Copernicus land monitoring service
Water related products

Land Monitoring

Tobias.langanke@eea.europa.eu

Copernicus for water management workshop
29th May 2018, Brussels

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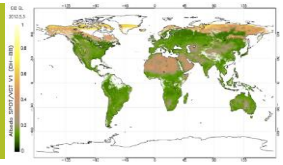
Copernicus Land Monitoring Service (CLMS)

Systematic Biophysical Monitoring

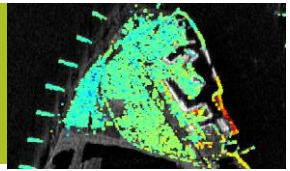


Land Cover & Land Use mapping

Thematic hotspot mapping

Reference data

Ground Motion service



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Portfolio overview: optimal use of multiple input data

HR images
(10-20m pixels)

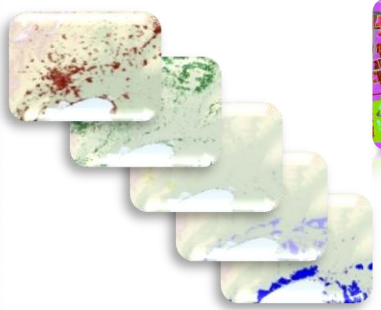
VHR images
(2.5m pixels)

SAR + …
(SRTM, S1, Aster GDEM)

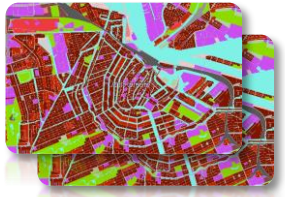
EU-DEM
2012

CLC & CLCC
1990-2000-06-12-18

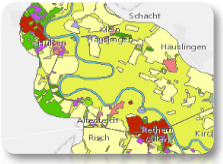
HRLs
2006-09-12-15-18



UA
2006-12-18



RZ
2012-18



N2K
2006-12

EU-Hydro
2012

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Portfolio overview and products directly/indirectly relevant for water

Part of portfolio	Product category	Individual products	Available reference years	Planned and/or in production
Local component	Urban Atlas (UA)		2006, 2012	2018
	Riparian Zones (RZ)		2012	2018
	Natura2000 (N2K)		2006, 2012	Ongoing extension of number of areas for same reference years
	Coastal Zones		-	Production start Q3 2018
	High resolution Phenology		-	Production start planned for Q3/Q4 2018
Pan-European	CLC and CLCC		1990, 2000, 2006, 2012	2018 in preparation
	HRL's (High Resolution Layers)	• Imperviousness • Forest • Grassland • Wetness & Water • Small Woody Features	2012 and 2015 (in case of imperviousness also 2006 and 2009)	2018 in preparation (Production start Q4 2018)
	Ground motion service		-	In planning
	Snow and Ice		-	In planning - Production from December 2018
Reference products	EU DEM		2012	
	EU Hydro		2012	

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Water related CLMS products

- Directly relevant:
  - Riparian zones (local component)
  - Water and Wetness (high resolution layer)
  - EU-Hydro (reference data)
- Indirectly relevant:
  - Planned coastal zone product
  - Planned snow and ice product
  - Planned high resolution phenology product

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Riparian Zones

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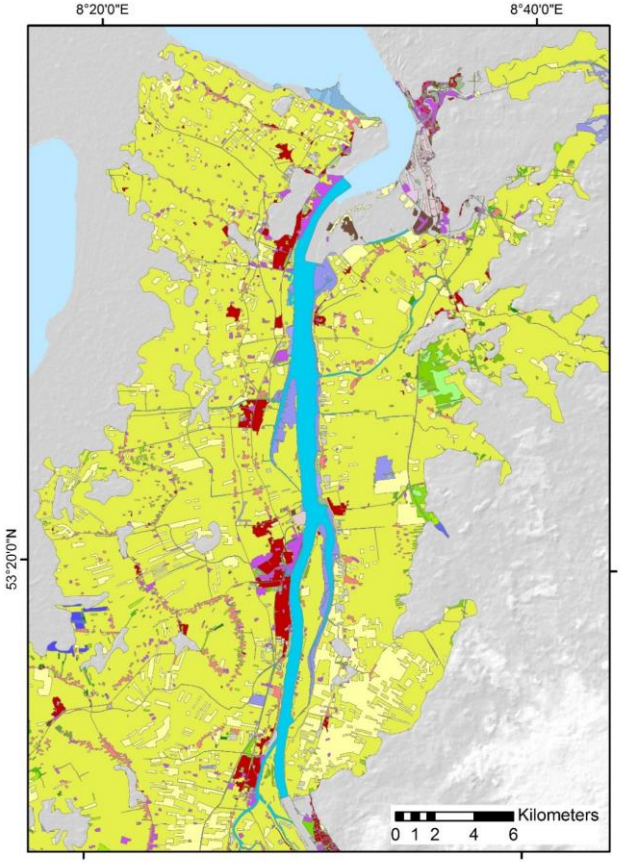
Riparian zones – in a nutshell

- **Three** products:
  - **Delineation of Riparian zone** (Potential Riparian Zone, Observable Riparian Zone and Actual Riparian Zone) for Strahler 3+
  - **VHR Land use/Land cover (LU/LC) mapping 2012.** 56 LC/LU Classes along a buffer zone of Strahler 2+ rivers (2018 currently in production)
  - **Green Linear Elements** (GLEs) along buffer zone of selected rivers (Strahler 3+) for the year 2012.
- Total area covered: 805.013 km^2
- http://land.copernicus.eu/local/riparian-zones/view



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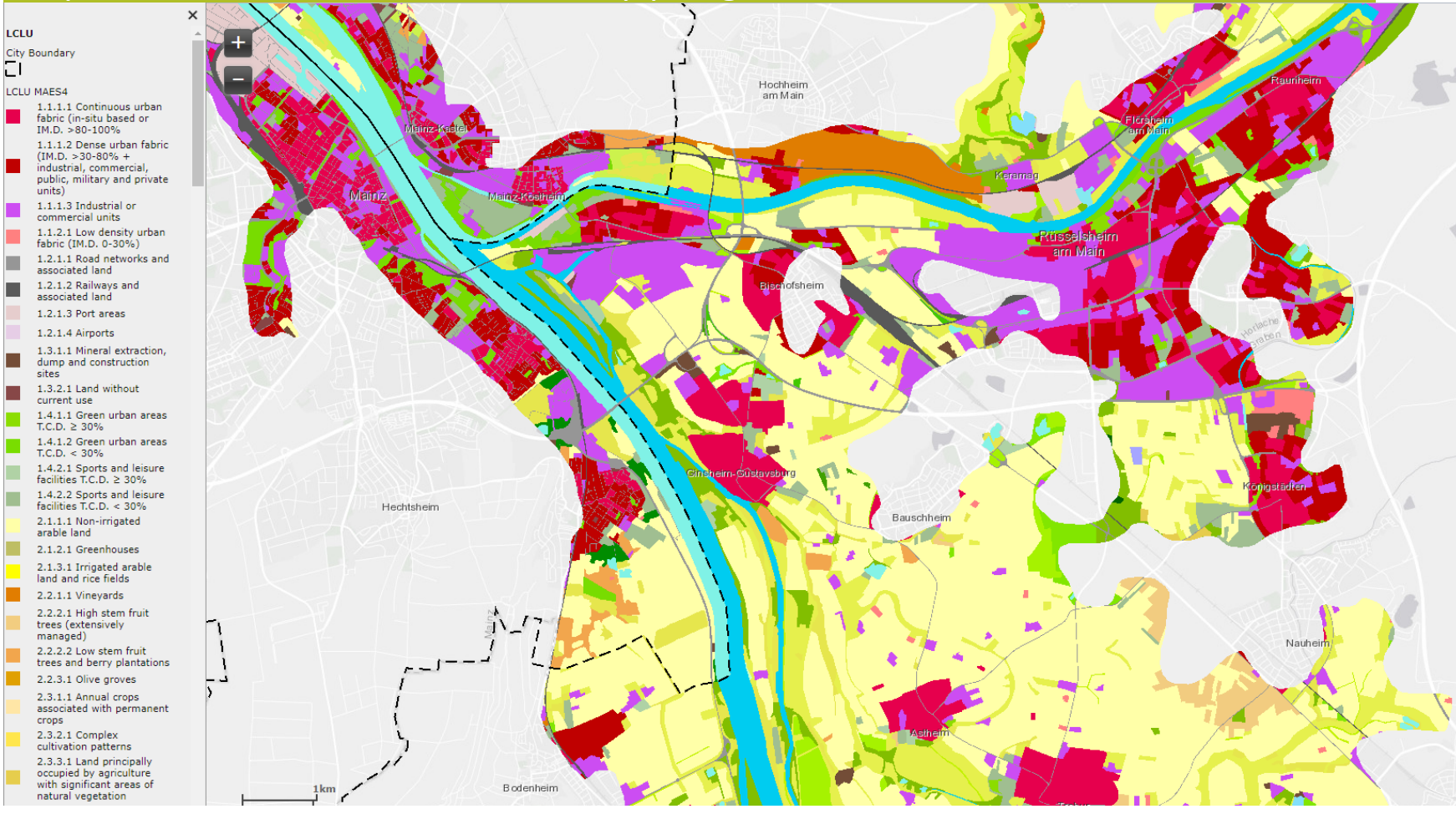
Riparian Zones – LU/LC mapping



Riparian Zones – Green Linear Elements

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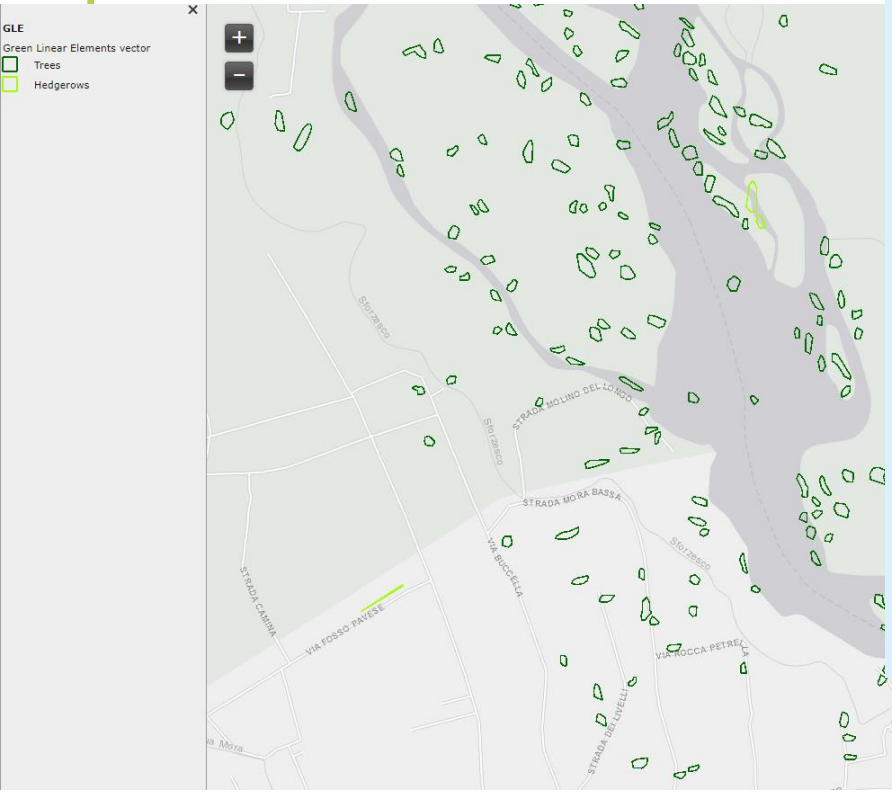

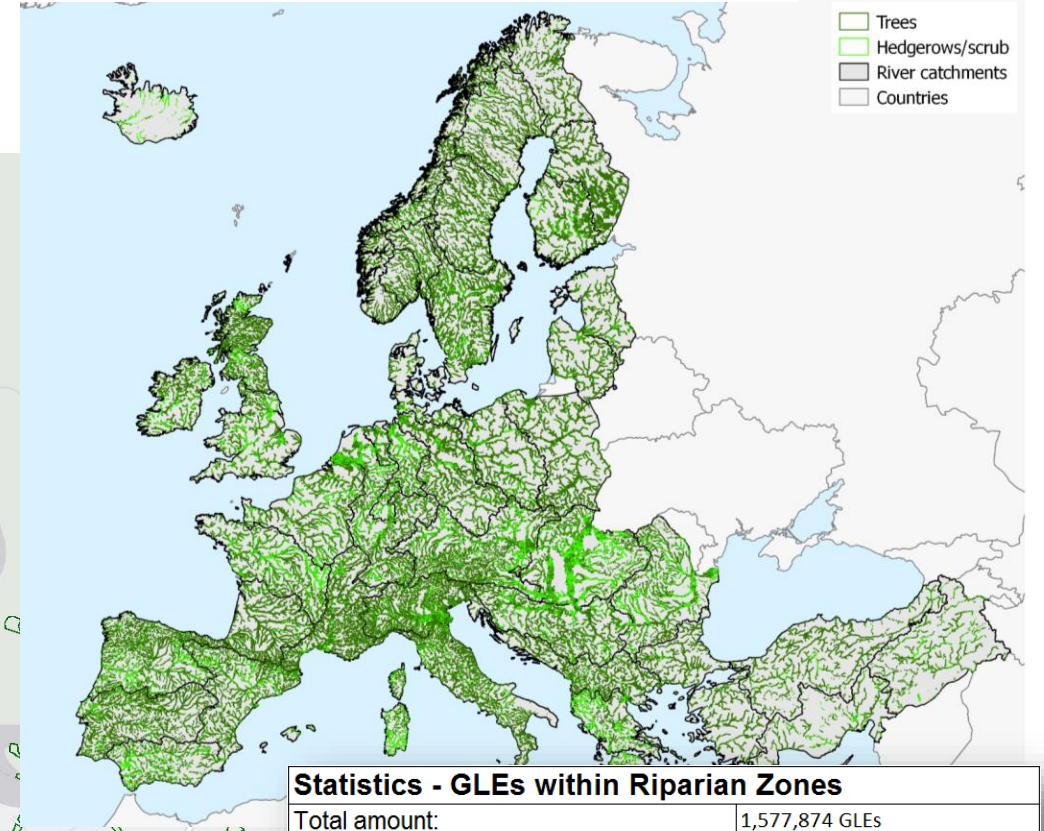

Statistics - GLEs within Riparian Zones	
Total amount:	1,577,874 GLEs
Total area:	1,965.45 km² (556,658.26 km²)
Covered Percentage of Riparian Zones:	0.35%
Overall thematic accuracy:	87.13%

EU-Hydro

EU-HYDRO is a database for all EEA39 countries providing:

- **Photo-interpreted river network** derived from VHR data
  - Water bodies and wide rivers
- **Drainage Model** derived from EU-DEM
  - Catchments and drainage lines and nodes.
- **Update with improvements** and error corrections in late 2018

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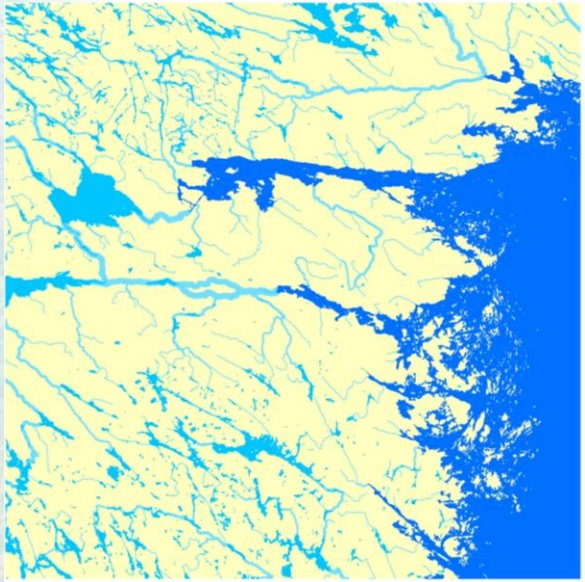
EU-Hydro

Photo-interpreted river network

- derived from VHR data -

Coastal
Transit
Inland
River network
River basins

Nodes
Culverts
Ditches
Canals



Drainage Model

- derived from EU-DEM -

Streams
Catchments
Nodes

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EU-Hydro

Excerpts of information within…

- Relational database with consistent hydrological topology
  - Upstream, downstream connection nodes
  - Pfaffstetter
  - Strahler
  - ECRINS river segment identifiers
  - Country owner
- Harmonized all throughout EEA39
- Calculated drainage area per river segment
- Suitable for hydrological network analysis

Connected 352 river segments which belongs to the same river

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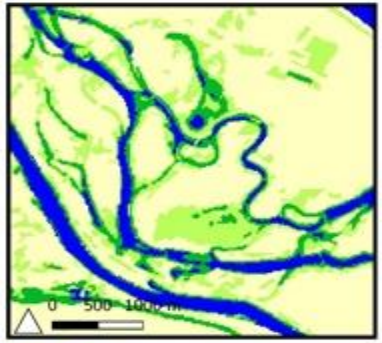
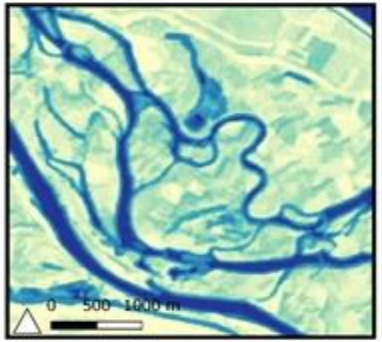
Water and Wetness HRL





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Water/Wetness HRL

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Products:

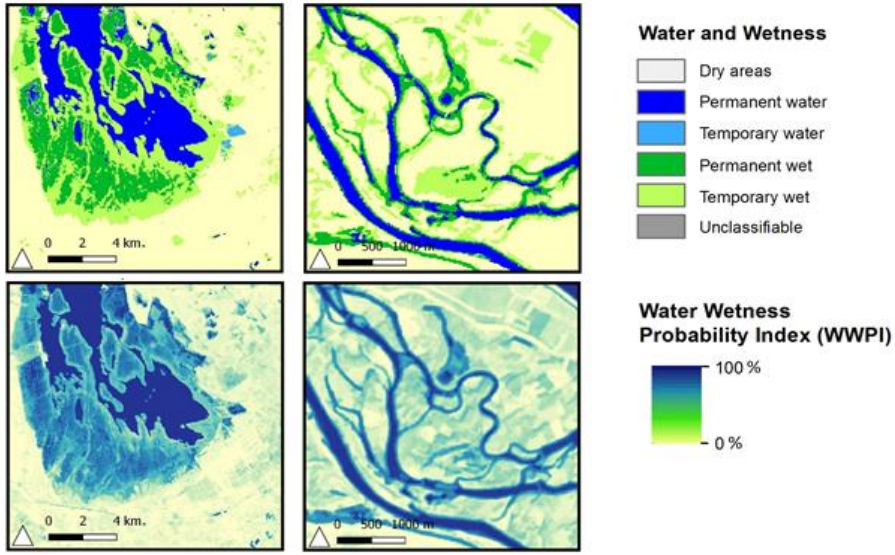
- Classified Water & Wetness product (20m)
- Water Wetness Probability Index from…
  …2009 to 2015 (20m)
- Aggregated 100m and national projection products

Input Data:

- Multi-temporal optical HR composites: SPOT, ResourceSat, Sentinel-2, Landsat (2009-15)
- Multi-temporal SAR data: Sentinel-1 (since 2014), ENVISAT-ASAR, METOP-Ascat (since 2004)
- Soil moisture calibration database
- VHR images & in-situ data (via CORDA)

Highlights:

New high-quality information on water & wetness presence in Europe on HR scale (2009-2016 multi-year products)



Water/Wetness HRL examples

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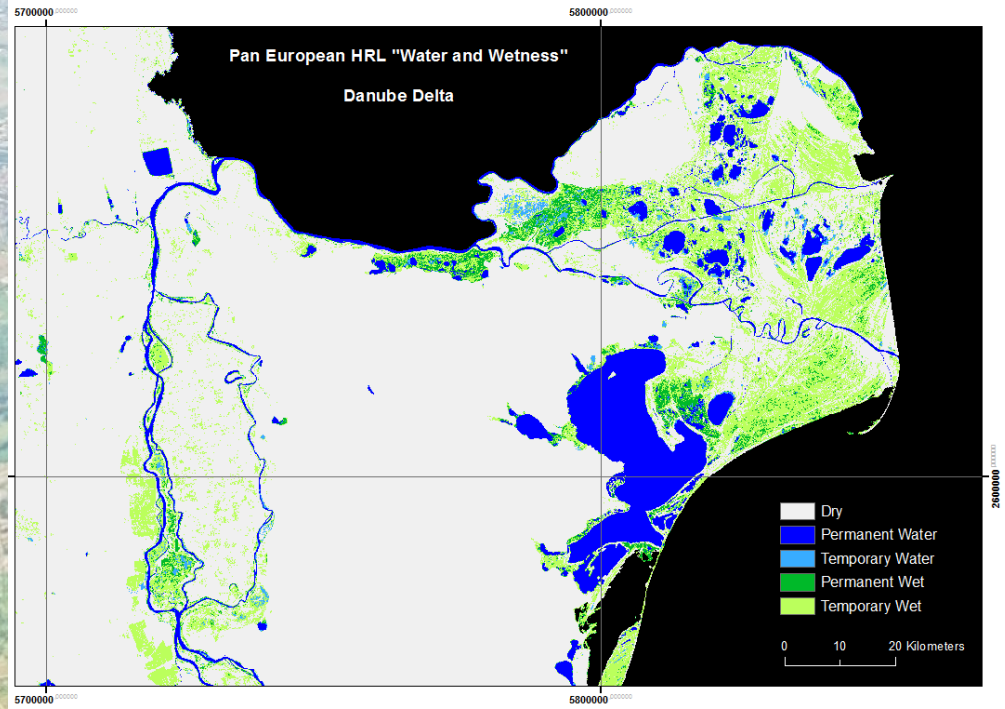

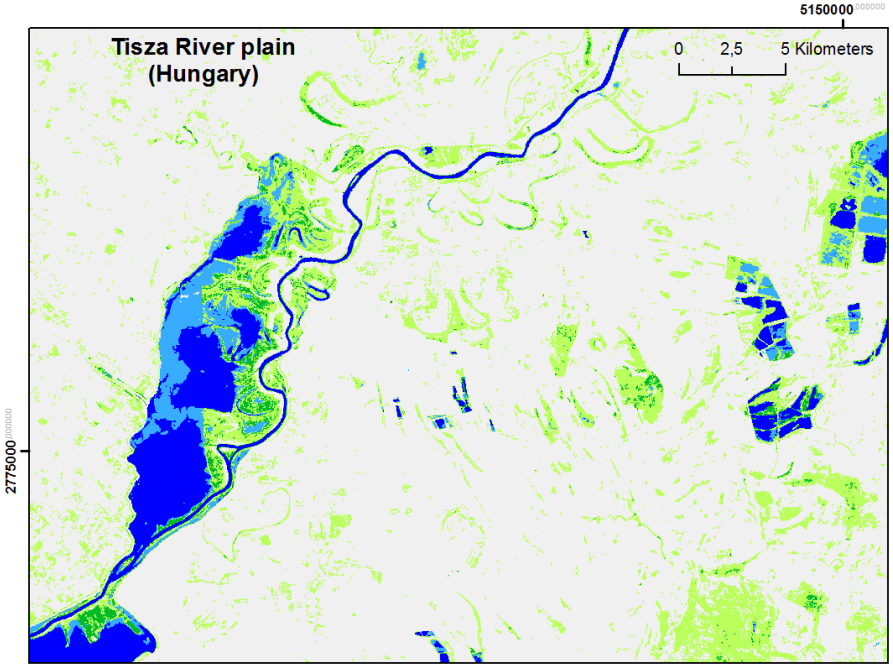

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Water/Wetness HRL examples

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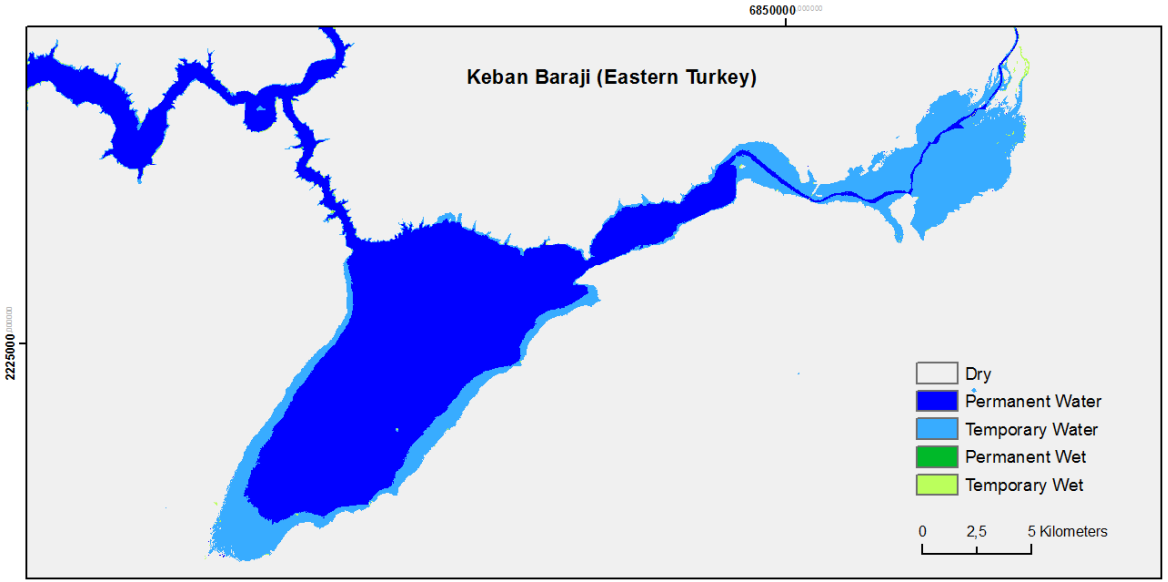
- Dams with variable water-levels



2009

2011

2014

Water/Wetness HRL examples

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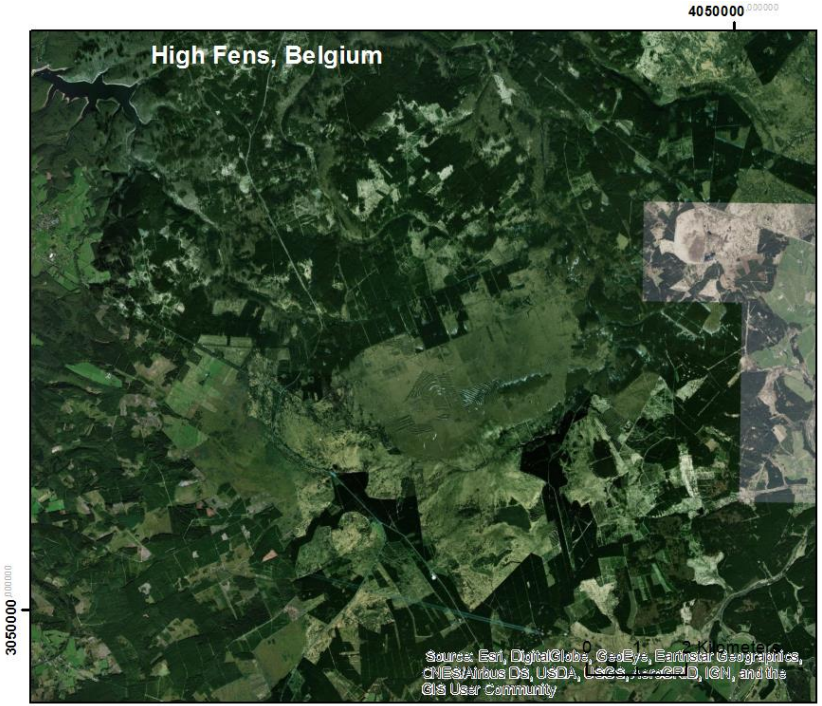
- Raised bogs and moorlands



https://en.wikipedia.org/wiki/High_Fens

https://de.wikipedia.org/wiki/Hohes_Venn

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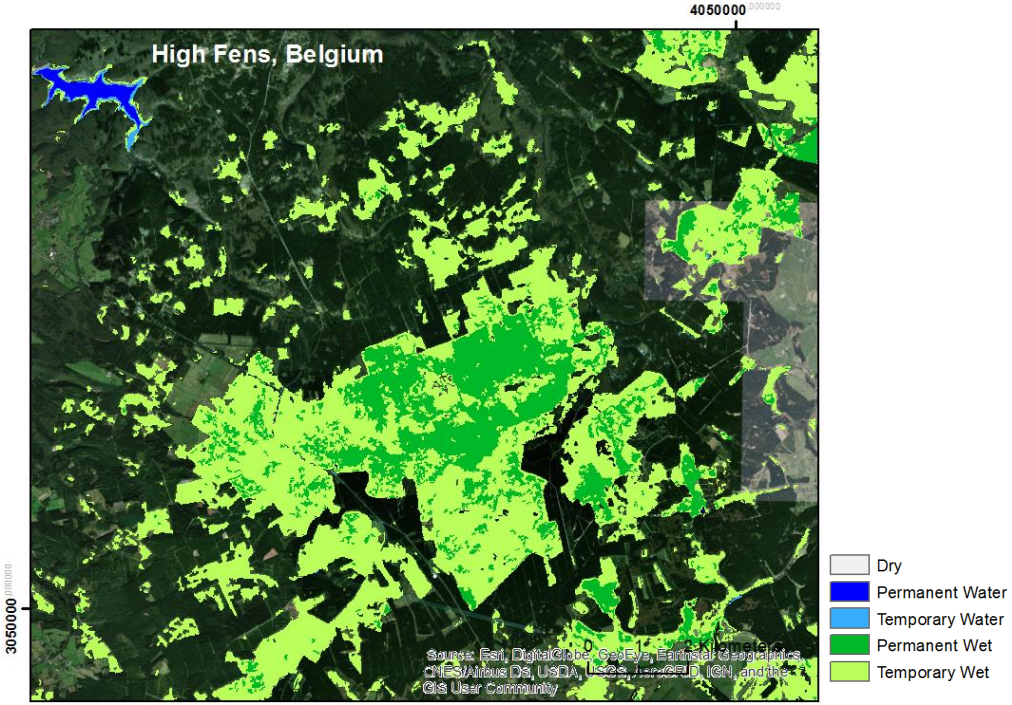
Water/Wetness HRL examples

- Raised bogs and moorlands



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Water/Wetness HRL examples

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irrigated agriculture - Spain

http://www.navier.es/

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Water/Wetness HRL examples

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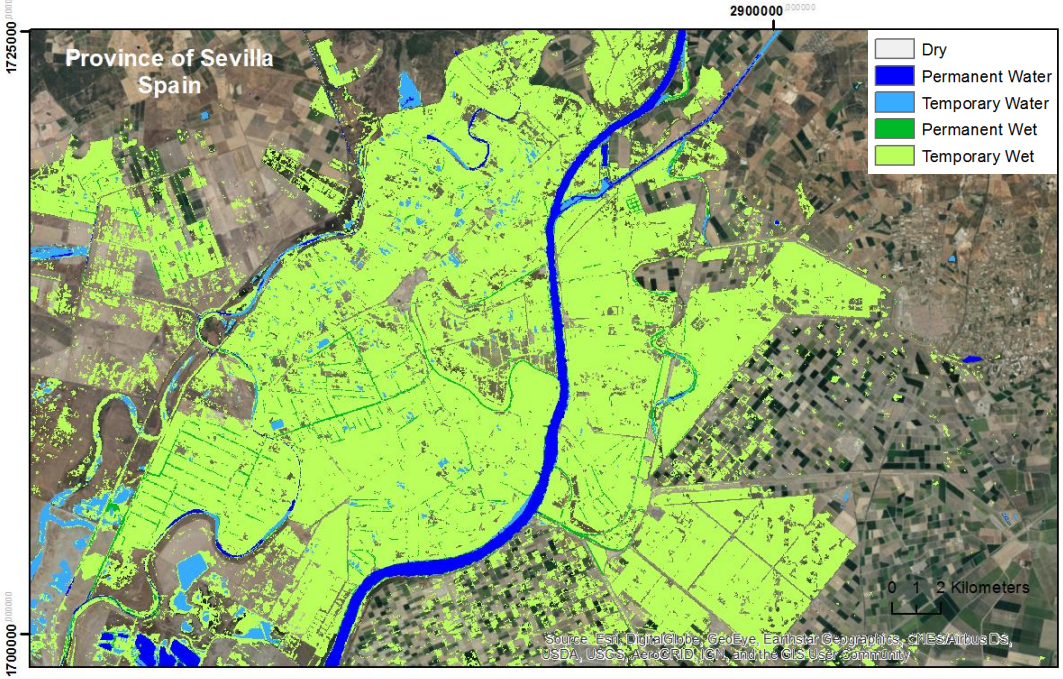
irrigated agriculture - Spain



http://www.navier.es/

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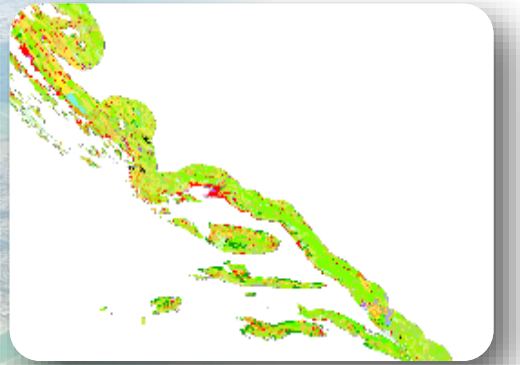
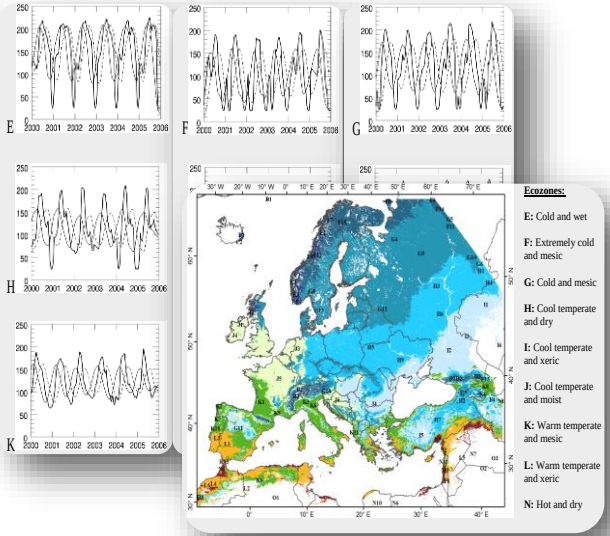
Products in preparation possibly relevant

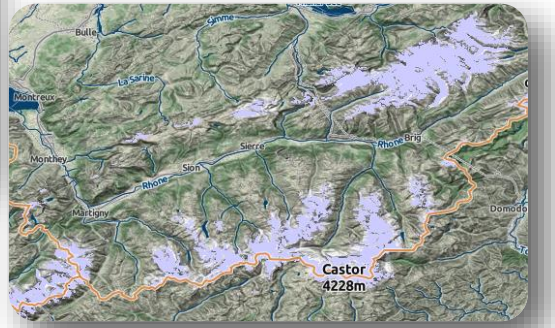
Coastal Zones



HR phenology



Snow & ice



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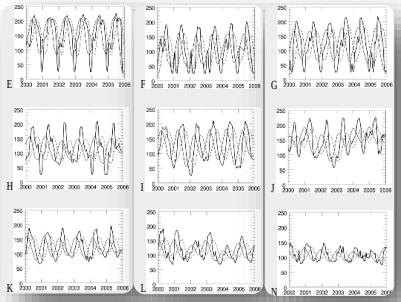
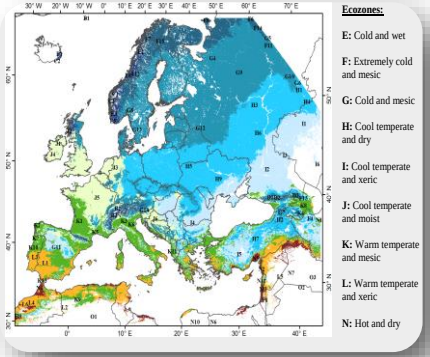
Planned High Resolution Phenology product

- Based on Sentinel-2 time series, 10m spatial resolution
- Two main products:
  - **Phenology parameters**: Dates and values at Start of Season (SOS), End of Season (EOS) and seasonal maximum. Length of the growing season (LOS), amplitude, base value, and seasonal integral values.
  - **Seasonal trajectories**: The reconstructed vegetation index time-series, which are input to the phenology detection. e.g. daily, 10-day, monthly, and yearly upon user's request.
- Possible Use:
  - Agriculture (crop types, management intensity)
  - CC impact assessment (changes in growing season, impacts of droughts, forest fires, floods etc)
  - Improvement of production of other CLMS products and LU/LC mapping in general





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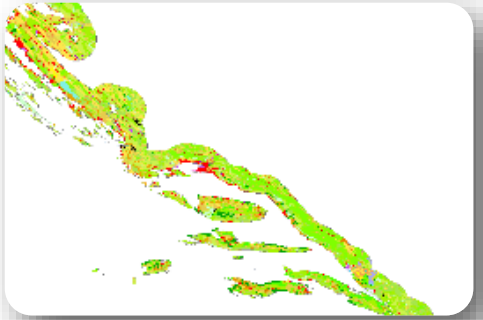
Planned Coastal Zones product

- In coordination with CMEMS (Copernicus Marine Environment Monitoring Service) several products are planned. On CLMS side:
  - VHR **LC/LU mapping** of approximately 60 classes of the coastal zone (10 km landwards buffer). Reference years 2012 and 2018. Total area covered: 671.600 km^2
  - **Coastal dynamics** (in an early planning stage!)
    - Coastal erosion
    - Coastline dynamics
  - **Riverine water discharge** (in an early planning stage!)
- Status of activities:
  - Publication of CfT: Q3-2018
  - Start of implementation: Q4-2018



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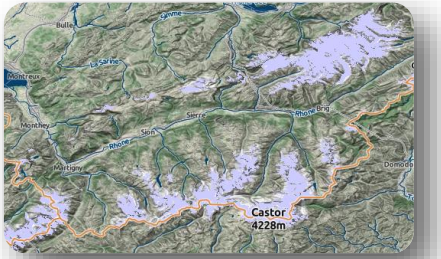
Planned Snow&Ice product

- Copernicus Pan European High Resolution Snow and Ice Monitoring
  - Snow cover:
    - Based on S2: 20m NDSI + Fraction of Snow Cover above and under the canopy
    - Based on S1: differentiation of dry/wet snow (+ under the cloud wet snow)
    - Yearly Permanent Snow line, Snow cover duration, …
  - Lake Ice:
    - Based on S2
    - Freeze up/break up date (aggregated within EU-Hydro inland waters and river polygons)
- Status:
  - User consultation workshop Brussels 7th June 2018 (http://copernicus.eu/events)
  - Publication of CfT in Q3-2018
  - Start implementation end of Q4-2018



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CLMS data and more detailed information

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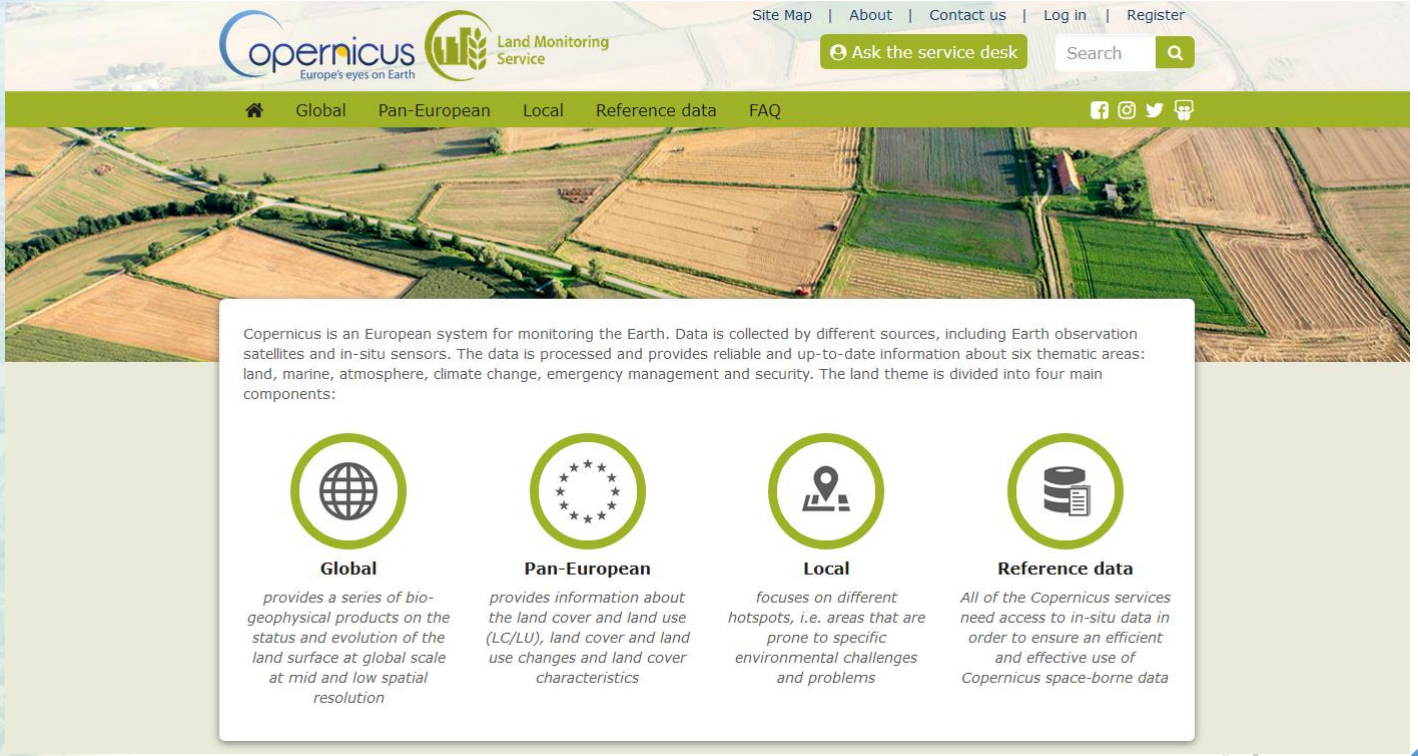

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