucia Perugini
European Environment Agency – EEA

Michelle Hermes
European Association of Remote Sensing Companies - EARSC

Mila Luleva
Rabobank ACORN

Mirco Migliavacca
Joint Research Centre - European Commission

Paulo Canaveira
APA - Portuguese Environment Agency

Richard Hall
Equinor

Valeria Forlin
DG CLIMA C.3 - European Commission

THANK YOU!

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