

Geospatial and EO data usage for LULUCF monitoring and ongoing developments covering EU27

Update based on the 2025 NID submissions



Second conference on Earth Observation for Monitoring, Reporting and Verification of Carbon Removals

Tobias Langanke

European Environment Agency



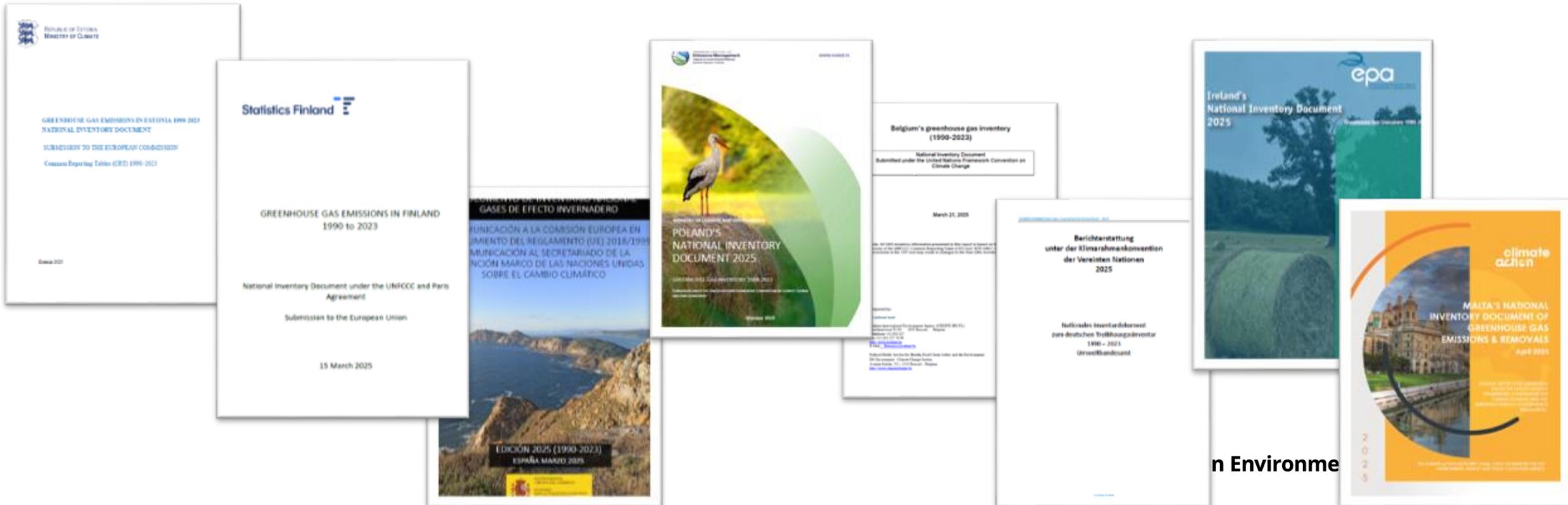
Context for focus on geospatial and EO data in LULUCF monitoring

“Member States shall use geographically-explicit land-use conversion data in accordance with the 2006 IPCC Guidelines” (Annex V to Regulation 2018/1999, part 3)

- Why increasing geospatial data use?
 - **Help identify priority areas** that have the potential to contribute to climate action
 - Improved monitoring of **natural disturbances**
 - **Increase timeliness** in the annual inventories
 - ensures local carbon sinks and removals are monitored as precisely as possible, **ensures that policies can be targeted**

Status and update – Land representation EU27 in NID 2025 submission

- **Update based on National Inventory Documents (NID)** as submitted in January **2025** by EU27
- **Chapter 6** on the LULUCF sector usually contains description of method/approach and data used for each country
- Despite shared template for structure, NID's differ significantly in terms of level of detail and accessibility of the information (room for improvement)



Status and update: 2025 methods for AD compilation EU27

For the monitoring of land use and land-use change, (..), each country should therefore select the most suitable dataset or apply a multi-source approach to use several datasets. **The requirement to use geographically-explicit land use datasets does not impose a specific data format**, (..). What is intended is that such data remains interoperable with other datasets to facilitate carbon calculations at high spatial resolution. (LULUCF handbook v2 p.72)

Type of method

- **Sample based methods:**

from ground surveys (such as a national forest inventory or national land survey) or remote sensing. (provides accurate statistical representation of LUC, not tracking of specific areas)

- **wall-to-wall maps**

LU/LC maps that, when combined with other data, can be used to generate land-use and land-use change information (full tracking of LUC areas)

- **Statistical survey methods**

Info on land use and **management practices**; this data is often used in combination with other data to develop a complete land use estimate

Implementation in MS

Hybrid approaches

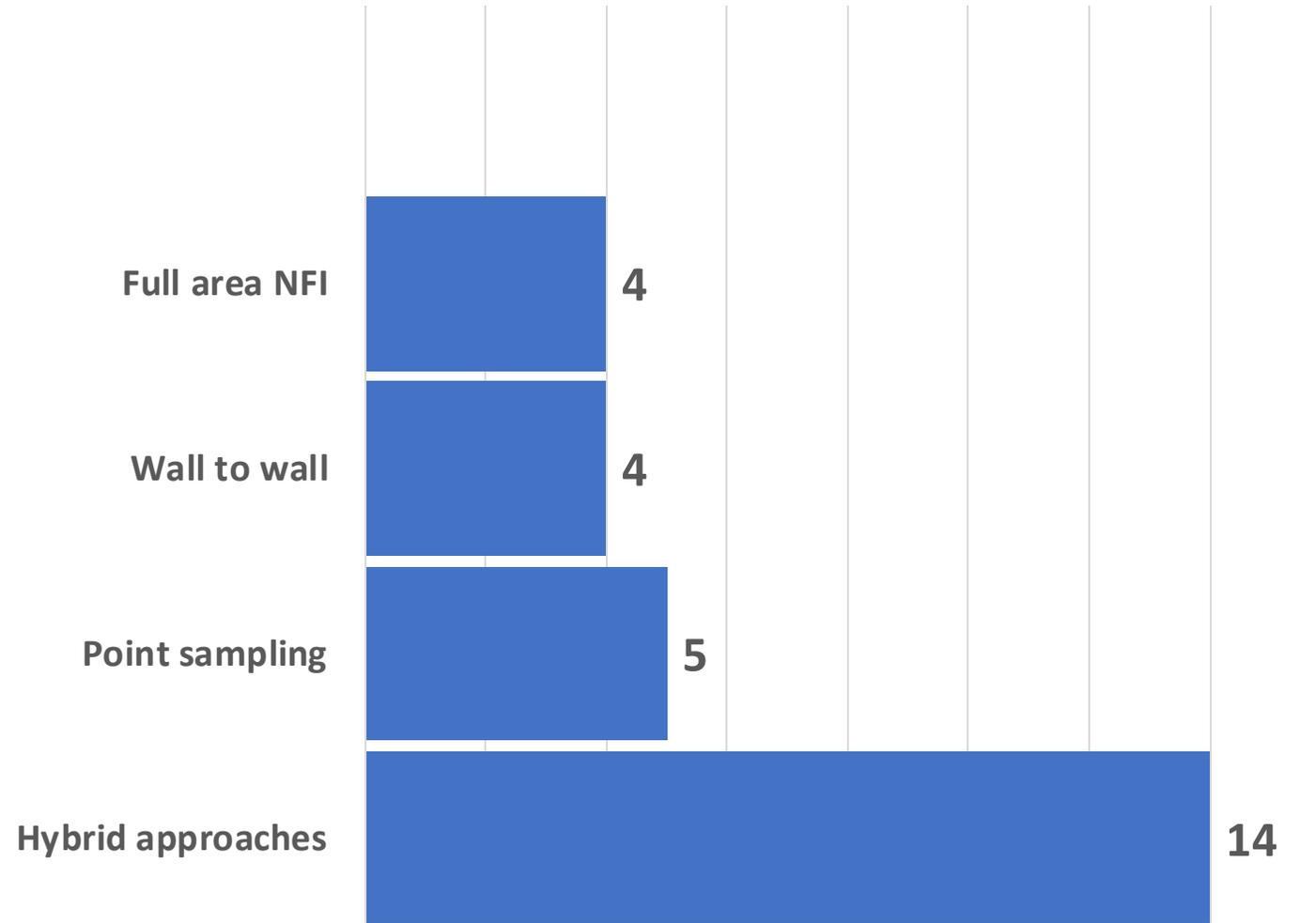
Regular point sampling schemes

Exclusive use of full area NFI data

Wall to wall geospatial time series



Status and update: 2025 methods for AD compilation EU27



- **Exclusive use of full area NFI data**, geospatially explicit but no wall-to-wall mapping
- **Wall to wall geospatial time series**. Can be based on dedicated LU mapping or existing geospatial products
- **Regular point sampling schemes (non NFI)**, often attributed with existing geospatial data (often vector data) and/or using RS
- **Hybrid approaches** combining various **national geospatial with statistical and other** relevant data

Status and update: land monitoring **datasets** used

- **Most of the countries** use a **combination of datasets**
- **NFI's (National Forest Inventories)** are often used for land monitoring of the forest area (and sometimes for other categories)
- Only **few countries** can track land use changes with **wall-to-wall** maps

National Land Cover and Land Use datasets

Corine Land Cover (CLC) and other European datasets

National IACS/LPIS data

National cadaster data

Point sampling data

National statistics

National Forest Inventory (NFI)

Remote Sensing (RS) data like aerial photographs or Lidar data

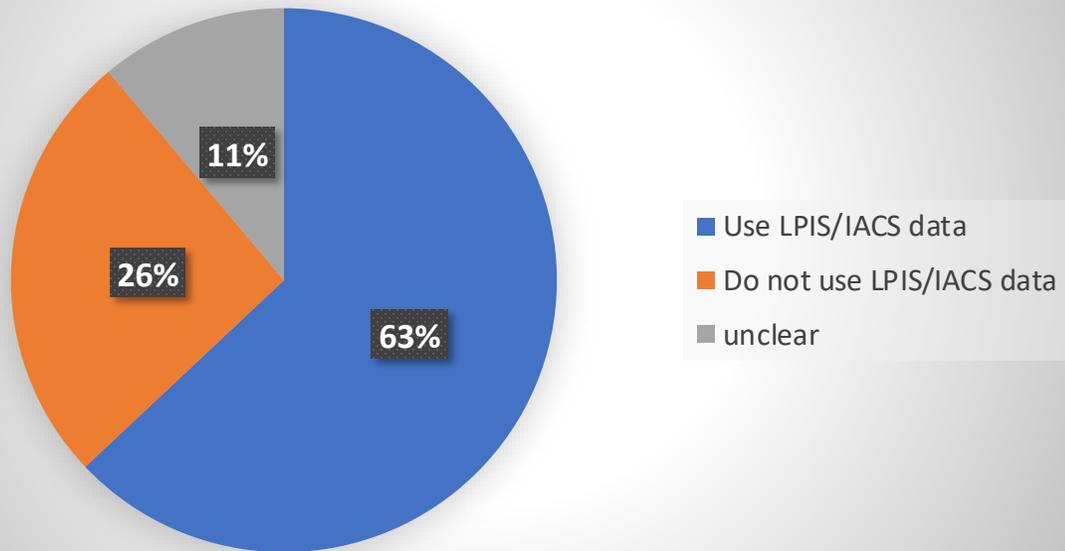


Status and update: land monitoring datasets: CLMS and LPIS/IACS

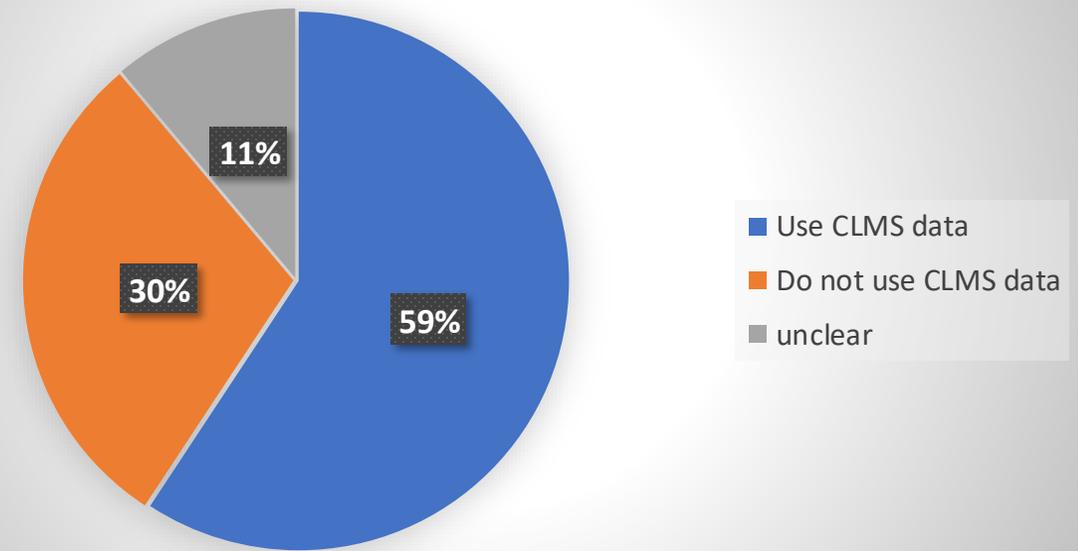
Increasing use of CLMS data (usually CLC), and LPIS/IACS data

- 16 countries use CLMS data
- 17 countries use LPIS/IACS data

LPIS/IACS data use



CLMS data use



Status and update 2025 on methods for AD compilation for EU27

- **5 countries with some level of changes in methods** for land representation since we did a study based on 2022 submission
- **But: Good news: 14 countries are planning further improvements**, such as:
 - **Increased spatial resolution** of input data
 - **Combination/supplementing of NFI data with other datasets**
 - **Geospatial capture of trees outside forest & hedgerows**
 - **Improved geospatial data for roads and settlements**
 - **Moving to full geospatial wall-to-wall system**
 - **Adding geospatial datasets** to existing hybrid approach
 - **Including/improving use of LPIS/IACS data**
 - **Adding European geospatial datasets** to hybrid approach

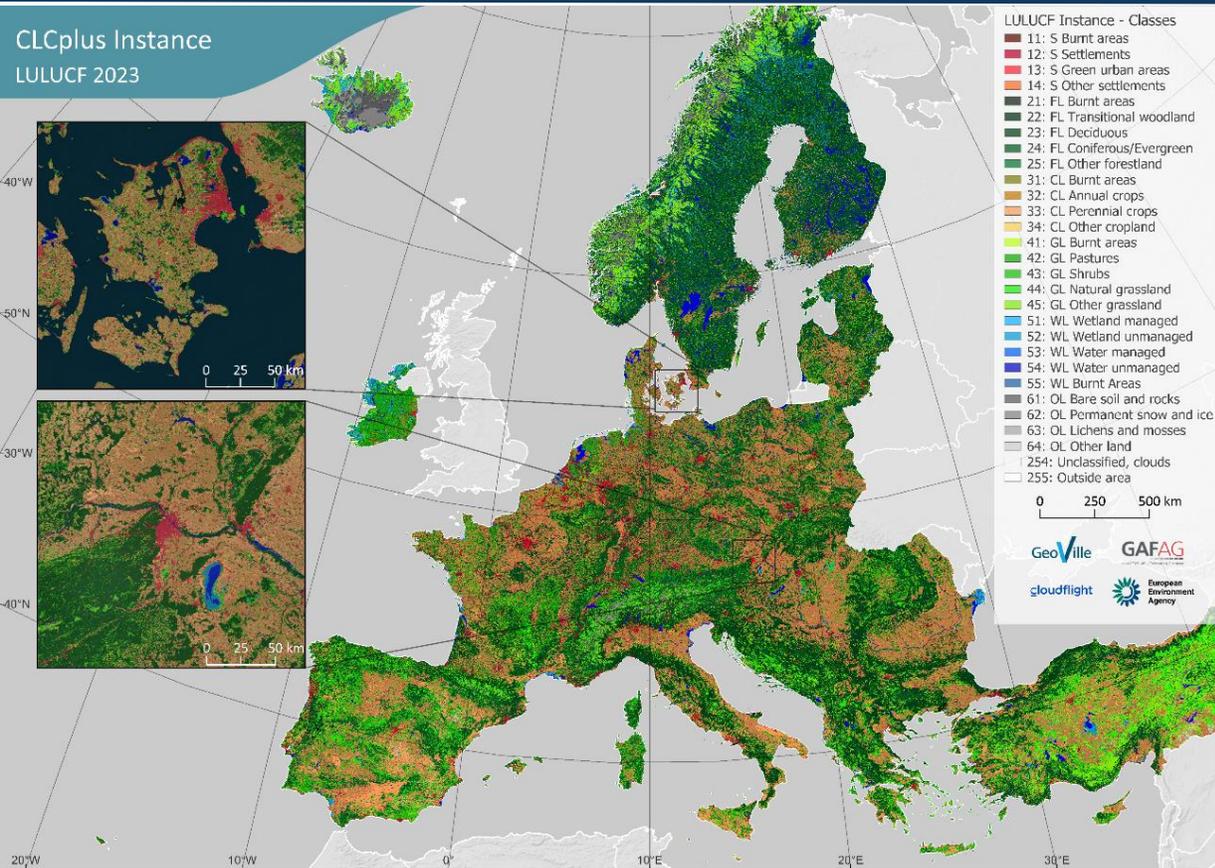
See later presentations for examples! Estonia, Sweden, Poland, Flanders, Italy, Romania, France and others

What challenges do countries face when considering improvements?

- **Challenges around annualization** of reported data, the input data for which is often not annually updated
- **Need for long consistent time series** provides challenges for any changes in methodology.
- **Methodological challenges** in combining existing elements with spatially explicit datasets
- Move to wall-to-wall method requires **operational updating strategy** in place and maintained
- **Differences in definitions for LULUCF categories** mean approaches developed elsewhere or on European datasets need national adaptation



Update European geospatial dataset “LULUCF instance”



What is the LULUCF instance?

- Yearly updated, 100m grid, European EO data based proxy for the LULUCF Categories
- Not one dedicated mapping, but combination of ca. 15 existing European EO based datasets (largely from CLMS)

Production and availability

- 2018 & 2021 experimental prototype(s)
- 2022 & 2023 first operational version(s) – available on request now. Publication on CLMS portal before end 2025.
- User-friendly documentation (Product User Manual), expert metadata & LOG file tracking ruleset change

Possible use

- **EEA MRV use:** Support EEA LULUCF MRV with additional component (in testing)
- **MS direct data use:** MS can consider the data as gap-filler, context information or inspiration when developing/improving their land representation for LULUCF monitoring and reporting
- **Provide Tools:** Inspire and support countries in producing their own products for LULUCF building on the CLCplus core system

Update European geospatial dataset “LULUCF instance”

Next steps:

- Publication on CLMS portal (before end 2025), **2022** and **2023** initially
- Existing datasets **available on request** until then!
- **Testing MRV use** on EEA side and learning from MS feedback
- Continue to provide **training options**
- Explore **possible increase in spatial resolution** of LULUCF instance from **100m to 10m**



+ publication LULUCF instance on CLMS portal (before end 2025)
+ CLCplus Core (access with EIONET PW) <https://clcplus-core.land.copernicus.eu/>



Concluding points and discussion

- **No “one size fits all” solution** for improving monitoring by MS’s. Different solutions to reach “Approach 3”!
- A large number of MS is **actively working on improved land representation** methodologies
- A large number of MS is **already creatively combining national data sources with European datasets and LPIS/IACS** data to fill gaps, increase timeliness of monitoring and add thematic detail
- Countries can learn from each other, and from data providers, **and the other way**: data providers and other stakeholders can learn from country experiences, user needs and challenges!
- **GHG Inventory knowledge hub** (EEA) in preparation as one central tool to support exchange, provide easy and centralized access and encourage networking
- [LULUCF Handbook](#) maintained as key reference document



Thank you!

Contact us:
lulucf@eea.europa.eu

Useful links

[EEA GHG data viewer](#) (user friendly)

[EEA GHG data viewer & database](#) (expert use)

[Climate & Energy in the EU](#) (website)

[Handbook LULUCF regulation](#)

[Enhancing Europe's land carbon sink](#)

