Interoperability requirements and use of IACS in LULUCF

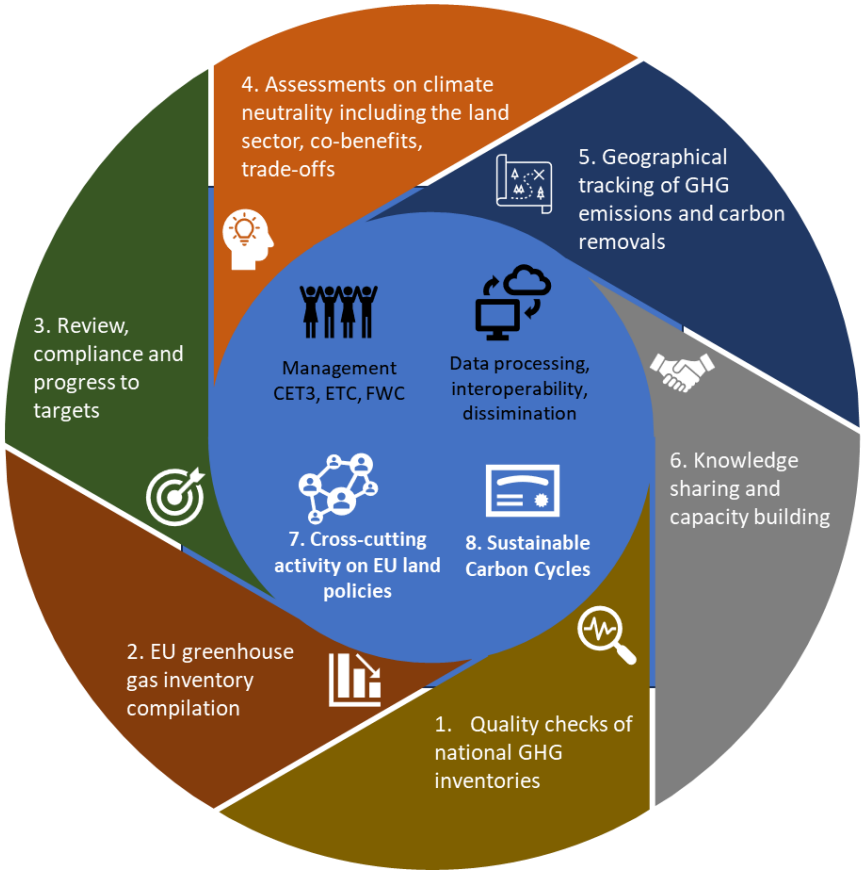
Rafal Zielinski (EEA) / EO for improving LULUCF MRV/ 08.10.2024

Outline

- EEA/CET3 supports LULUCF implementation
- LULUCF in relation to other policies and the role of IACS data
- Challenges in use of spatial data for LULUCF
- Example of 2 MSs using IACS data for GHG inventory

EEA supporting the implementation of the LULUCF regulation

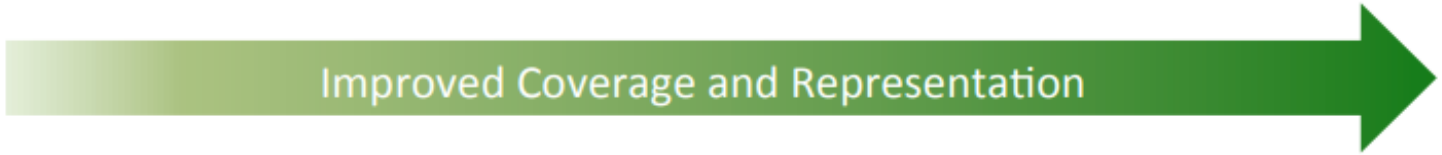
- **Quality checks** of Member States GHG inventories and compilation of the EU GHG inventory
- Support implementing LULUCF regulation by **comprehensive reviews, compliance check** and **progress to targets**
- **Knowledge sharing and capacity building** with Member States for of greenhouse gas emissions and carbon removals improved and annual geographic tracking
- **Support MS with the gradual improvement of GHG inventories** through methodological guidance, facilitating access to inventory activity data and emissions factors, expert training and facilitating good practice exchanges between inventory compilers.



Improving accuracy and robustness of estimates of GHG inventories

IPCC 2006 Tiers and Approaches for implementing **LULUCF Reg. 2018/841**

Tier 3 **High res. data (e.g. model)**	Not applicable	Modelled data combined with LUC matrix (not necessarily spatially dis-aggregated)	Geo-information at high-resolution, detailed time series, country-specific disaggregated data based on inventories and/or models
Tier 2 **Country specific values**	National area statistics, combined with country-specific values – typical 1st improvement	Annual LUC stats, combined with country-specific values	Geo-information, time series, country specific values – good coverage, detailed analysis
Tier 1 **IPCC default values**	National area statistics, combined with IPCC default values – basic entry level	Annual (or annualised) LUC stats presented as national matrix – applied using default IPCC values	Geo-information, time series, default values – weak, but better than App 1 and 2
	Approach 1 **National statistics**	**Approach 2** **Land Use Change matrix**	**Approach 3** **Geo-tracked**



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Regulatory framework

Gov Reg 2018/1999 Annex V Part 3:

- For monitoring and reporting in the LULUCF sector, Member States shall use **geographically explicit land-use conversion data** in accordance with the 2006 IPCC Guidelines for national GHG inventories

…geographically explicit land-use

- Member States are encouraged **to explore synergies and opportunities to consolidate** reporting **with other relevant policy areas** and strive towards greenhouse gas inventories which allow for **interoperability with relevant electronic databases and geographic information systems**…

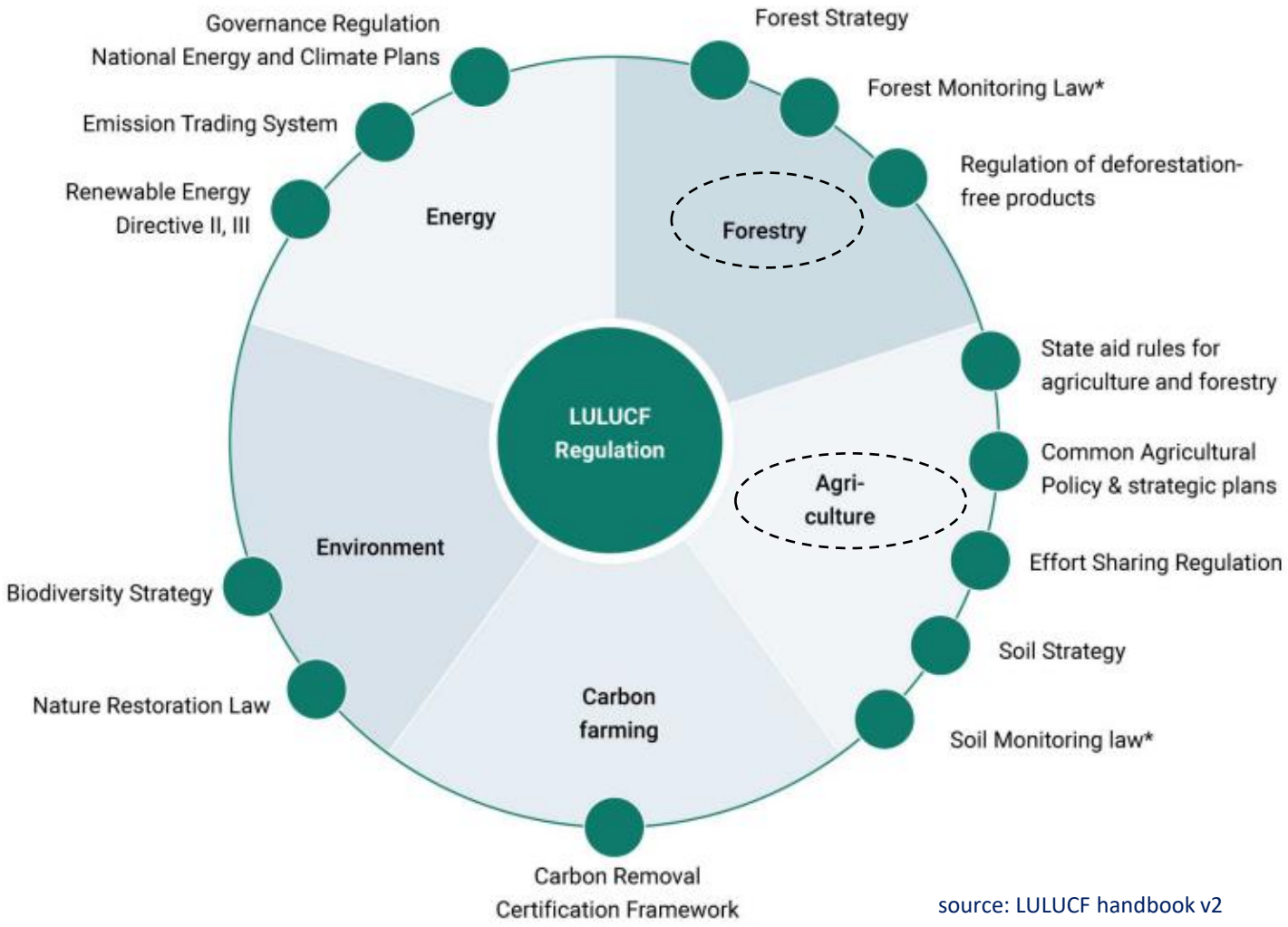
…explore synergies with other relevant policy areas

….interoperability (in) land-use information

- The greenhouse gas inventory **shall enable the exchange and integration of data between the electronic databases and the geographic information systems**, in order to facilitate their comparability and public accessibility.

….interoperability (out) GHG inventory

LULUCF in relation to other EU policies/initiatives



source: LULUCF handbook v2

- EU farms used 157 million hectares of land for **agricultural** production, **38 % of the total land area of the EU**.
- EU had about 160 million hectares of **forests**, covering about **39% of the total land area of the**, while other wooded lands covered about 20 million hectares.

(Source: Eurostat 2023)

* Legislative proposal

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CAP data from an external (climate policy) perspective

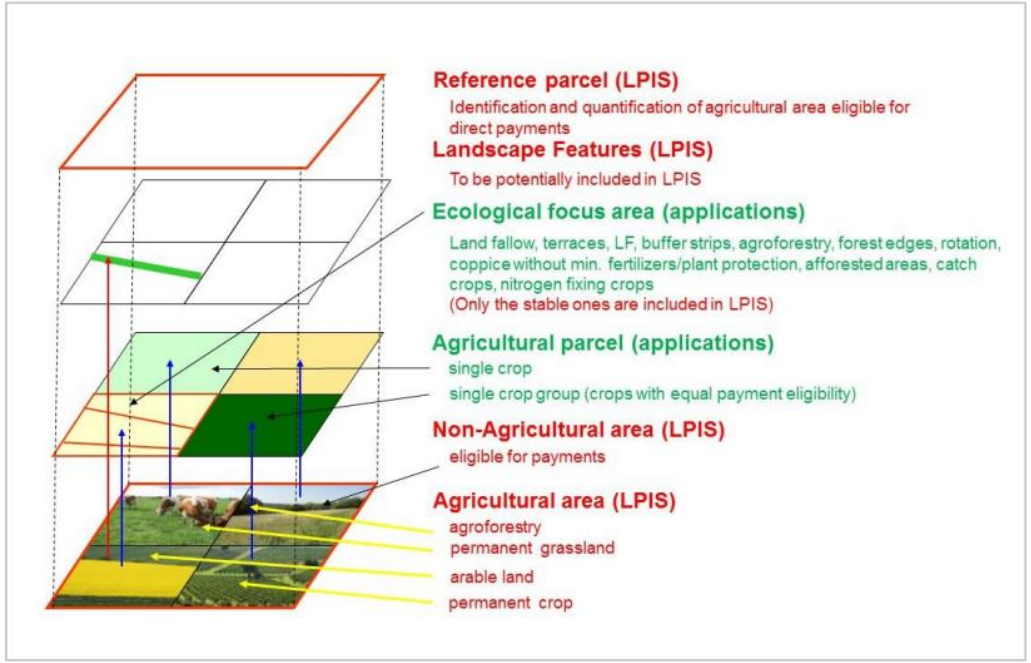
Spatial and non-personal IACS data

- LPIS – agricultural land under subsidies LC
- GSA – annual LU
- CbM/AMS – agricultural practices (LU) – unknown?
- Animal inventory – aggregated level?

- Very specific – difficult to understand for non-CAP community
- Various concepts – LC/LU, eligibility, payments, …
- LPIS/GSA/FOI – different geometries, and stability over time and content

- Trusted, timely delivered, annual, validated data, frequently updated, best in the land sector?

- Existing, Available, Accessible? Will continue? Easy to use?



Source: Martirano, G. and Toth, K., Technical Guidelines on IACS Spatial Data Sharing - Part 2 – Interoperability, Publications Office of the European Union, Luxembourg, 2023, doi:10.2760/646422, JRC132427.

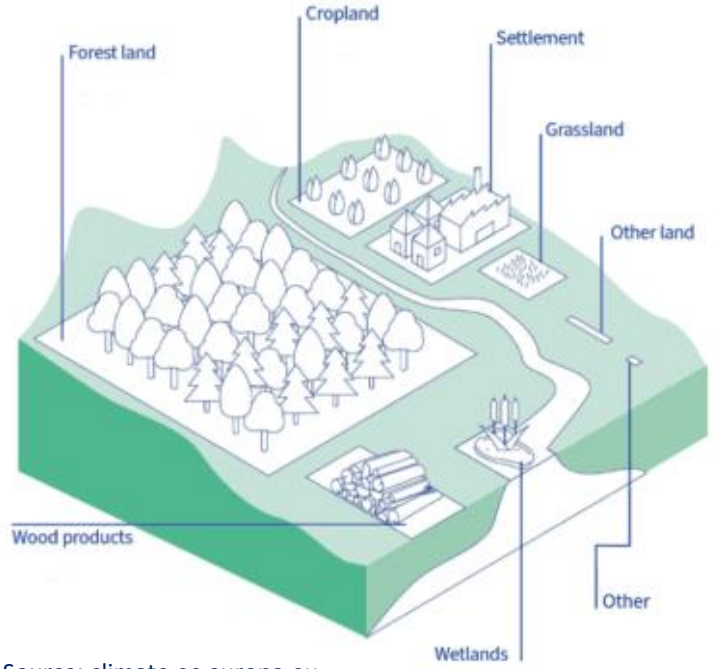
IACS - Integrated Administration and Control System
LPIS - Land Parcel Identification System
GSA - Geo-Spatial Application
CbM - Check by Monitoring
AMS - Area Monitoring System

LULUCF land-use categories

- **6 x Land Use** categories used for LULUCF
- Lengthy **time series** i.e. from 1990 (x-2)
- **Wall2Wall** coverage – no gaps/exclusion
- **Area** reported
- **Status** table/dataset

- **Land Use Change** (T1-T0)
- 12 classes,
- Change **area reported**
- **Conversion** matrix/table

- Activity data – **land use**/land management
- **Emission factors**/Carbon stock change factors
- **GHG inventory (annual reporting)**



Source: climate.ec.europa.eu

LAND-USE CONVERSIONS

Full application of the guidance requires estimation of land-use conversions that take place between data collection intervals, particularly when different carbon stock estimates and different emission and removal factors are associated with lands before and after a transition. Applicable land uses and land-use conversions are shown below:

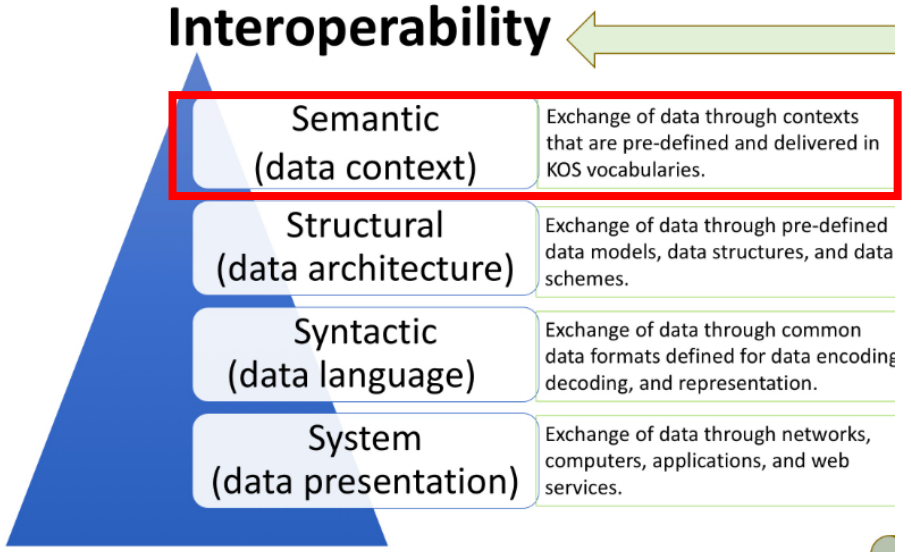
FF	=	Forest Land Remaining Forest Land	LF	=	Land Converted to Forest Land
GG	=	Grassland Remaining Grassland	LG	=	Land Converted to Grassland
CC	=	Cropland Remaining Cropland	LC	=	Land Converted to Cropland
WW	=	Wetlands Remaining Wetlands	LW	=	Land Converted to Wetlands
SS	=	Settlements Remaining Settlements	LS	=	Land Converted to Settlements
OO	=	Other Land Remaining Other Land	LO	=	Land Converted to Other Land

Interoperability between policies and datasets

- Interoperability: “The **ability** of computer systems or software to **exchange and make use of information**” -- Oxford Dictionary

- Interoperability supports the **reusing of datasets**, **avoiding duplicative** investments in data gathering and can help to solve related policy problems
- Interoperability **is the property** that facilitates unrestricted sharing and use of **data** or resources between disparate systems
- Interoperability **describes the characteristic** of a product, or system, to **work with other** products or systems.

- It should **work both ways**, **LULUCF datasets produced** at first for GHG reporting, should be interoperable with other environmental datasets so it **can be used for other purposes**.



Source: isko.org

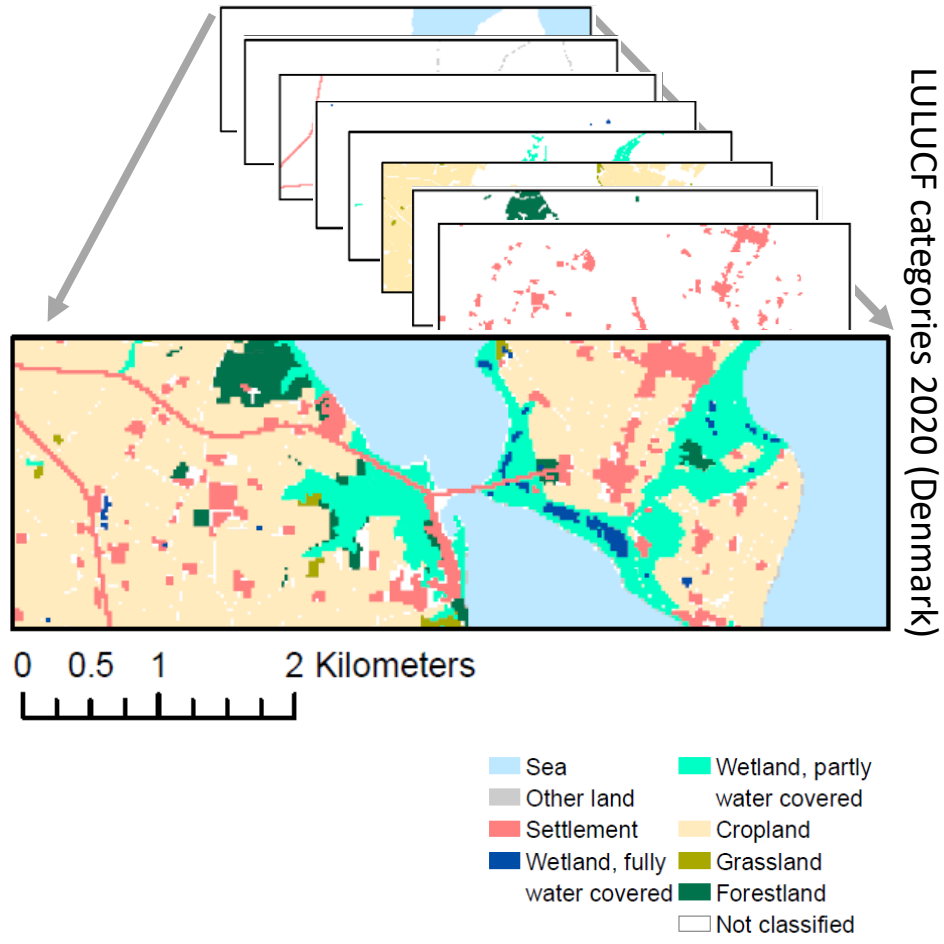
Spatial Land Use data for LULUCF (1/2)

Challenges with creating a dataset from multiple sources:

- Different definitions and purposes LC ≠ LU
- Semantic mapping necessary, and an appropriate level of disaggregation in data harmonization towards the LULUCF categories

- Completeness and temporal resolution
- Data availability/accessibility/understanding
- Metadata and documentation

- Integration of multiple cartographic information sources (i.e. solving topology)
- Large volumes of geographic data, integrating non-homogenized historical cartographies, with diverse data models, scales and purposes.



Source: https://dce2.au.dk/pub/TR227.pdf

Spatial Land Use data for LULUCF (2/2)

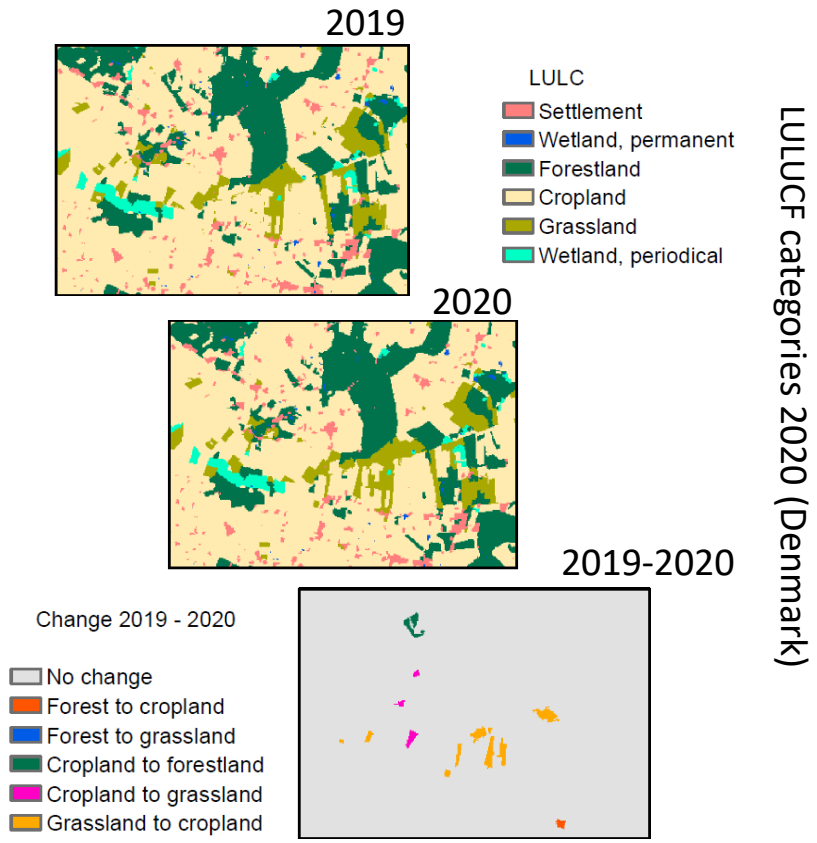
Challenges with creating a dataset from multiple sources:

- A need of consistent time series
- Avoiding double-counting
- Importance of historical data (i.e. 2005-2009)

- Noisy land use change (data issues apparent)
- Easier to correct statistical than a spatially-explicit data

- For the LULUCF land use a need of standardization information
- Adaptation to the INSPIRE directive

- High entry level: technical
- Often limited resources



Source: https://dce2.au.dk/pub/TR227.pdf

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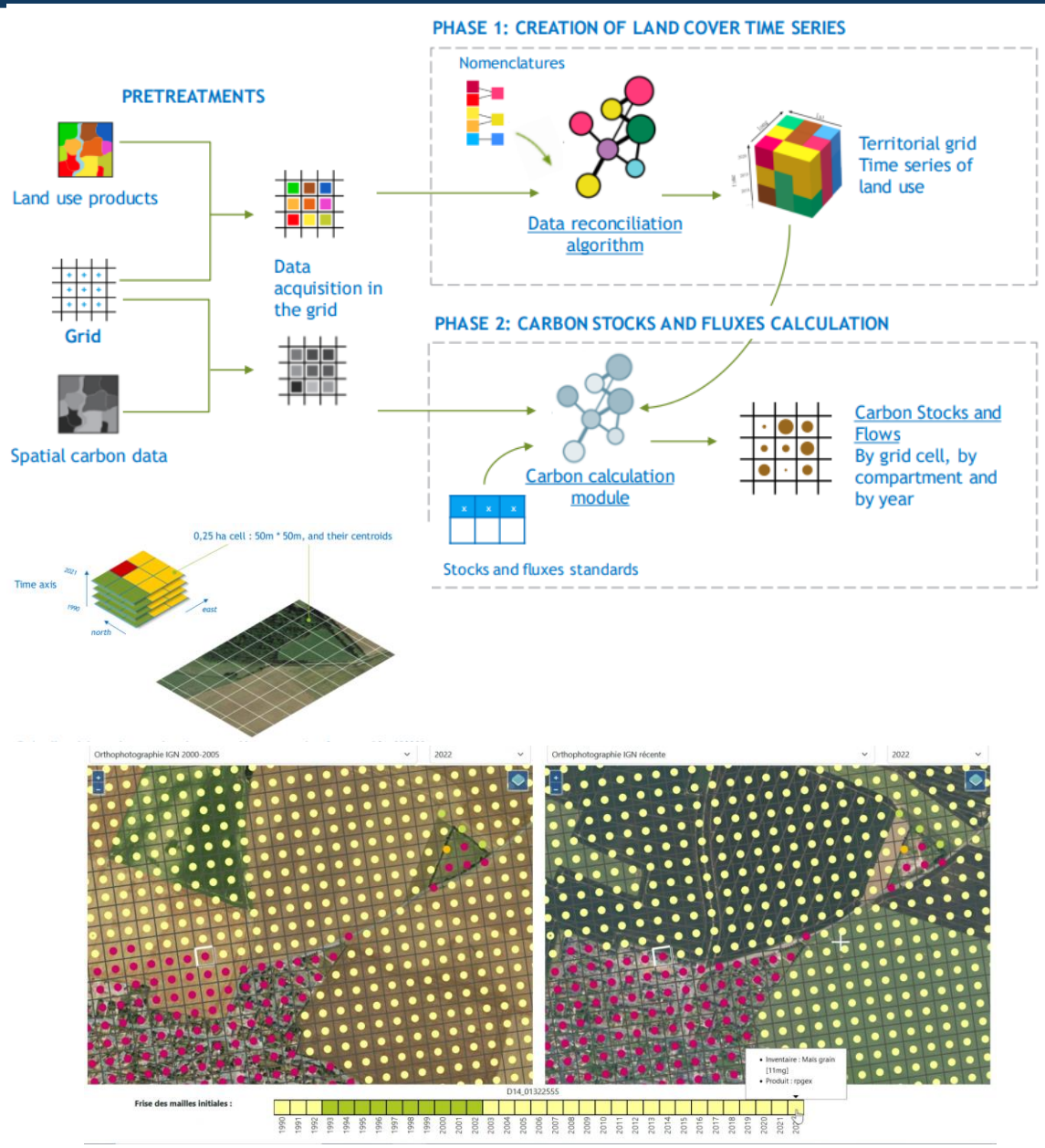
Example: France

- Unique solution at the country level
  - **Wall to wall** coverage
  - Based on grided points (spaced 50x50m): **220M points, MMU 0.25ha**
  - **Attributes assigned yearly,** for each centroid, based on available information, and a hierarchy established between products
  - **70 disaggregated** LULUCF classes.
  - Multi-source approach, adaptable to new datasets, **11 different types of data sets**

- Use of **LPIS /GSAA,** Urban Atlas, CLC, N2000,CartoDB

- One data source may contribute to one or more LULUCF categories (challenge for sematic mapping)
- LU/LUC and calculation of carbon fluxes **at the point level**
- More information: NIR 2023, CITEPA

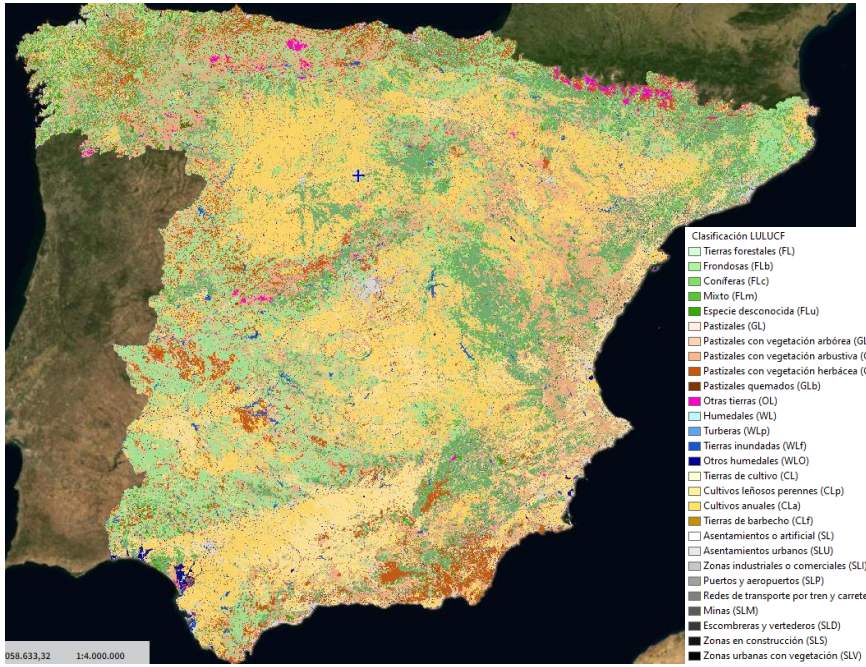


Example: Spain

- Unique solution at the country level
  - **Wall to wall** coverage
  - Spatial dataset, single layer, GSD=**25m**
  - **8 LULUCF datasets** (1970, 1990, 2000, 2006, 2009, 2012, 2015 and 2018)
  - **7 datasets of LULUCF changes**
  - **28 disaggregated classes** instead of 6 LULUCF categories

- Use of multiple dataset including **LPIS /GSAA** (2009+)
- Hierarchical order/ priority approach for data integration
- A huge effort in integration and homogenization of various sources
- In addition, manual work/photointerpretation: +3M ha
- Adaptation to the INSPIRE directive

- More information: MITECO, NIR 2023, TechSpec



Categorías LULUCF	2009	2012	2015	2018
FL	FF09	FF12	FF15	FF18
CL	SIGPAC09	SIGPAC12	SIGPAC15	SIGPAC18
GL	FF09+ SIGPAC09 (PS)	FF12+ SIGPAC12 (PS)	FF15+ SIGPAC15 (PS)	FF18+ SIGPAC18 (PS)
WL	SIGPAC09+IGR-HI +DGA+IGME	SIGPAC12+IGR-HI +DGA+IGME	SIGPAC15+IGR-HI +DGA+IGME	SIGPAC18+IGR-HI +DGA+IGME
SL	SIGPAC09+ catastro+IGR-RT + BTN25+ SIOSE09	SIGPAC12+ catastro+IGR-RT + BTN25+ SIOSE11	SIGPAC15+ catastro+IGR-RT + BTN25+ SIOSE14	SIGPAC18+ catastro+IGR-RT + BTN25+ SIOSEAR17
OL	FF09+capa roquedos	FF12+capa roquedos	FF15+capa roquedos	FF18+capa roquedos

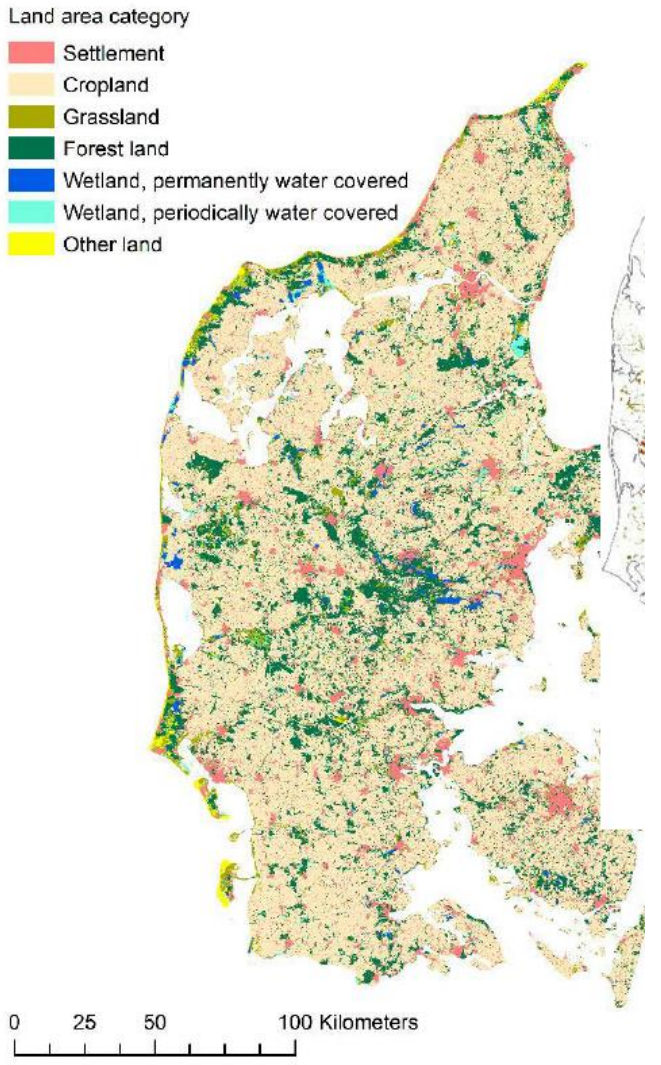
Example: Denmark

- Unique solution at the country level
  - **Wall to wall** coverage
  - Spatial dataset, single layer**, GSD=25m**
  - **8** instead of 6 **LULUCF categories** (Wetland 2 separate classes, Sea)
  - Produced **annually**
  - **Updated methodology**: 1990 to 2012, 2011 to 2022 and 2022+

- Multiple data sources: **LPIS/GSAA (2011+)**, Topographical database, Wetland restoration data

- **Extensive semantic** exercise, well documented, 300+ crop codes,

- More information: NIR 2023, DCE, TechSpec



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Conclusion

- **Several MS use IACS data** for the GHG inventory to better estimate GHG emissions/removals in the LULUCF sector
- For the MS with spatial explicit data usage, the **IACS data are considered as a backbone structure** providing validated information about agricultural sector.
- Lack of online/public data availability should not be a constrain or a blockage factor for reusing data within institutions of a MS for the GHG inventory.
- Publicly available data (i.e. LPIS/GSAA) may boost development and data uptake
- From the **LULUCF perspective there is still work to be done** in the context of spatial data harmonisation, semantics and interoperability to enhance the inventory and reduce the uncertainty

Thank you for your attention

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