

LULUCF Instances: first prototype products.

Status, possible use, collaboration with countries.



Land Monitoring

JRC LULUCF Workshop 2023

LULUCF inventories for enhanced climate action

11-12 May 2023

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Reminder: CLMS products and LULUCF – the general idea

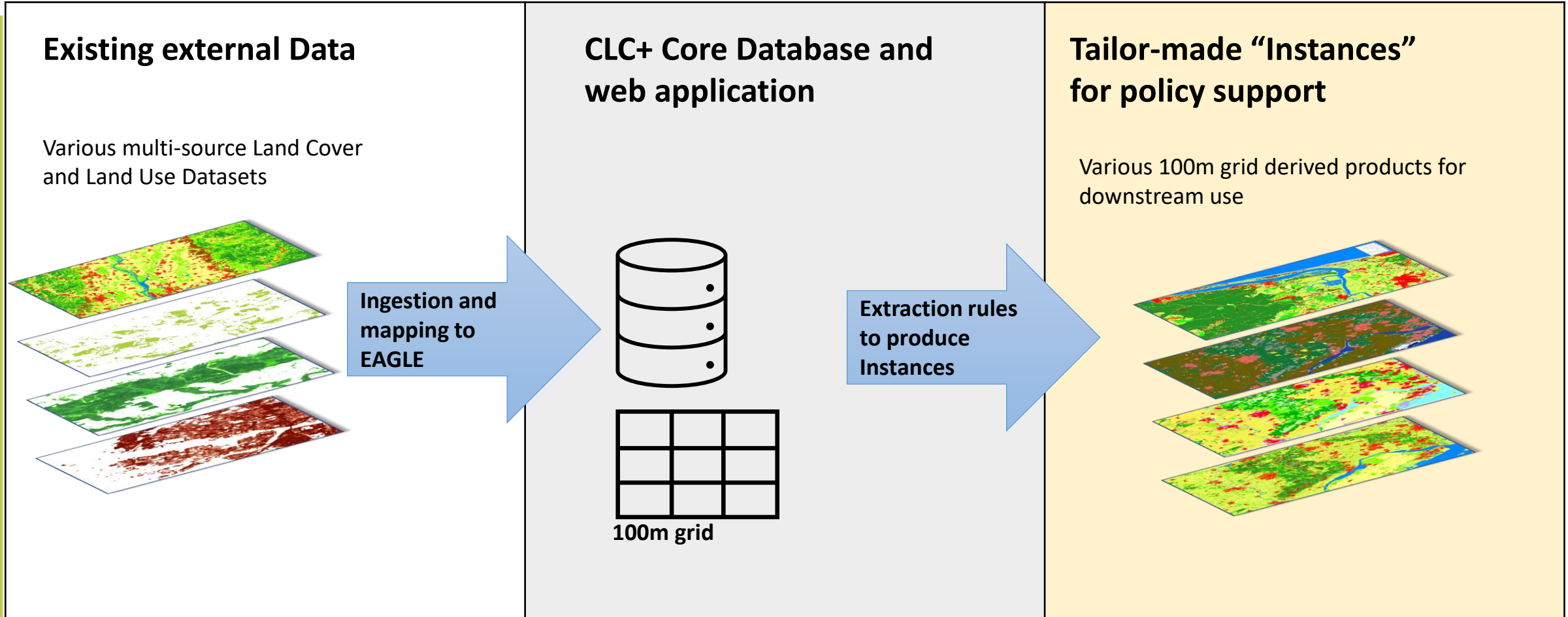
- use Copernicus Land Monitoring Service (CLMS) geospatial data **to support the LULUCF process**
- Idea: **use a flexible database solution (CLC+ Core)** that can
 - **harmonize** existing (dissimilar) LC/LU input data by using a common nomenclature (EAGLE)
 - **combine** existing data by developing extraction rules in the system
 - **output 100m grid**, tailor made products (**LULUCF instances**)



- **specific LULUCF products (instances):**
 - Are being produced by EEA, to provide EEA with (country) **independent activity data proxies**
 - Can be explored and produced by **countries** that are **developing their own spatially explicit monitoring/reporting**



CLC+ Core: Workflow from input data to instances





CLC+ core at <https://clcplusplus-core.land.copernicus.eu/>

The screenshot shows the CLC+ Core web interface. At the top, there are navigation links for 'Data Catalogue', 'EAGLE Ontology', 'About EAGLE', 'Organisations', and 'Users'. The main header displays 'Extraction 'workshop_example_extraction'' with a status of 'EXTRACTED'. Action buttons include 'REPUBLICHS ON GEOSERVER', 'START EXTRACTION', 'DOWNLOAD', and 'PUBLISH'. The left sidebar contains 'General Information' for the extraction, including Name, Country, Region, Reference Year, and Time Range. The main area features a map of Copenhagen, Denmark, with various land cover classes highlighted in red and purple. Below the map is a table of 'Input Classes'.

Class Code	Name	Ingestion	Eagle Elements	100% Eagle compliant	Colour	Show in Map
1	Sealed (buildings and flat ...	CLC+Backbone (2019)	Sealed Artifici...+4	<input checked="" type="checkbox"/>	Red	<input checked="" type="checkbox"/>
1	111 - Continuous urban fa...	Corine Land Cover (CLC) 2...	Sealed Artifici...+5	<input checked="" type="checkbox"/>	Purple	<input checked="" type="checkbox"/>

CLC+ Core is a consistent multi-use grid database repository

- populated with a broad range of land cover, land use and ancillary data from the CLMS and other sources
- **Currently access only with EIONET account**
- Options for country specific online training can be explored
- Contact LULUCF@eea.europa.eu for more information





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LULUCF instance initial input data

Product Category	Product Name	Reference year	Data format
HRLs 2018			
Imperviousness	Degree of Imperviousness	2018	Raster
Forest	Tree Cover Density	2018	Raster
Forest	Dominant Leaf Type	2018	Raster
Grassland	Grassland	2018	Raster
Water and Wetness	Water and Wetness	2018	Raster
Small Woody Features	Small Woody Features	2018	Raster
CLC / CLC+ Backbone 2018			
CLC raster	Corine Land Cover	2018	Raster
CLC+ Backbone	Corine Land Cover Plus Backbone	2018	Raster
Local Components 2018			
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 used			
EUCROPMAP 2018	d'Andrimont et al 2021 EU Crop map 2018	2018	Raster

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LULUCF instance initial target classes/categories

Core Category	Subcategory
FL	Deciduous
	Coniferous/Evergreen
	Small woody
	Transitional woodland
CL	Annual crops
	Perennial crops
GL	Pastures
	Shrubs
	Other grasslands
WL	Wetlands (managed)
	Wetlands (unmanaged)
	Vegetated wetlands, swamps
	Exploited Peat bogs
	Unexploited Peat bogs
	Peat bogs undefined use
S	Settlements
	Urban green areas
OL	Bare soil and rocks
	Lichen and moss
	Permanent snow and ice
	Unspecified Other Land



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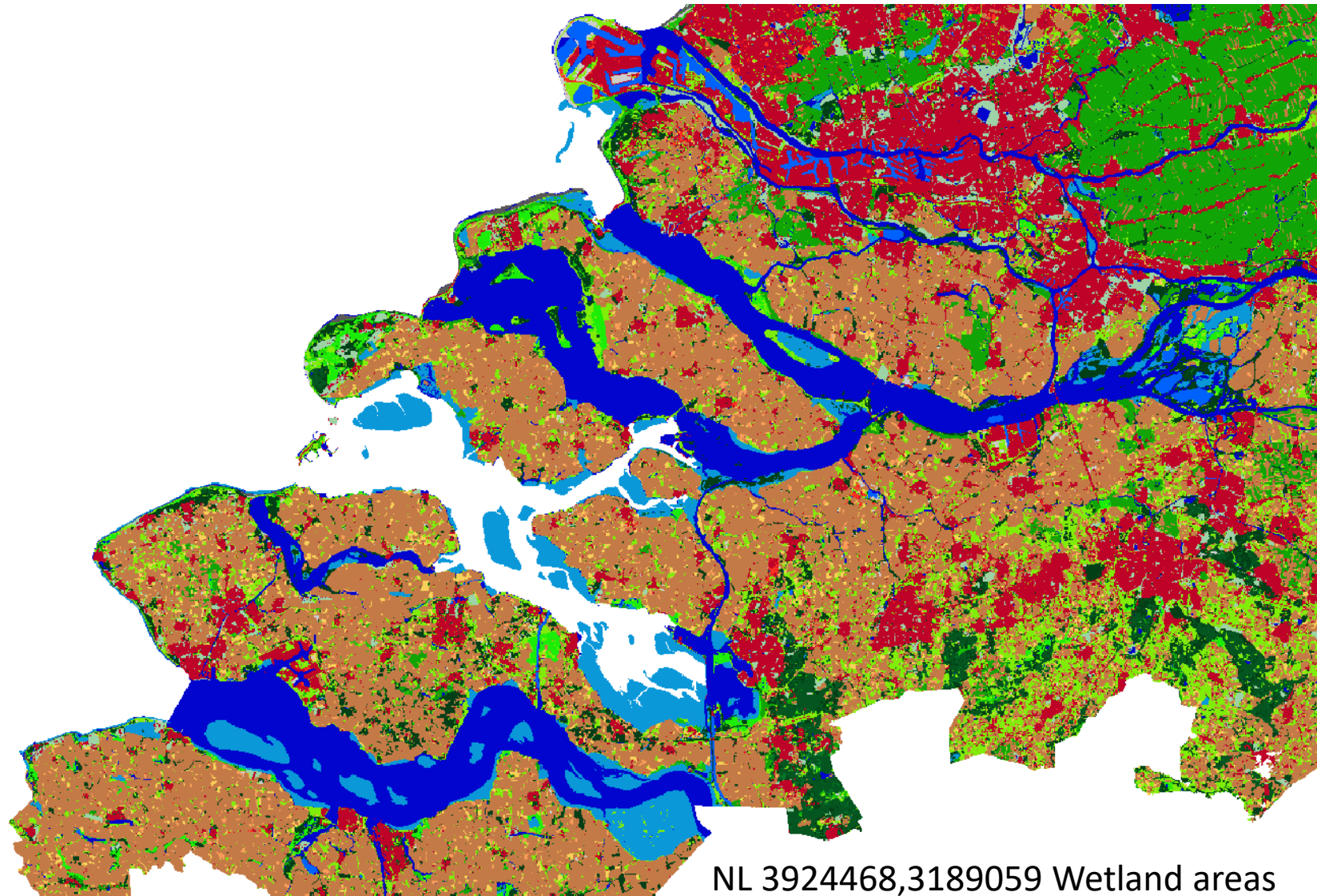
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First example beta (final prototype) 2018 LULUCF instance



- S Settlements
- FL transitional woodland
- FL deciduous
- FL coniferous
- CL annual crops
- CL perennial crops
- GL pasture
- GL shrubs
- GL natural grassland
- WL Wetland managed
- WL Wetland unmanaged
- WL Water managed
- WL Water unmanaged
- S green urban areas
- FL other forestland
- CL other cropland
- GL other grassland
- S other settlements
- OL bare soil and rocks
- OL permanent ice and snow
- OL lichens and mosses
- OL other otherland
- S Burnt areas
- FL Burnt areas
- CL Burnt areas
- GL Burnt areas
- unclassified, clouds
- outside area

NL 3924468,3189059 Wetland areas



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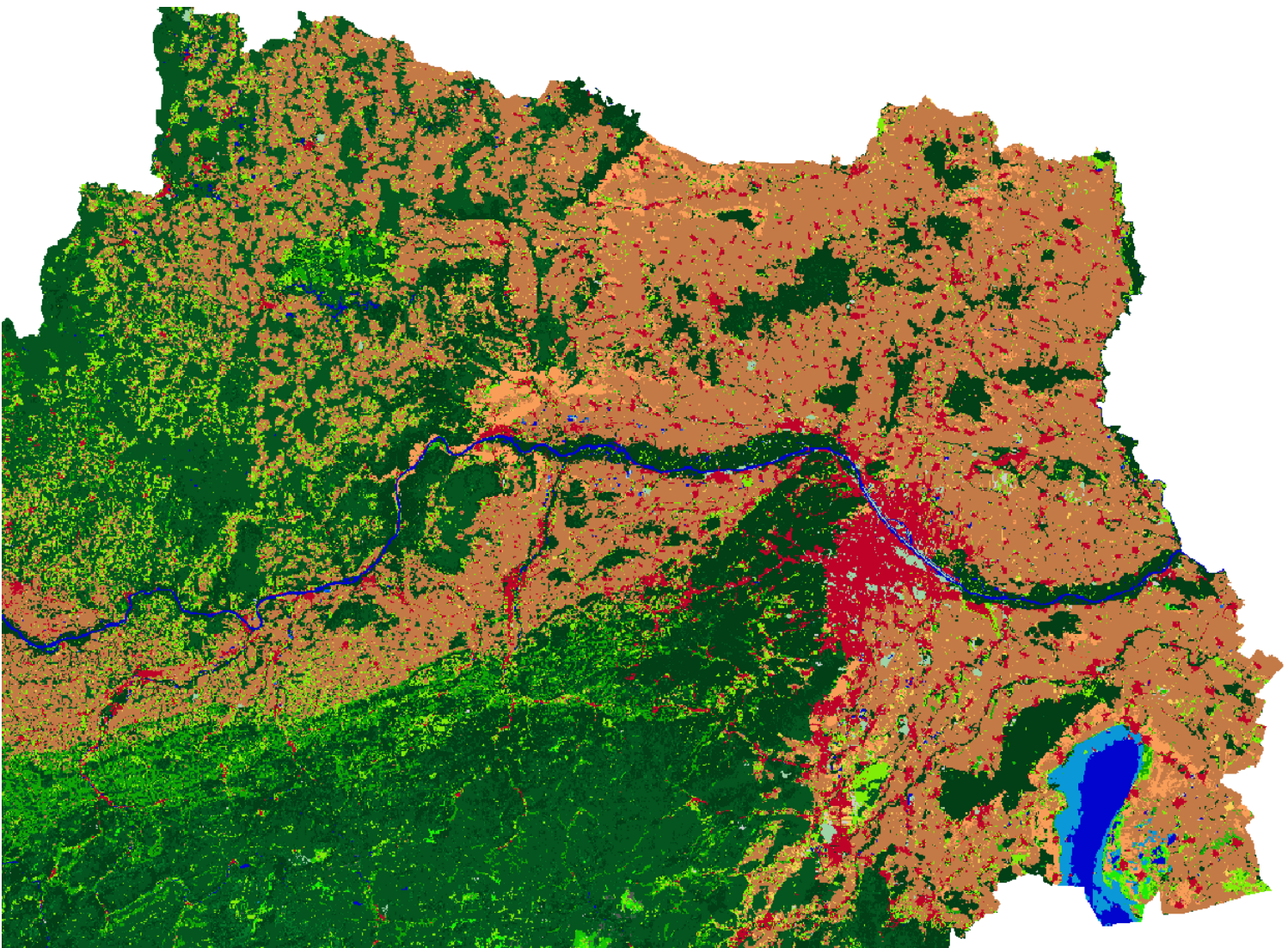
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First example beta (final prototype) 2018 LULUCF instance

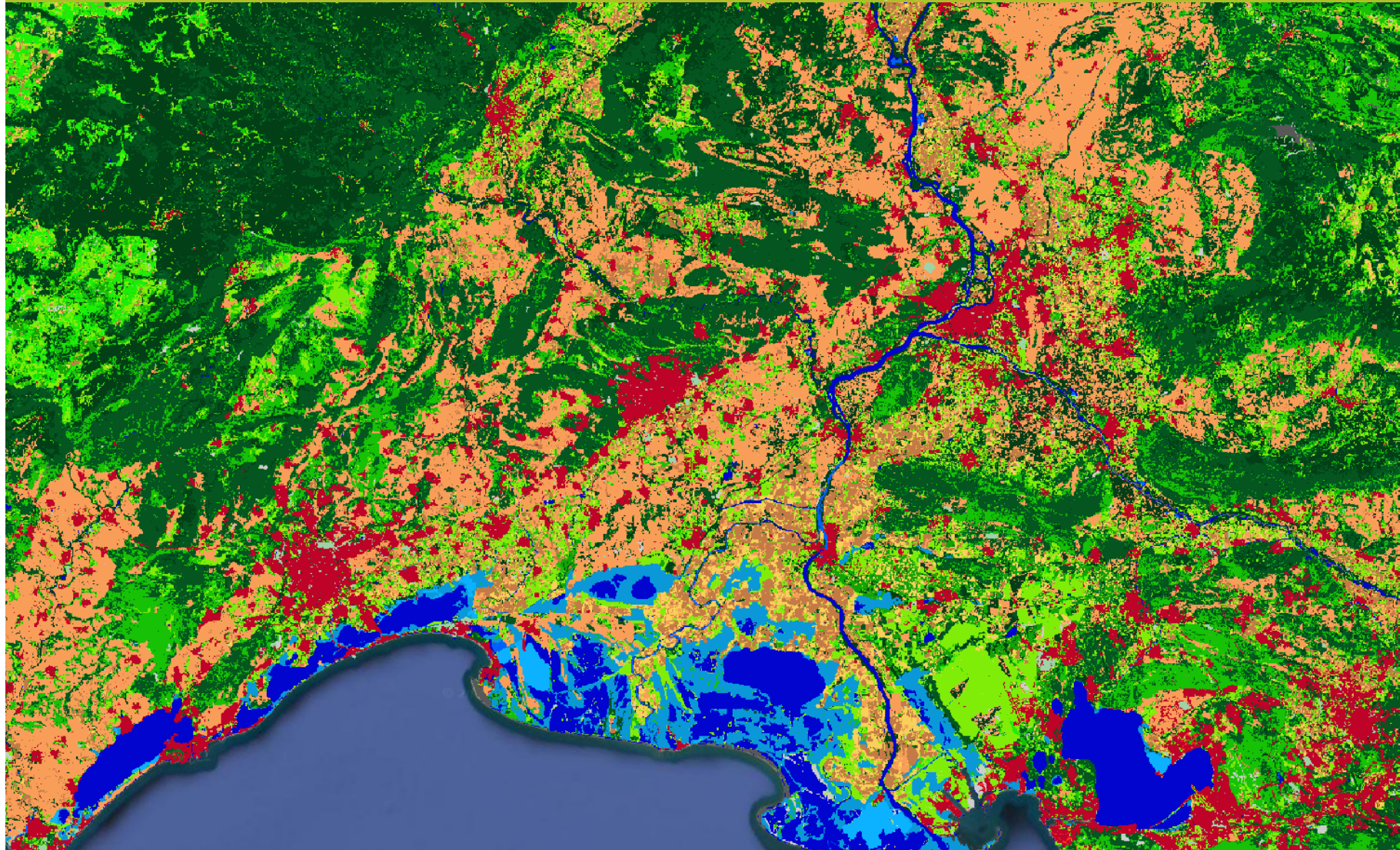


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AT 4766387,2805010 Lake Neusiedel, agricultural area



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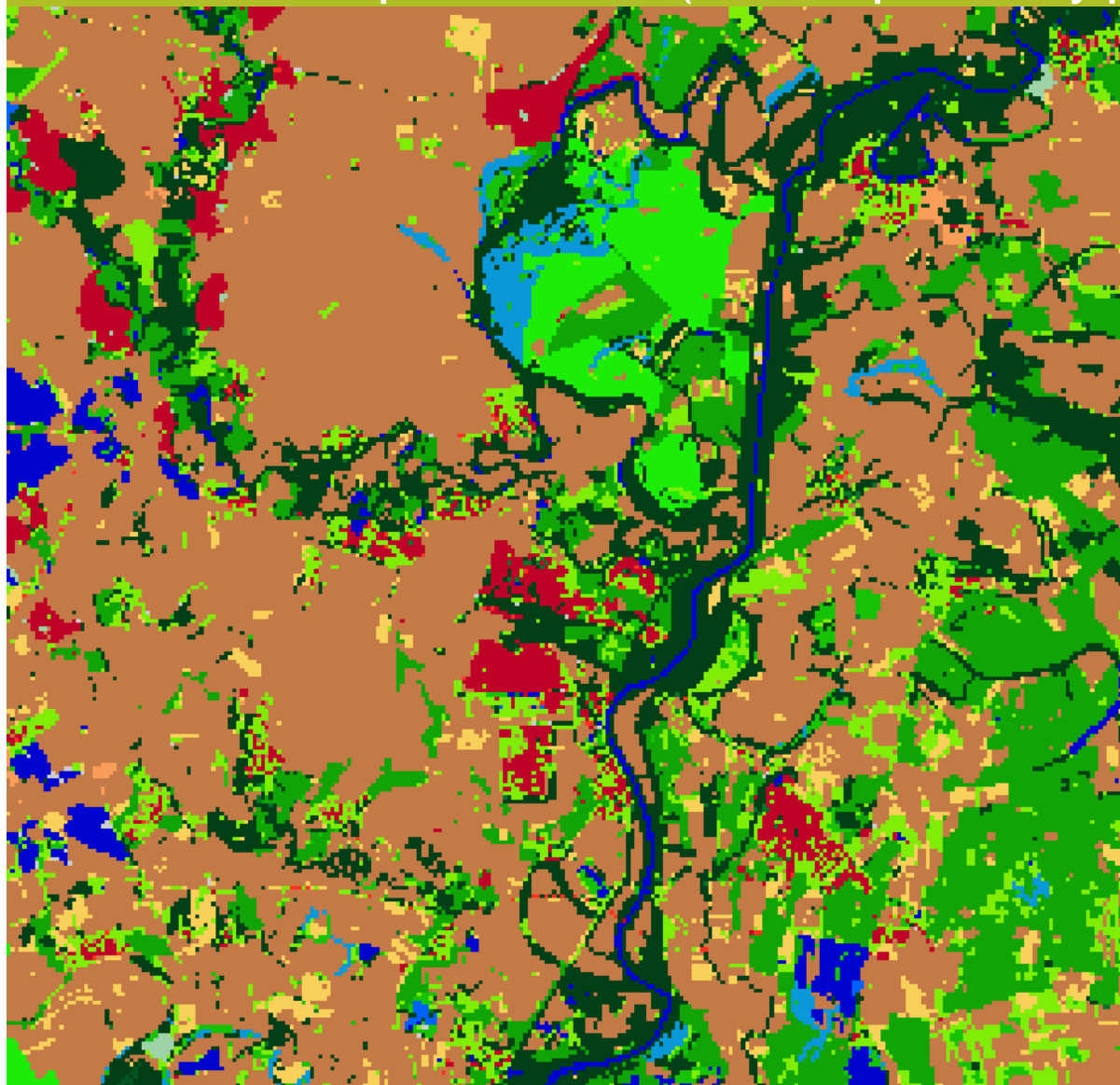
- FR 3859786,2316528 almost all classes mapped in this extent





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- HU 5145194,2821373 riparian area

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Comparison reported values and LULUCF instance results

2018	AT*	AT (alpha version)	CZ*	CZ (alpha version)	LUX*	LUX (alpha version)	FR*	FR (KP)*	FR (alpha version)	HU*	HU (alpha version)	NL*	NL (alpha version)	ES*	ES (alpha version)
FL	4046,7	4039,6	4046,7	3111,9	89,2	104,2	24659,7	23677,1	18239,0	2055,2	2354,7	364,8	464,1	15698,1	13404,6
FL - FL	4039,5		4039,5		89,1		24597,7	23615,1		2053,9		363,0		15695,4	
L - FL	7,2		7,2		0,0		62,0	62,0		1,3		1,8		2,7	
CL	1404,5	1404,9	1404,5	3635,4	67,1	50,4	18165,3	18105,7	16951,8	5197,3	4417,4	853,6	969,7	20015,1	11446,3
CL - CL	1400,5		1400,5		66,8		18023,7	17964,2		5191,3		821,4		20008,5	
L - CL	4,0		4,0		0,3		141,6	141,6		6,0		32,2		6,7	
GL	1340,3	2016,7	1340,3	1570,4	71,5	78,2	15154,3	14151,0	14919,5	1199,4	1806,4	1443,7	1357,1	11894,2	16591,2
GL - GL	1337,9		1337,9		71,1		15164,7	14061,1		1188,2		1396,9		11892,2	
L - GL	2,4		2,4		0,4		89,6	89,8		11,1		46,8		1,9	
WL	153,3	74,1	153,3	1,4	0,9	0,0	1179,2	1158,8	536,8	263,5	0,0	822,9	559,8	419,9	1255,0
WL - WL	152,2		152,2		0,9		1169,2	1148,1		263,3		820,2		419,6	
L - WL	1,1		1,1		0,0		10,0	10,0		0,2		2,7		0,3	
S	564,1	269,7	564,1	346,8	30,0	21,8	5839,1	5786,6	2318,4	585,5	312,3	630,2	519,0	1465,3	1172,7
S - S	560,0		560,0		29,8		5780,8	5728,4		583,0		622,9		1440,0	
L - S	4,1		4,1		0,2		58,2	58,2		1,7		7,3		25,3	
OL	878,1	412,8	878,1	16,9	0,0	0,6	1549,7	979,3	526,6	2,4	13,7	9,1	11,7	1158,5	2408,4
OL - OL	865,2		865,2		-		1543,1	972,6		2,4		9,1		1158,5	
L - OL	12,9		12,9		-		6,6	6,6		0,0		1,2		0,0	
nodata		176,5		204,5		4,4			1696,1		397,4		107,7		4390,7
outside area		16771,4		17278,4		1837,6			83223,8		15864,6		12787,5		323501,8
total area	8387,0	8394,4	8387,0	7887,4	258,6	259,5	66547,4	63857,8	55188,3	9303,3	9301,3	4154,2	3989,7	50651,0	50668,8

*numbers are taken from the countries 2022 submissions CRF table 4.1. The numbers are for the reference year 2018 and all numbers are in *kha*.





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LULUCF instance timeline & next steps

- Significantly **improved 2018 beta version** by end May 2023
- Testing of beta version and comparison of statistics with country reported data
- 2021 inventory year LULUCF instance in Q4/2023
- Production **in sync with inventory years from late 2024** provision of 2022/2023 inventory year (able to support comprehensive review in 2025)
- Inclusion of **additional and new datasets** (wetlands, soil?, crops)
- Testing of **adopting extraction rules to country specific** LULUCF category definitions (in particular: Forest)
- **Developing use for MRV system** at EEA
- **outreach to countries** for cooperation/feedback and possible training



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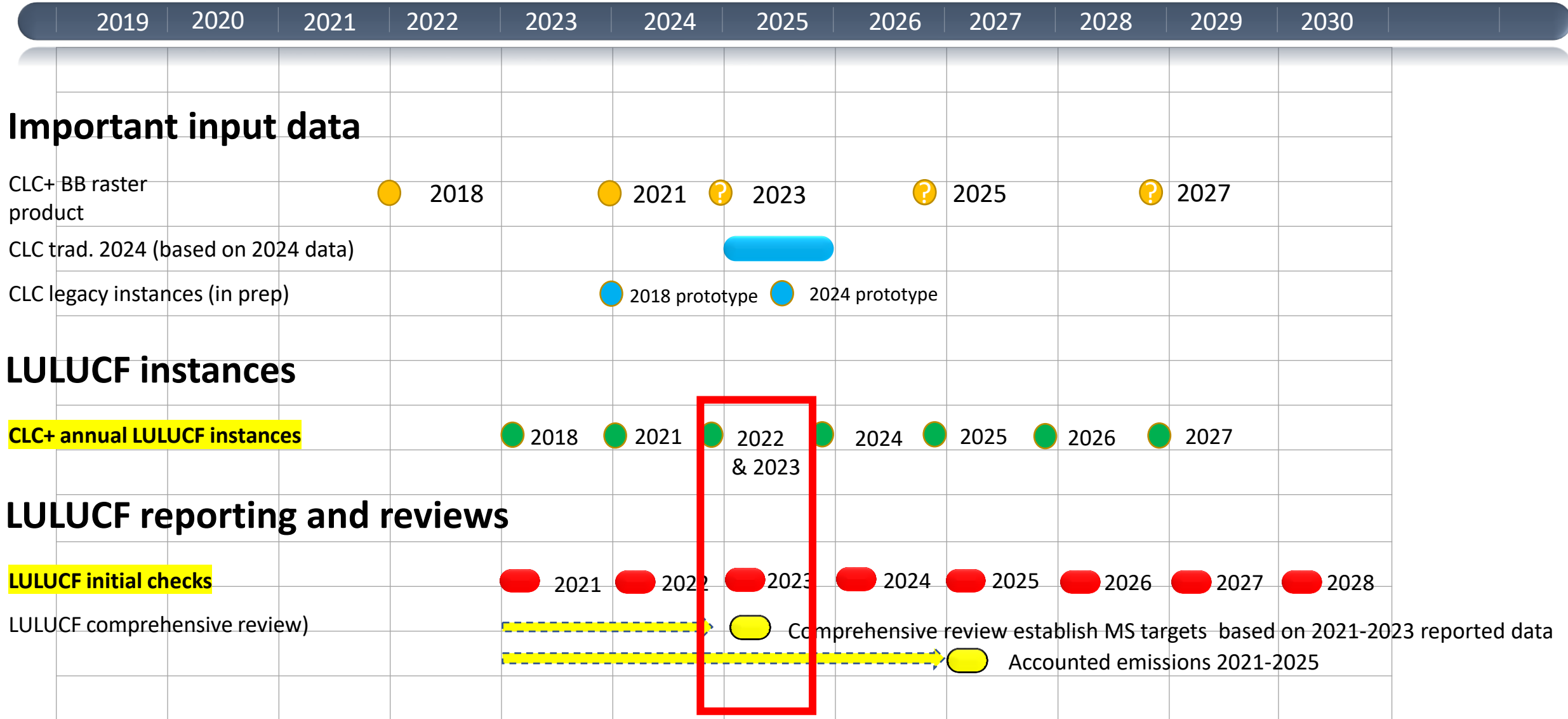
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Timeline LULUCF instances under CCA 2021-2027





Invitation to cooperate with EEA

- Are some countries interested in sharing (samples of?) **country geospatial LULUCF data** for mutual benefit?
 - Identifying problematic classes and areas
 - Identifying data gaps
- Exploring how far countries can go **with their own data** in using CLC+ Core (can be confidential)
- **Possible CLC+ Core training** for LULUCF can be discussed for individual countries or small groups of countries
- **Upcoming event 18/19th September** on: “*Geographic tracking of carbon emissions and removals from the land use sector*”.
Format and details tbd.





Take-home message

- EEA is developing an Earth Observation based “**LULUCF instance**” product, as an independent proxy for LULUCF activity data
- The **web application CLC+ Core** is used to create the LULUCF instance
- **CLC+ Core** is available for country experts to explore and use also for their own LULUCF related purposes
- We would like to **encourage cooperation** with, and feedback from countries and the JRC





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Thank you!

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To find out more



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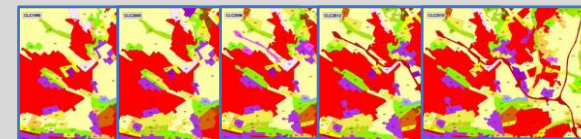
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CLC, CLC+, CLC+BB, CLC Core etc what do these terms mean?

Corine Land Cover (CLC) - Also called CLC “traditional”:

- Computer-aided visual image interpretation and change mapping based expert land use and land cover products at high thematic resolution, but low spatial and temporal resolution with a time series going back to 1990 (2000, 2006, 2012, 2018). 2024 update planned.
- Production lead by EEA/ETC, but implemented by countries
- Reliable change data, time series fully consistent, country “ownership”



CLC+ (“Corine Land Cover plus”)

- Unlike CLC (traditional), CLC+ is a **system** that contains **both new geospatial data** (CLC+BB raster and vector), **and a database/web app** (Core). CLC+ (as a system) aims to be a **generic multipurpose successor for CLC**, more agile and flexible to support multiple EU policies:
- **CLC+ BB** (Backbone): Geospatial data component of the CLC+ System. Raster and vector products.
 - Raster: New wall-to-wall (**pure**) **land-cover product** with 11 classes. Available for 2018, 2021 in production (available end 2023), update frequency then every 2 years (2021-2023-2025 etc).
 - Vector product: 18 class vector product aiming at producing “meaningful landscape objects”. Available for 2018 in principle, but use-case, distribution and possible future updates under discussion.
- **CLC+ Core**: Database and web-application **based around the EAGLE concept**. Very heterogeneous land use and land cover is ingested into the system, “mapped” to the EAGLE nomenclature and can then be combined to create tailor made 100m grid geospatial output (instances). Initial instances will be:
 - CLC+ LULUCF instances: aiming at creating independent proxies for the LULUCF categories (activity data)
 - CLC+ “CLC legacy” instances: developing a bottom-up product that will longer term enable the continuation of the CLC (traditional) time series.