

EO-based MRV for Non-Forest Land Categories in Romania

Progress, Limitations, and Improvement Perspectives



Marius Constantinescu, Antoaneta Roman,
Alin Chițu, Felicia Bucura

**Conference: Earth observation for
monitoring, reporting and verification of
carbon removals 2025**

Event

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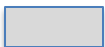



Context

- Integration of EO with national statistics and administrative datasets
 - ❖ *Annual LU Matrix*. Hybrid approach (*EO + statistical*)
 - ❖ *Explicit Geospatial Mapping Workflow*. Combining EO sources (LPIS, CLC, LiDAR)
 - ❖ *Mapping Organic Soils*. Spatial overlay of soil classification and EGM
 - ❖ *EO contribution to Carbon Stock Change Tier 2 development*
- Limitations
- Improvements & Recommendations

- Integration of EO with national statistics and administrative datasets
- ❖ *Annual LU Matrix*



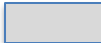



- Integration of EO with national statistics and administrative datasets
- ❖ *Annual LU Matrix*

		To																
		AD(kha)	Ag	Pp	Pf	Pa	Vv	Lv	AtA	Pd	AtVF	Jn	Tf	AU	ZuV	ZuA	AT	
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 Cropland subcategories	 Forestland subcategory	 Settlements subcategory
 Grassland subcategories	 Wetlands subcategories	 Otherland subcategory

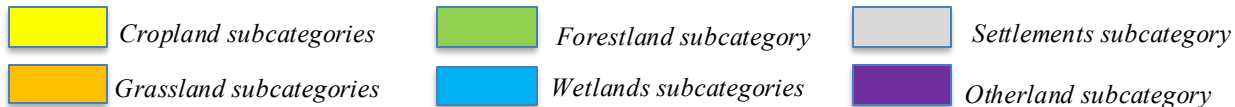
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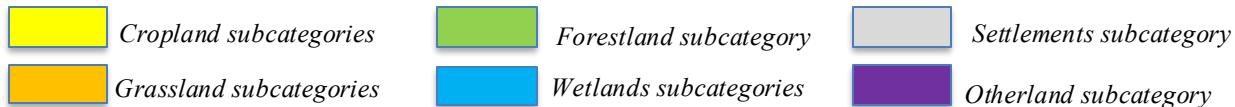
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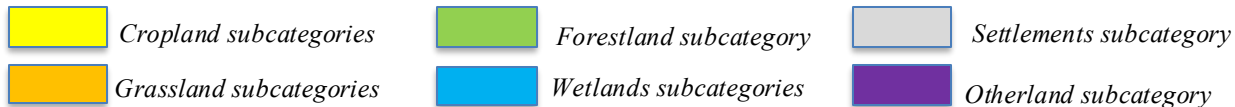
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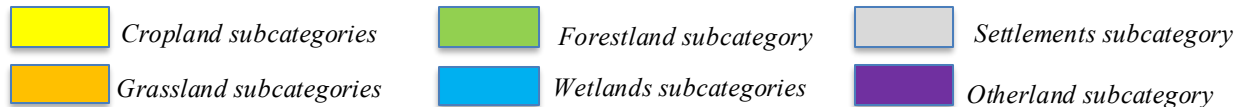
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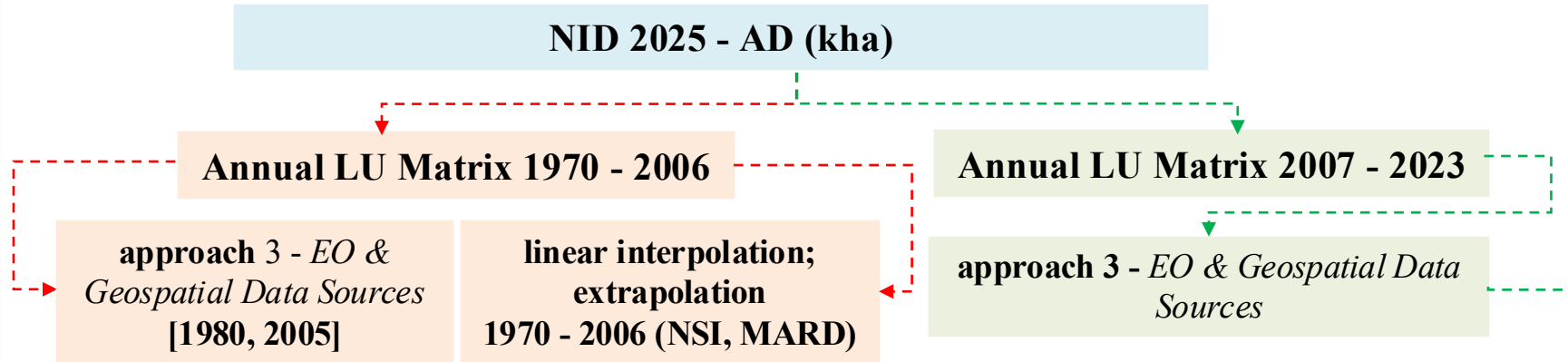


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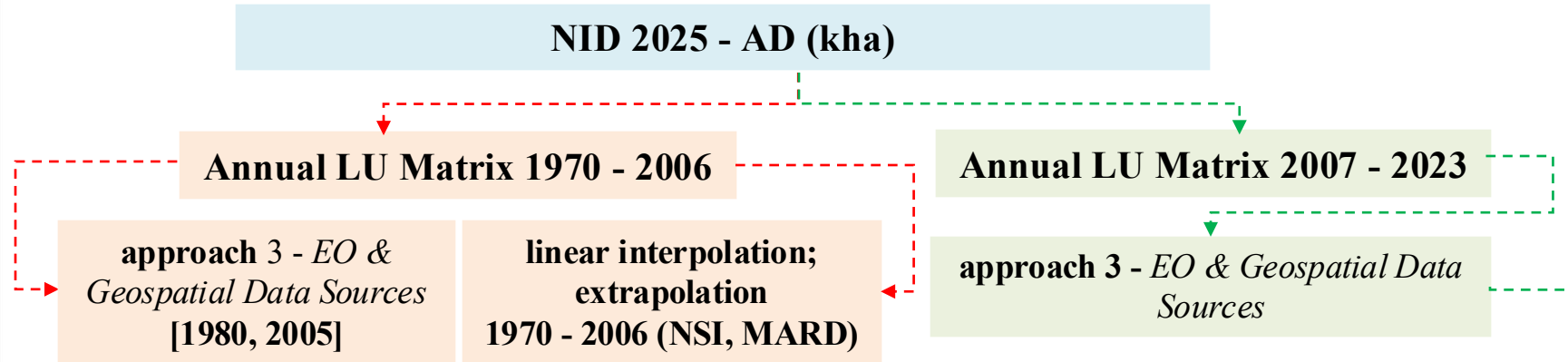
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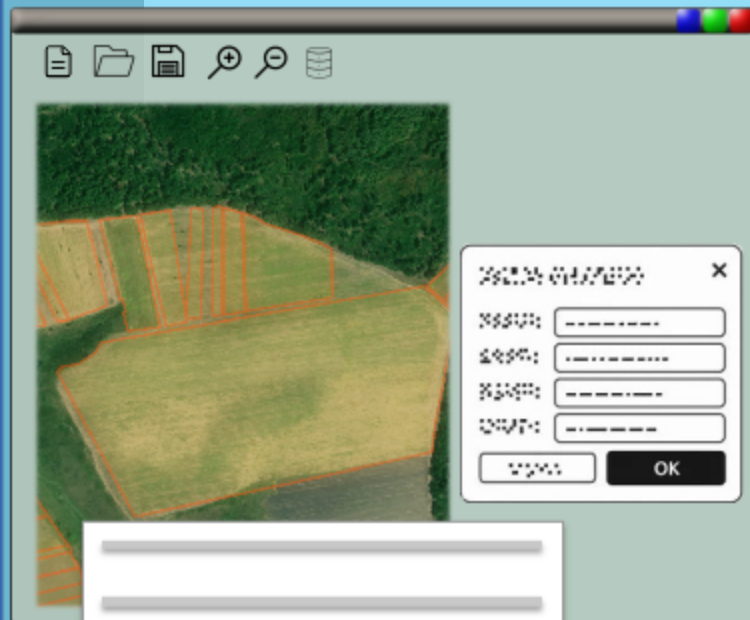
- Integration of EO with national statistics and administrative datasets
- ❖ *Annual LU Matrix*



Land use	Statistical analysis	Annual LU Matrix 1970 - 2006	Annual LU Matrix 2007 - 2023
Cropland	RSD (% AD/ kha)	2.12	4.27
	± U (%)	30	10
Grassland	RSD (% AD/ kha)	0.92	4.93
	± U (%)	30	10

- Integration of EO with national statistics and administrative datasets
- ❖ *Explicit Geospatial Mapping Workflow*

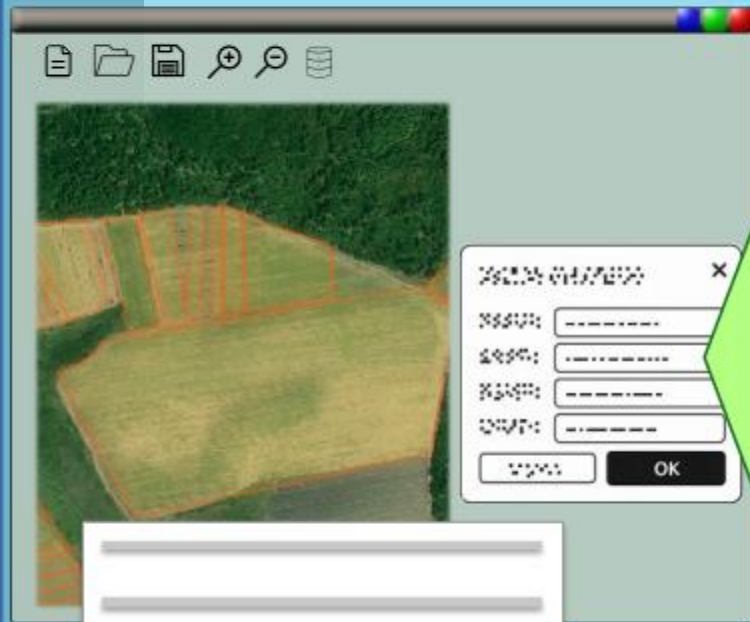
Registered farmers payment requests



Yearly

- Integration of EO with national statistics and administrative datasets
- ❖ *Explicit Geospatial Mapping Workflow*

Registered farmers payment requests



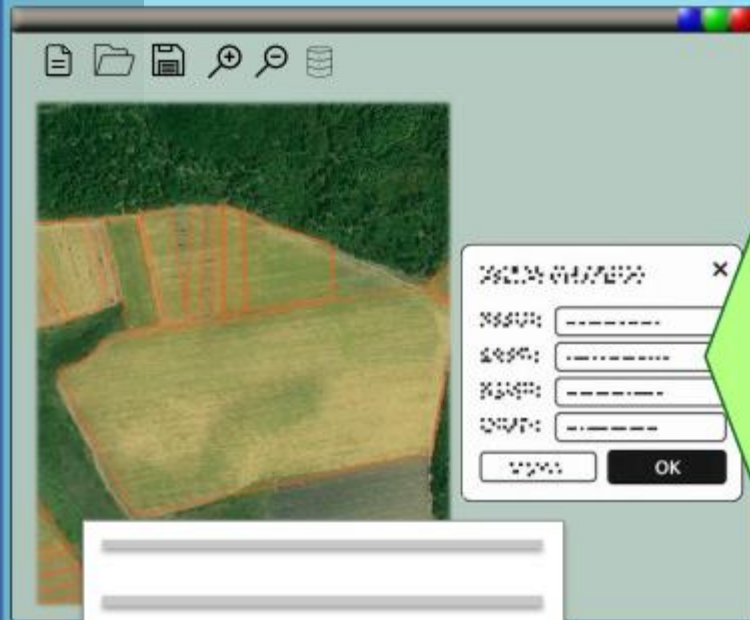
APIA land use classification



Occasionally

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Registered farmers payment requests



Yearly

APIA land use classification



Occasionally

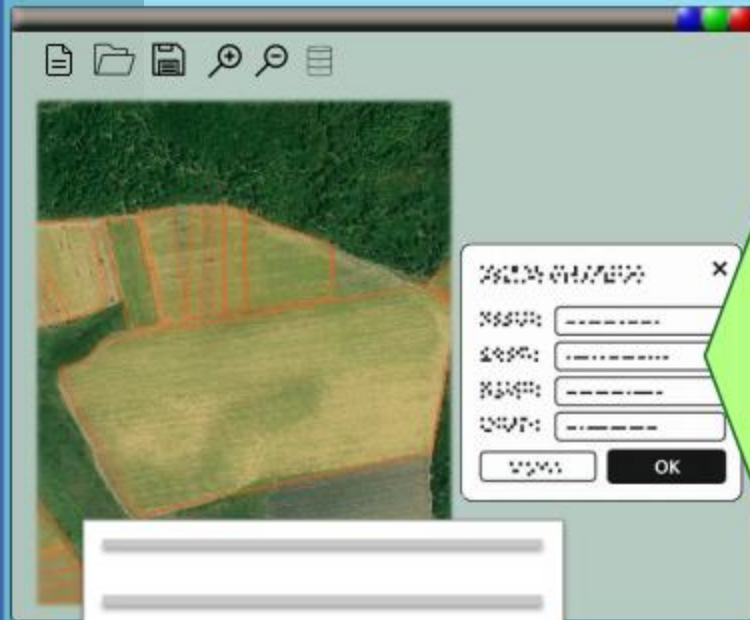
APIA reference (base polygons)



Once (2007)

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Registered farmers payment requests



Yearly

APIA land use classification



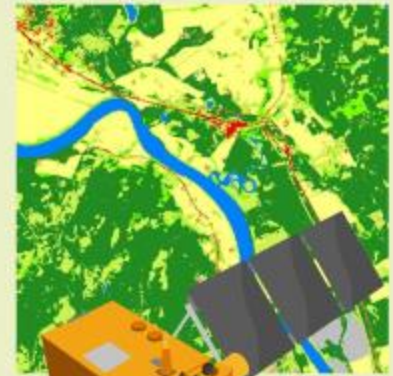
Occasionally

APIA reference (base polygon)



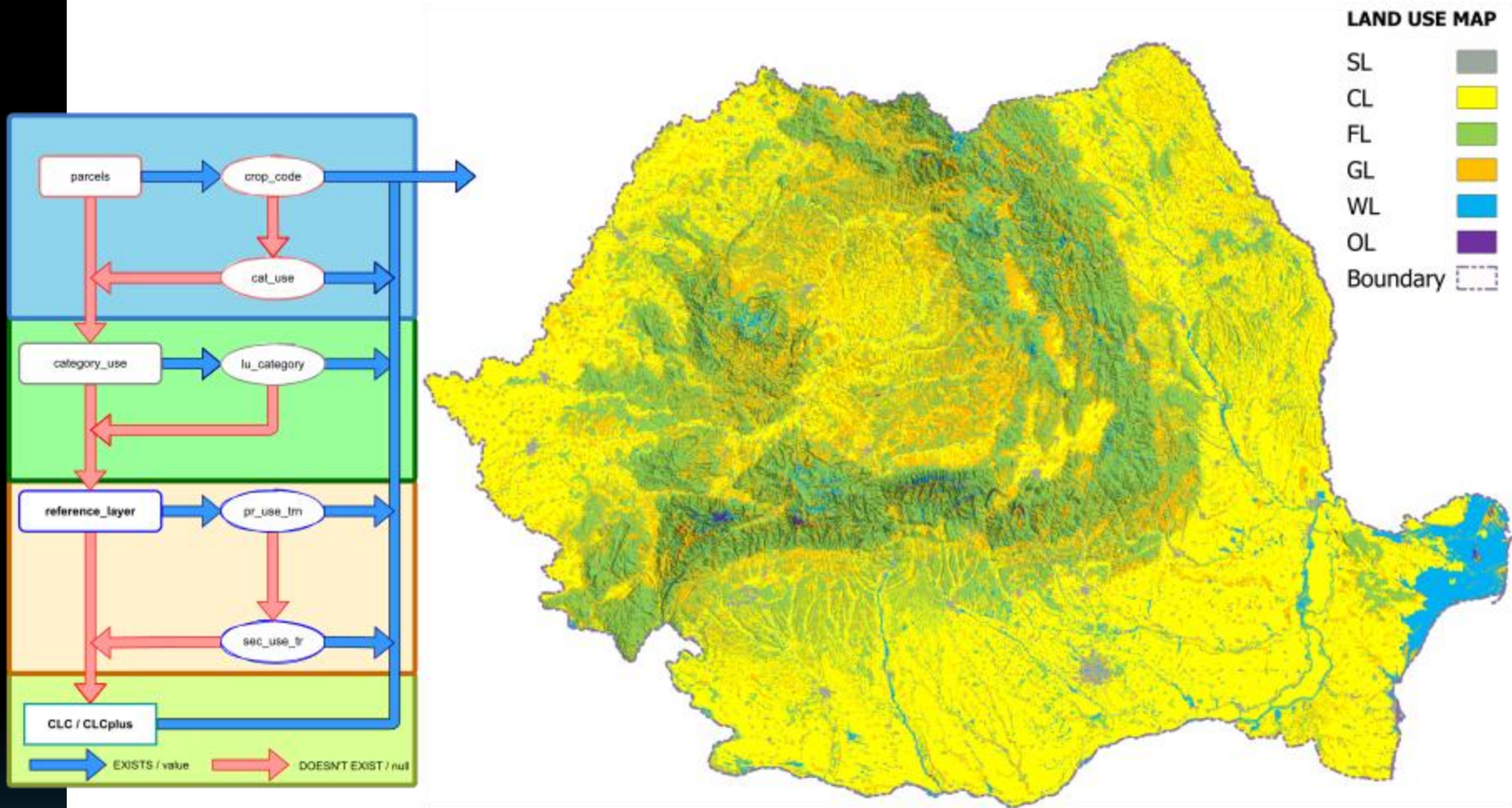
Once (2007)

CLC and CLC+ backbone

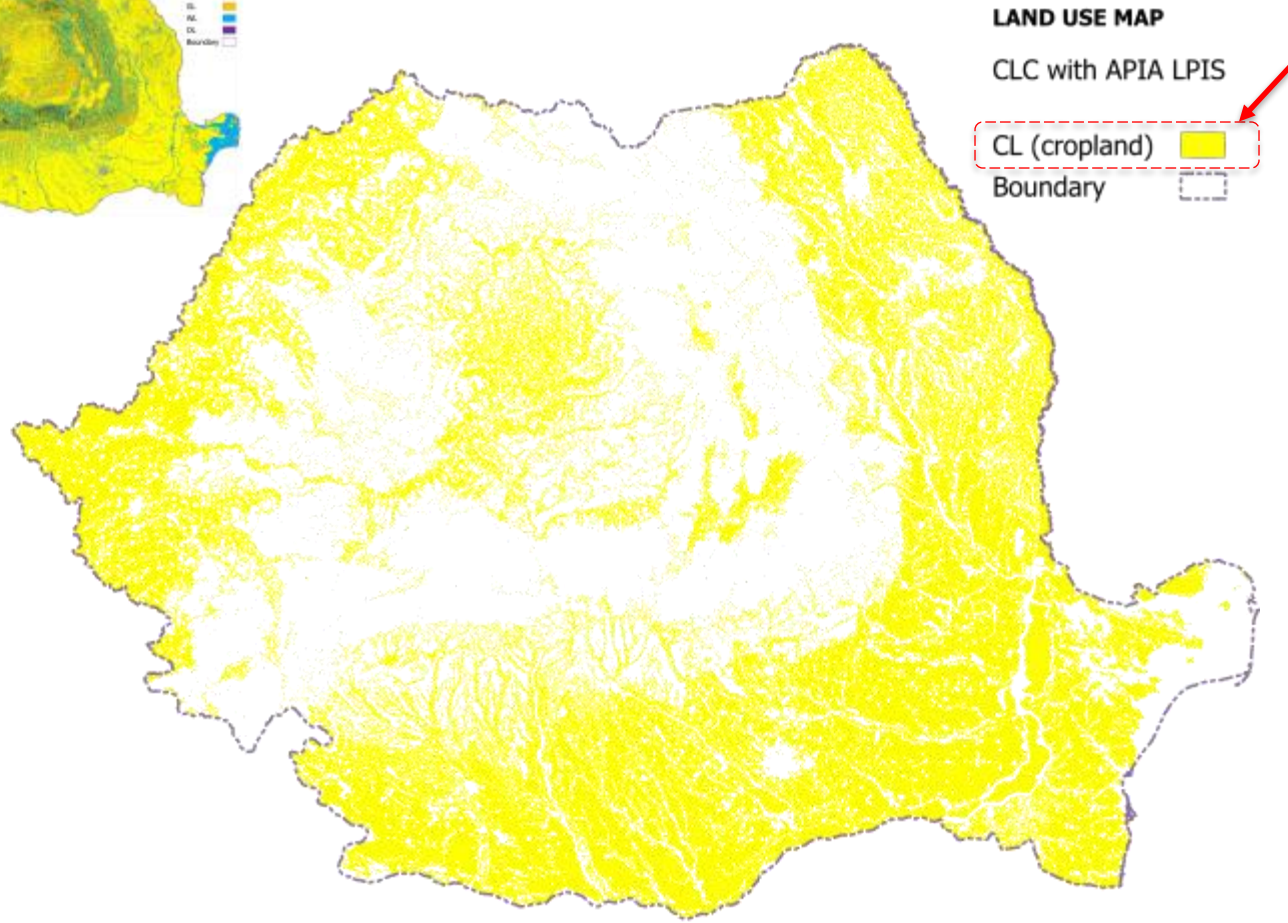
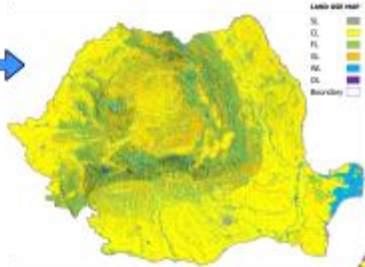
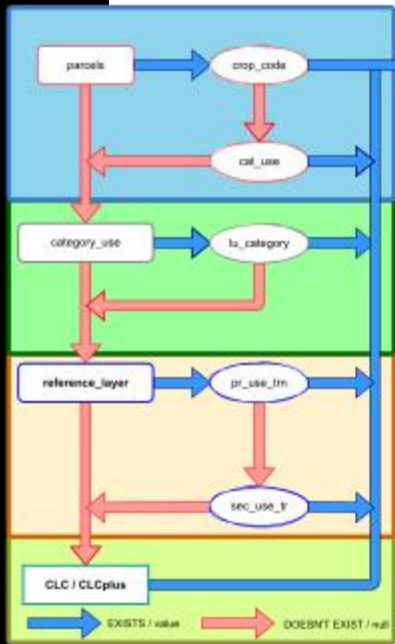


Periodically (6 to 2 years)

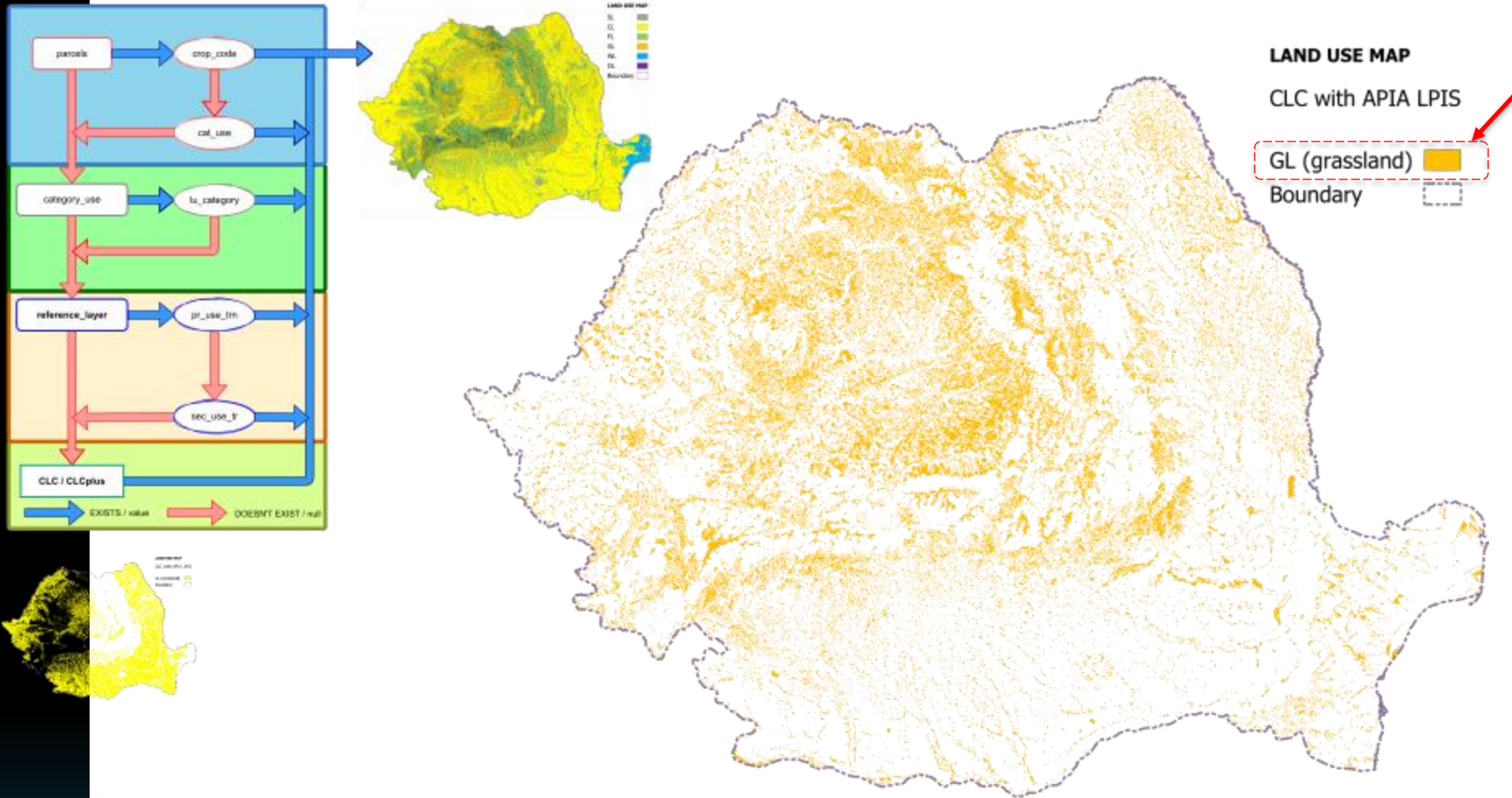
- Integration of EO with national statistics and administrative datasets
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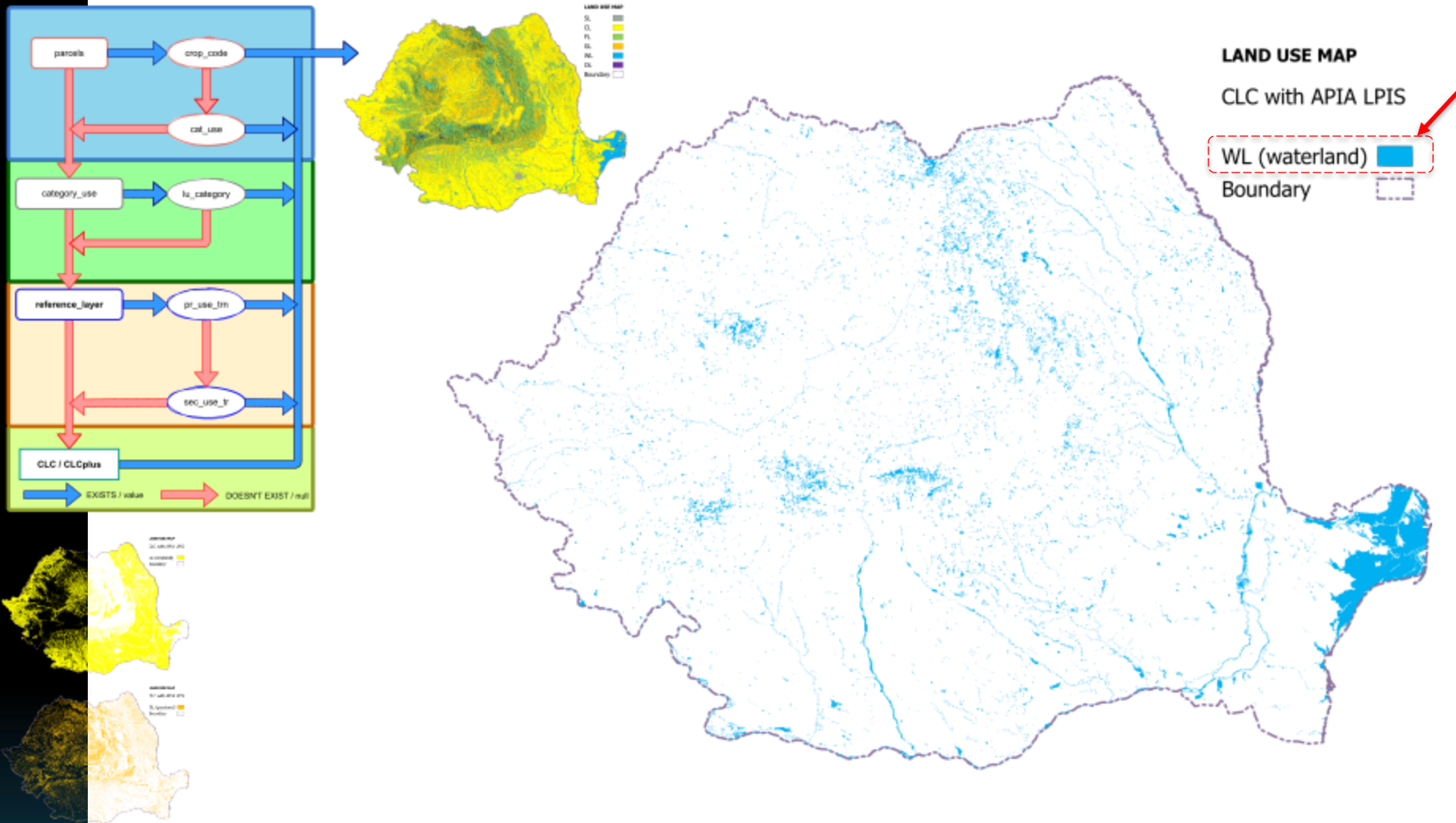
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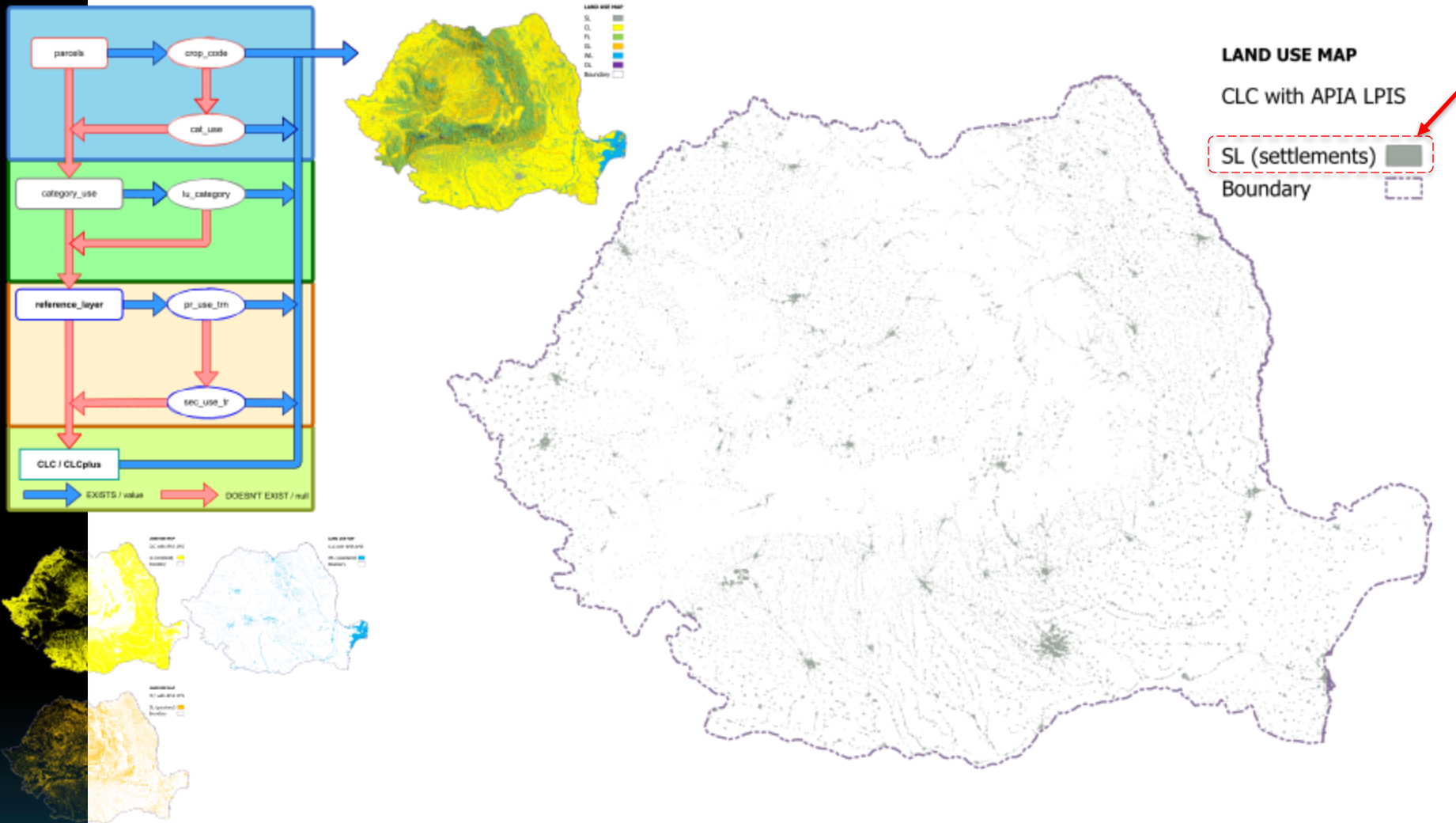
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ICS

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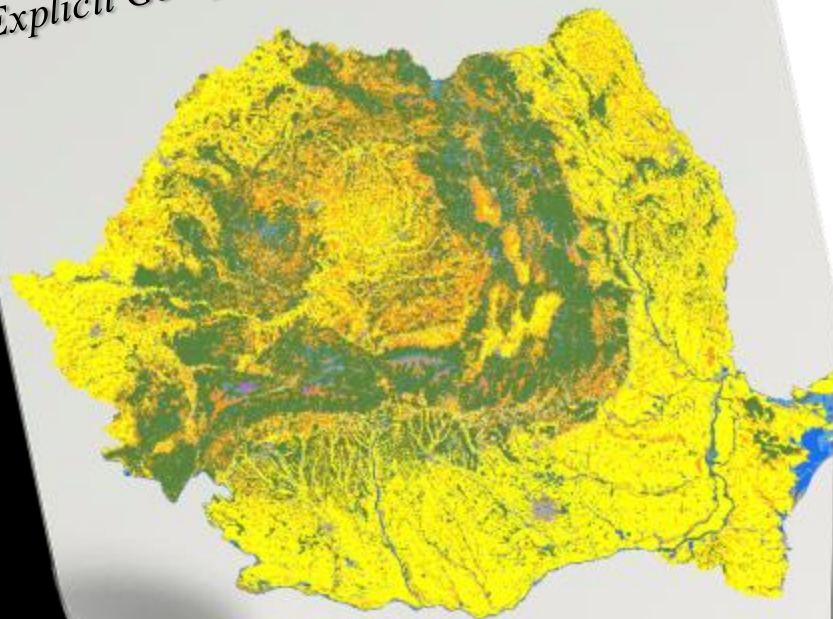
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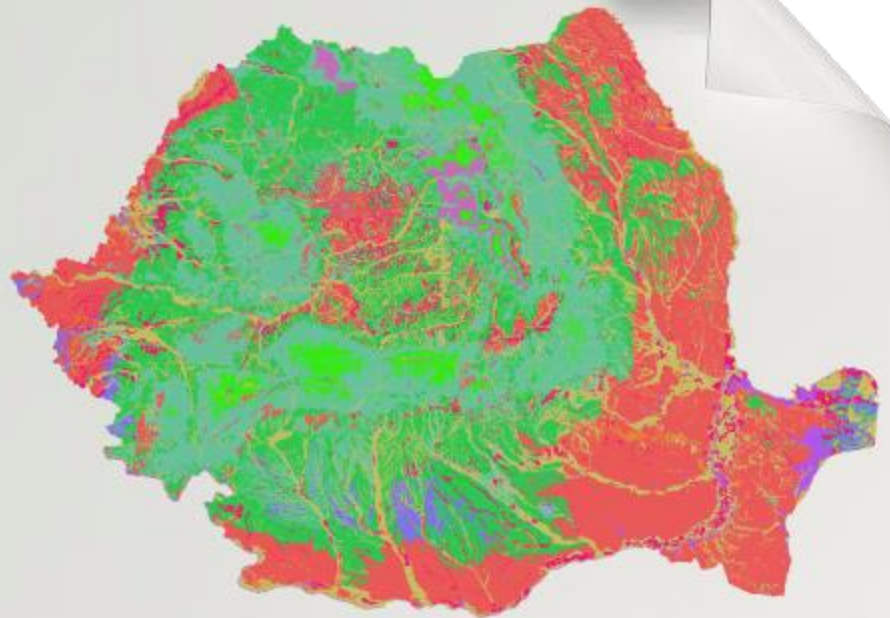
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- ❖ *Mapping Organic Soils*

Spatial overlay of soil classification and EGM

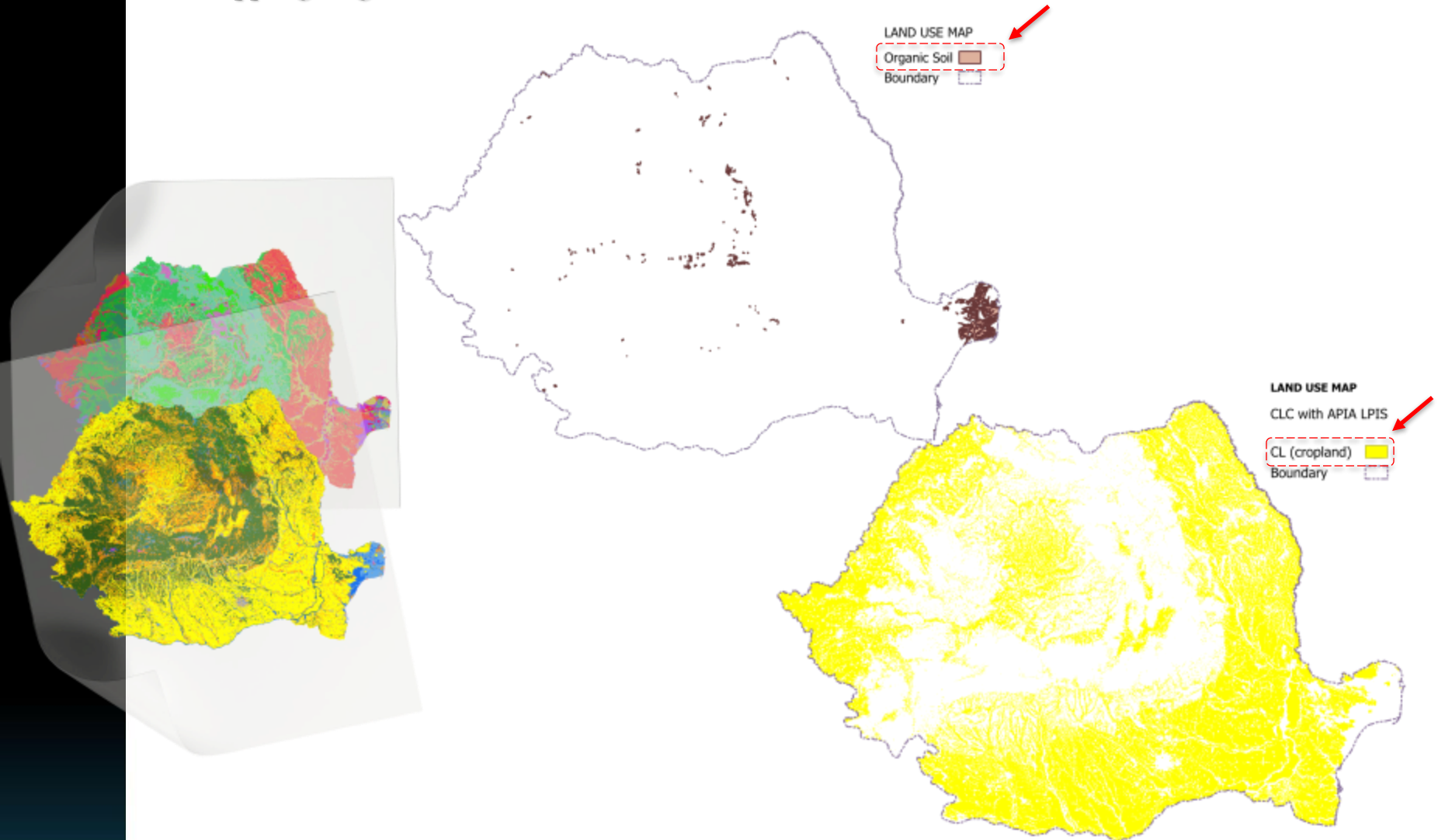
Explicit Geospatial Map



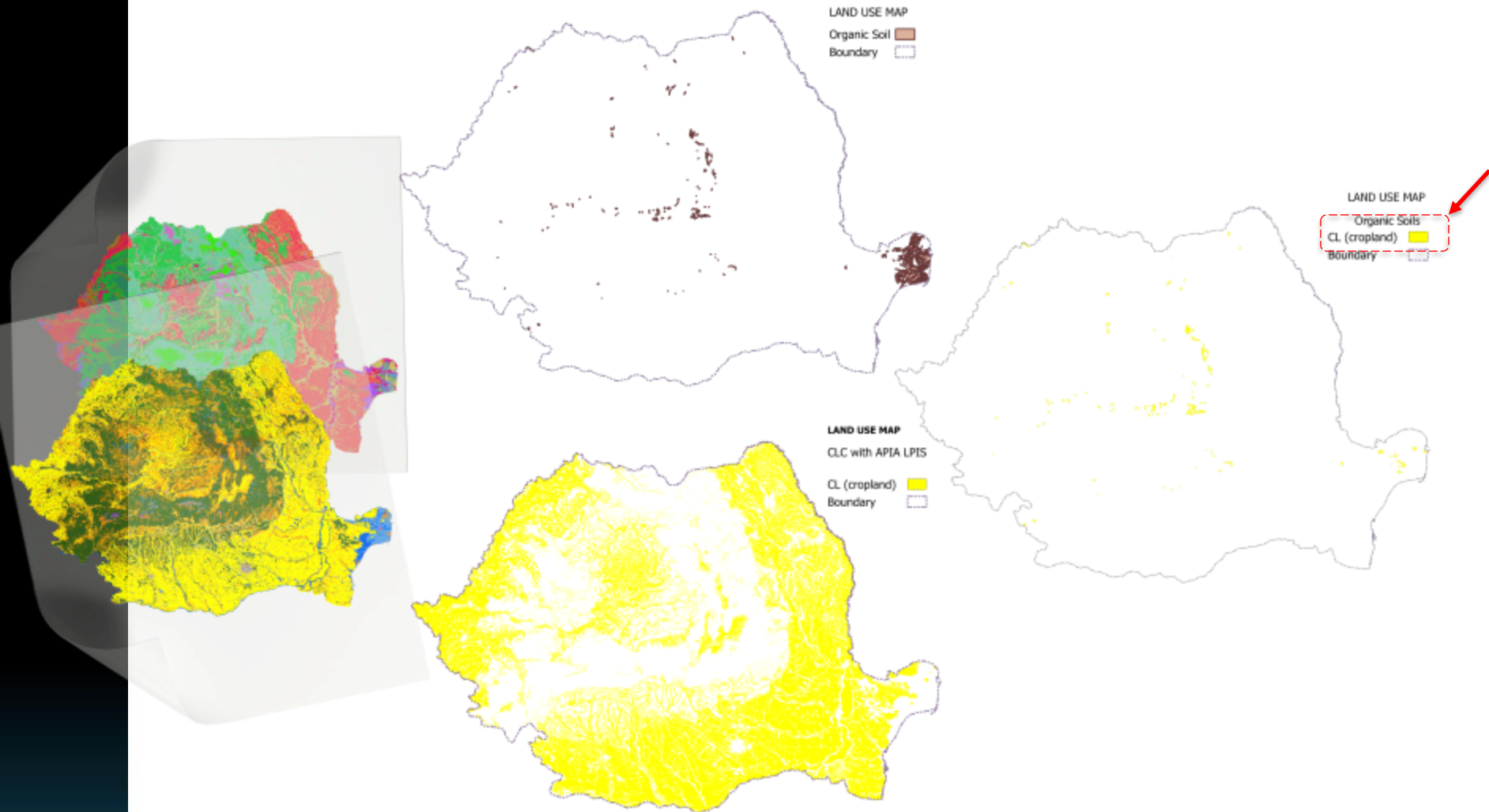
National Soil Classification Map



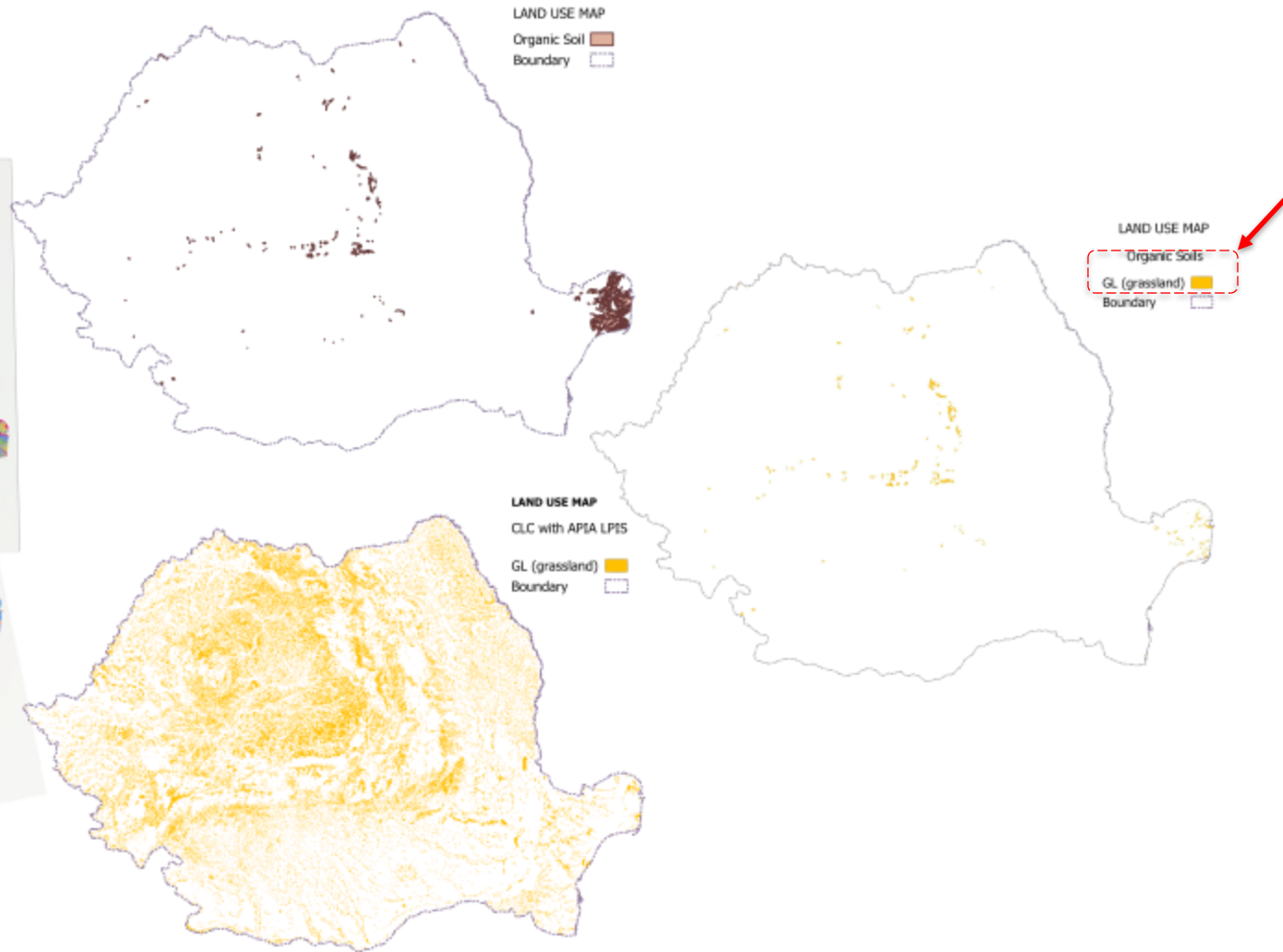
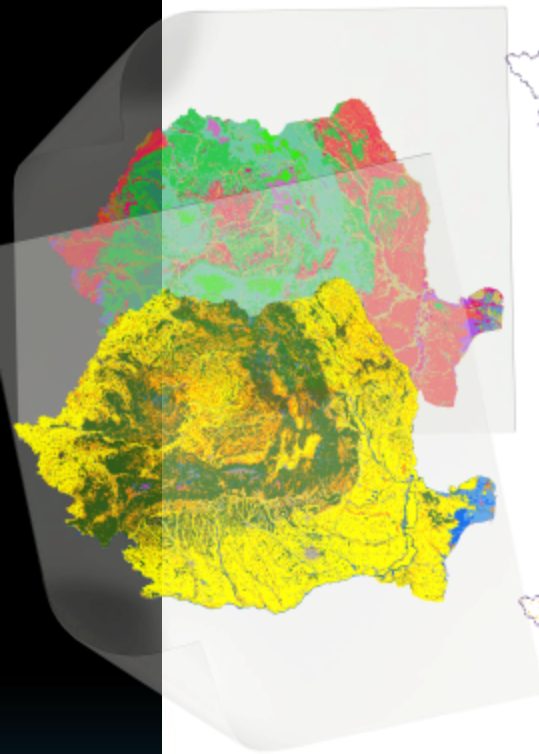
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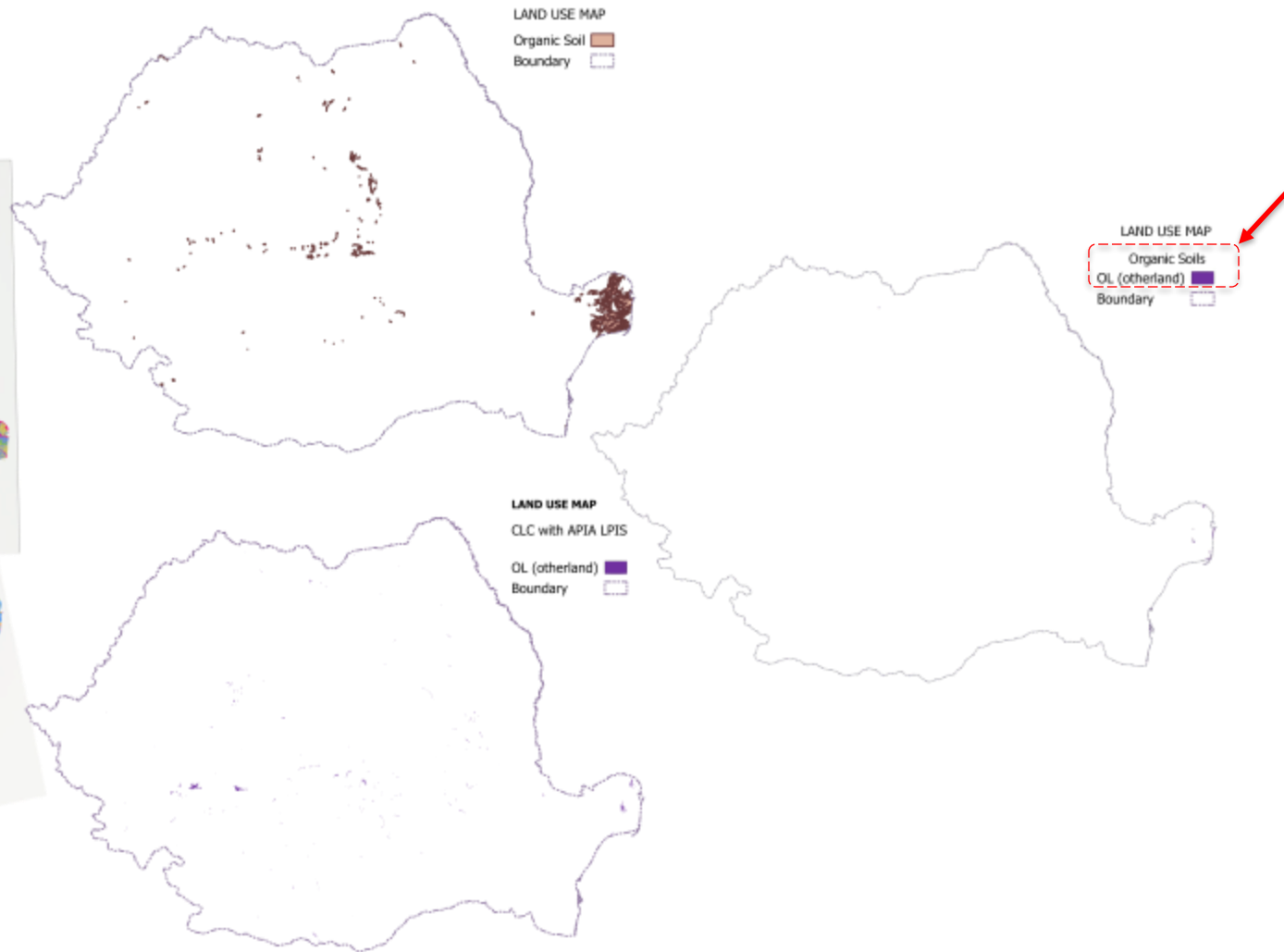
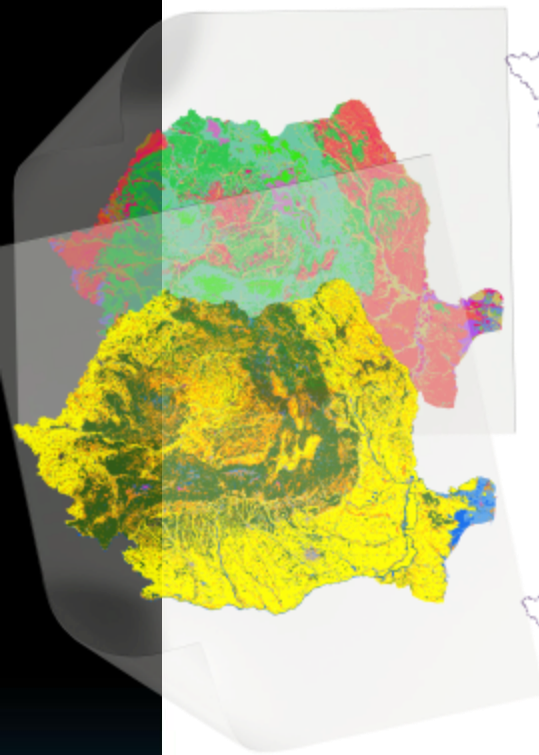
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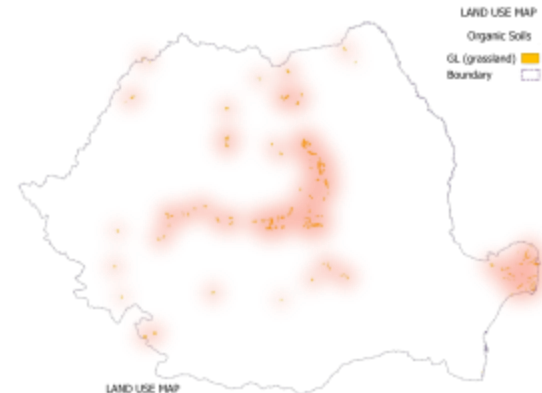
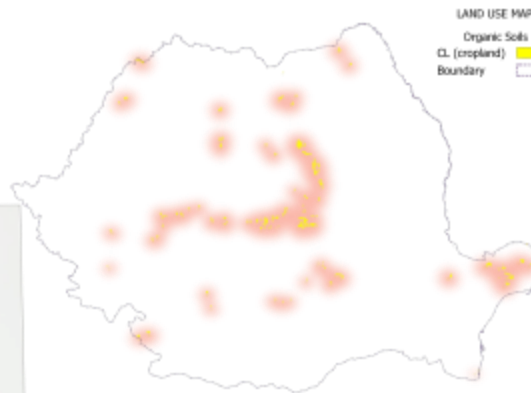
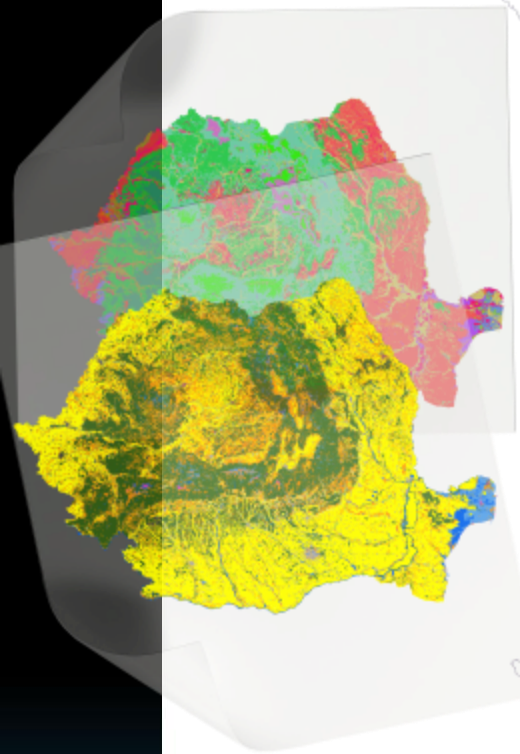
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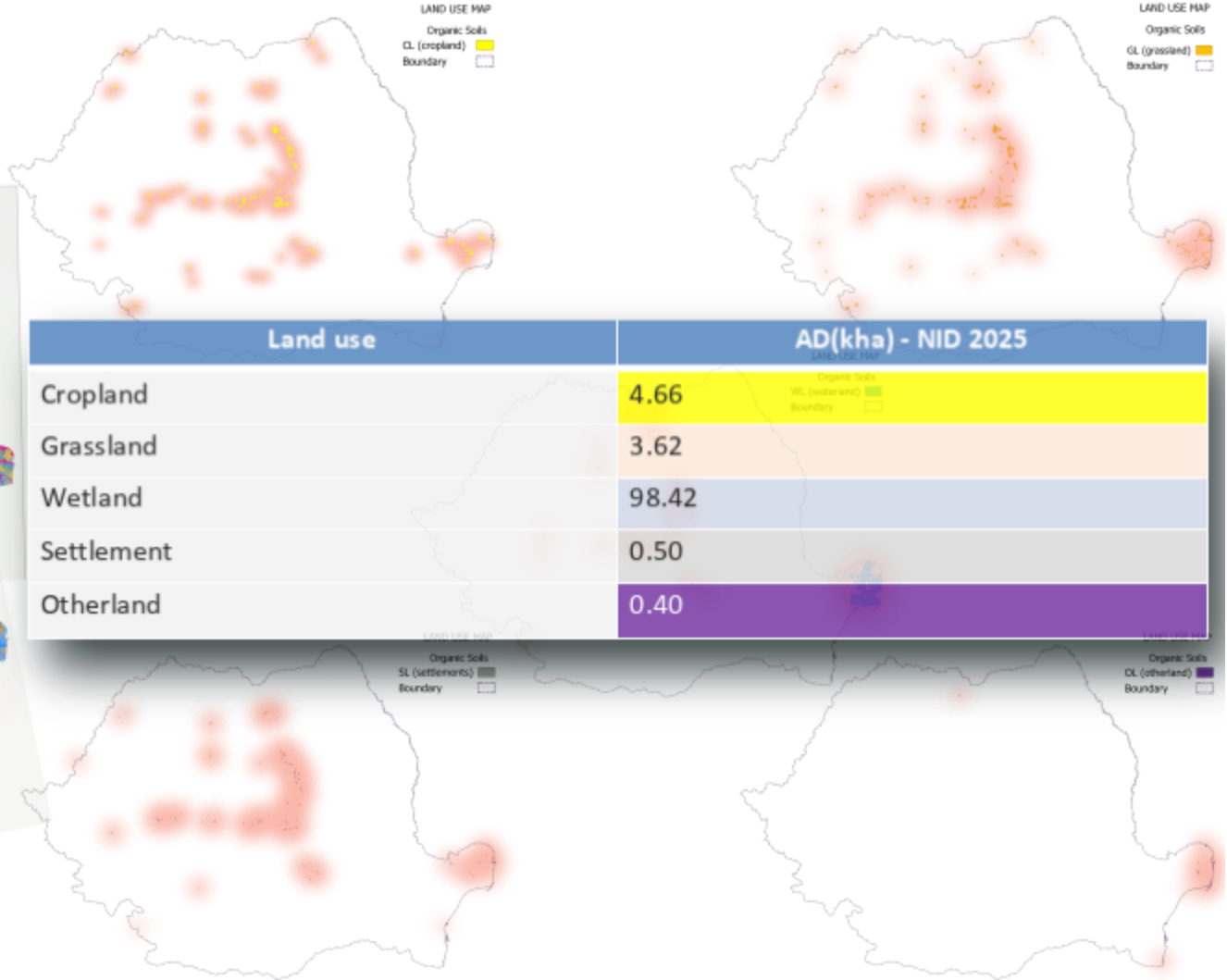
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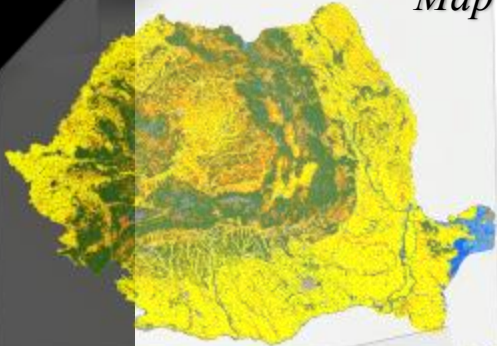


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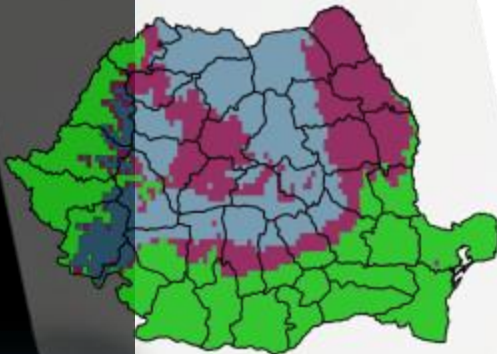
ICS

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- ❖ *EO contribution to Carbon Stock Change Tier 2 development*

Explicit Geospatial Map

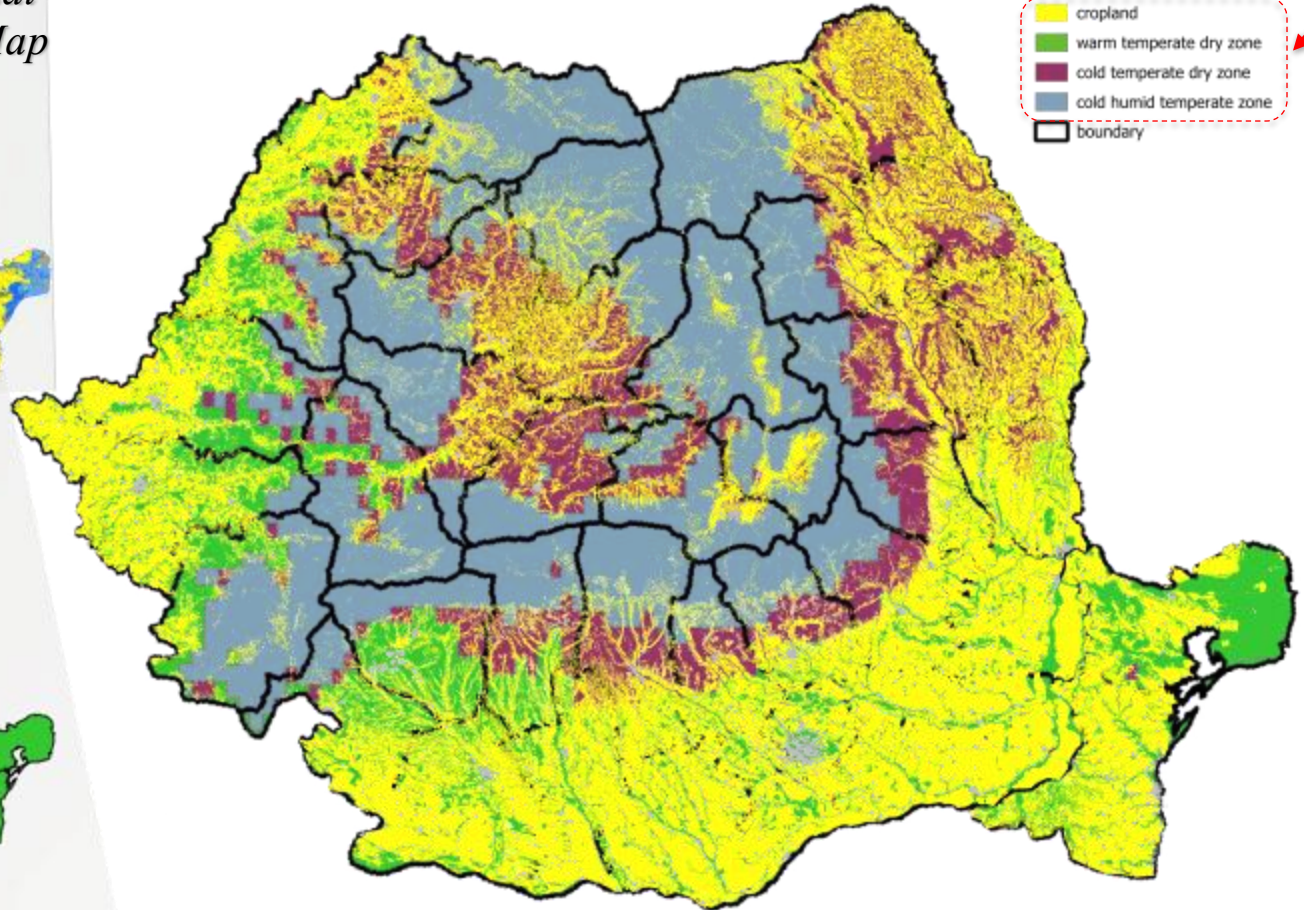


Climate Zones EC/JRC



ROMANIA LAND USE - CLIMATE ZONES

Yellow	cropland
Green	warm temperate dry zone
Purple	cold temperate dry zone
Blue	cold humid temperate zone
Black outline	boundary

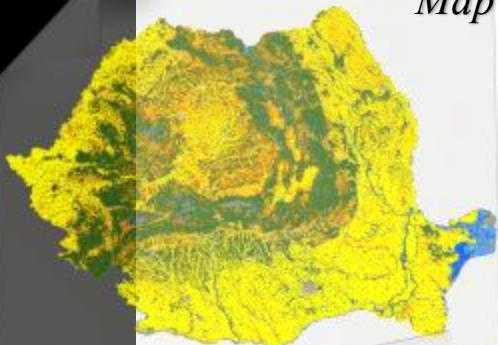


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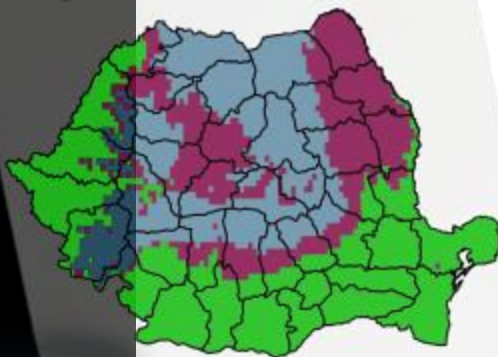
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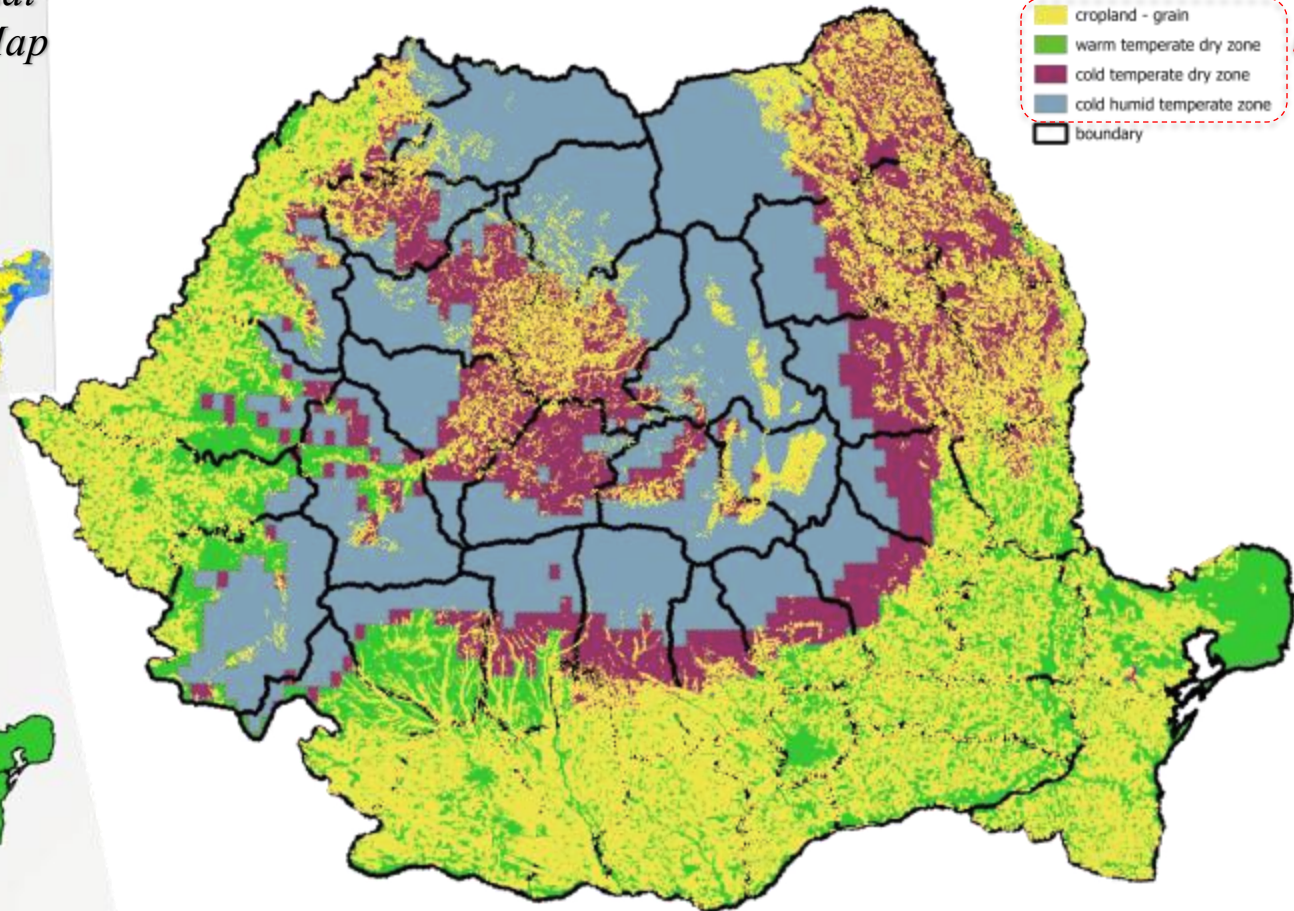
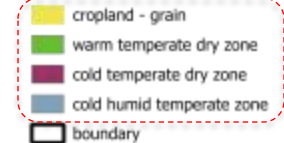
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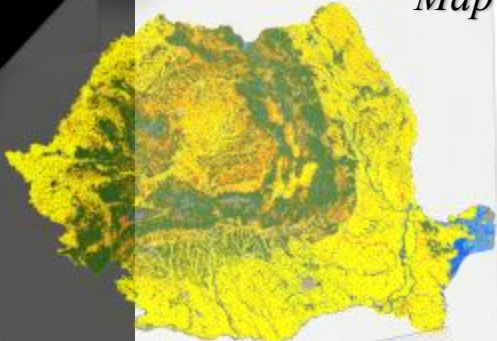


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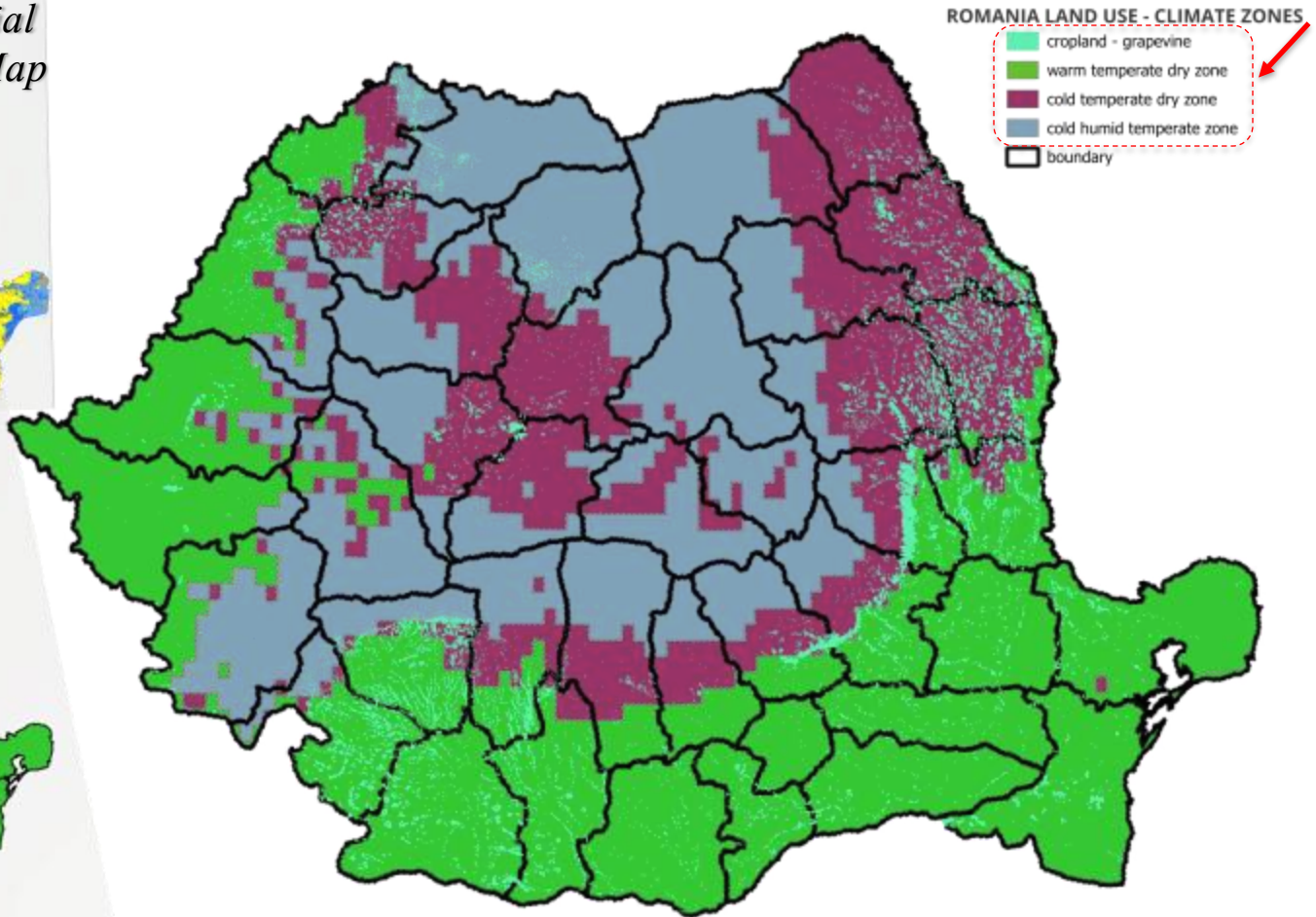
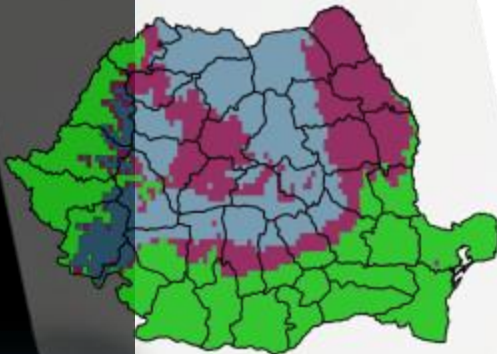
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Climate Zones EC/JRC

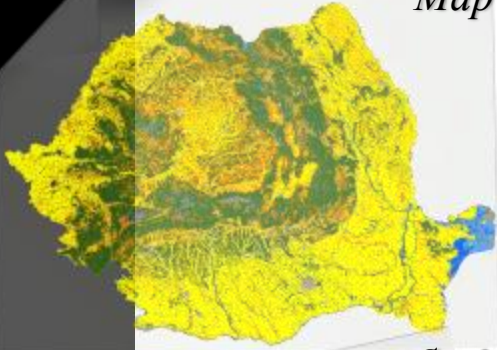


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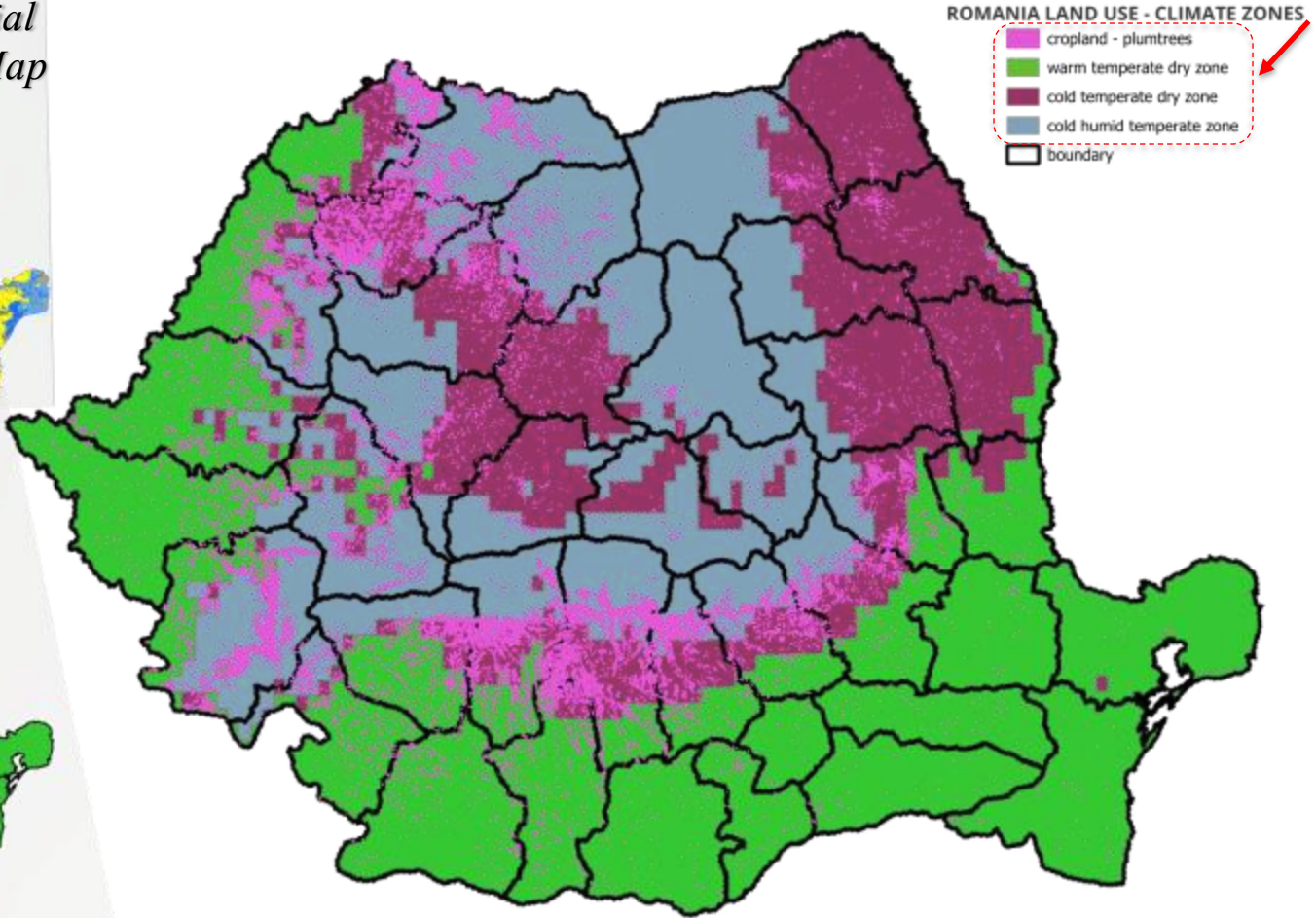
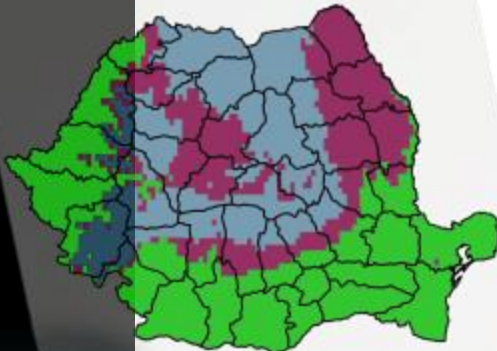
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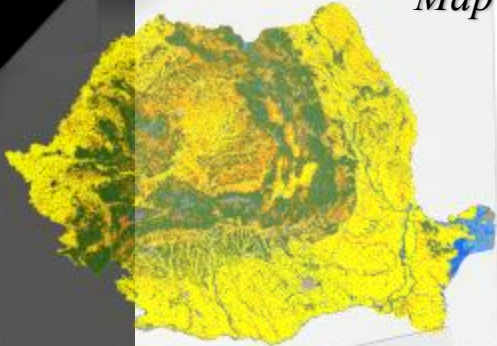


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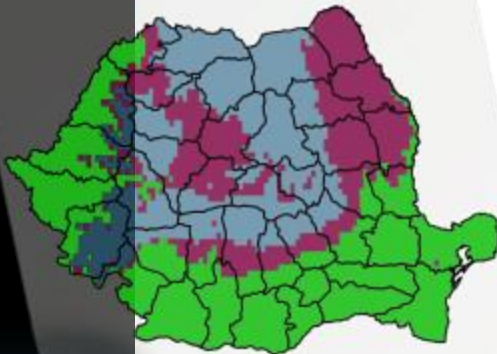
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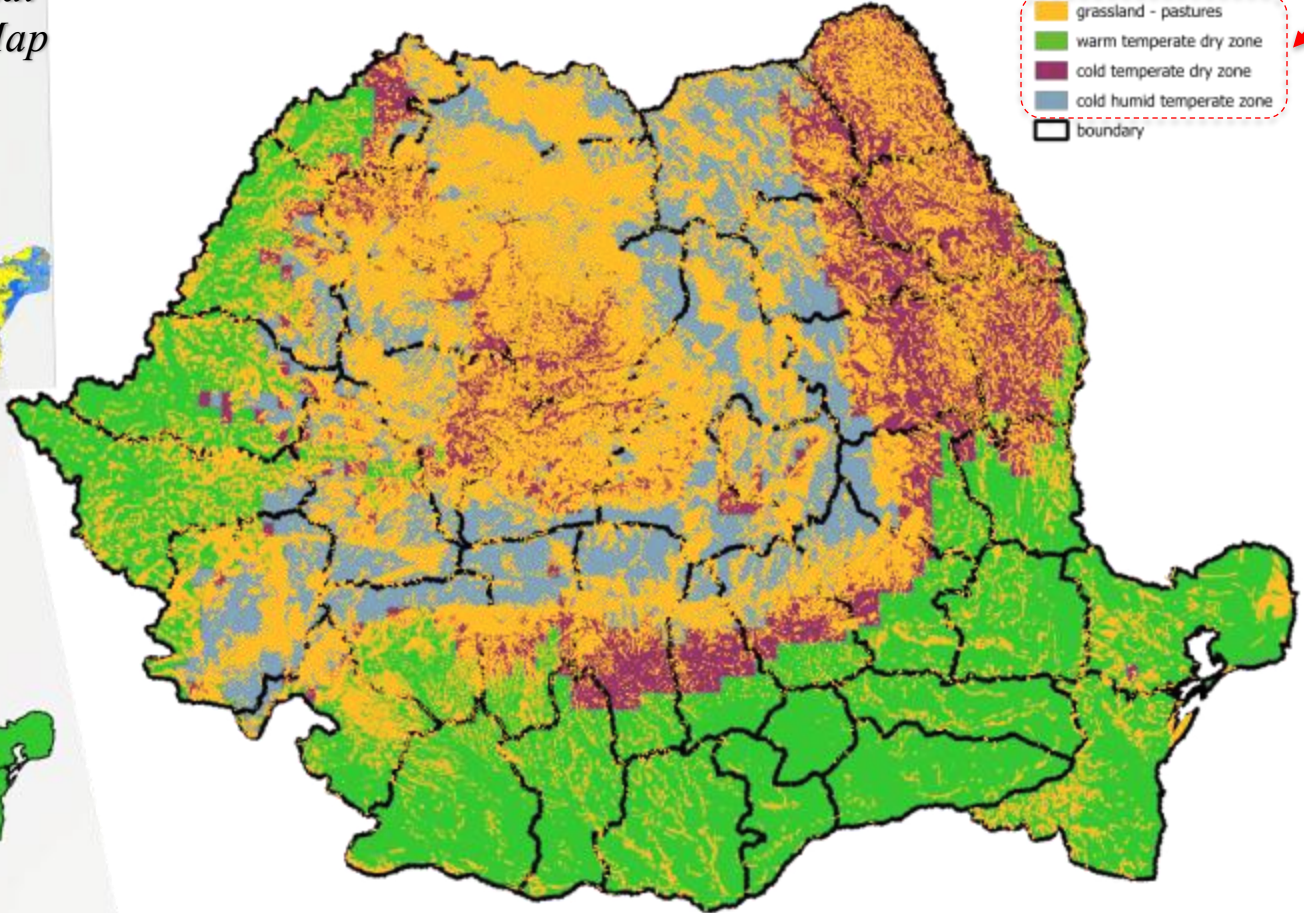


Climate Zones EC/JRC



ROMANIA LAND USE - CLIMATE ZONES

Yellow	grassland - pastures
Green	warm temperate dry zone
Purple	cold temperate dry zone
Blue	cold humid temperate zone
Black outline	boundary



- ***Limitations***

- ✓ ***First***, annual area normalization to ensure the total land area matches Romania's official of 23,839 kha
- ✓ ***Secondly***, a ***Time Series in***Consistency between 2006 and 2008
- ✓ ***Lastly***, the current approach does not yet function as a fully integrated, unified system

Moving forward, addressing these limitations - especially through EO standardization, temporal harmonization, and systemic integration - will be essential to strengthening the robustness of Romania's MRV framework under LULUCF.

- ***Improvement Perspectives***

- ✓ *Standardize EO data inputs across Member States*
- ✓ *Address temporal inconsistencies using Sentinel EO archive*
- ✓ *Integrate spatial, statistical, and institutional MRV components*
- ✓ *Promote EU-level capacity building*





Q&A Session

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