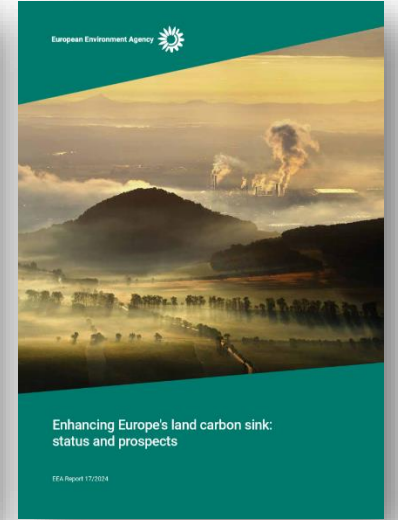
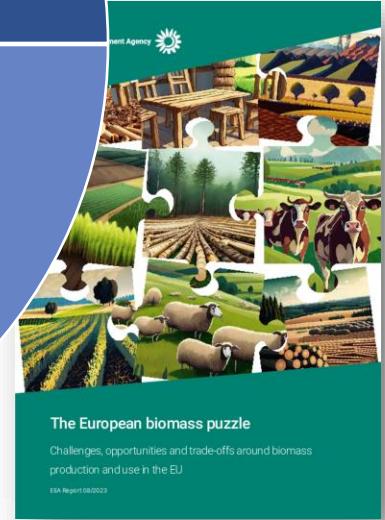
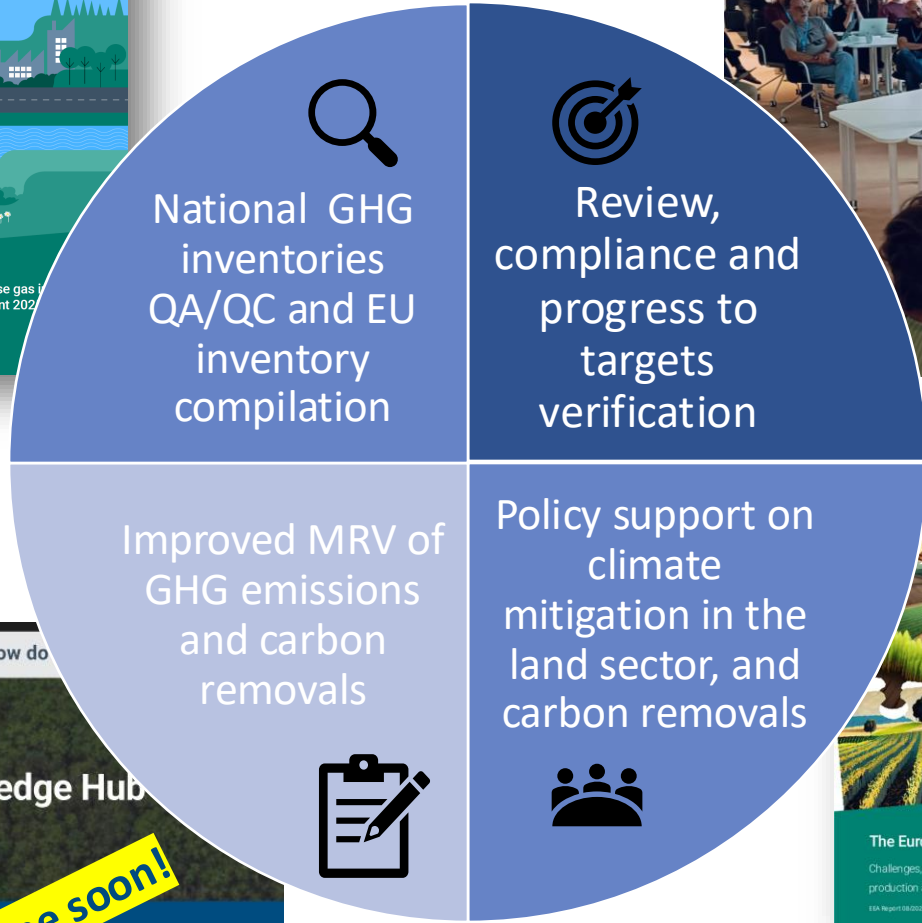
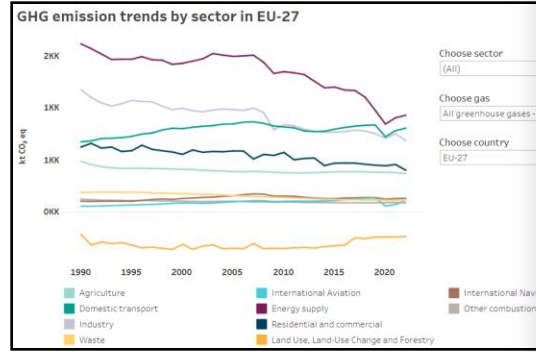


# Only what you measure, gets done: LULUCF in the GHG inventory

Lucia Perugini EEA/ EO4MRV /07 October 2025

# Introduction EEA CMT3: GHG reporting and verification



An official website of the European Union | How do

European Environment Agency

GHG Knowledge Hub

Online soon!

LULUCF Overview →

Head:

# EEA - GHG reporting and verification Unit



**Lucia PERUGINI**  
Acting: Head of Unit

14 staff members:



**Agnes Hanna PIERRE**  
Trainee seconded from the European Commission



**Claire QOUL**  
Expert - Greenhouse Gas Emissions Reporting and Review



**Gorka MENDIGUREN GONZALEZ**  
Expert - Greenhouse Gas Emissions and Carbon Removals



**Herdis GUDBRANDSDOTTIR**  
Expert - Data Integration Carbon Emissions and Removals



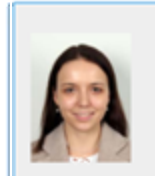
**Katarzyna KOWALCZEWSKA**  
Expert - Agriculture and LULUCF Integration



**Laerke Worm CALLISEN**  
Expert - CRCF: Greenhouse Gas Emissions Inventories



**Linde ZUIDEMA**  
Expert - Climate neutrality and LULUCF



**Karolina WOJCIECHOWSKA**  
Assistant - Department Assistant



**Ondrej PASTIERIK**  
Expert - Greenhouse Gas Emissions and Carbon Removals



**Peter IVERSEN**  
Expert - LULUCF: Forests and Climate



**Rafal ZIELINSKI**  
Expert - Land monitoring and interoperability



**Raúl ABAD VIÑAS**  
Expert - LULUCF Emission Inventories Review



**Ricardo FERNANDEZ**  
Expert - Climate Change Mitigation

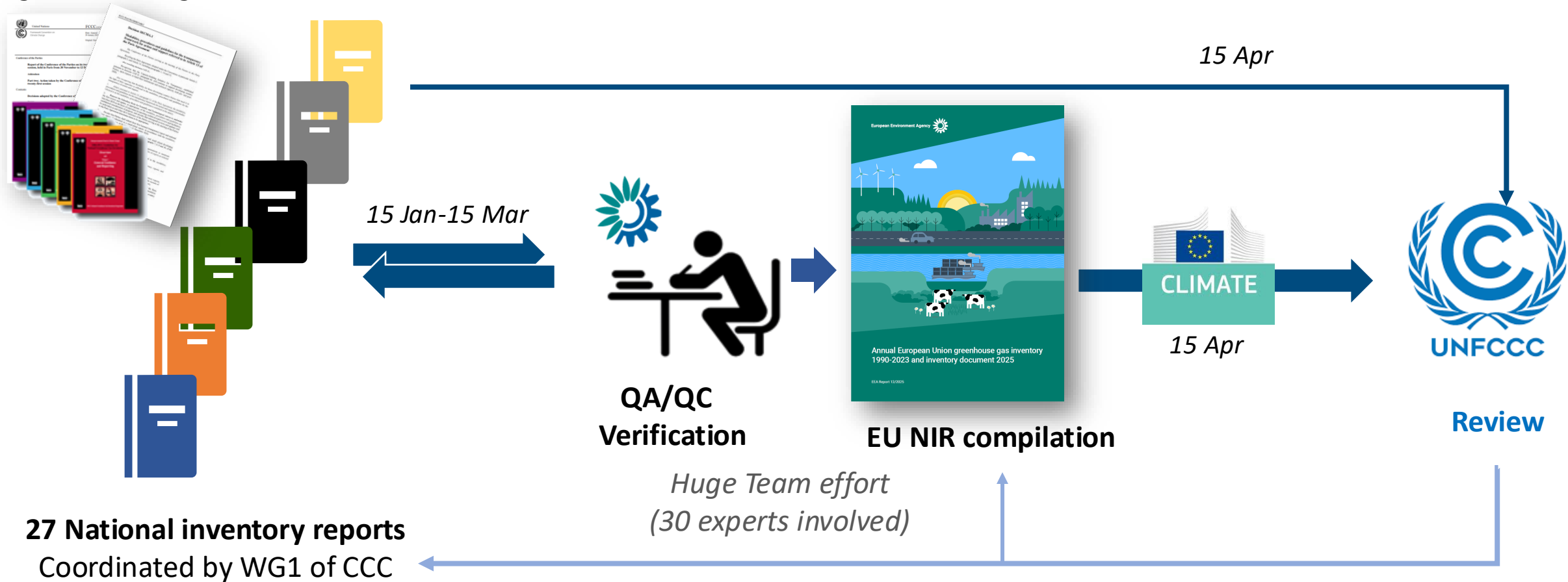


**Tobias LANGANKE**  
Expert - Copernicus and LULUCF

*WHO  
WE  
ARE*

# EEA prepares the European Union GHG inventory report

Main guidance: IPCC GL and UNFCCC decisions and EU governance regulation



# Role and importance of GHG inventories

## GHGI → Unique source of information

- **Complete and comparable time series in line with international and EU standards**
- **Country level; annual basis (yr-2) since 1990 (consistent across the time series)**
- **Quality checked (Country, EEA and International review process –UNFCCC)**
- **Subject to continuous improvement process**



# IPCC guidelines approaches and principles



## TIER 3

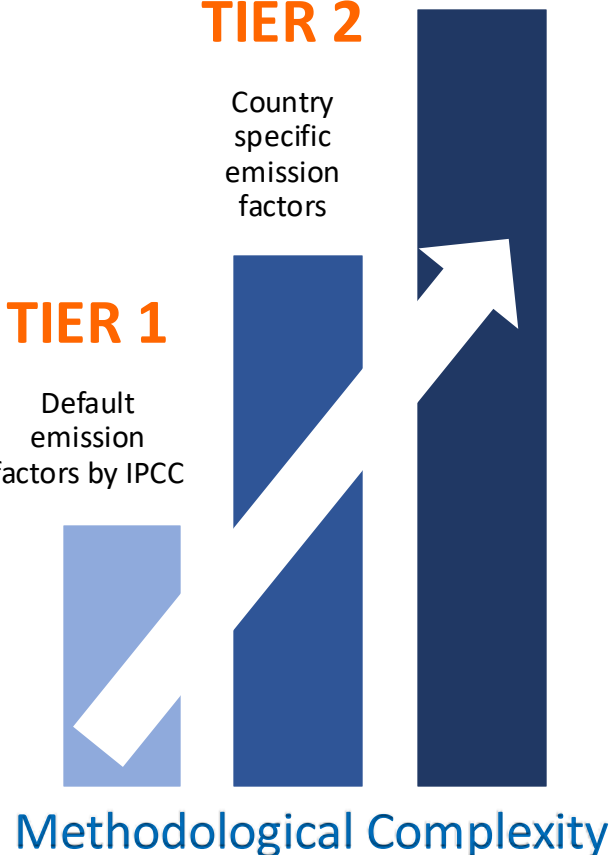
Higher order methods (e.g. models/inventories)

## TIER 2

Country specific emission factors

## TIER 1

Default emission factors by IPCC



## IPCC REPORTING PRINCIPLES

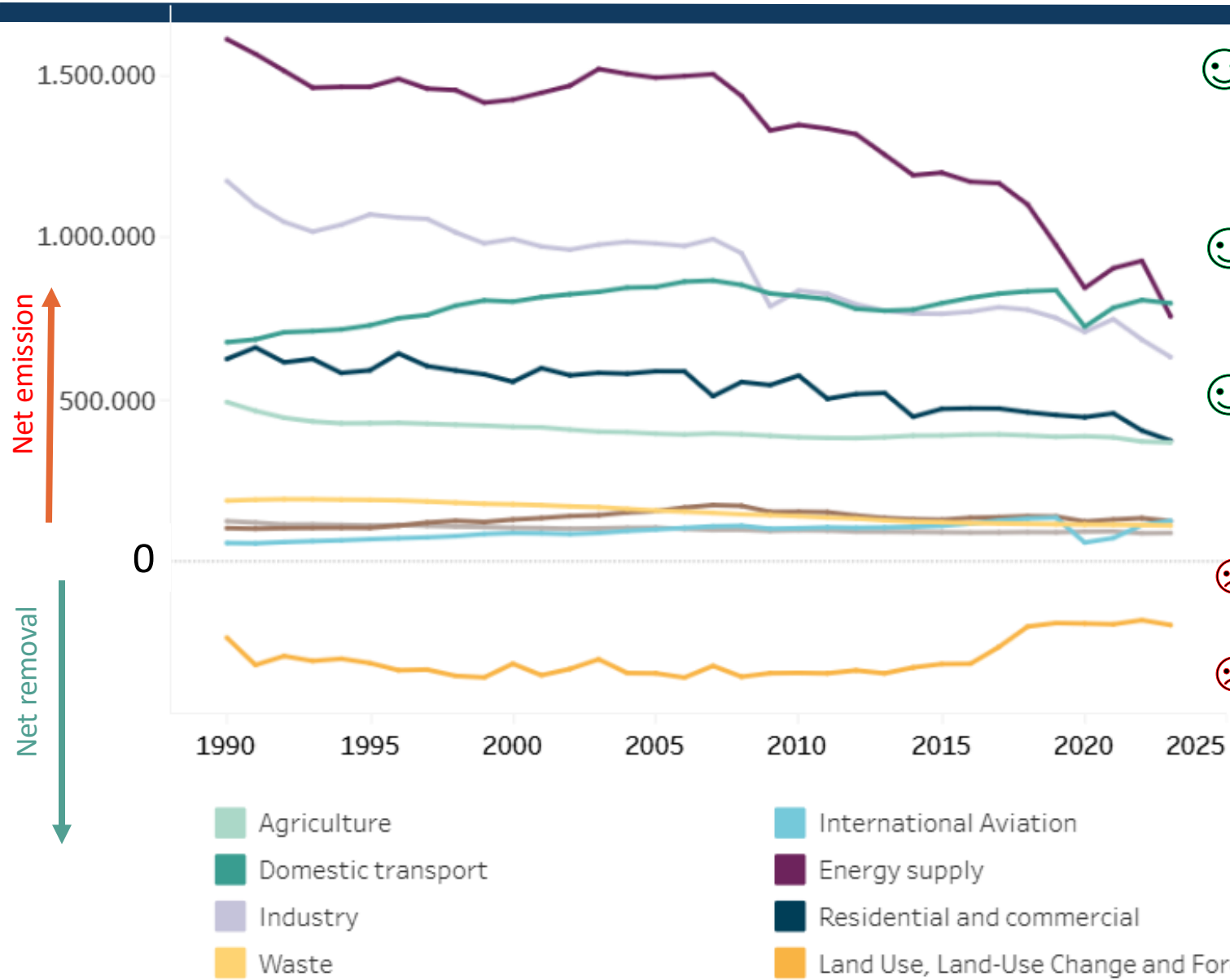
- **Transparency**: fully documented
- **Accuracy**: i.e., no over- nor under-estimates (no bias). Uncertainties need to be preported
- **Completeness**: i.e. estimates are reported for all relevant categories of sources and sinks, gases, and relevant geographic areas.
- **Consistency**: throughout time series → since 1990!!
- **Comparability**: among national inventories



# GHG emission trends by sector

EU-27 | kt CO2 equivalent

## EU GHG INVENTORY



😊 **2023 reduction** in domestic GHG emissions by **9%** compared with 2022: **largest relative reduction since 1990**

😊 **37% net GHG reduction since 1990 (GDP growth by 70%)**

😊 **Energy sector: -22%** -> reduction in use of coal and natural gas, increase in renewable energy consumption

😞 **Transport: Increasing trends**

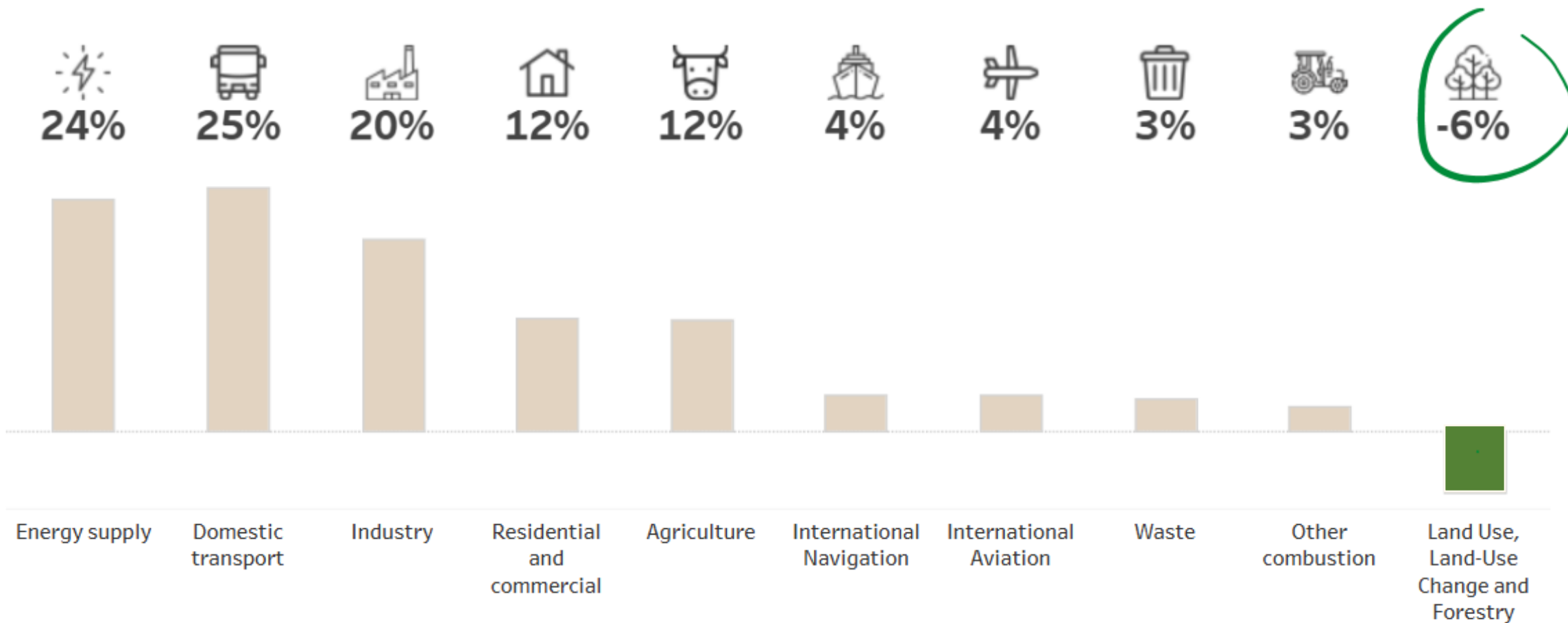
😞 **In the forest and land sector, net removals decreased in the past few years.**



# GHG emissions by sector in 2023

EU-27

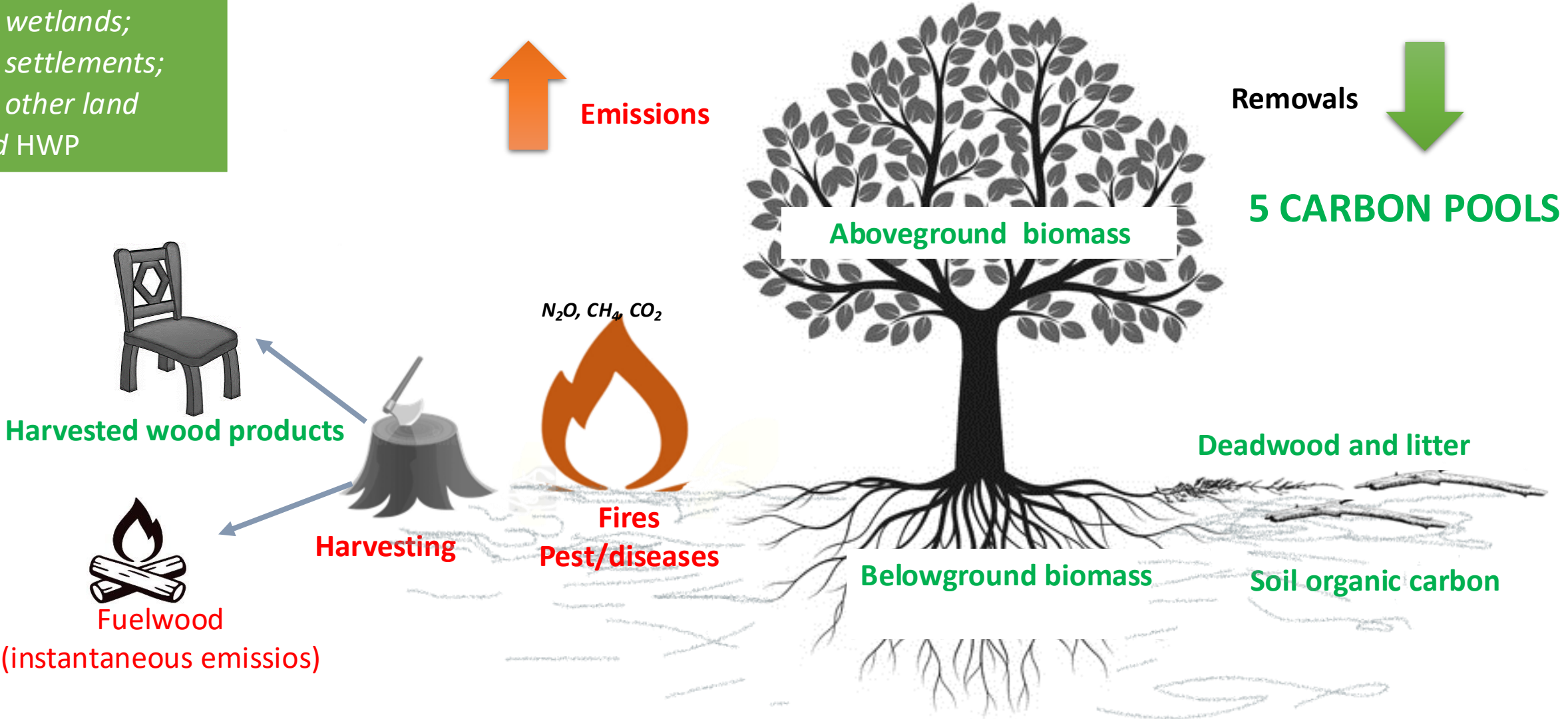
**3.152** Mt CO<sub>2</sub> eq.  
emissions in 2023  
*(includes all sectors)*



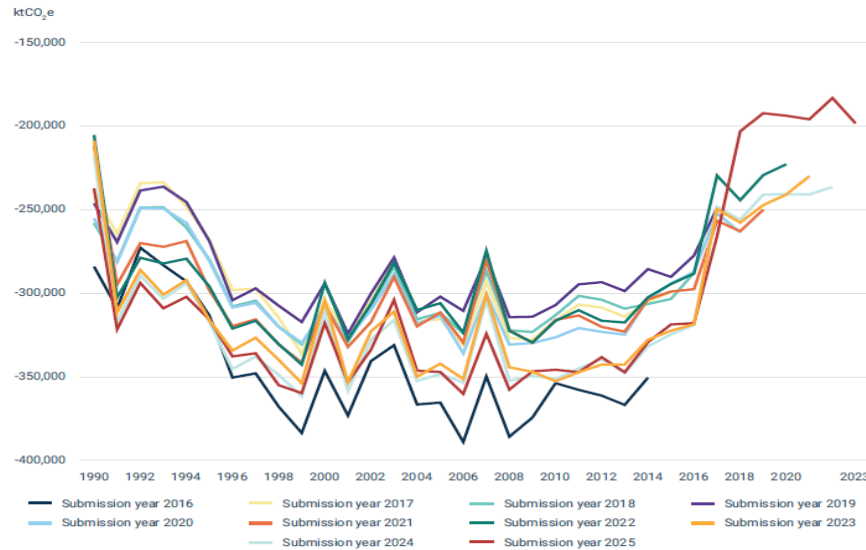
# Land use, land use change and forestry (LULUCF)

## Land use categories

- 1. forest land;
  - 2. cropland;
  - 3. grassland;
  - 4. wetlands;
  - 5. settlements;
  - 6. other land
- And HWP



# Role and importance of quality data



The sector is complex (biological and environmental variability of natural processes)

High uncertainties and interannual variability

Inventories are constantly improved over time (coverage of pools, area representation etc)

## Governance regulation requires MS to improve their LULUCF inventories:

- Tier 2/3 for key categories (from 2022)
- Higher accuracy (Tier 2 all pools from 2028)
- Tier 3 for special areas from 2028 (i.e. High carbon stock, under protection reforestation and high climate risks)
- Spatially explicit LUC (since 2022)
- Data interoperability (GIS&datasets)



# Implications of geographic specific requirement



**No specific data format is required:** countries choose the most suitable dataset or use a multi-source approach



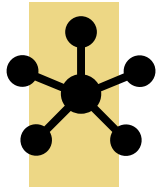
*Overview of EO use in EU GHGI*  
*Tobias Langanke (EEA)*



**Methods aligned to higher geographical details:** Approaches, models, and higher-tier (2–3) methods should align with the geographically explicit land monitoring framework.



*Research roadmap for Improved forest monitoring and modelling*  
*Mirco Migliavacca (JRC)*



**Data should be interoperable** to enable high-resolution carbon calculations and integration with other datasets.



*Monitoring of agricultural land*  
*Philippe Loudjani (JRC)*  
*Interoperability in LULUCF*  
*Rafal Zielinski (EEA)*

**CRCF**



**GHG inventories**  
Geographic explicit Land conversion tracking



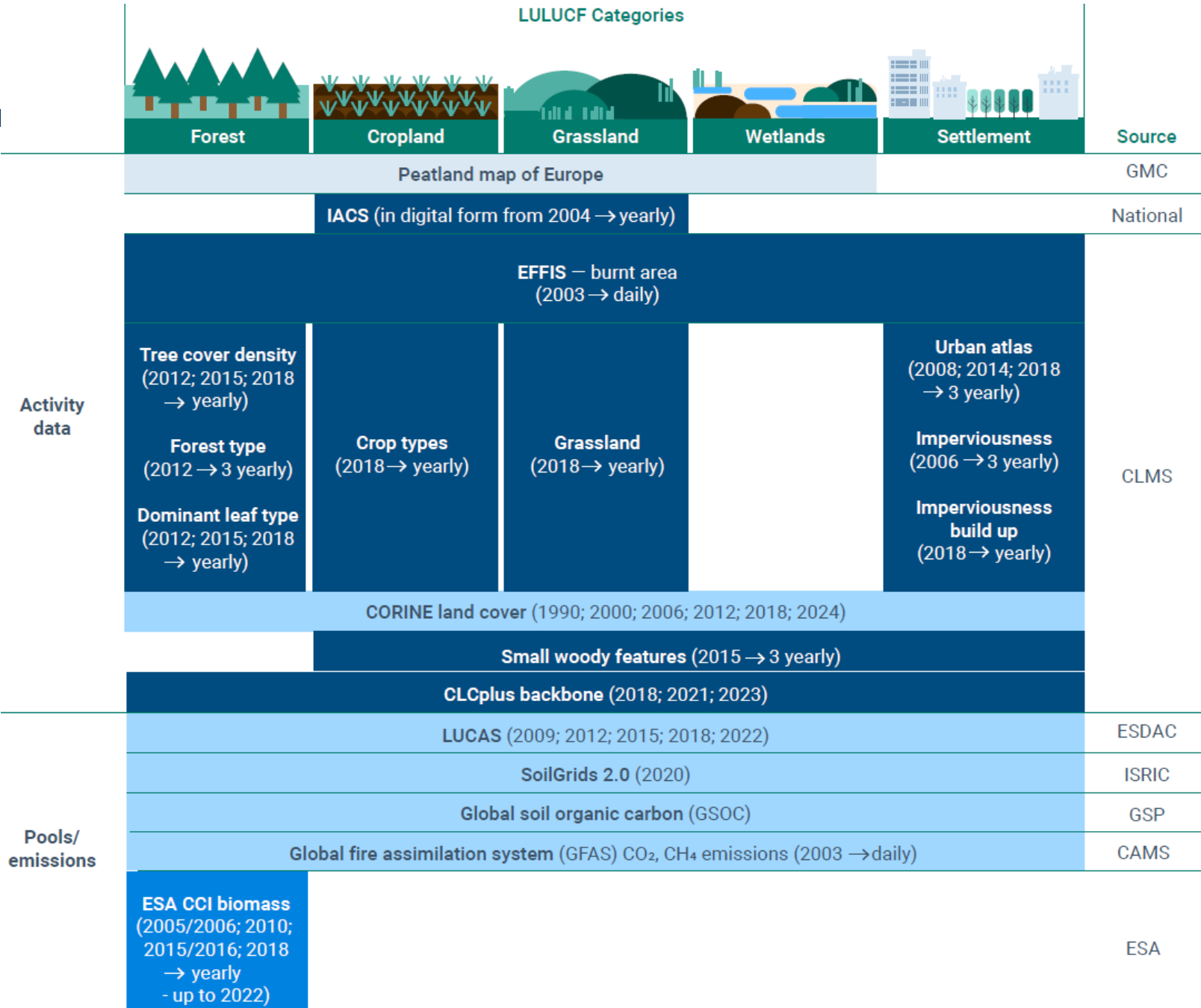
**Carbon farming monitoring data**



*Exchange and integration of data between the GHG inventory and site measurements coming from CF MRV processes*



# Geospatial datasets



A wide range of pan-European geospatial products are available

## Opportunity:

- identify land cover changes
- support emission and removal estimates (e.g. stratification)
- verify data accuracy.

## Challenges

- Category classification differs among countries and policy files
- Time/spatial scale

Level of spatial detail: High Medium Low Mixed scale/detail level



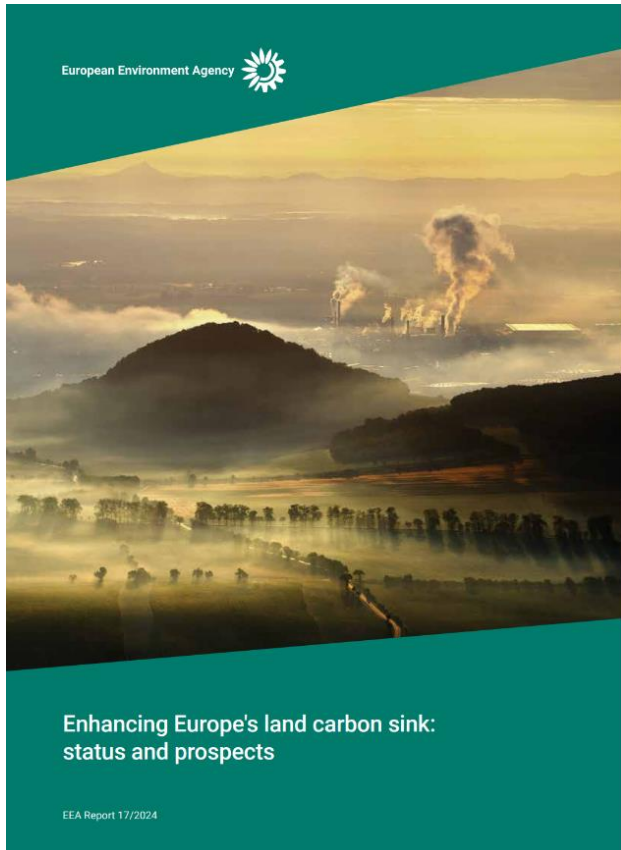
# Enhancing Europe's land carbon sink: Status and prospects



eea.europa.eu

## Objectives and scope

Overview of the land sector, its status and contribution to climate change mitigation in Europe (with a focus on data...)



1. Introduction

2. Status

3. Mitigation options

4. Governance & policies

5. Geospatial data

6. Outlook

Published in June 2025

### Partners involved

- ETC/CM, ETC/CA, ETC/DI

### Consultation rounds

- EEA
- Eionet
- EC stakeholders (CLIMA, JRC, ENV, AGRI, RTD)

European Environment Agency



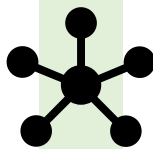
# Leveraging Technology & Data for LULUCF Mitigation



Capitalise on the evolving **technological & data landscape**



Improve **data interoperability** and create **reporting synergies** across land-related policies



**Enhanced monitoring and data developments** to boost effectiveness and cost-efficiency of LULUCF mitigation actions (public & private actors)

*“If you can measure it, you get it done”*

or better...it is difficult to improve what you cannot measure



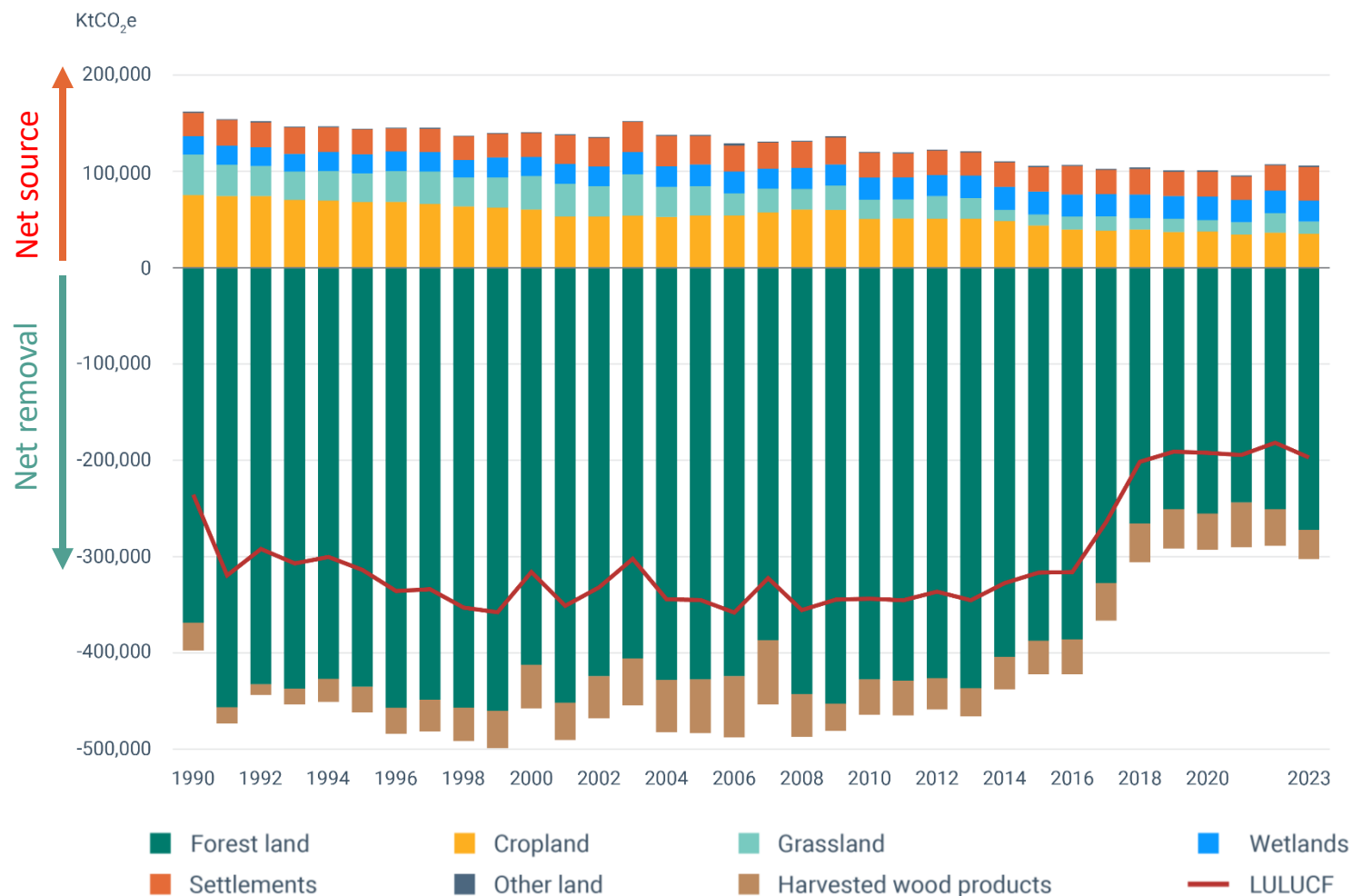
# LULUCF in the GHG inventory

Peter Iversen EEA/ EO4MRV /07 October 2025

European Environment Agency 

# LULUCF - Status, past trend and drivers

LULUCF net emissions (+) and net removals (-) for the EU-27 (1990-2023) in ktCO<sub>2</sub>e



## Status (2023)

- Net land carbon sink was -198 MtCO<sub>2</sub>e
- Compensated 6% of emissions from other sectors

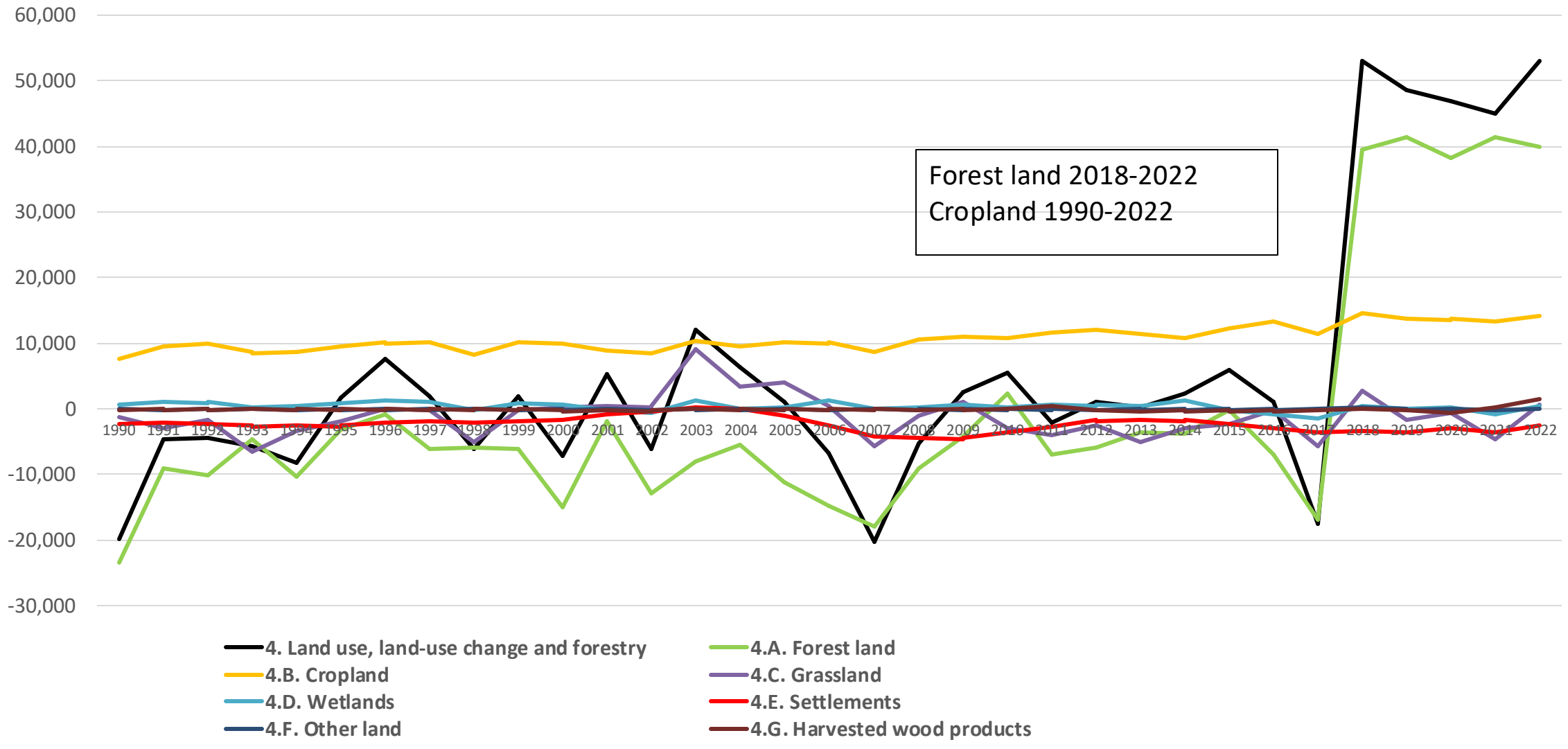
## Trend

- Declining net sink
- 2014-2023 the average annual sink was 30% smaller compared to 2004-2013

## Main factors

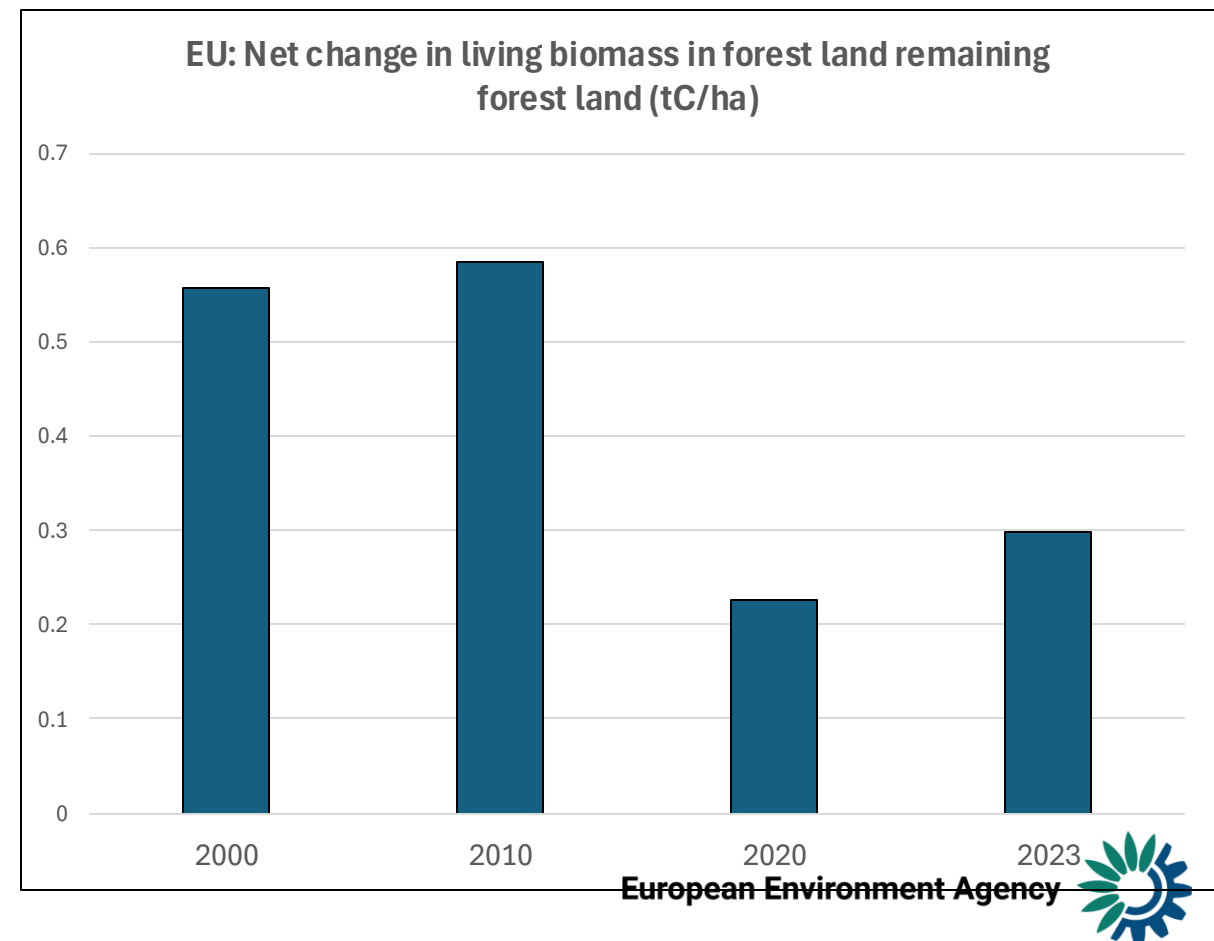
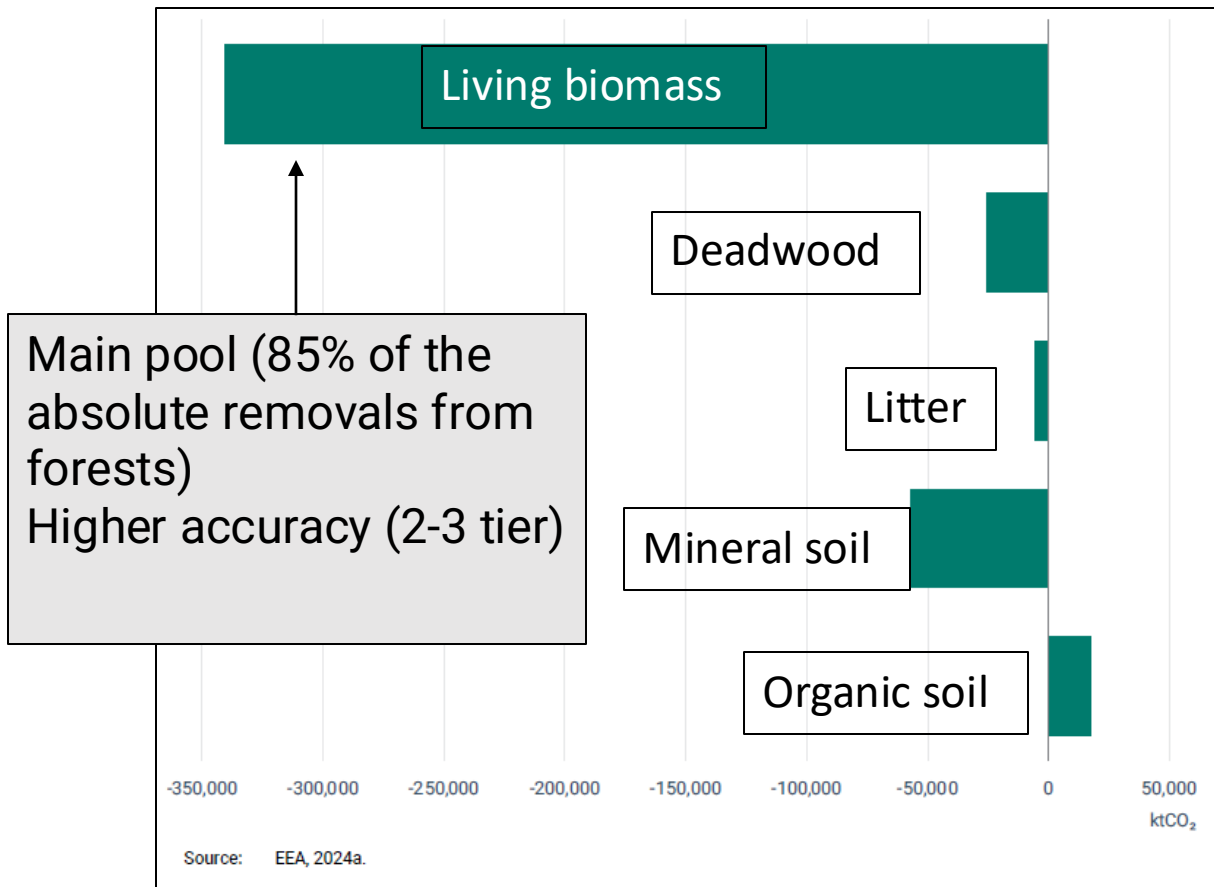
- Decline in the forest sink
- Cropland and settlements are the major sources of emissions

# EU Recalculation 2024 to 2025 (ktCO<sub>2e</sub> year<sup>-1</sup>)



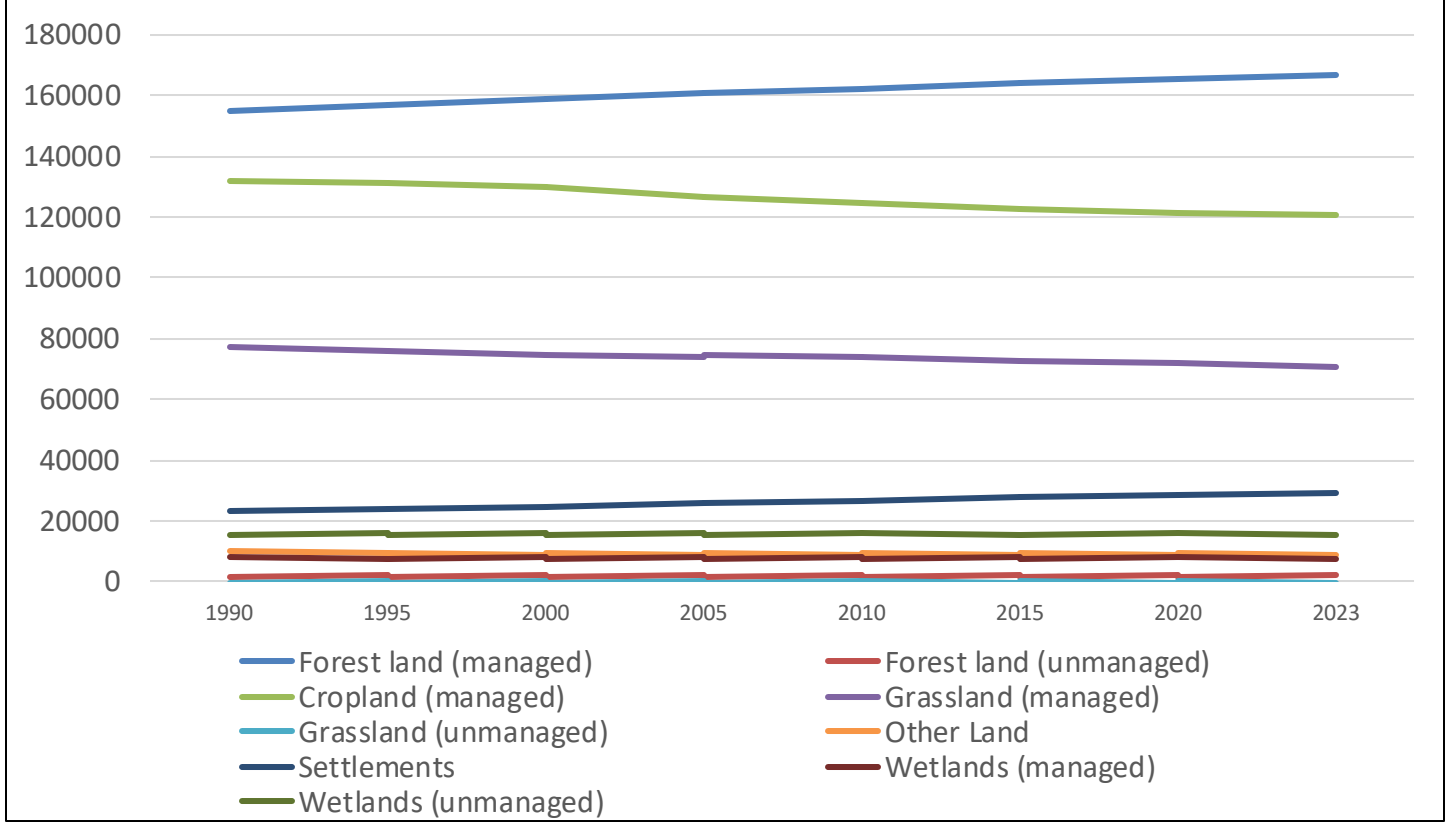
**The living biomass pool in forests** (above and below ground) is by far the largest contributor to the EU LULUCF sink.

Photosynthesis, plant respiration, mortality, impacts of natural disturbances and harvesting are all playing a role in the annual net change



# Land use change in EU

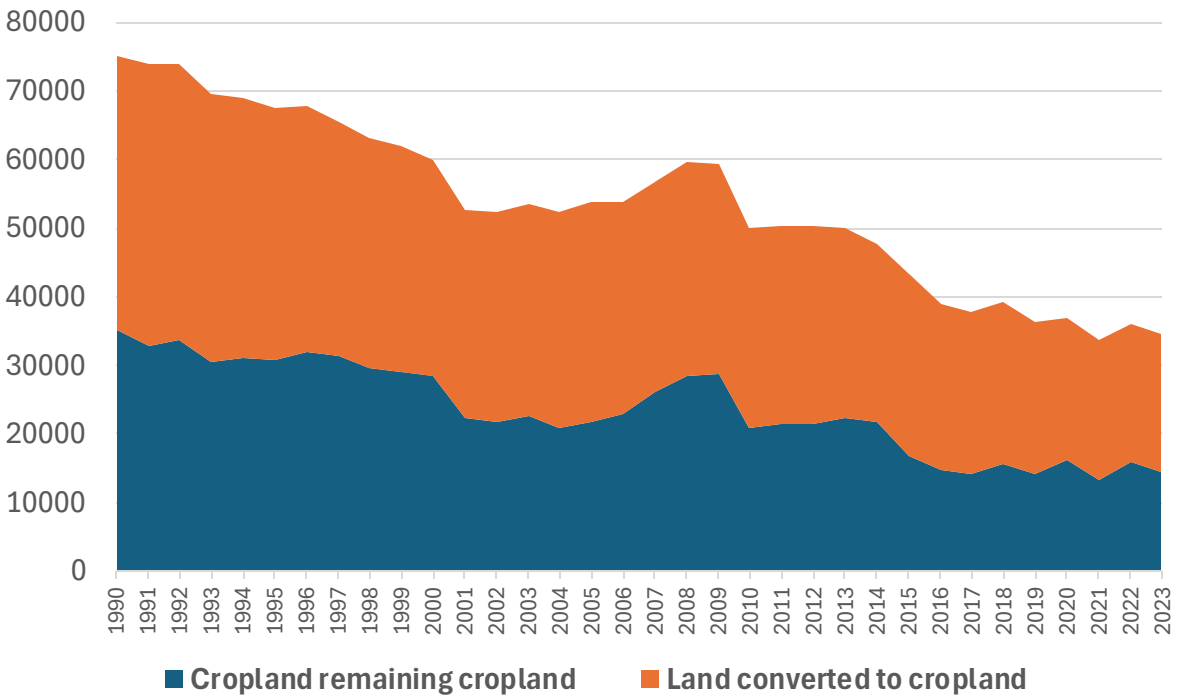
Land use categories 1990-2023 (Kha)



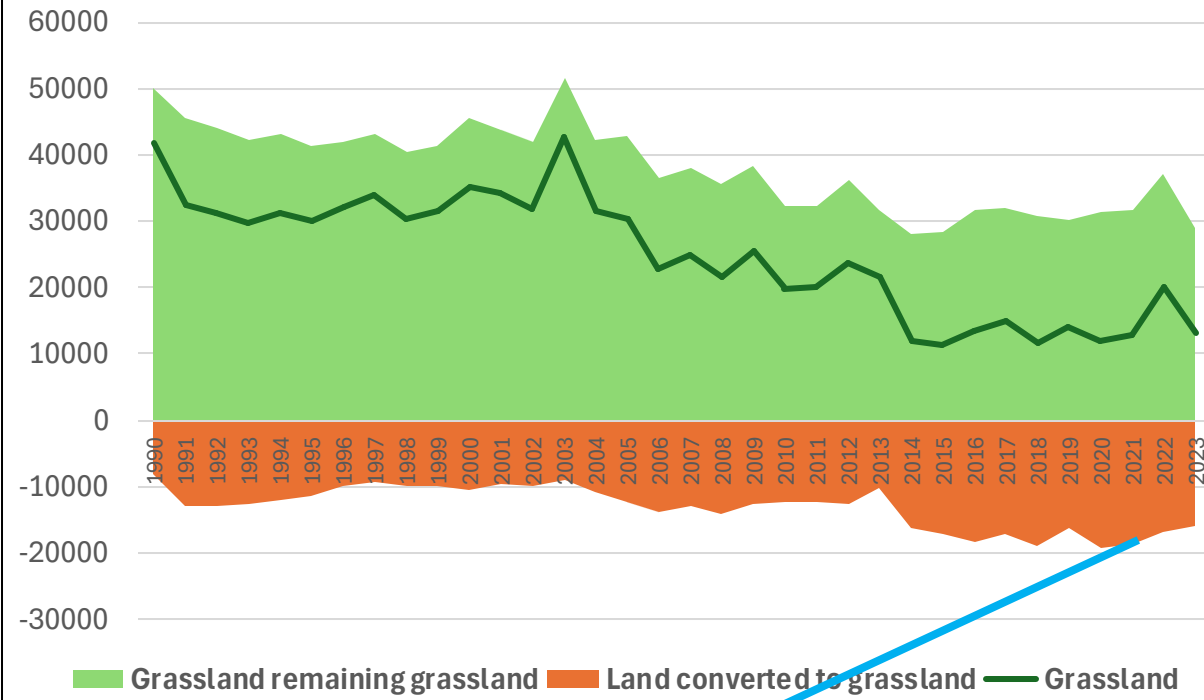
## Net change since 1990, percent and area

Managed forest 7,8%,	+12 Mha
Cropland: -8,7%,	-11 Mha
Managed grassland: -8,8%,	-6,8 Mha
Unmanaged grassland: +451%,	+0,2Mha
Managed wetlands: +2,5%,	+0,2 Mha
Unmanaged wetlands: +1,1%,	+0,2 Mha
Settlements +25%,	+5,8 Mha
Oter land -4,7%,	-0,5 Mha

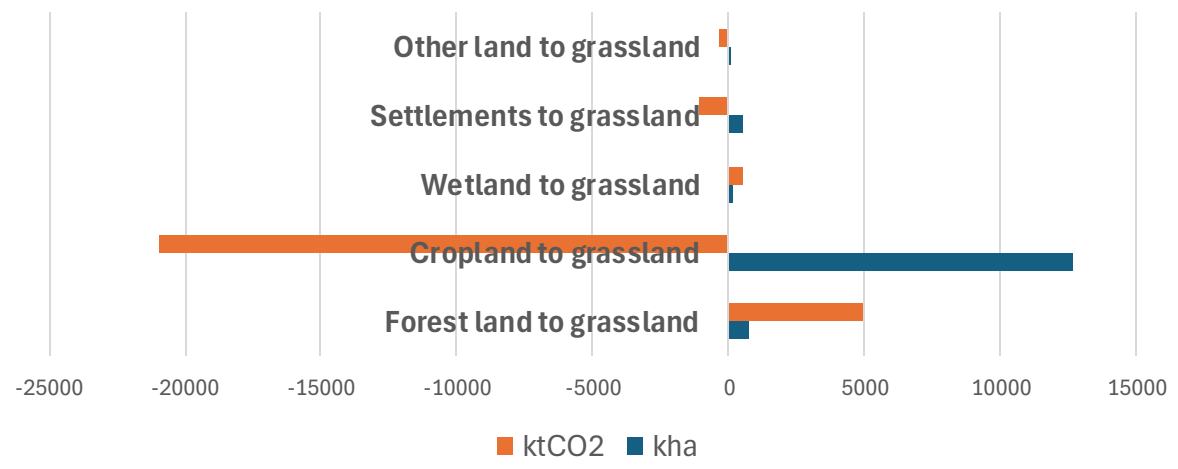
### Cropland (ktCO2e)



### Grassland (ktCO2e)



### Land converted to grassland (table 4C, 2023)



# Emissions and removals from soils in the EU

## Net emissions/removals by soil type



Emissions and removals of greenhouse gases are affected by land use. Soil carbon can increase due to growth of plants and be lost due to disturbance of the soils including drainage. Note: Emissions is a positive number and removals is a negative number. Only land use categories and soil types for which countries report emissions or removals from soils are shown in the overview.

### Net emissions/removals in 2023 in EU-27 by land use category and soil type

Select year

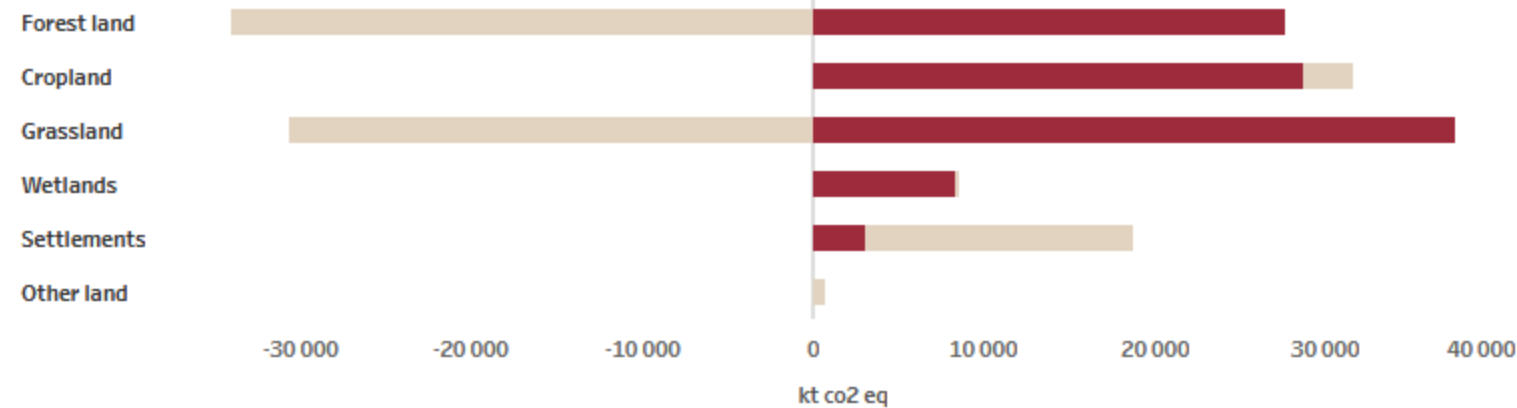
2023

Select country

EU-27

Emissions from mineral soils

Emissions from organic soils



Data source: European Environment Agency

[Soil carbon briefing from 2022: Soil carbon | Publications | European Environment Agency \(EEA\)](#)



# Main messages

## Declining sink

Forest land is the dominant land use category in the inventory, with biomass having increased in all years since 1990 and probably since the 1950ties. A complex set of factors will make it challenging to sustain this increase.

## Tracking of land

Land use changes have significant impact on the inventory, often more than land remaining in the same category – meaning tracking of land use is really important.

## Hot spots

The area of managed land with organic soils is less than 5% of the total land area in the EU but it contributes with significant emissions – more than 100 MtCO<sub>2</sub>e/year

# Thank you!

Contact us:  
[lulucf@eea.europa.eu](mailto: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](#)

