



Land Monitoring

Copernicus Land Monitoring Service

Products portfolio and future developments

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InCoNaDa Project - final conference

4 April 2024, Łódź



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OF THE EUROPEAN UNION



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Environment
Agency



European
Commission

Copernicus Land Monitoring Service

- **Geographical** information on **land cover and its changes, land use, vegetation** state, **water cycle** and Earth's **surface energy variables** on European and global levels for environmental applications
- **Harmonized** and **consistent** in time and space
- Products and manuals are free and open
- Implemented by JRC and EEA
- Website: <https://land.copernicus.eu/>

Land cover and land use mapping

Priority area monitoring

Bio-geophysical parameters

Ground motion monitoring

Satellite data

Reference and validation data



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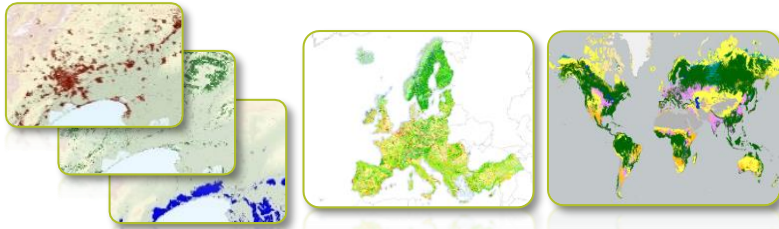


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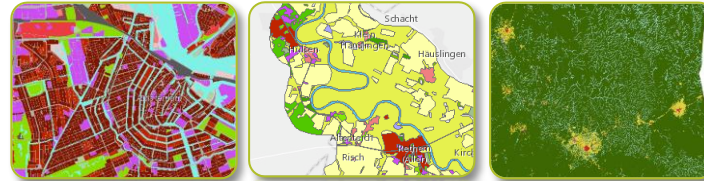
CLMS portfolio: Categories of products



**Land cover and
land use mapping**



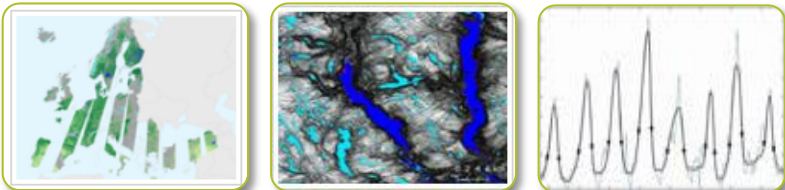
**Priority area
monitoring**



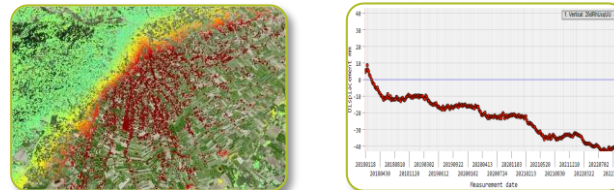
Satellite data



**Bio-geophysical
parameters**



**Ground motion
monitoring**



**Reference and
validation data**



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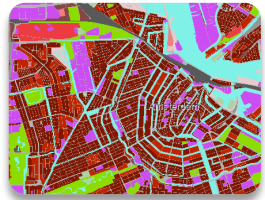


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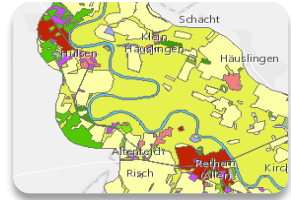


Overview of CLMS products

Urban Atlas
2006-12-18-21



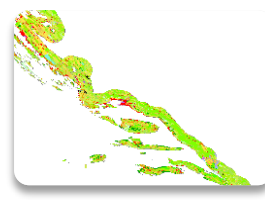
Riparian Zones
2012-18-24



Protected Areas
2006-12-18-21



Coastal Zones
2012-18-24



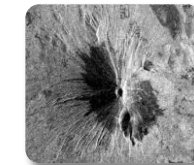
VHR optical images
(2-5m pixel)



HR optical images
(Sentinel 2 10-20m pixel)



HR radar images
(SRTM, Sentinel 1 14m pixel)



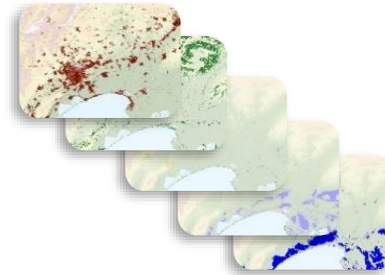
CLC & CLCC
1990-2000-06-12-18-24



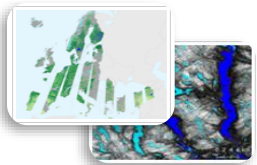
CLC+ BackBone
2018-21-23



High Resolution Layers
2006-09-12-15-18-various



Biophysical Parameters
Near Real Time



European Ground Motion Service
Yearly 2018 to 2022-2023



EU-Hydro
Next update 2026



CLMS: Priority Area Monitoring

Urban Atlas

2006-12-18-21



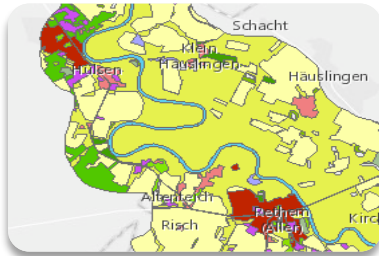
Protected Areas

2006-12-18-21



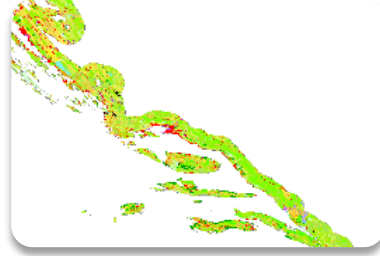
Riparian Zones

2012-18-24

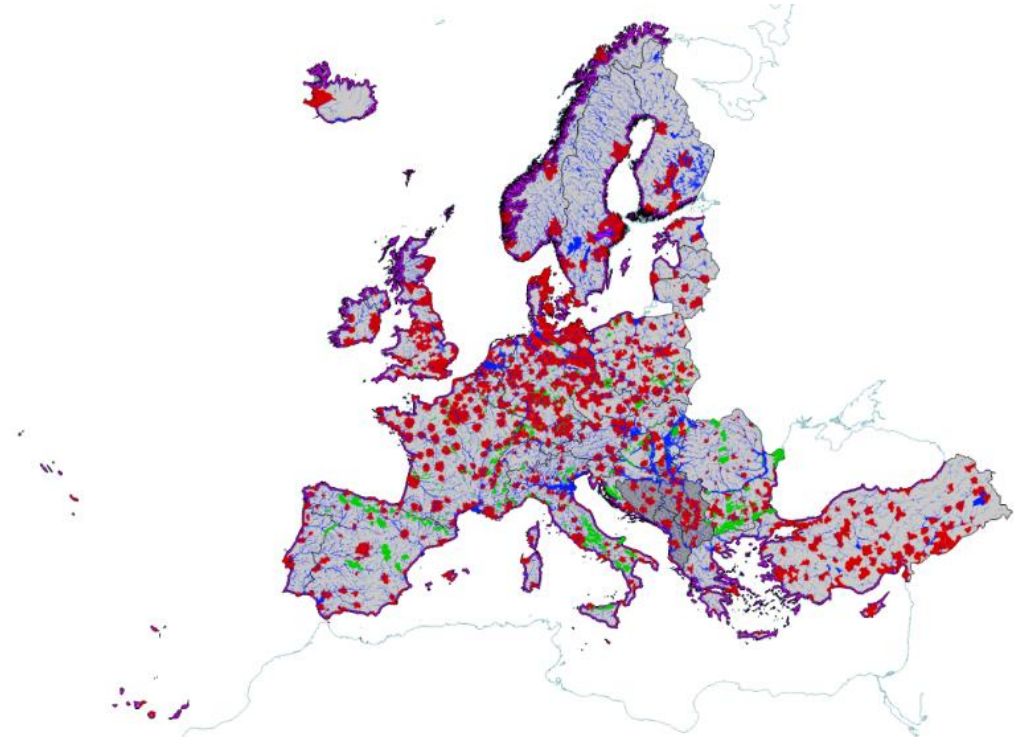


Coastal Zones

2012-18-24



- Vector based VHR LC/LU mapping of priority areas
- MMU 0.5 ha
- Tailored nomenclature
- 6/3 year cycles: status and change mapping



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CORINE land cover (CLC)

CORINE = Co-ordination of Information on the Environment

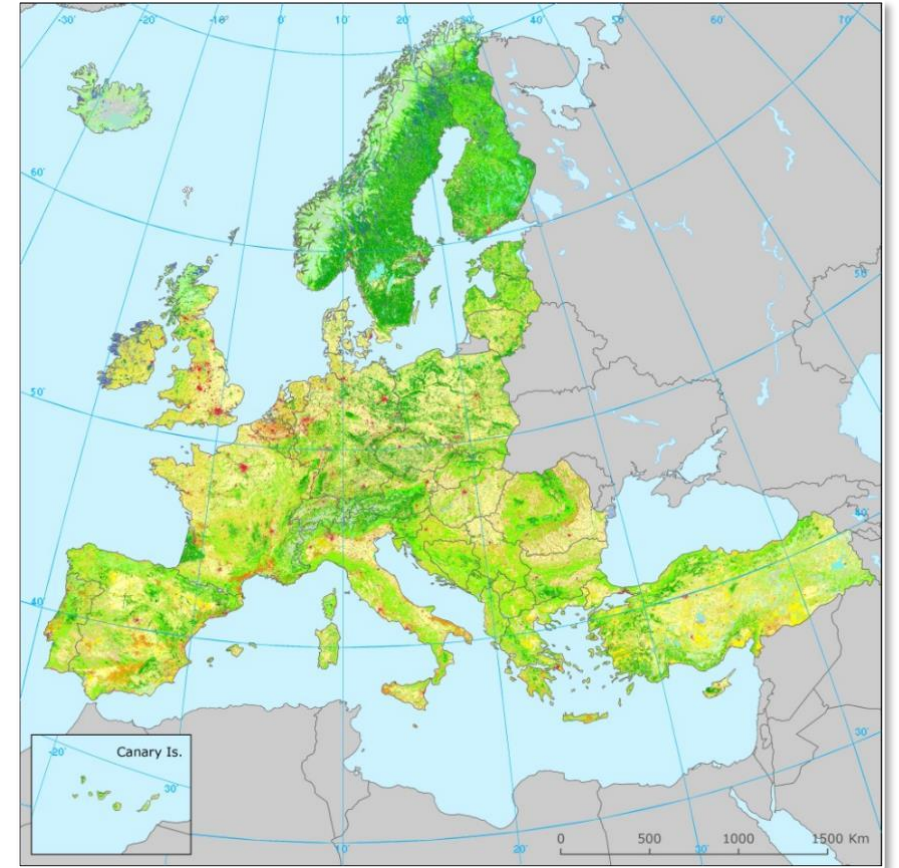
CLMS oldest and most sought-after database

Coordination and implementation

- ✓ Coordination by EEA
- ✓ Implemented by EEA-39 countries
- ✓ Support by ETC DI

Results

- Input to environmental indicators of EEA (i.e., to State of Environment reports), land and ecosystem accounts
- National uses (e.g. Habitat mapping and status assessment, flood risk assessment, landscape typology, green Infrastructure planning, LULUCF)



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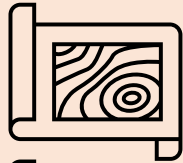


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CLC and the CLC+ System

Corine Land Cover CLC *Traditional*

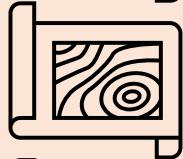
CLC
1990



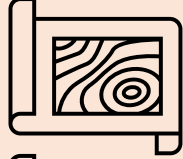
CLC
2000



CLC
2006



CLC
2012



CLC
2018

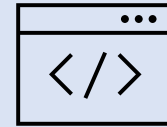
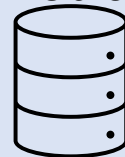


CLC
2024

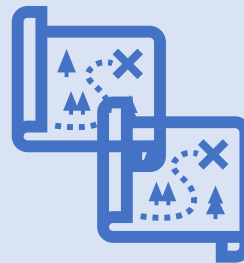


Corine Land Cover + System (CLC+)

CLC+ Core database
and
Web application



CLC+ instances
Tailor made 100m
raster products



CLC+ Backbone (CLC+ BB)
Raster and vector land cover
data



CLC+ BB
Raster
2018



CLC+ BB
Vector
2018



CLC+ BB
Raster 2021



CLC+ BB
Raster 2023, 2025,
etc. (every 2 years)



HRL – Vegetated Land Cover Characteristics

- Annual production
 - 2017/2018 – 2021: release in 2024
- **Tree cover / Forests**
 - Tree Cover Density
 - Dominant Leaf Type
 - Forest Type
- **Grassland**
 - Status, Change, Mowing
 - Ploughing Indicator
 - Herbaceous
- **Crop Types**
 - Cropping Patterns



Crop Types 2021

0: No Cropland

- 1110: Wheat
- 1120: Barley
- 1130: Maize
- 1140: Rice
- 1150: Other Cereals
- 1210: Fresh Vegetables
- 1220: Dry Pulses
- 1310: Potatoes
- 1320: Sugar Beet
- 1410: Sunflower
- 1420: Soybeans
- 1430: Rapeseed
- 1440: Flax, cotton and hemp
- 2100: Grapes
- 2200: Olives
- 2310: Fruits
- 2320: Nuts



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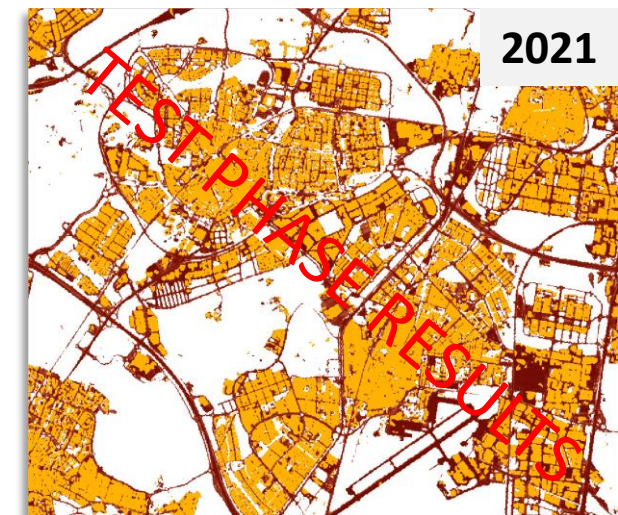
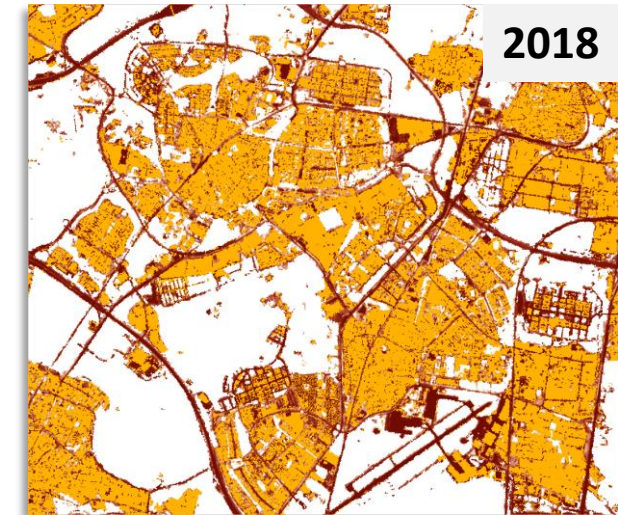
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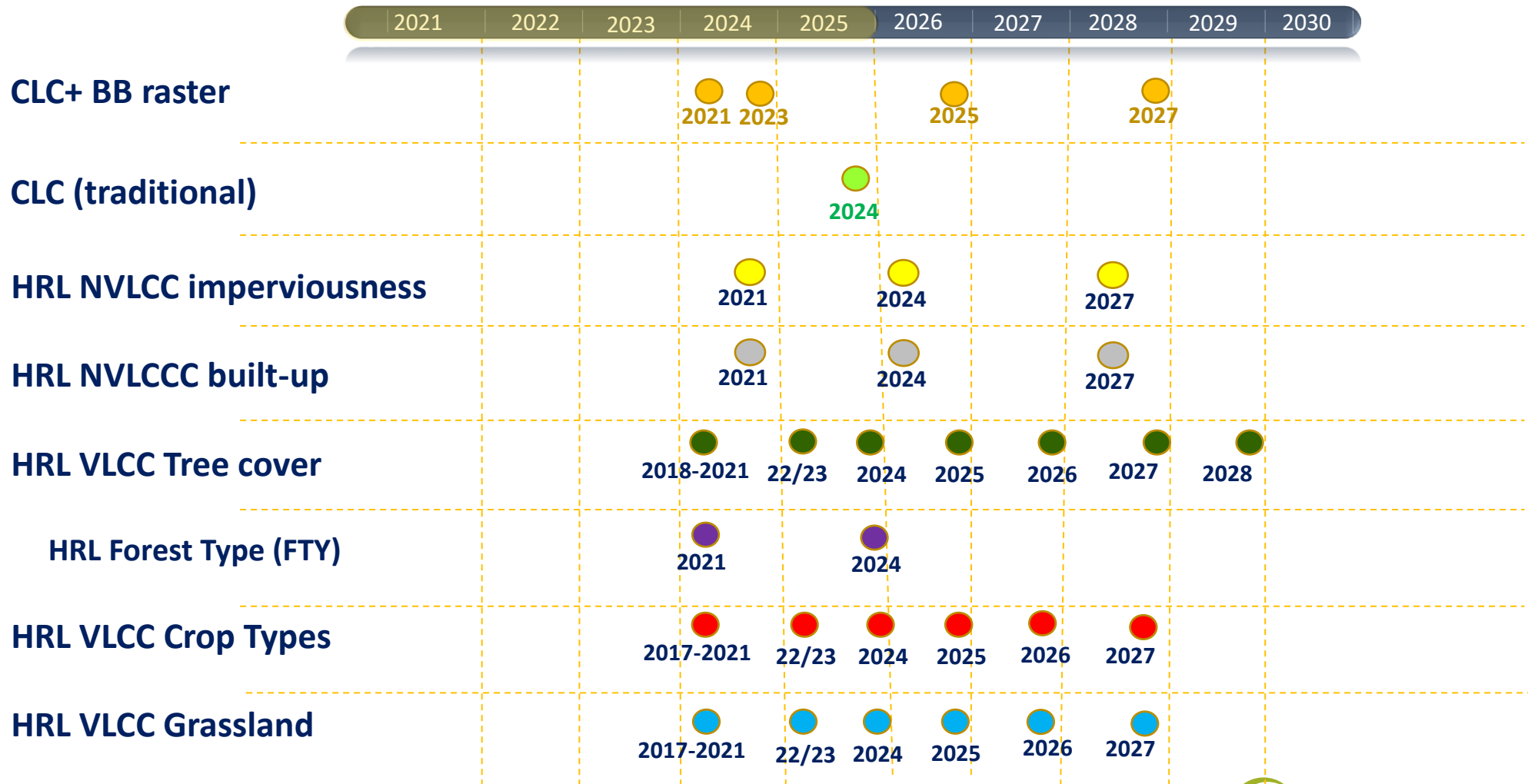
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HRL Non-Vegetated Land Cover Characteristics

- Production of Imperviousness Densities (IMD) and Imperviousness Built-up (IBU) underway
 - *Successful test phase and ETC DI verification*
 - *Continuity and evolution*
 - *Fully cloud-based production, U-Net model*
 - *First-time IBU Change (18-21)*
- Upcoming: launch of a concept study on “Permanent Bare Surfaces” to reflect the needs of soil monitoring



HRL Delivery Timings



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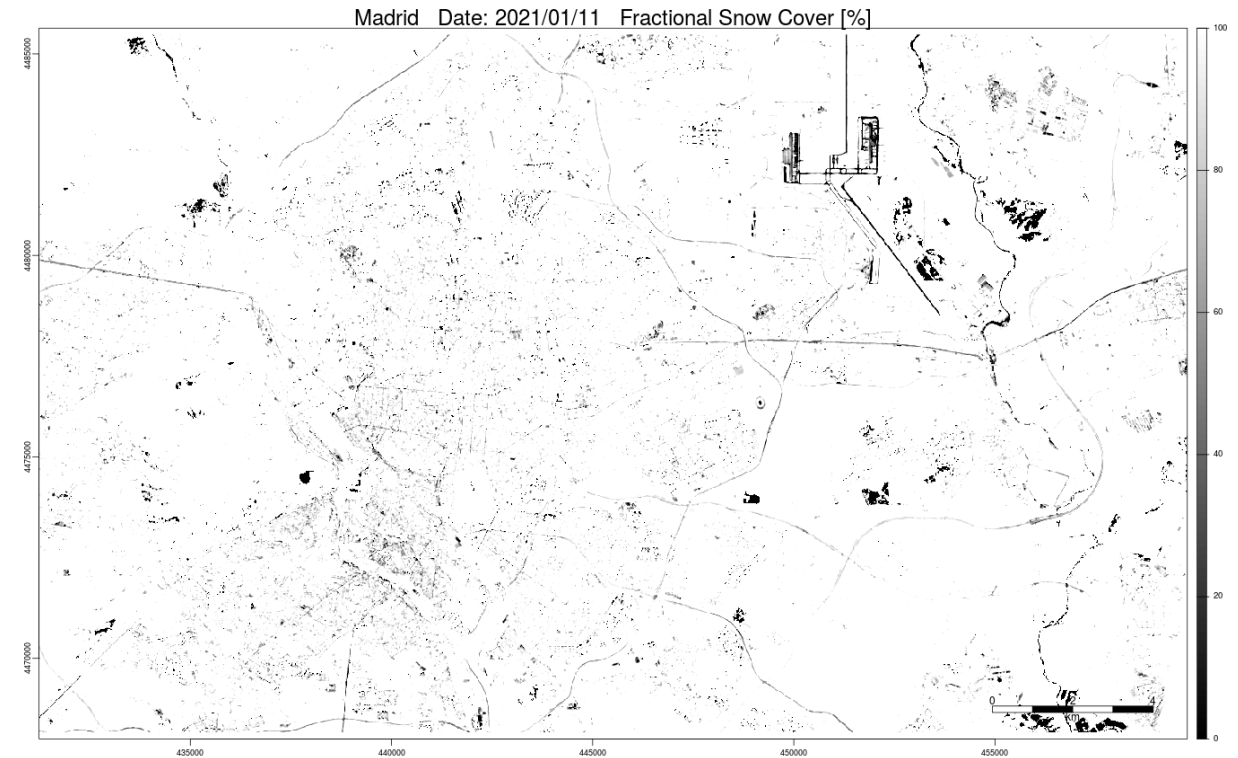
HRL – Small Woody Features

- Based on VHR coverages
- 5 meter every 3 year for EEA38/9
- Woody landscape features within **agricultural areas indicator**
- **Forest connectivity indicator:** measuring spatial intactness of forest cover
- Potential contributions to **urban greening**: monitoring green infrastructures



High Resolution Water Snow and Ice

- Pan-European production in **near real-time (NRT)** based on Sentinel-1 and Sentinel-2 images.
- **7 different snow products** that include information on snow cover extent, snow cover duration and snow conditions.
- **2 water products** provide information on water cover duration and on the characteristic of the presence of open water surfaces.
- **3 ice products** provide information on presence and duration of ice cover on European hydrographic network.



Fractional Snow Cover [in %], Madrid, January 2021



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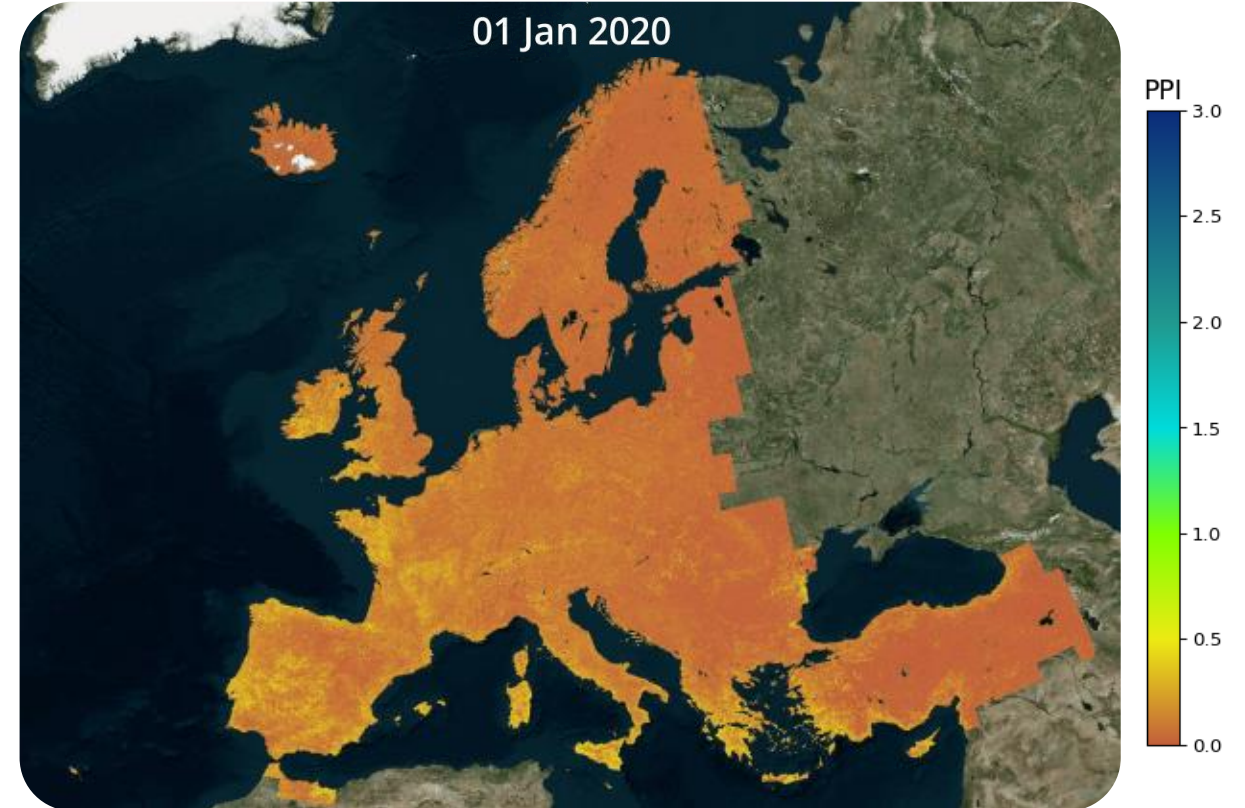
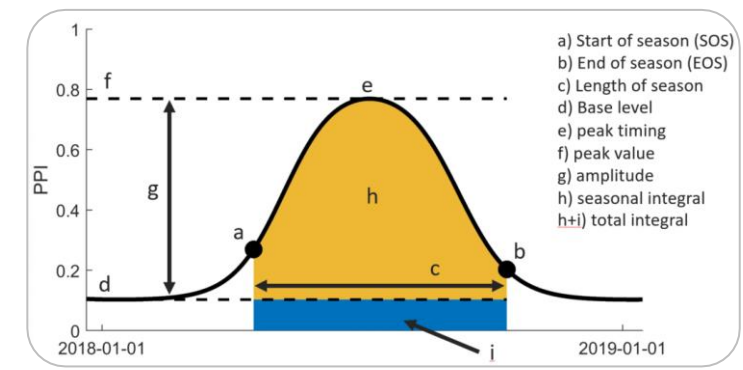


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HR Vegetation Phenology and Productivity

- Covering: 2017-2022
 - Releasing 2023 in Apr 24
- Continued production with new ITT
- Evolution:
 - Aboveground biomass (GPP)
 - Tree Cover Disturbances
 - Reprocessing to align with Sentinel-2 Collection-1
 - Number of NRT vegetation indices will be reduced



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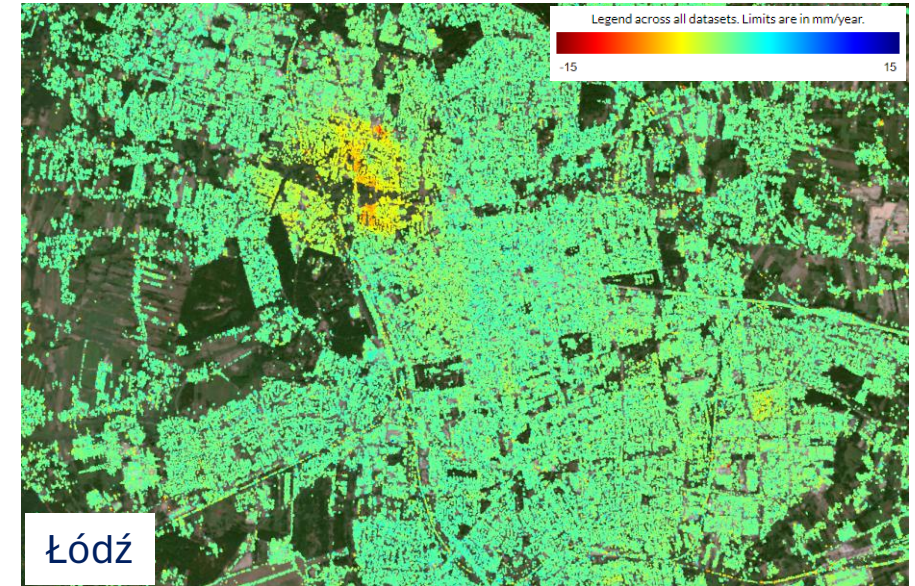
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European Ground Motion Service

- Produced using data collected by the **Sentinel-1** radar satellite mission.
- EGMS products provide a **high-density, continental-scale** map of ground motion.
 - Measures the millimetric-scale motion, over-time, of ground features that reliably reflect back the satellite's radar pulse.
 - Reflecting features may be natural, like bare rocks, or anthropogenic structures.
 - This allows measuring and mapping:
 - Land subsidence
 - Landslides and slope phenomena
 - Uplift (natural or anthropogenic)
 - Movement of larger-scale infrastructure

Available data: 2018-2022

New update – 2019-2023 – available in October 2024!



@usgs

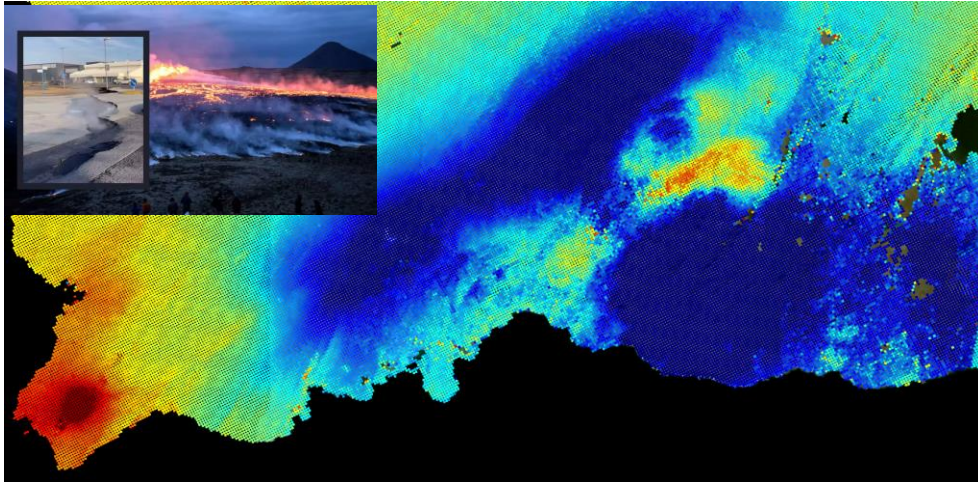
@wikipedia



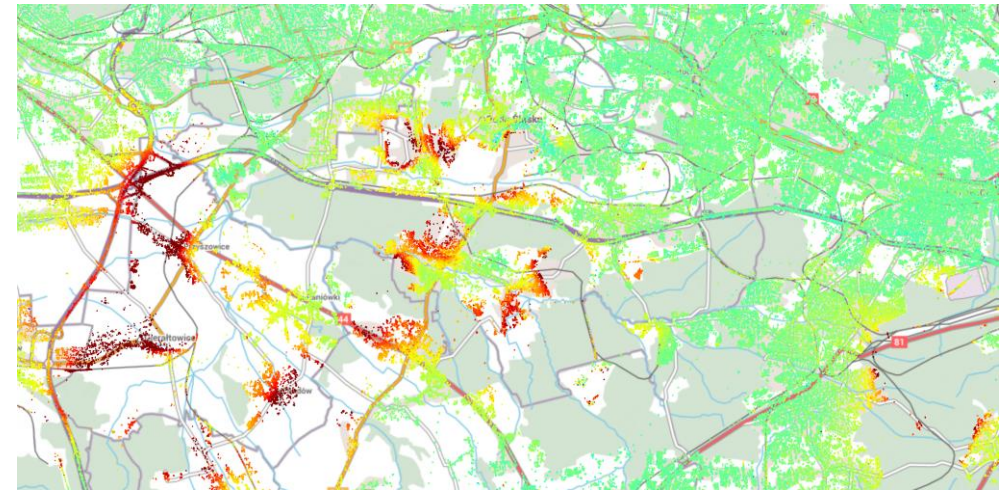
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Why is EGMS relevant for “Land”?

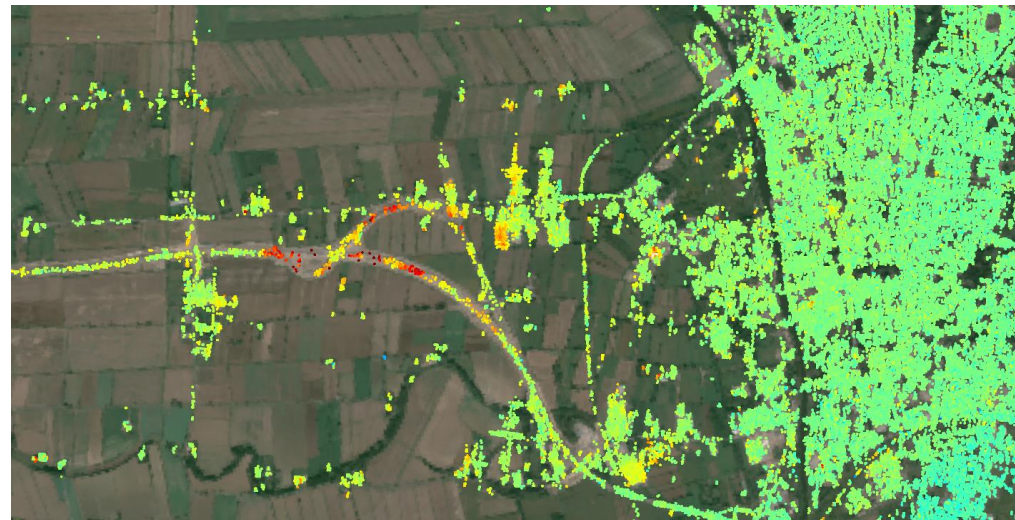


Understand and monitor natural processes



Understand the effects of human activities

Access the data here!



Know the motion of an infrastructure



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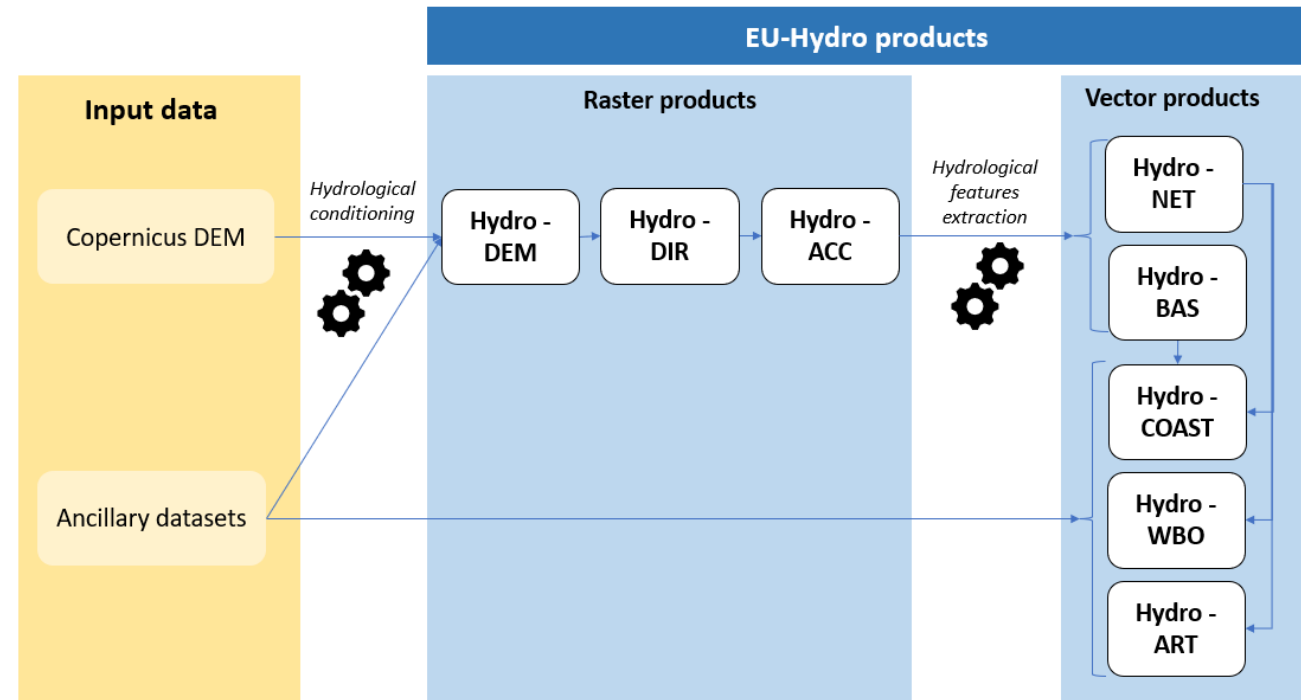


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Revamped EU HYDRO: suite of products

- Upgrade to 2.0 under preparation
 - Based on Copernicus DEM 10 m + ancillary data (VHR, vector & raster datasets)
 - **Raster layers** (Hydrologically conditioned DEM, flow direction, flow accumulation)
 - **Vector layers** (River network, watershed, water bodies, coastline and artificial structures)
 - Ramp up phase 2024, **full production 2025, publication 1st half 2026**



Revamped EU HYDRO: use cases

- **Geospatial reference** for CLMS products
- **Hydrographic reference** for water modelling applications
 - Hydraulic modelling input data
 - Coastline for analytical purposes
 - Geospatial and hydrographic reference for CEMS RM & RRM as well as CEMS Early Warning
 - Environmental assessment (e.g. evaluation of anthropogenic impacts; assessment of river connectivity)



Questions?

Copernicus Helpdesk:
copernicus@eea.europa.eu



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