



https://youtu.be/uzF_ftCeZ5Y

Copernicus, its Academy, EO and new professional profiles

Coordinator of the national Academy Network of the Copernicus Ambassador

Prof. Bernardo De Bernardinis

International Summer School -4th Edition
19-26 July 2026
"NATURAL HAZARDS AND CULTURAL HERITAGE"
PRESERVATION STRATEGIES

Under the high patronage of:

AS International Summer School, Copernicus Ambassador, Regione Umbria, Ministero degli Affari Esteri e della Cooperazione Internazionale, Agenzia Italiana per la Cooperazione allo Sviluppo

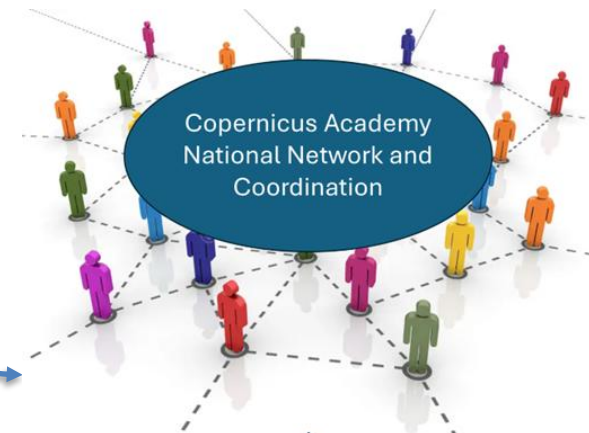
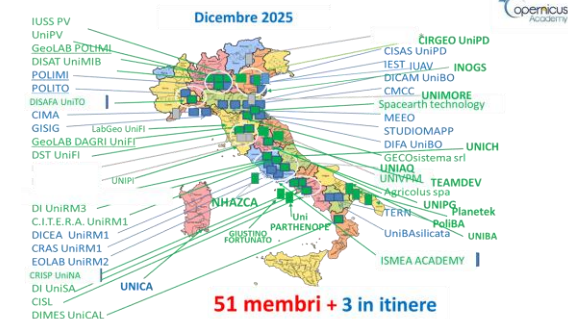
... EU SPACE Networks, Copernicus Ambassadors and Academy and Relays national networks and the User Uptake

10 and 11 April 2025
General Assembly
EU SPACE NETWORKS

Venice

Talent for tomorrow

Bridging the skills gap in the EU Space Sector



... EU SPACE Networks, Copernicus Ambassadors and Academy and Relays national networks and the User Uptake ...

In 2016, in order to inform potential users about the benefits that can be derived from using the Earth Observation (EO) and moreover educate them how to properly apply and use it through what Copernicus is



In 2024, this approach was extended to all other strategic European space programmes, giving rise to the EU SPACE NETWORKS system and their respective Ambassadors. However, only the Copernicus Ambassadors have retained the option of organising themselves into Academies and Relays at national level

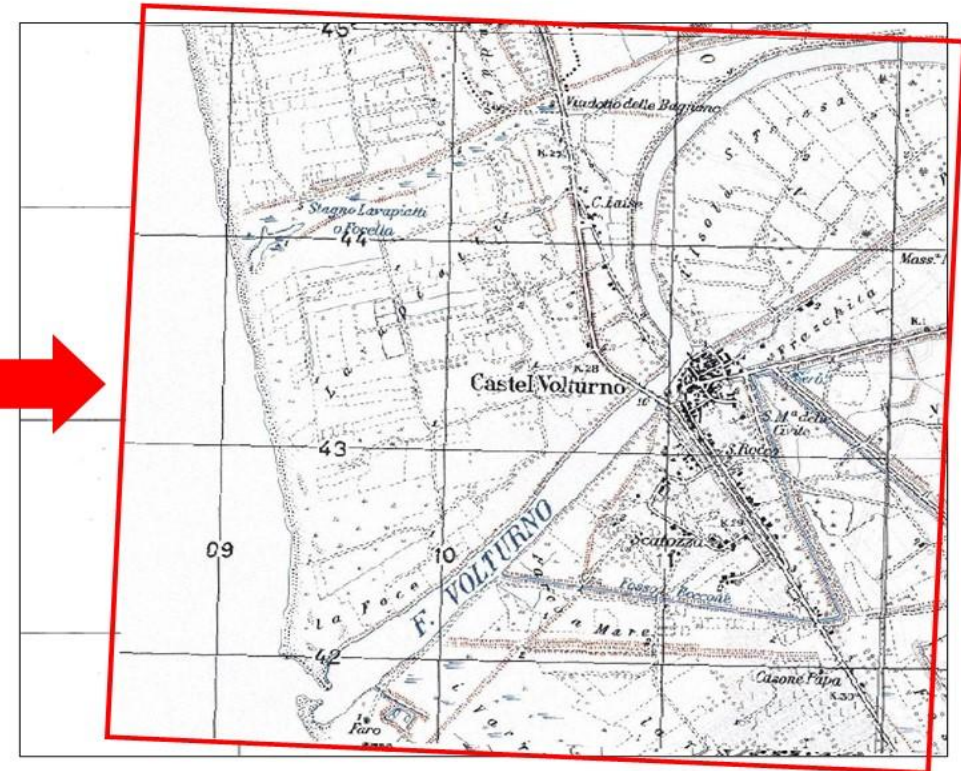
Within this process, the EC has promoted the creation, starting up and development of the two European Networks of Copernicus Relays and Academies, aimed in different and complementary ways:

- ✓ the Relays, to inform, listen and assist locally both public administrations and enterprises
- ✓ the Academies, to inform, educate, train and coach end users, including potential ones

In fact, we should note that both the 'qualitative Bleau' map, produced in the 17th century, and the 'metric cartography', produced by the Italian State (IGM) in the 20th century, namely after three centuries, which respectively represent the course and mouth of the Volturno, one of the major rivers in southern Italy, were both produced through site investigations, surveys on the ground and ground-based measurements



Willem Janszon Blaeu: Terra di Lavoro olim Campania Felix da *Theatrum Orbis Terrarum, sive Atlas Novus in quo Tabulae et Descriptiones Omnium Regionum* Amsterdam, 1645 - 1665



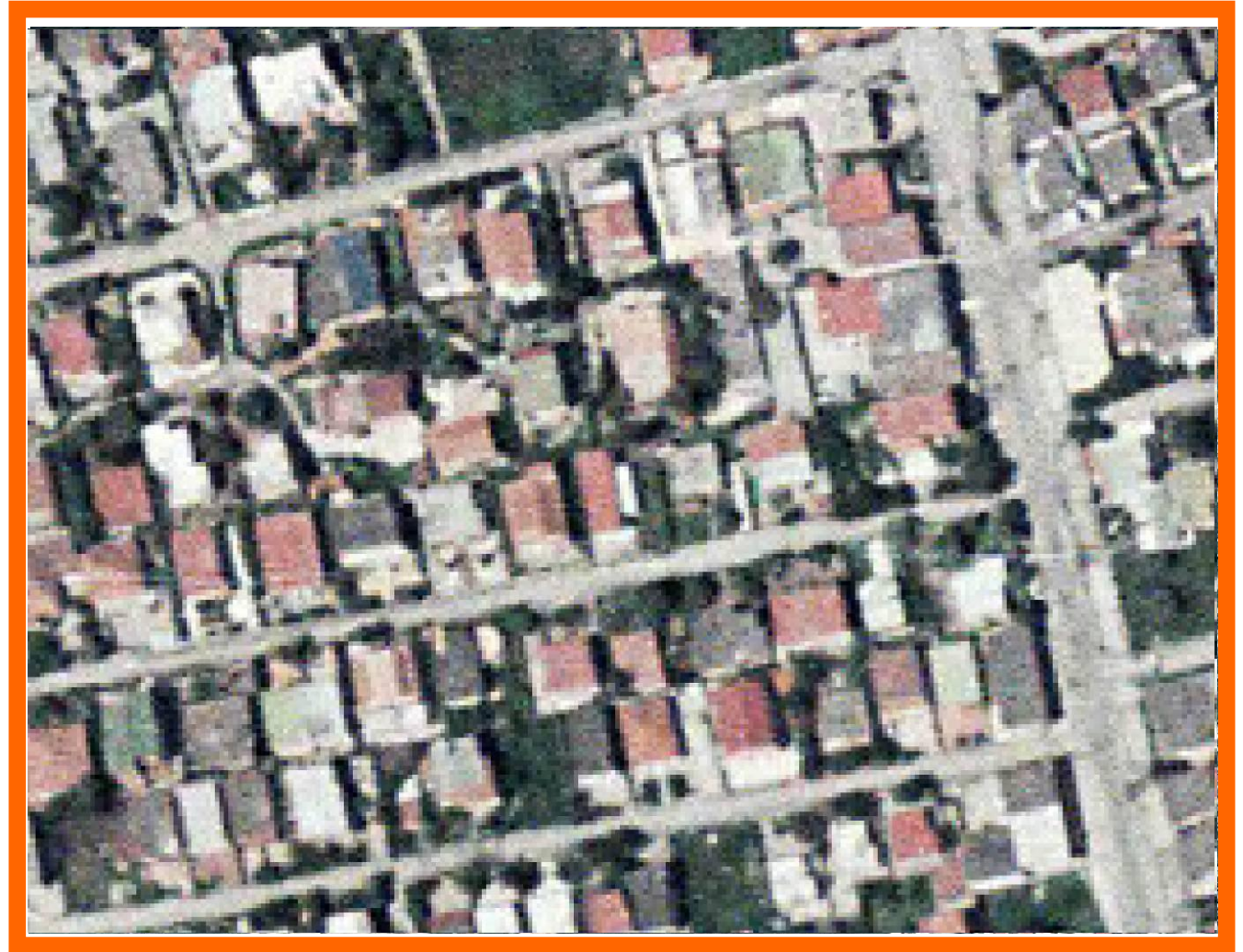
IGM (1:100.000)

After a long journey that began with the "measurement of a terrestrial arc" and the application of Eratosthenes' method, going through the "metric cartography" already available before the unification of Italy (1861) and by integrating and merging satellite data with other data and information still detected on or near the ground, eventually, we are able to produce even more complex and complete sets of information ...



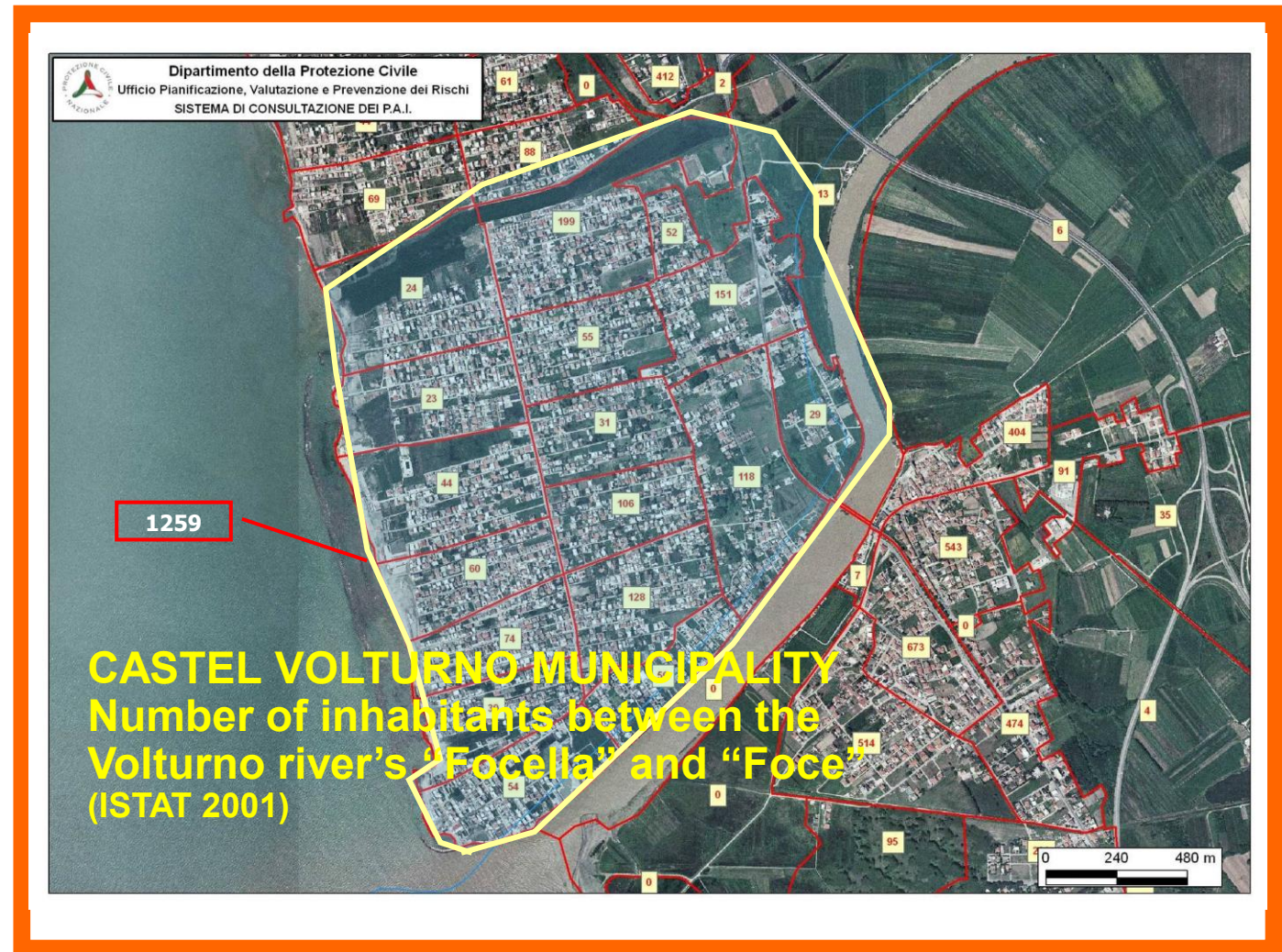
... from the thirties onwards

After a long journey that began with the "measurement of a terrestrial arc" and the application of Eratosthenes' method, going through the "metric cartography" already available before the unification of Italy (1861) and by integrating and merging satellite data with other data and information still detected on or near the ground, eventually, we are able to produce even more complex and complete sets of information ...



... and then we zoom in

After a long journey that began with the "measurement of a terrestrial arc" and the application of Eratosthenes' method, going through the "metric cartography" already available before the unification of Italy (1861) and by integrating and merging satellite data with other data and information still detected on or near the ground, eventually, we are able to produce even more complex and complete sets of information ...

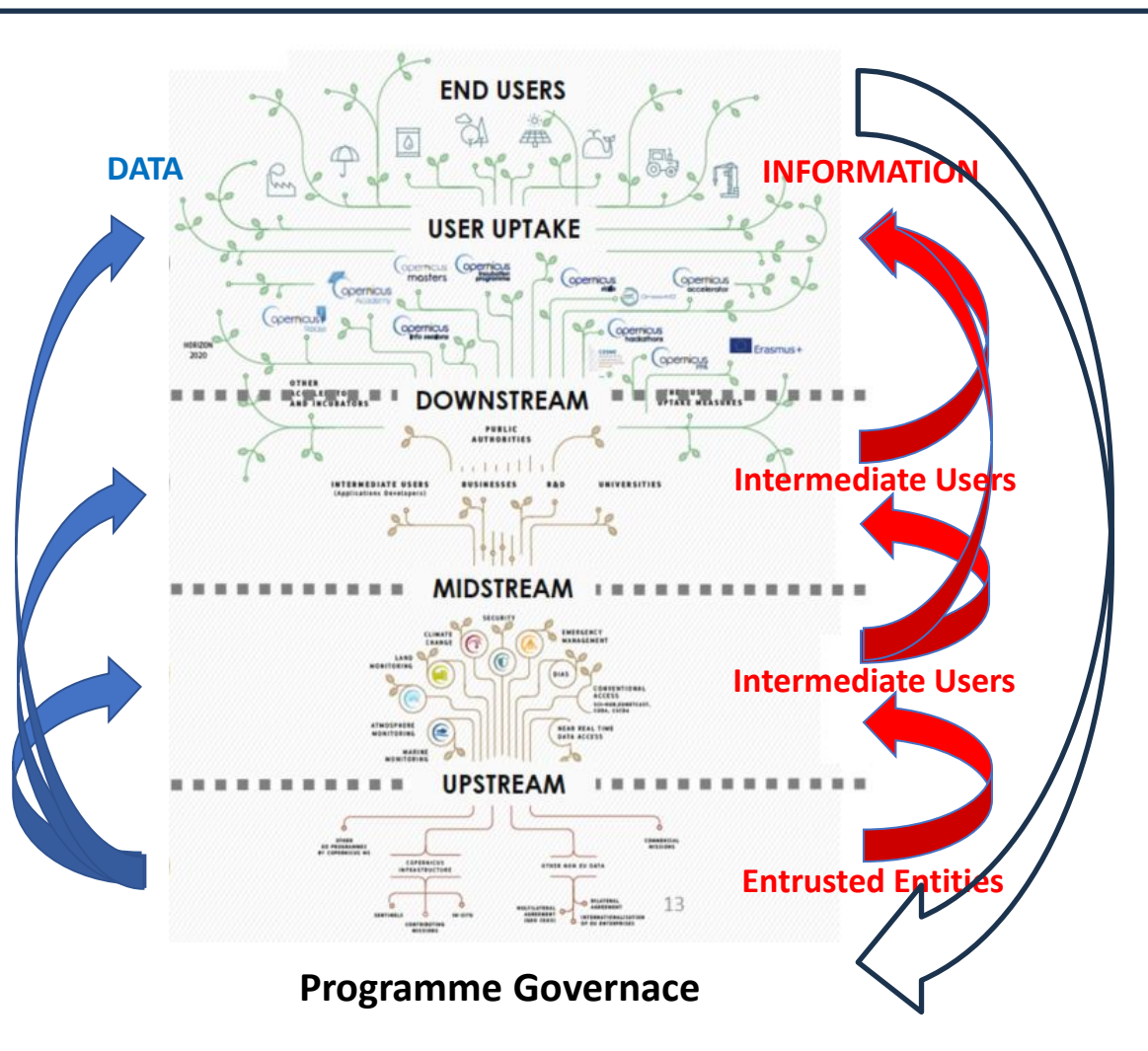


... and then we can obtain

Nowadays, **Earth Observation** can be described as:

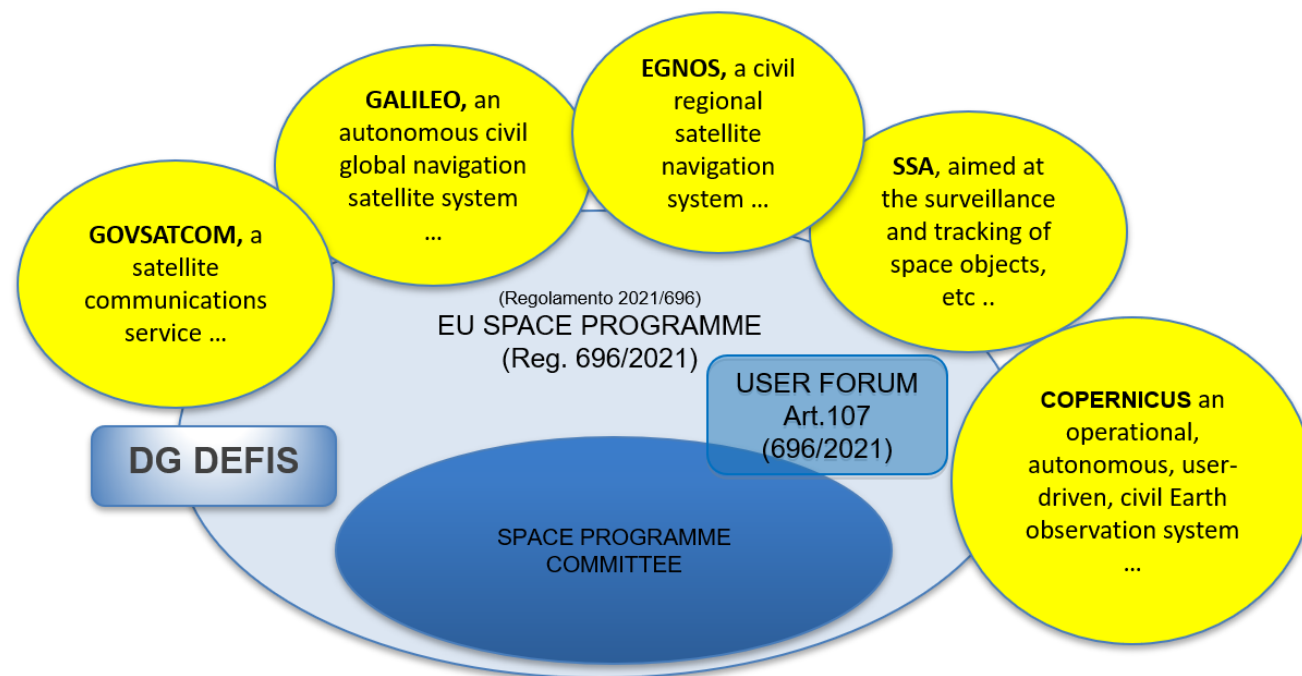
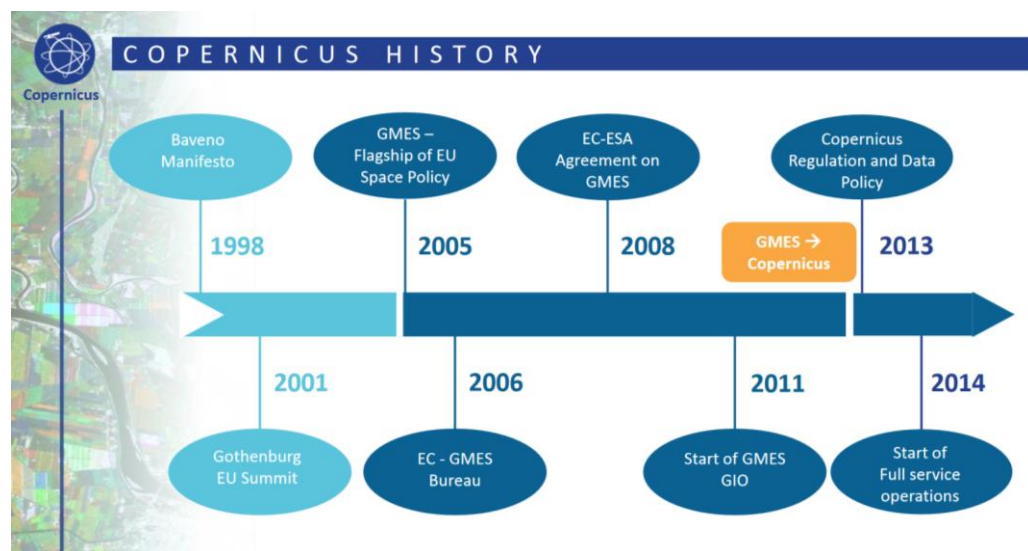
‘the field of human knowledge that, by collecting data from multiple sources, integrating and processing them through even complex simulation systems, aims to help identify and measure in space and time the elements present near and/or on Earth's surface, as well as the processes that relate them to each other in order to describe their state and evolution” ...

... and the **structure of an Earth Observation Program**, like **GMES** and **Copernicus**, must be organized in the sequence of different Components, that shows how inescapable and fundamental it is to reach and engage “**end users**” through the **User Uptake** final Program Component and **involve them in the governance** of the program itself

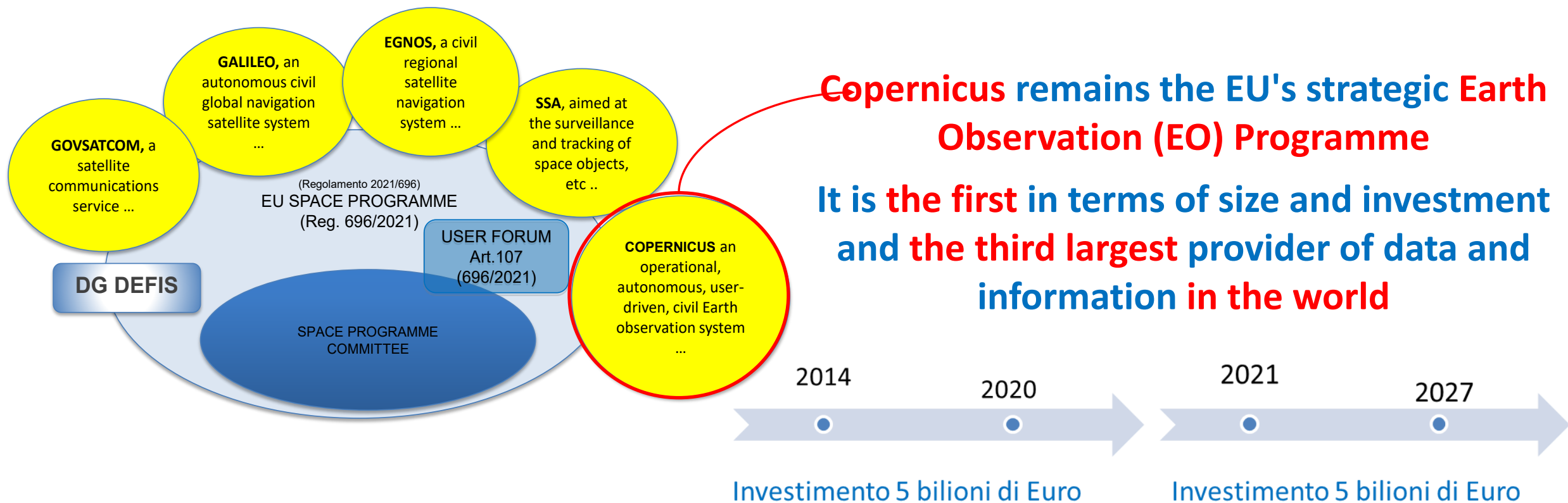


... from GMES, the first European Earth Observation Programme to the new “EU Space Programme” and its Regulation 626/2021 ...

It is believing and relying on the possibility to observe the Earth in a new way that a 'Copernican' revolution was started by the signature of the Baveno Manifesto in May 1998, leading to GMES and Copernicus, the European Earth Observation Programmes.



In 2021, the knowledge that have been developed and the experience accumulated during the long success story of GMES and then Copernicus, were gathered by the European Union into a single new Space Regulation (Reg. EU 696/2021) together with those of the other strategic European programs devoted to Space (SSA) and/or making different degrees of use of Space (Galileo, EGNOS and GOVSATCOM)

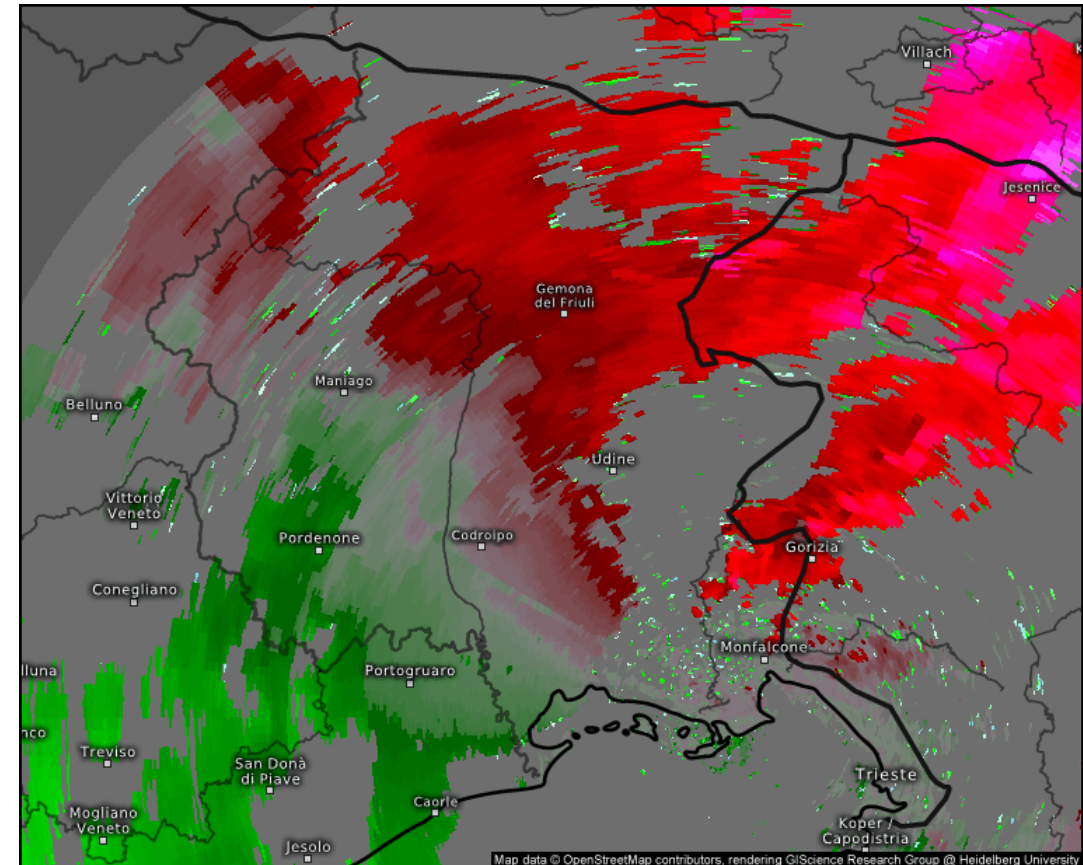


Copernicus remains the EU's strategic Earth Observation (EO) Programme

It is the first in terms of size and investment and the third largest provider of data and information in the world

... Its numerous services offer well over 800 open, free and free of charge informative products, for a volume of data and information exceeding 30 PBytes per quater !!! ...

THE COPERNICUS PROGRAMME IS NOT JUST ABOUT DATA COLLECTED FROM THE GROUND ...



Radar Fossalon, 125m (km/h)

Mon 05/12/2022, 17:10 CET

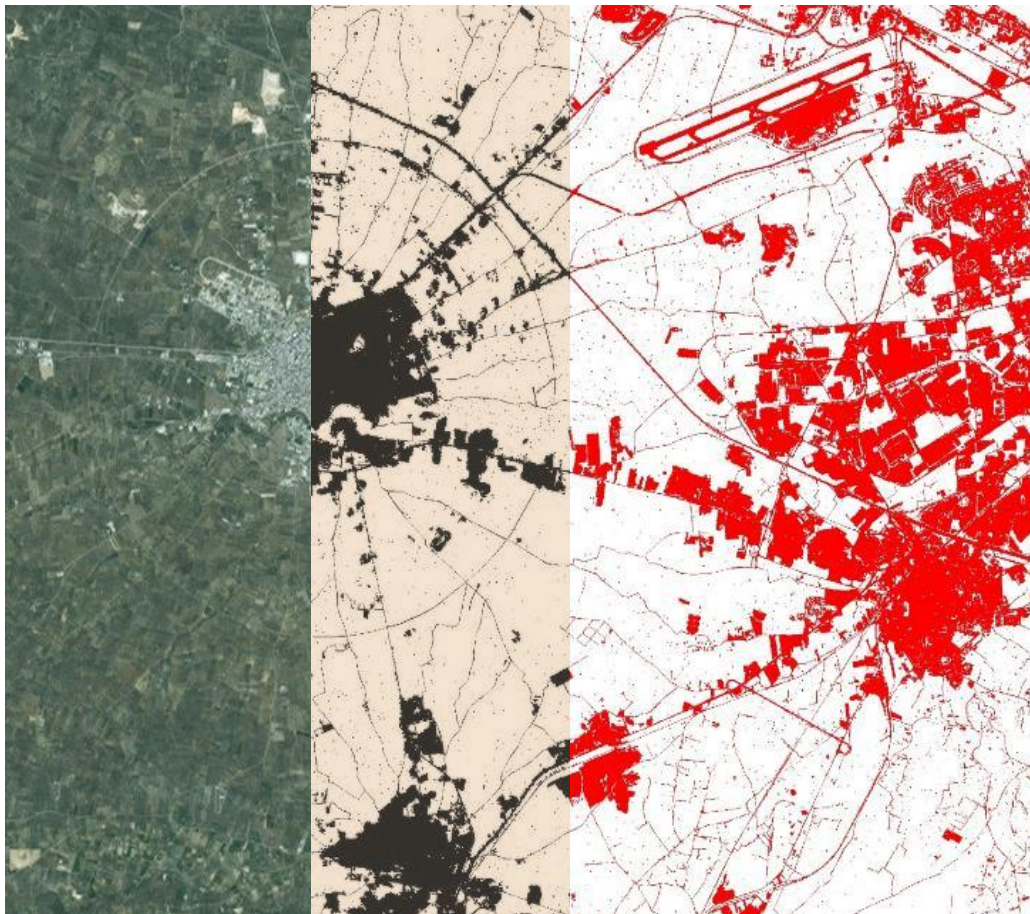


Friuli-Venezia Giulia



Source: Protezione Civile della Regione Friuli Venezia Giulia

THE COPERNICUS PROGRAMME IS NOT JUST ABOUT DATA COLLECTED FROM SPACE ...



- Improvement of geometric resolution and land cover estimates
- Identification of scattered dwellings and small-scale infrastructure

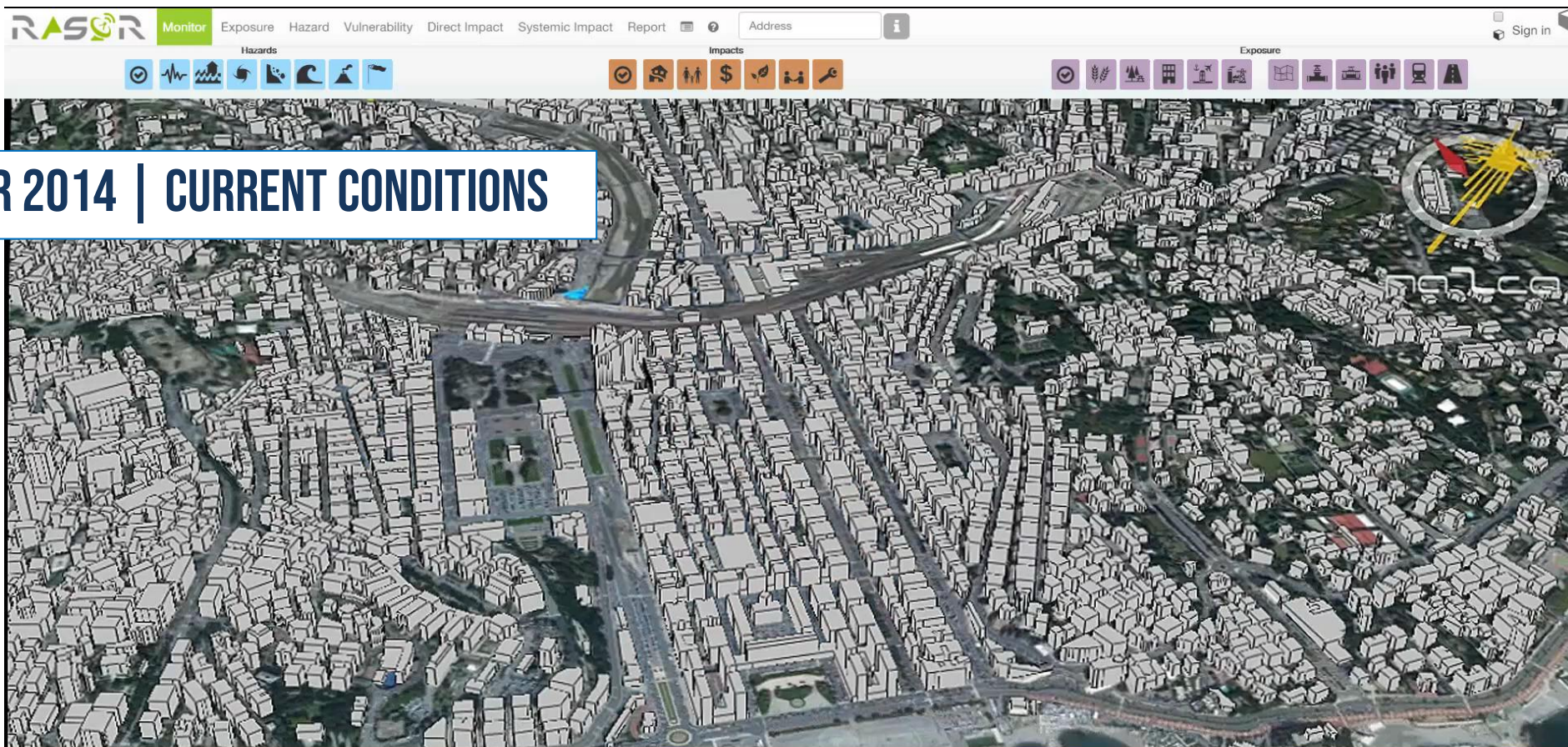
Copernicus EU map
20m x 20m

National map
5m x 5m (ISPRA)

Using *RapidEye*, a
Contributing
Mission (ISPRA)

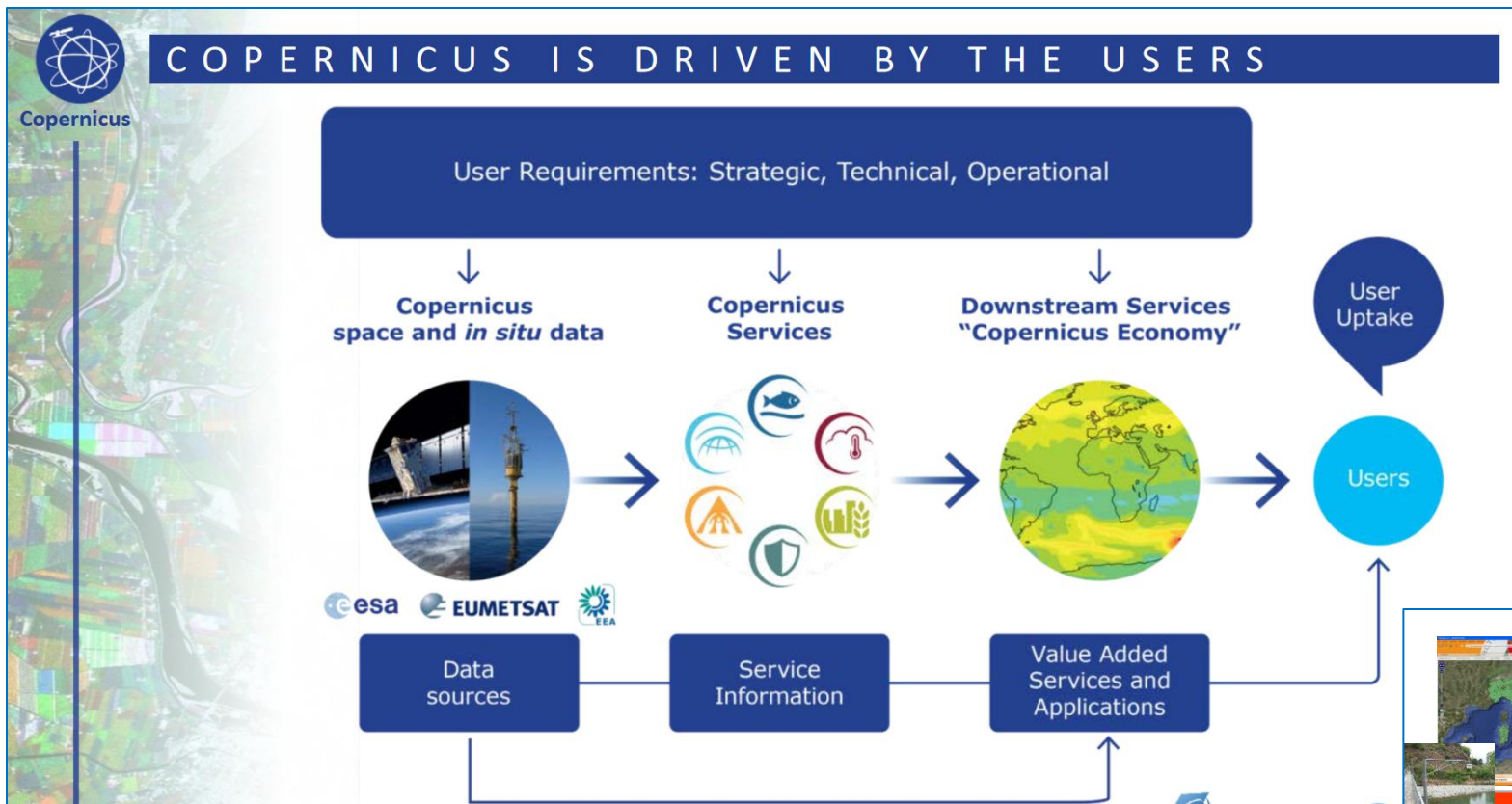


THE COPERNICUS PROGRAMME IS NOT JUST ABOUT MODELS THAT SIMULATE EVENTS ...



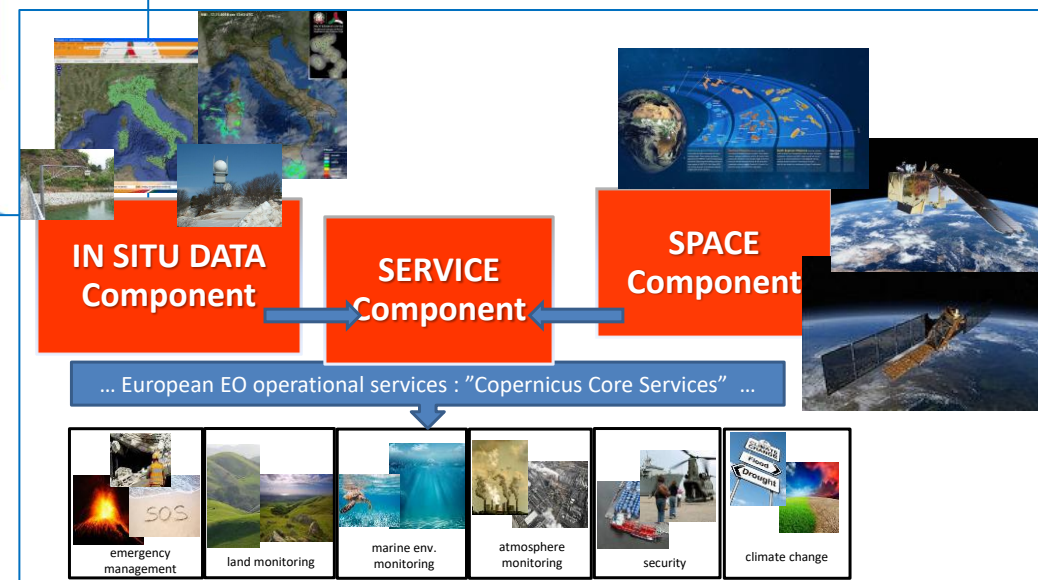
GENOVA, 9 OCTOBER 2014 | CURRENT CONDITIONS

... Copernicus structure, components, value and operational chain ...

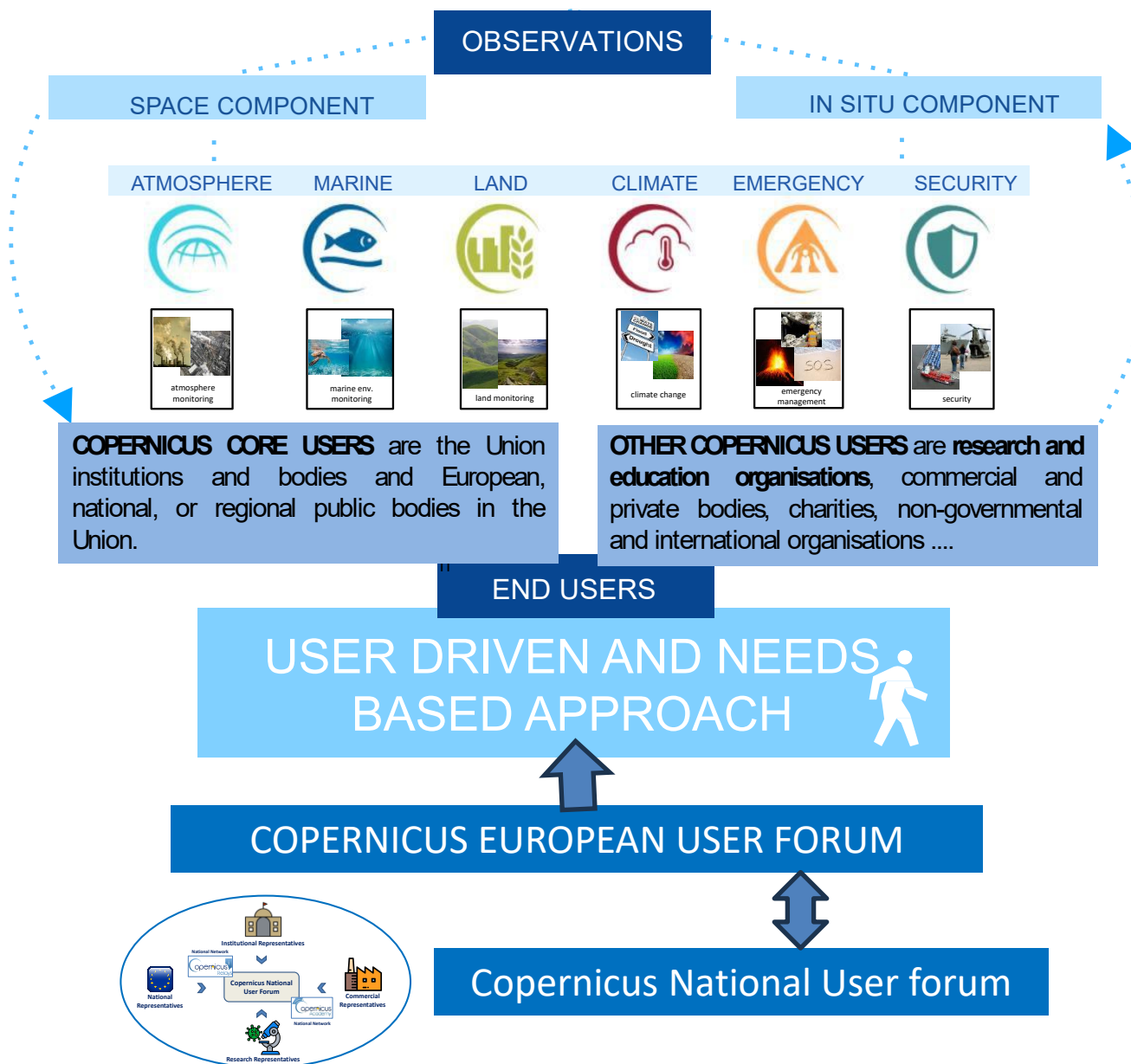


The value and operational chain ...

... and the structure of Components



... Copernicus structure, user communities and objectives ...



“... The objective of Copernicus should be to deliver accurate and reliable **Earth observation data, information and services** integrating other data sources, supplied on a long-term sustainable basis, to support the formulation, implementation and monitoring of **the Union and its Member States’ policies and actions based on user requirements.**

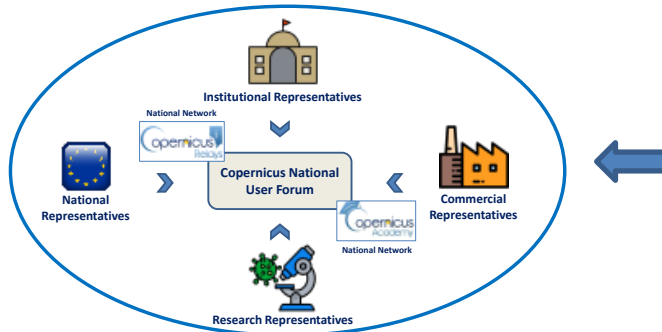
In order to attain its objectives, **Copernicus should ensure** an autonomous access to **environmental knowledge** and **key technologies** for **Earth observation** and **geo-information services**, thereby supporting the Union to achieve independent decision-making and actions **in the fields** of, inter alia, **the environment, climate change, marine, maritime, agriculture and rural development, preservation of cultural heritage, civil protection, land and infrastructure monitoring, security, as well as the digital economy. ...”**

REGULATION (UE) N. 626/2021

The **primary** aim is **to share information and coordinated decisions** about the ongoing and foreseen activities in the Copernicus Committee and User Forum at the European level.

The **second** aim is **to identify and define the needs and requirements of end users** for new and innovative technologies, products and operational services within the various Communities.

The **third** aim has been set up **to define the National and European state of play of the Copernicus Programme** as a whole, with focus on the national users' needs and requirements, and **to stimulate and produce a qualified, authoritative and coordinated national space policy in the Programme**, particularly regarding **all Core Services** offered at the European levels, as well as the **Downstream Services** that can be originated from them at the national level.



CNUF Consultation Boards

- Security  MINISTERO DELLA DIFESA
- Infrastructure & Transports 
- Cultural Heritage  MINISTERO DELLA CULTURA
- Agriculture  mipaaf
- Environmental protection }  ISPRA
- Coastal }
- Dissemination }
- Valorization - Industry and Enterprises
- Emergency  PROTEZIONE CIVILE NAZIONALE

National Boards contributing to the user requirement coordination

- Operational Geology
- Operational Hydrology
- Operational Climatology }  ISPRA
- Air quality  Sistema Nazionale per la Protezione dell'Ambiente
- Climate
- CO₂  Consiglio Nazionale delle Ricerche
- GREEN-NET  Ministero dello Sviluppo Economico

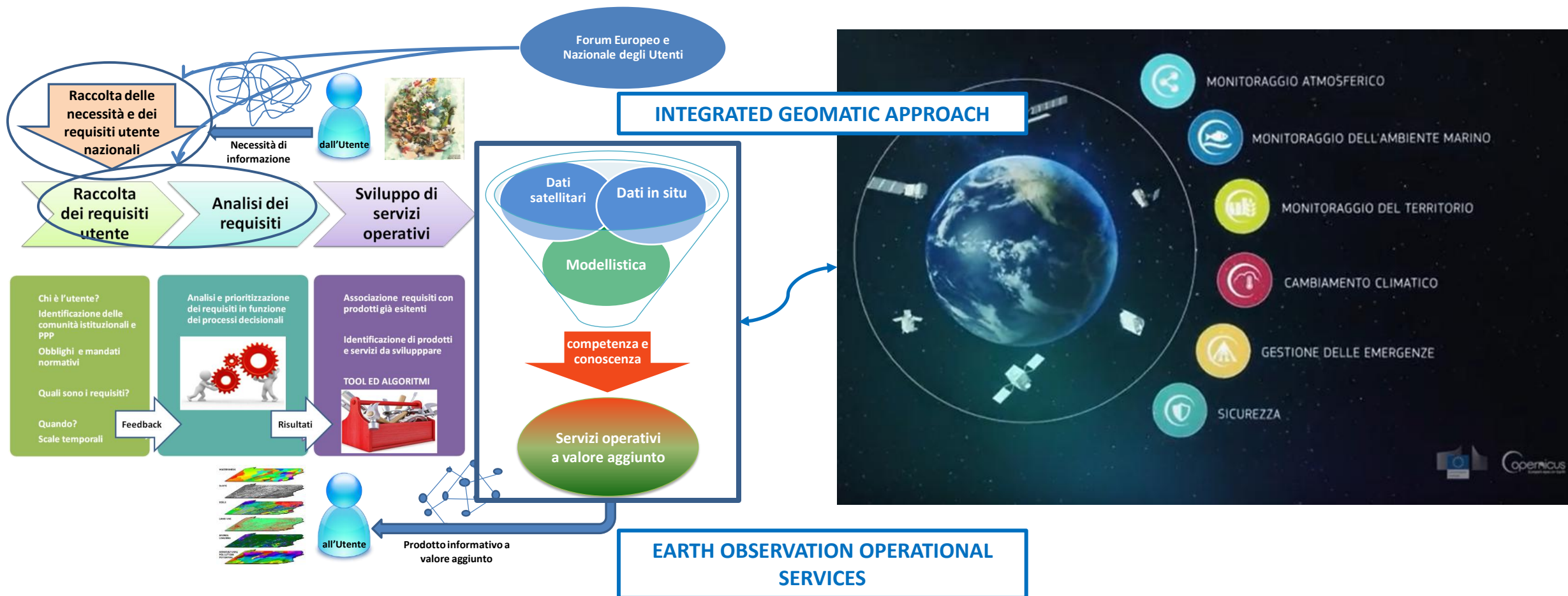
Copernicus Networks

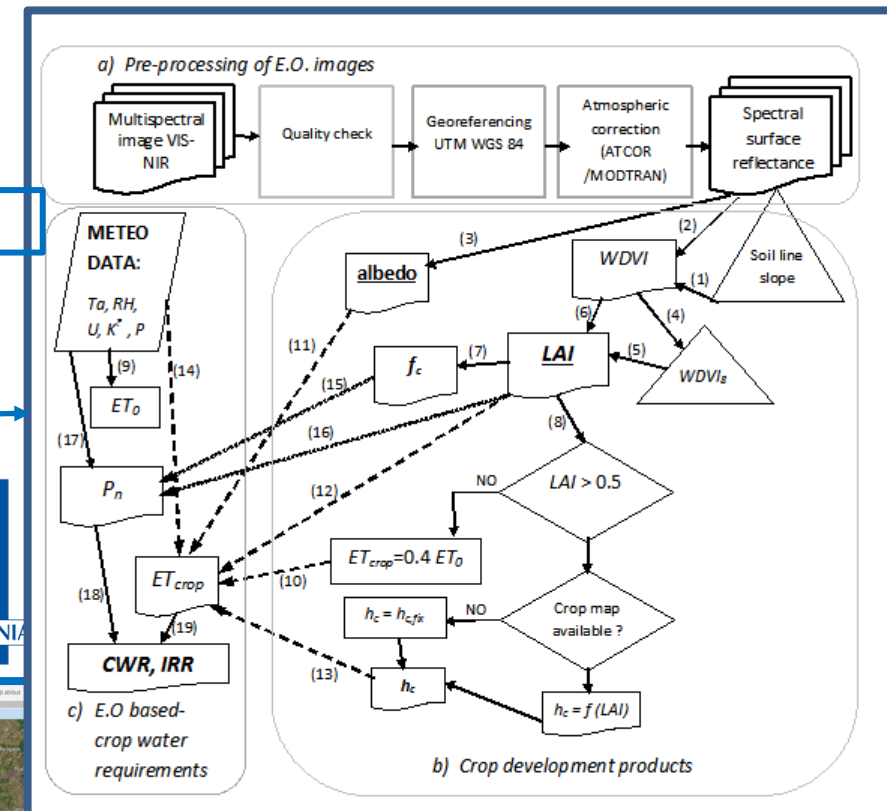
- Copernicus Academy
 - Copernicus Relays
- 

More than 900 participants

- **40** Institutional and non representatives
- **645** in consultation boards
- **75** in National Academy Network
- **10** in National Relays Network
- **172** in Operational Geology and Climatology National Boards

... Copernicus: from User needs to the development of operational services through an integrated Geomatics approach ...

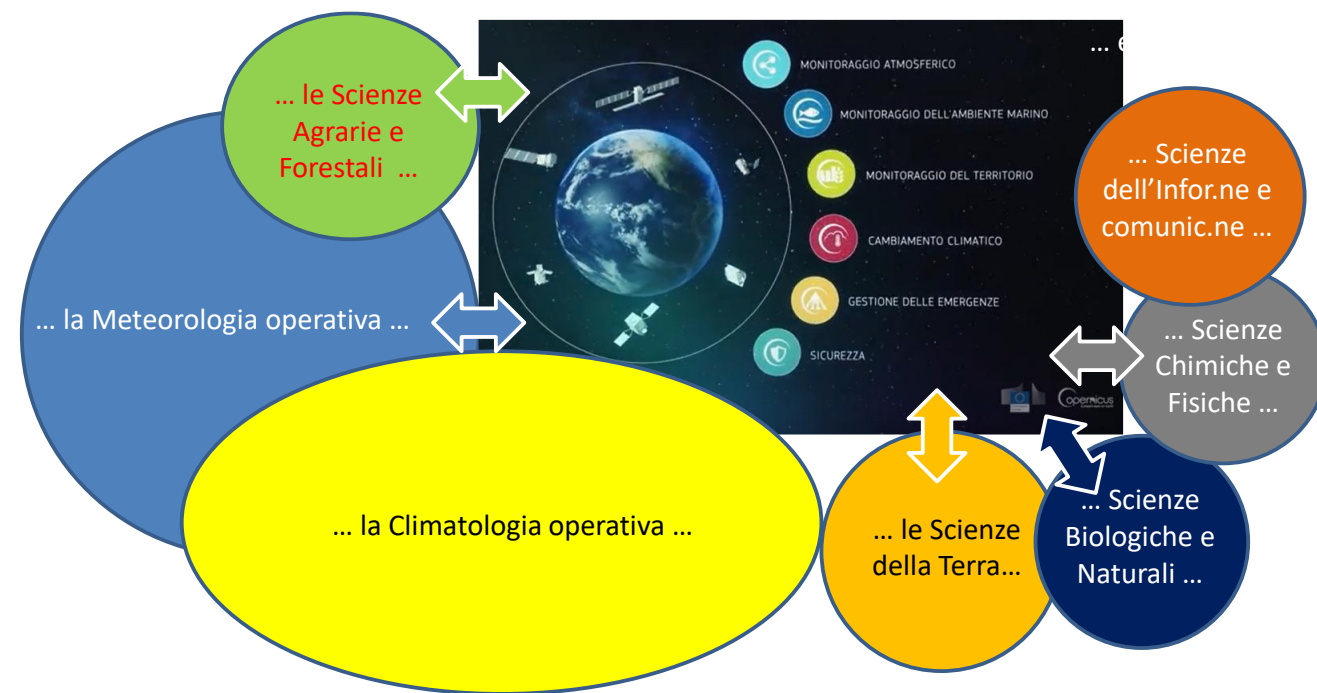




Prof. U. D'Urso, UniNA «Federico II»

... However, Copernicus, in order to produce or enhance what it makes available, requires an active and direct use of additional knowledge, information, and data produced by other operational activities and in other connected topics ...

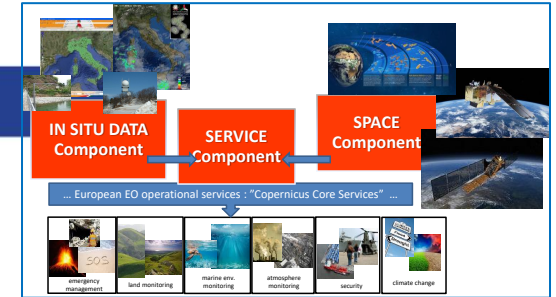
... thus, while Operational Climatology is part of Copernicus objectives and actions through the Climate Change Core Service, Operational Meteorology and other disciplinary areas and domains are separate, autonomous and independent, but still fully interacting and useful to Copernicus operational services, providing their needed specific knowledge, methods, products and services !!! ...

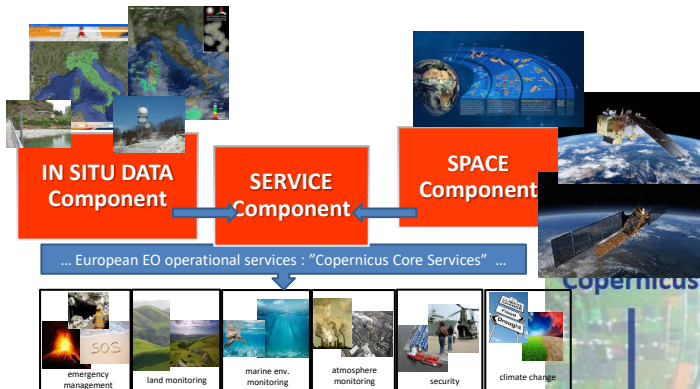




IN - SITU : OVERVIEW

- *In situ* data = observation data from ground-, sea-, or air-borne sensors, reference and ancillary data licensed for use in Copernicus
- Use of *In situ* data:
 - Validate & calibrate Copernicus products
 - Reliable information services
- Implementation in two tiers:
 - Tailored *in situ* data for each Copernicus service level
 - Cross-cutting coordination across services by the EEA





THE SENTINELS

Sentinel Mission and Status

Key Features

FULL, FREE AND OPEN

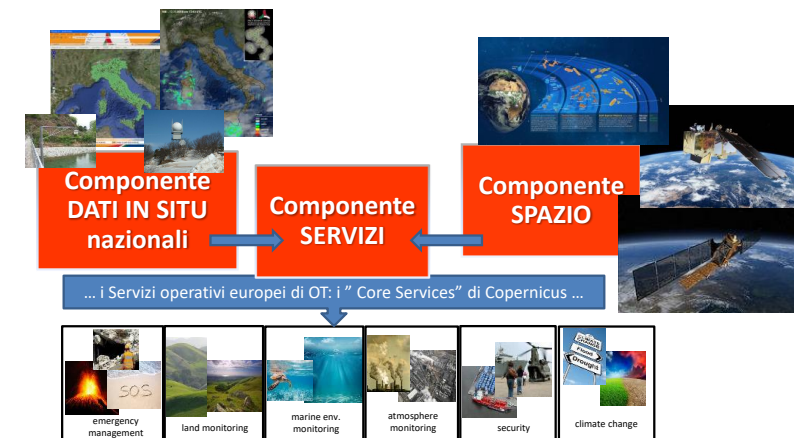
	SENTINEL-1: 9-40m resolution, 6 days revisit at equator	S1-A and B in orbit	Polar-orbiting, all-weather, day-and-night radar imaging
	SENTINEL-2: 10-60m resolution, 5 days revisit time	S2-A in Orbit S2-B in Orbit	Polar-orbiting, multispectral optical, high-res imaging
	SENTINEL-3: 300-1200m resolution, <2 days revisit	S3-A in Orbit S3-B Launch Q4 2017	Optical and altimeter mission monitoring sea and land parameters
	SENTINEL-4: 8km resolution, 60 min revisit time	1st Launch Q4 2022	Payload for atmosphere chemistry monitoring on MTG-S
	SENTINEL-5p: 7-68km resolution, 1 day revisit	Launch in Q2 2017	Mission to reduce data gaps between Envisat, and S-5
	SENTINEL-5: 7.5-50km resolution, 1 day revisit	1st Launch in 2021	Payload for atmosphere chemistry monitoring on MetOp 2 nd Gen
	SENTINEL-6: 10 days revisit time	July 2020	Radar altimeter to measure sea-surface height globally

Subject to Data Owner's Data Policy



... Copernicus: Service Component (EEA, JRC, ECMWF, MOI, SATCEN, FRONTEX, EMSA) ...

... However, the **Core Services** are the **primary objective of Copernicus**. They transform satellite and in-situ data into added value information by analysing, processing, integrating them with other sources, feeding them in some **geomatic approach** and then validating the obtained results. Mathematical simulative models are examined and used to increase forecasting capacity, for example, in ocean and atmospheric analysis. ...

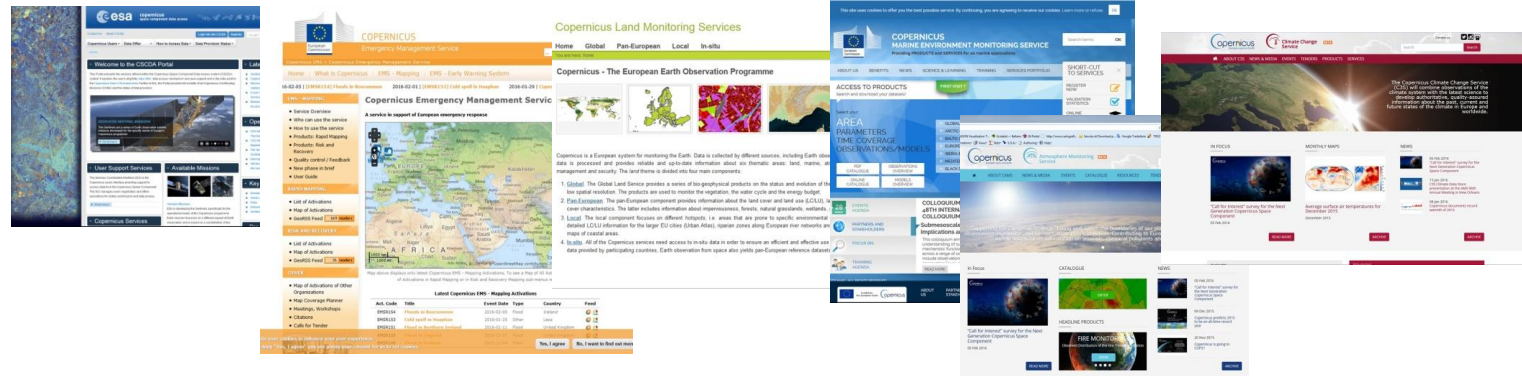


European Directive	Copernicus Application Domains									
	Agriculture, Forestry & Fisheries	Biodiversity & Environmental Protection	Climate & Energy	Civil Protection & Humanitarian Aid	Public Health	Tourism	Transport & Safety	Urban & Regional Planning		
Agriculture/Food security										
Nitrates European Directive (91/676/EEC)										
Common Agricultural Policy										
Habitats Directive (92/43/EEC)										
Birds Directive (2009/147/EC)										
Animal By-products Regulation (1069/2009/EU)										
Ecosystem structure/composition										
Habitats Directive (92/43/EEC)										
Birds Directive (2009/147/EC)										
Animal By-products Regulation (1069/2009/EU)										
Inland/coastal water and environment										
Marine Strategy Framework Directive (2008/56/EC)										
Water Framework Directive (2000/60/EC)										
Bathing Water Directive (2006/7/EC)										
Maritime Spatial Planning Directive (2014/89/EU)										
Strategic Environmental Assessment Directive (2001/42/EC)										
Floods Directive (2007/60/EC)										
Directive urban waste water treatment (91/271/EEC)										
Air quality										
Ambient air quality and cleaner air Directive (2004/107/EC & 2008/50/EC)										
Cultural Heritage										
The General Conference of the United Nations Educational, Scientific and Cultural Organization meeting in Paris from 17 October to 25 November 1972										
Raw materials										
Raw Materials Initiative (COM 2008/699)										
Natural and man-made hazards										
Restrictions on the marketing and use of certain dangerous substances and preparations (asbestos) (1999/77/EC)										
Thematic strategy for soil protection" [COM(2006) 231]										
Water Framework Directive (2000/60/EC)										
Floods Directive (2007/60/EC)										
Waste Directive (2008/98/EC)										
Ice and snow										
No specific reference										
Urban Area Management										
Enhancing Europe's Natural Capital COM(2013)0249 final Decision n. 1386/2013/EU										

Copernicus Application Domain	Related Copernicus Service(s)	Link
Agriculture, Forestry and Fisheries		http://www.copernicus.eu/main/agriculture-forestry-and-fisheries
Biodiversity and Environmental Protection		http://www.copernicus.eu/main/biodiversity-and-environmental-protection
Climate and Energy		http://www.copernicus.eu/main/climate-and-energy
Civil Protection and Humanitarian Aid		http://www.copernicus.eu/main/civil-protection-and-humanitarian-aid
Public Health		http://www.copernicus.eu/main/public-health
Tourism		http://www.copernicus.eu/main/tourism
Transport and Safety		http://www.copernicus.eu/main/transport-and-safety
Urban and Regional Planning		http://www.copernicus.eu/main/urban-and-regional-planning
Legend Copernicus Marine Environment Monitoring Service (CMEMS) Copernicus Land Monitoring Service (CLMS) Copernicus Climate Change Service (C3S) Copernicus Emergency Management Service (CEMS) Copernicus Security Service (CSS) Copernicus Atmosphere Monitoring Service (CAMS)		

... the **Core Services** are primarily intended for the implementation of the **sectorial European Directives** and are transversal to several application domains that, for the most part of them, respond to the interests of specific and broad User Communities. ...

COPERNICUS: Service Component



The processed data and the information produced by the different Copernicus Core Services are available through the respective dedicated web portals.

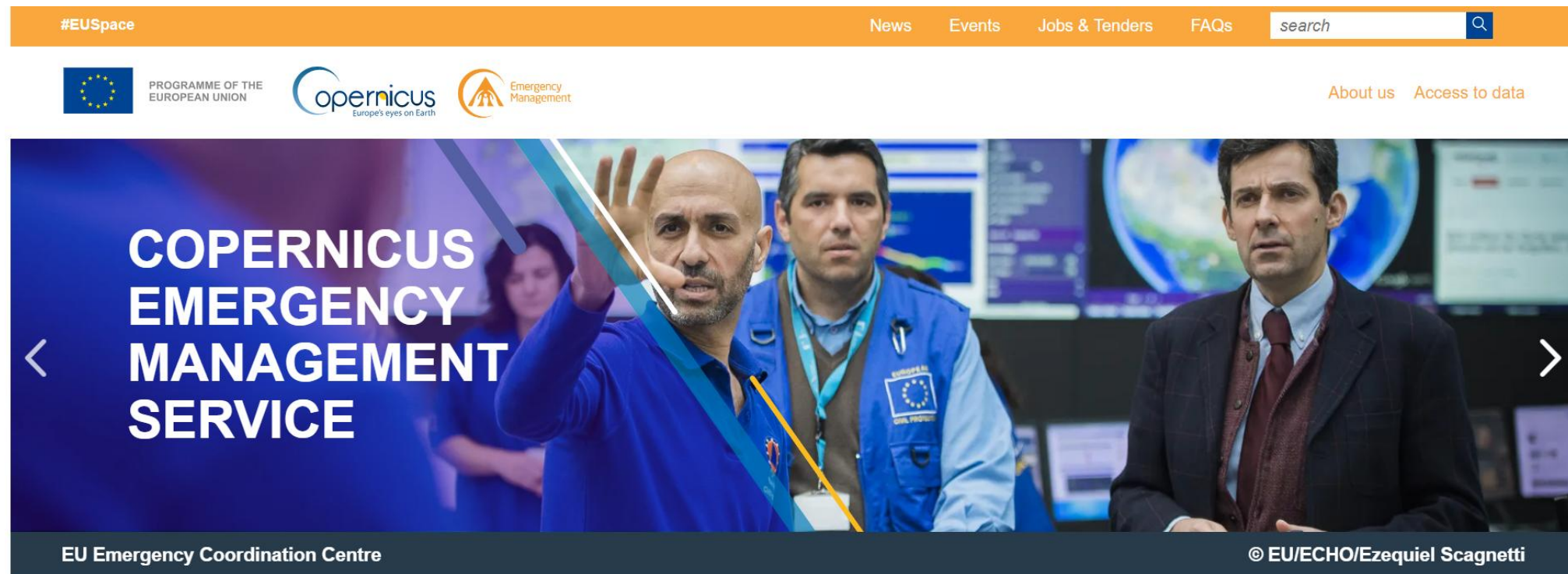
- Land-related data: <http://land.copernicus.eu>
- Atmosphere-related data: <http://atmosphere.copernicus.eu>
- Marine-related data: <http://marine.copernicus.eu>
- Emergency-related data: <http://emergency.copernicus.eu>
- Climate change-related data: <http://climate.copernicus.eu>

Each of them has its own access rules and procedures and access, data and information are all free of charge and open, except for the Copernicus Security Service .

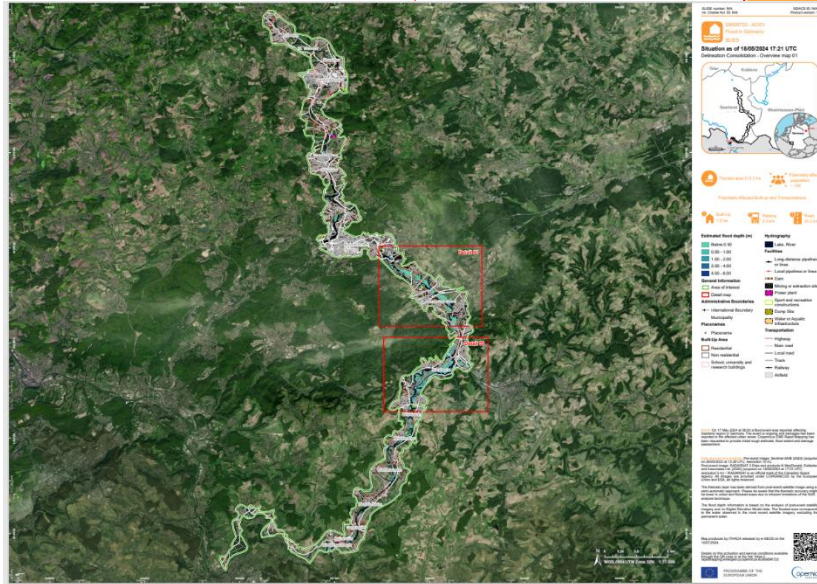
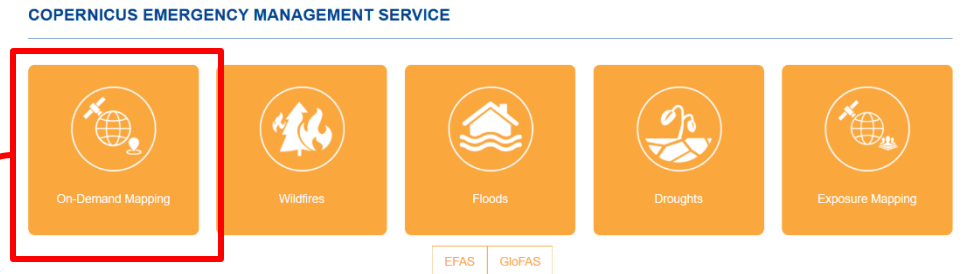
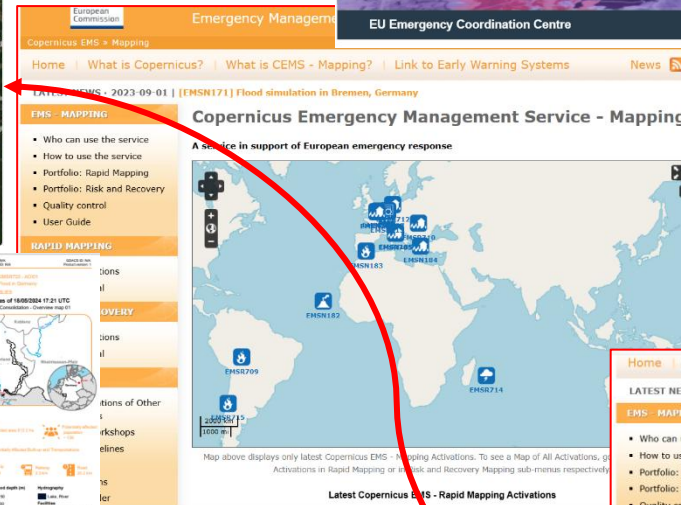
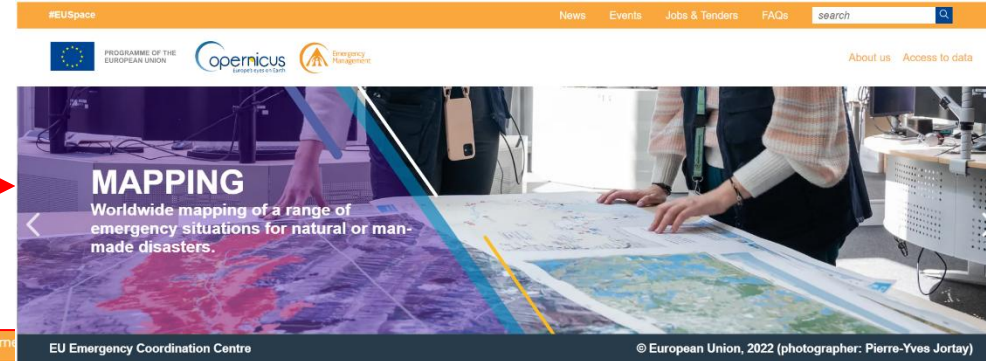
COPERNICUS EMERGENCY MANAGEMENT SERVICE: a brief introduction and some examples of use



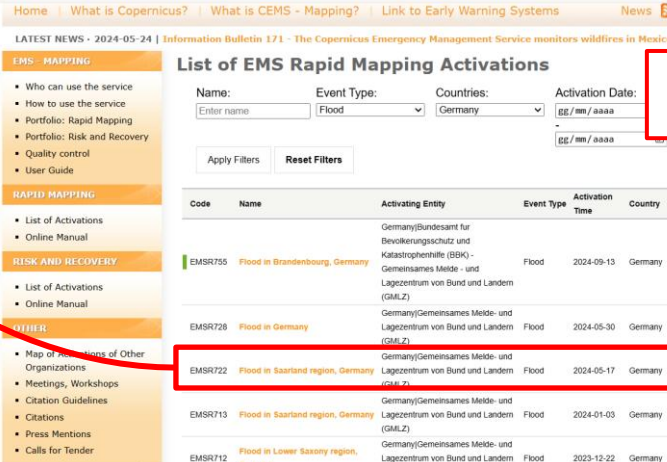
CEMS answers to the civil protection needs to face and recovery from floods, tsunamis, earthquakes, landslides, forest fires, etc. and, even if only authorized users can trigger the service, everybody can access maps on its site: <http://emergency.copernicus.eu/>



COPERNICUS EMERGENCY MANAGEMENT SERVICE: a brief introduction and some examples of use



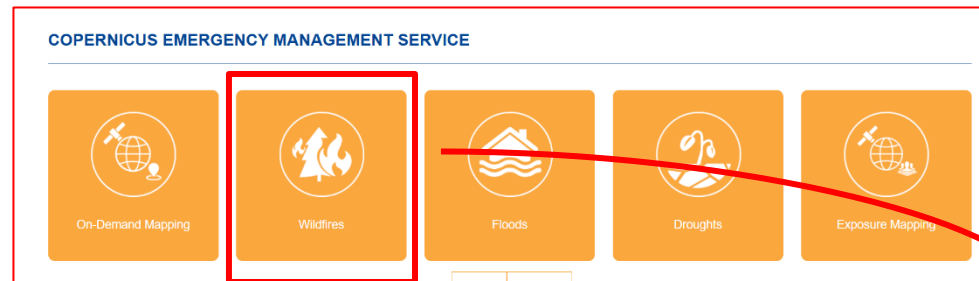
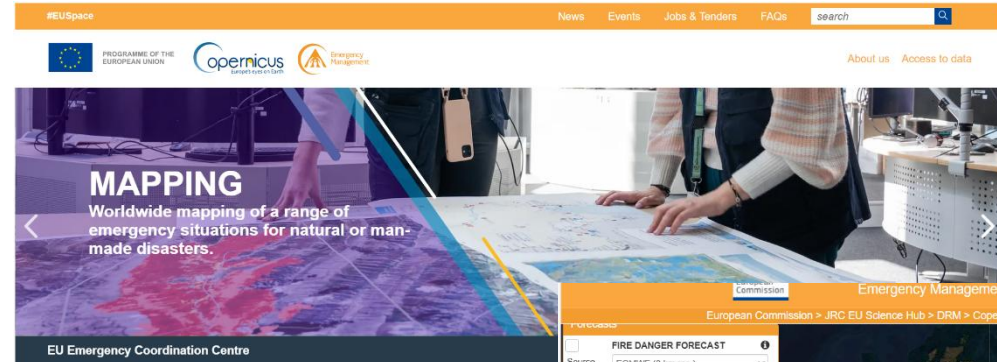
Rapid Mapping



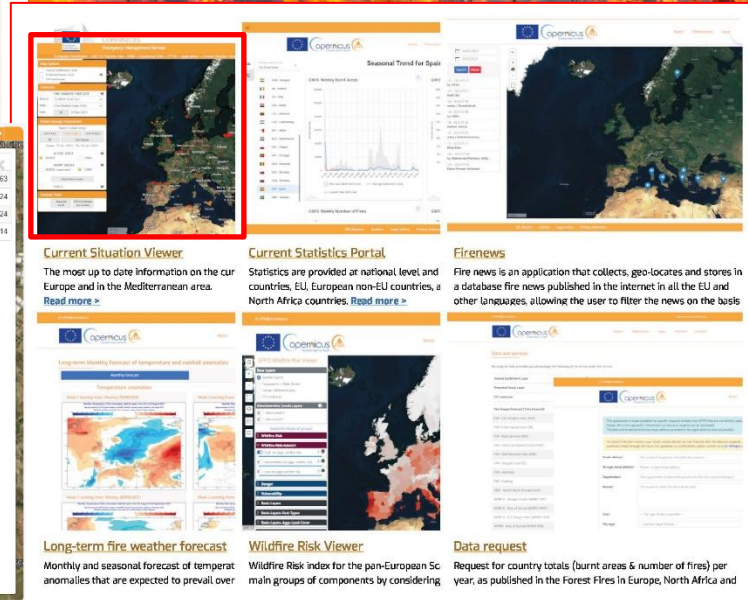
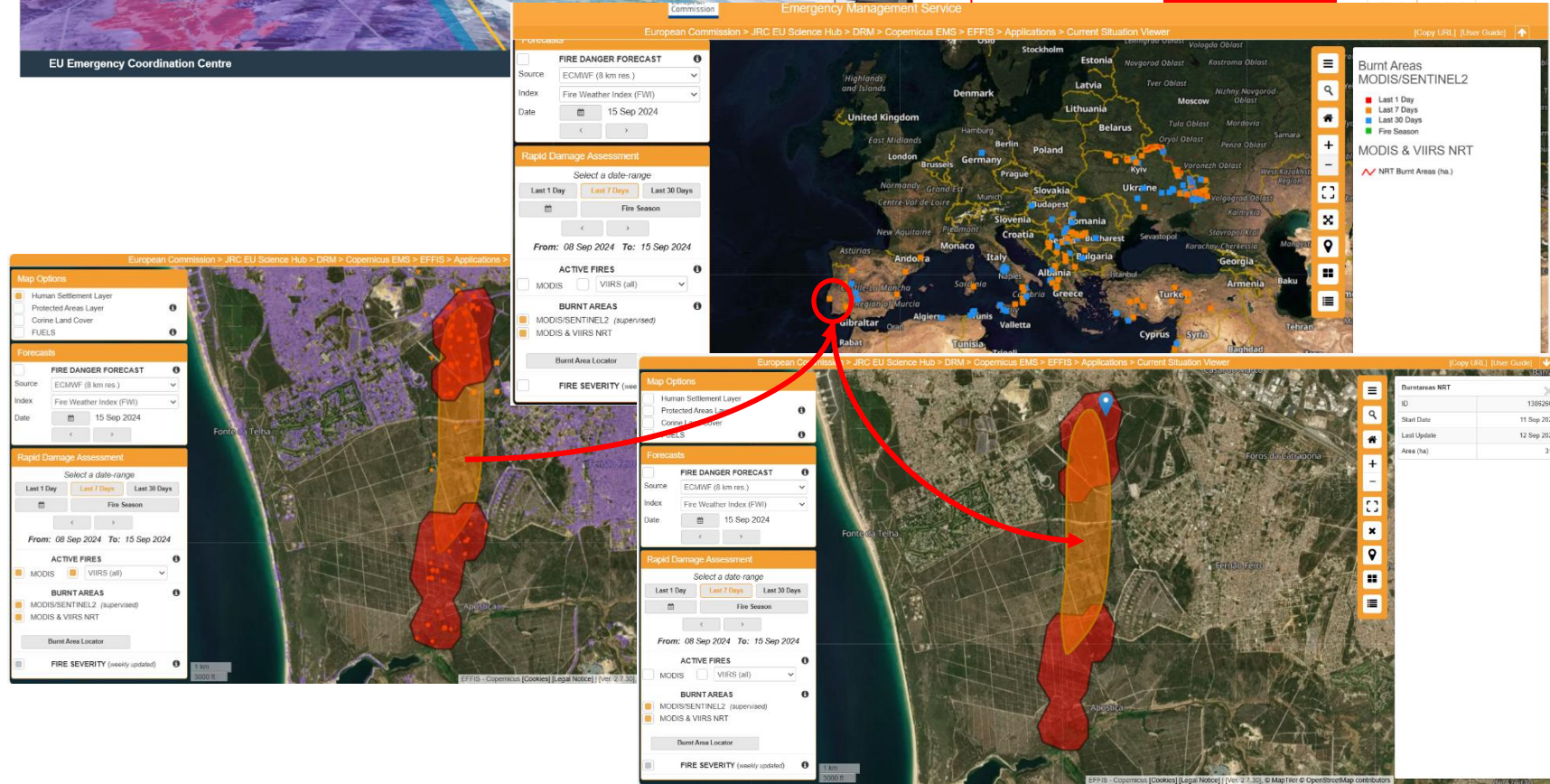
Code	Name	Activating Entity	Event Type	Activation Time	Country
EMSR755	Flood in Brandenburg, Germany	Germany/Bundesamt für Bevölkerungsschutz und Katastrophenhilfe (BBK) - Gemeinsames Melde- und Lagezentrum von Bund und Ländern (GMLZ)	Flood	2024-09-13	Germany
EMSR728	Flood in Germany	Germany/Gemeinsames Melde- und Lagezentrum von Bund und Ländern (GMLZ)	Flood	2024-05-30	Germany
EMSR722	Flood in Saarland region, Germany	Germany/Gemeinsames Melde- und Lagezentrum von Bund und Ländern (GMLZ)	Flood	2024-05-17	Germany
EMSR713	Flood in Saarland region, Germany	Germany/Gemeinsames Melde- und Lagezentrum von Bund und Ländern (GMLZ)	Flood	2024-01-03	Germany
EMSR712	Flood in Lower Saxony region, Germany	Germany/Gemeinsames Melde- und Lagezentrum von Bund und Ländern	Flood	2023-12-22	Germany

Risk and Recovery

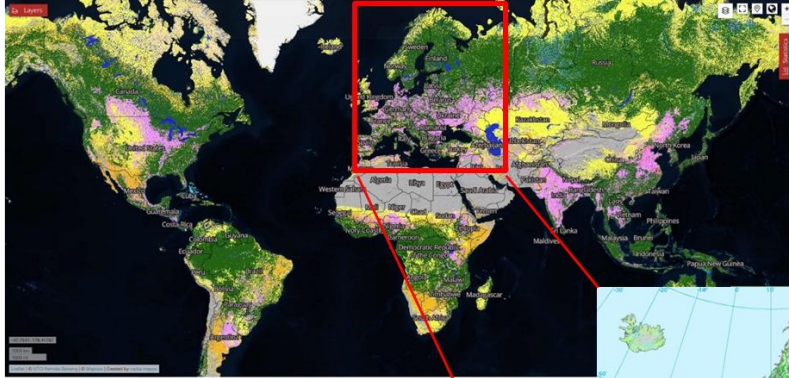
COPERNICUS EMERGENCY MANAGEMENT SERVICE: a brief introduction and some examples of use



Rapid Mapping

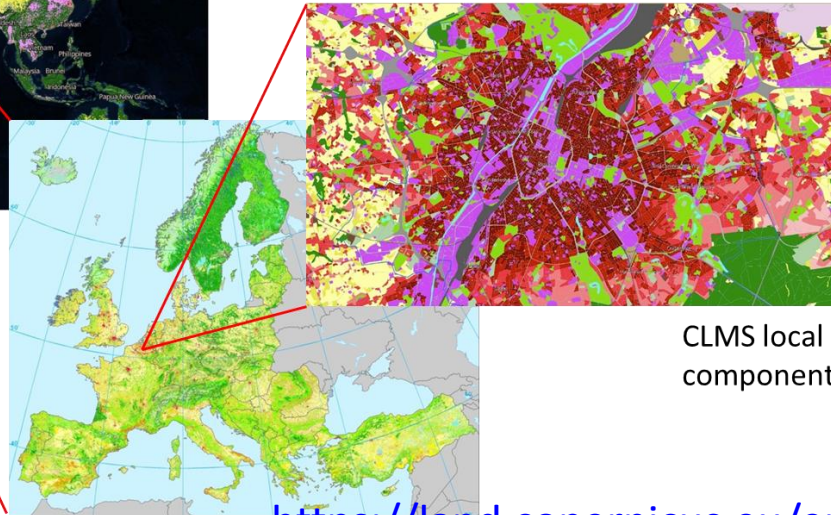


CLMS: components, services and website access



CLMS global (JRC)

Copernicus Land Monitoring Service, with its three components, six services and more than 180 products ...

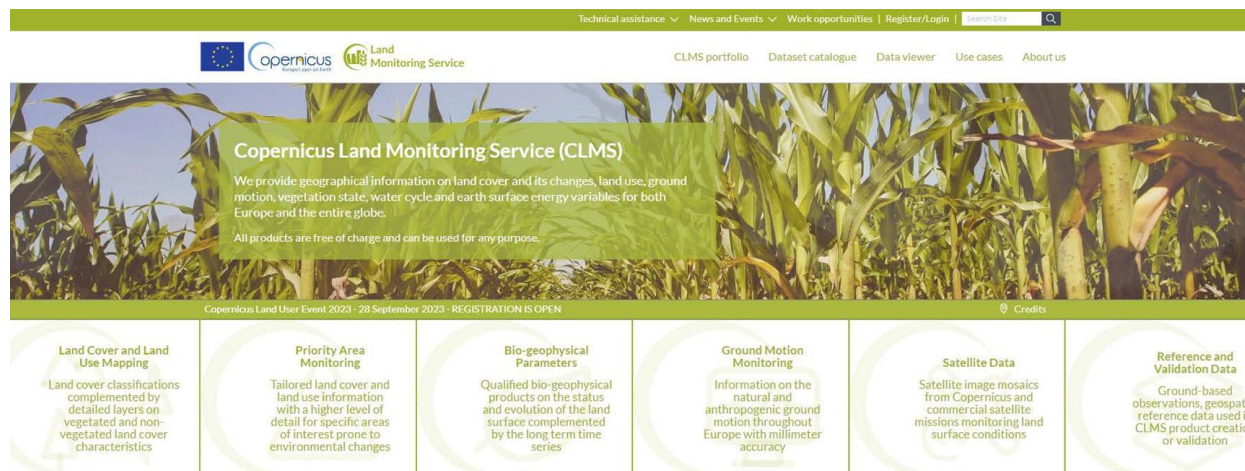


CLMS local component (EEA)

CLMS pan-European (EEA)

<https://land.copernicus.eu/en>

... contributes to the pursuit of the objectives previously highlighted, as well as many other such as ...



Land Cover and Land Use Mapping



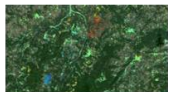
Priority Area Monitoring



Bio-geophysical Parameters



Ground Motion Monitoring



Satellite Data



Reference Data



Credit: Lorenzo Solari, EEA

CLMS: product spatial and temporal scales

Project:
HRL-VLCC

MMU
25 ha

Corine
Land
Cover



Sentinel-2 dal
2018 in avanti

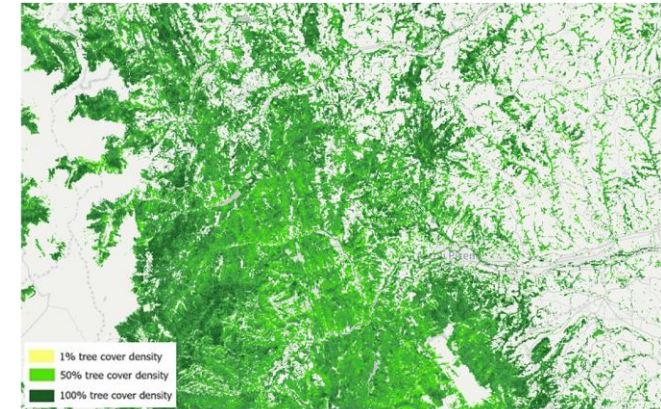
1990
2000
2006
2012
2018
2024

10 m,
20 m,
100 m



Sentinel-2 &
Sentinel-1

Tree
Cover
Density



2012
2015
2018
2019
2020
2021
...

Multiannual layers

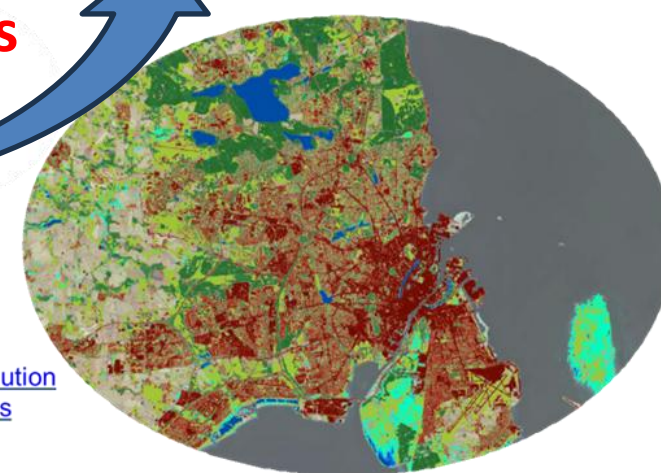
Annual layers

From the reporting time
scale to the local events
time scale

From the Medium to
the High resolution



High
Resolution
Layers



Imperviousness Density
Tree Cover Density
Grassland
Permanent Water
Temporary Water
Permanent Wet
Temporary Wet

2006
2009
2012
2015
2018
2019
...

CLMS: access to products and the new Data Viewer



CLMS portfolioDataset catalogueData viewerUse casesAbout

Copernicus Land Monitoring Service (CLMS)

We provide geographical information on land cover and its changes, land use, ground motion, vegetation state, water cycle and earth surface energy variables for both Europe and the entire globe.

All products are free of charge and can be used for any purpose.



Land Cover and Land Use Mapping

Land cover classifications complemented by detailed layers on vegetated and non-vegetated land cover characteristics



Priority Area Monitoring

Tailored land cover and land use information at a higher level of detail for specific areas of interest prone to environmental changes



Ground Motion Monitoring



Satellite Data

Dynamic Land Cover

The Dynamic Land Cover product provides a primary land cover scheme at three classification levels with class definitions according to the Land Cover Classification System (LCCS) scheme. The product is produced annually, and the actual version of the product (V3.0) is available for the 2015-2019 reference years.

CORINE Land Cover

CORINE Land Cover is a pan-European land cover inventory with 44 thematic classes. Initiated in 1985 (the 1990 reference year) the inventory is available for the 1990, 2000, 2006, 2012 and 2018 reference years including change layers 1990-2000, 2006-2012 and 2012-2018.



Technical assistanceNewsCLMS portfolio

HomeData viewer

Products and datasetsActive layers

Land Cover and Land Use Mapping

☒ Dynamic Land Cover

☐ CORINE Land Cover

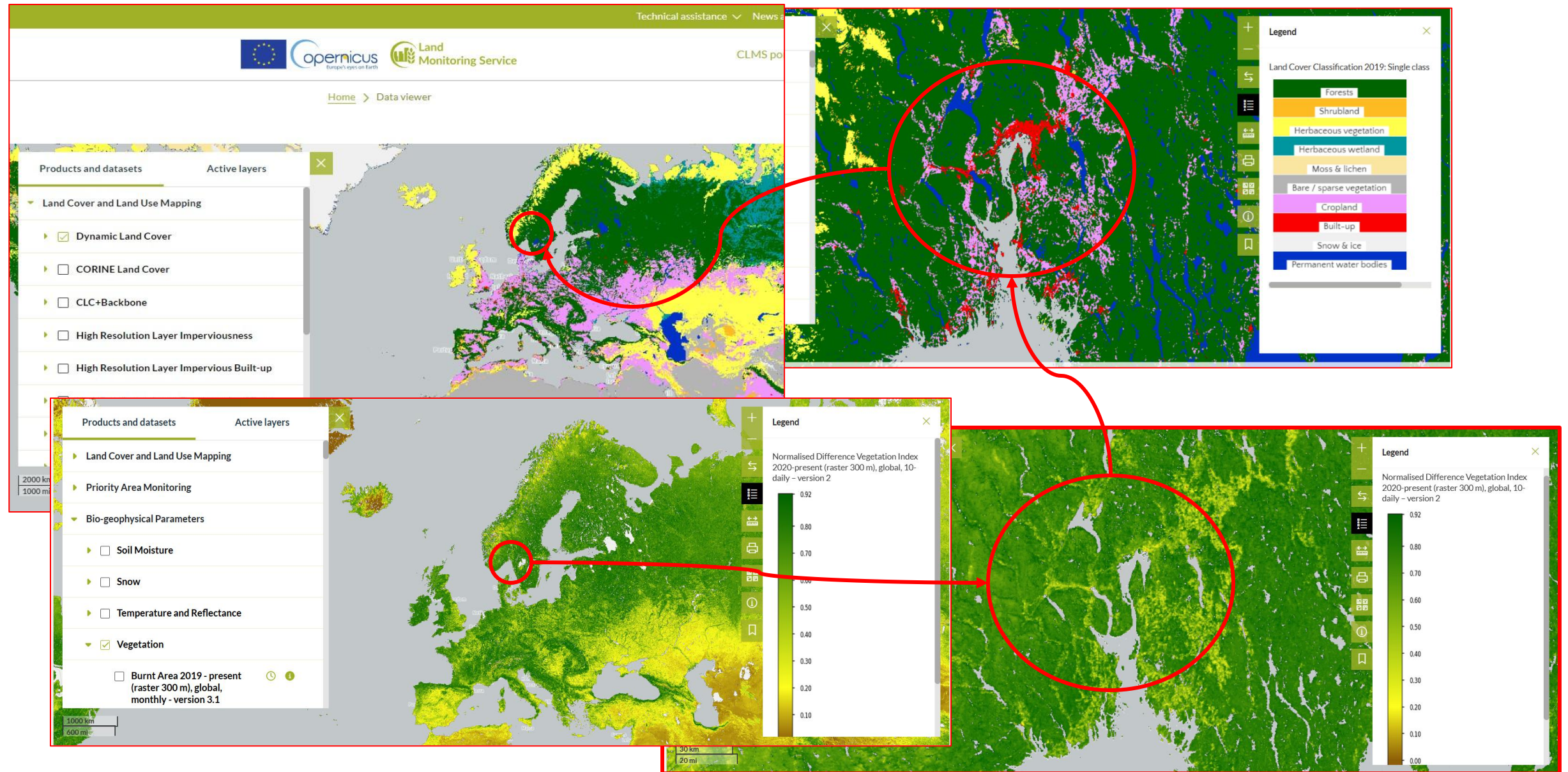
☐ CLC+Backbone

☐ High Resolution Layer Imperviousness

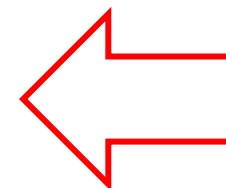
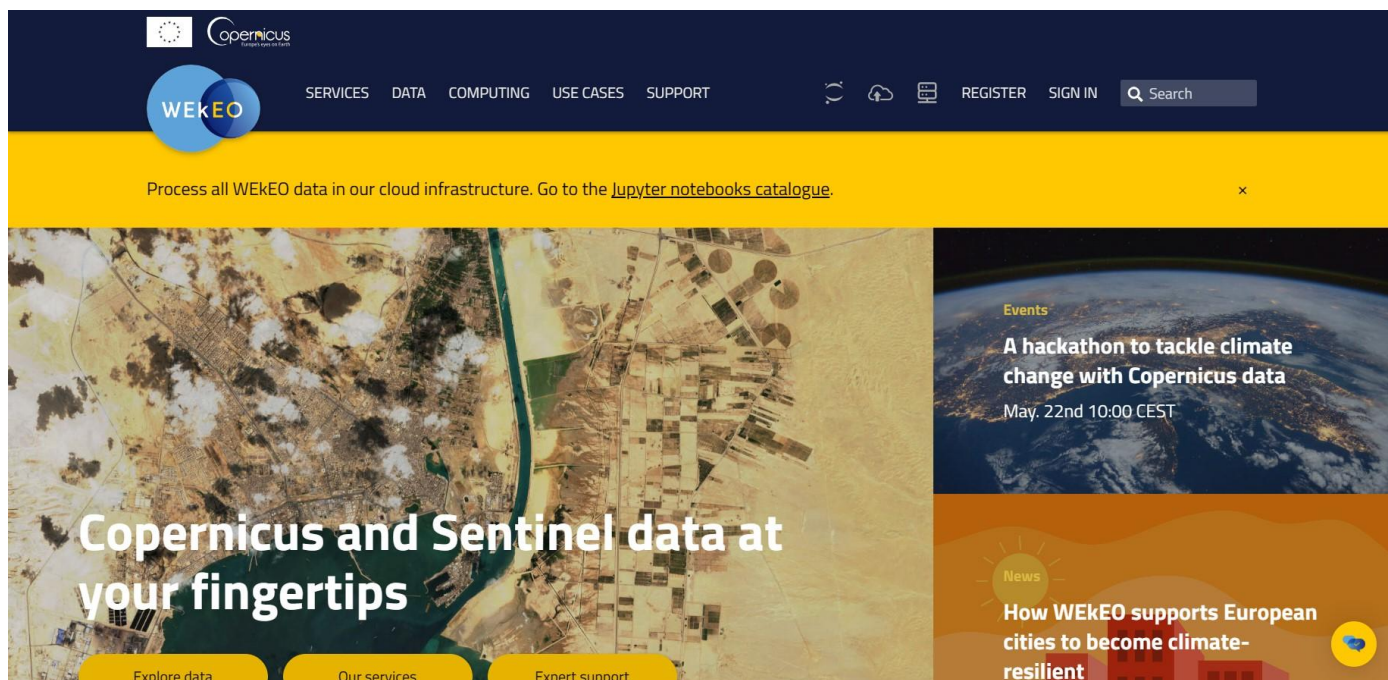
☐ High Resolution Layer Impervious Built-up



CLMS: access to products and the new Data Viewer

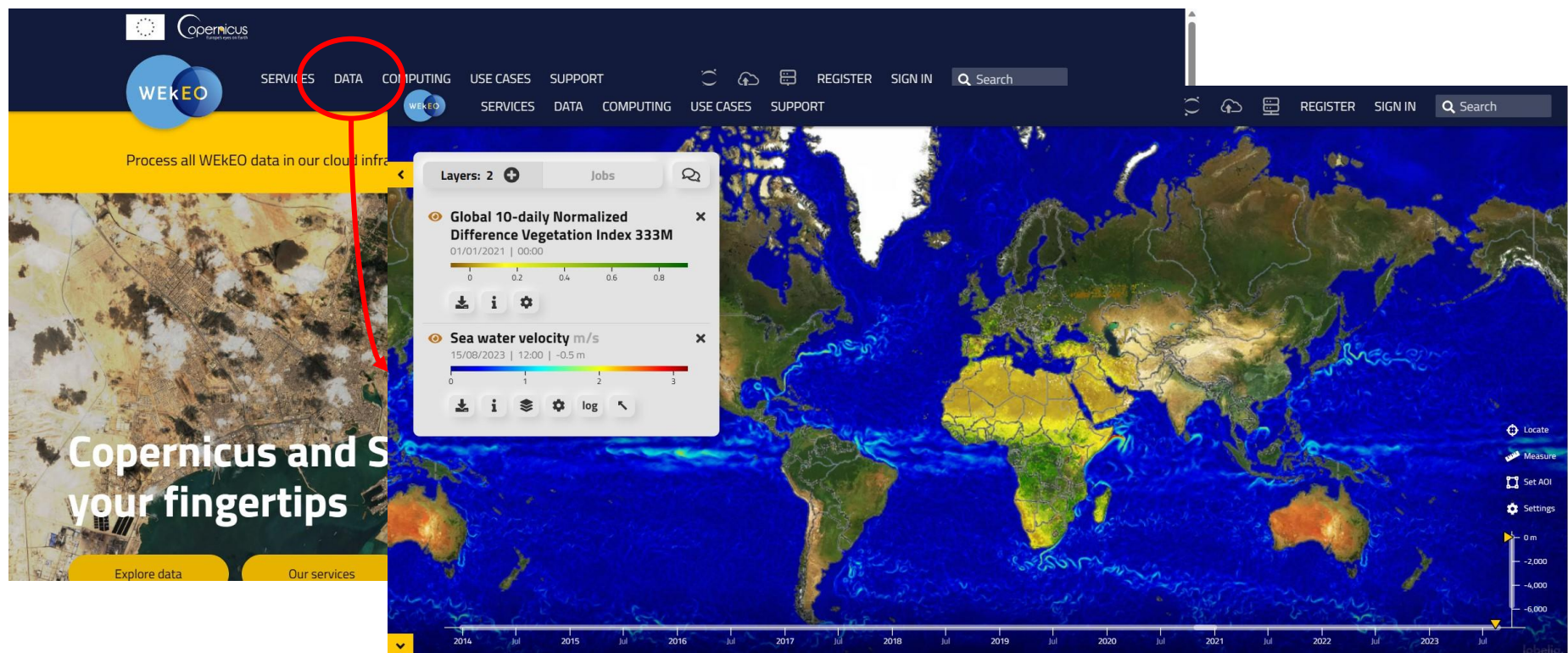


WEkEO DIAS: access to CLMS products

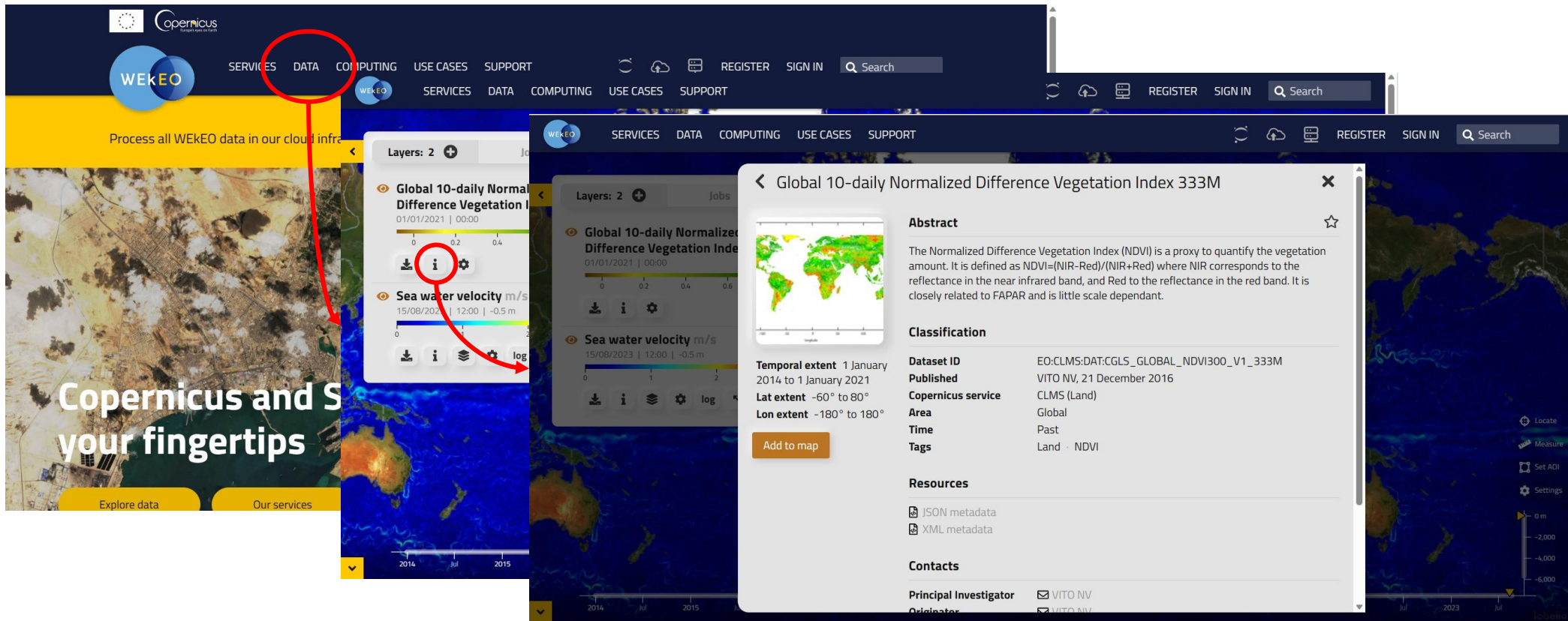


The WEkEO DIAS is the only one of the five [Copernicus Data and Information Access Services](#) (DIAS) co-founded by the European Commission, in 2018) completely and directly financed by Copernicus and it provides a single distributed tool for accessing, visualizing and analyzing all Copernicus data, information and services ([What data is available in WEkEO?](#))

WEkEO DIAS: access to CLMS products



WEkEO DIAS: access to CLMS products

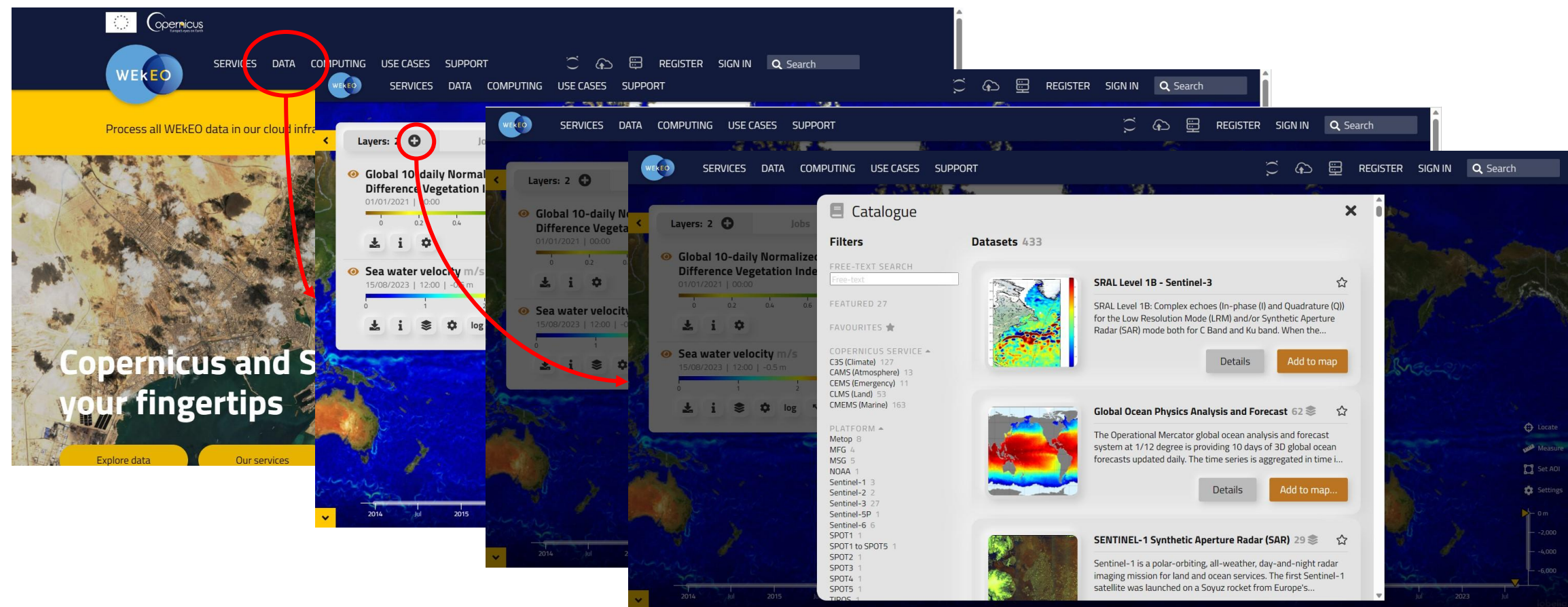


The screenshot displays the WEkEO web application interface. The top navigation bar includes links for SERVICES, DATA, COMPUTING, USE CASES, and SUPPORT. The 'DATA' link is highlighted with a red circle. Below the navigation bar, a yellow banner reads 'Process all WEkEO data in our cloud infrastructure'. The main content area shows a map with two layers: 'Global 10-daily Normalized Difference Vegetation Index' and 'Sea water velocity m/s'. A red circle highlights the 'i' icon (information) for the 'Global 10-daily Normalized Difference Vegetation Index' layer. A red arrow points from this icon to a detailed information panel on the right. The panel contains the following information:

- Global 10-daily Normalized Difference Vegetation Index 333M**
- Abstract:** The Normalized Difference Vegetation Index (NDVI) is a proxy to quantify the vegetation amount. It is defined as $NDVI = (NIR - Red) / (NIR + Red)$ where NIR corresponds to the reflectance in the near infrared band, and Red to the reflectance in the red band. It is closely related to FAPAR and is little scale dependent.
- Classification:**
- Dataset ID:** EO:CLMS:DAT:CGLS_GLOBAL_NDVI300_V1_333M
- Published:** VITO NV, 21 December 2016
- Copernicus service:** CLMS (Land)
- Area:** Global
- Time:** Past
- Tags:** Land · NDVI
- Resources:** JSON metadata, XML metadata
- Contacts:** Principal Investigator: VITO NV, Originator: VITO NV

At the bottom left, there is a yellow button labeled 'Explore data' and a white button labeled 'Our services'.

WEkEO DIAS: access to CLMS products



WEkEO

SERVICES DATA COMPUTING USE CASES SUPPORT

REGISTER SIGN IN Search

Process all WEkEO data in our cloud infrastructure

Layers: 2

Global 10-daily Normalized Difference Vegetation Index

Sea water velocity m/s

Copernicus and Sentinel-1 at your fingertips

Explore data Our services

Catalogue

Filters

FREE-TEXT SEARCH

FEATURED 27

FAVOURITES

COPERNICUS SERVICE

PLATFORM

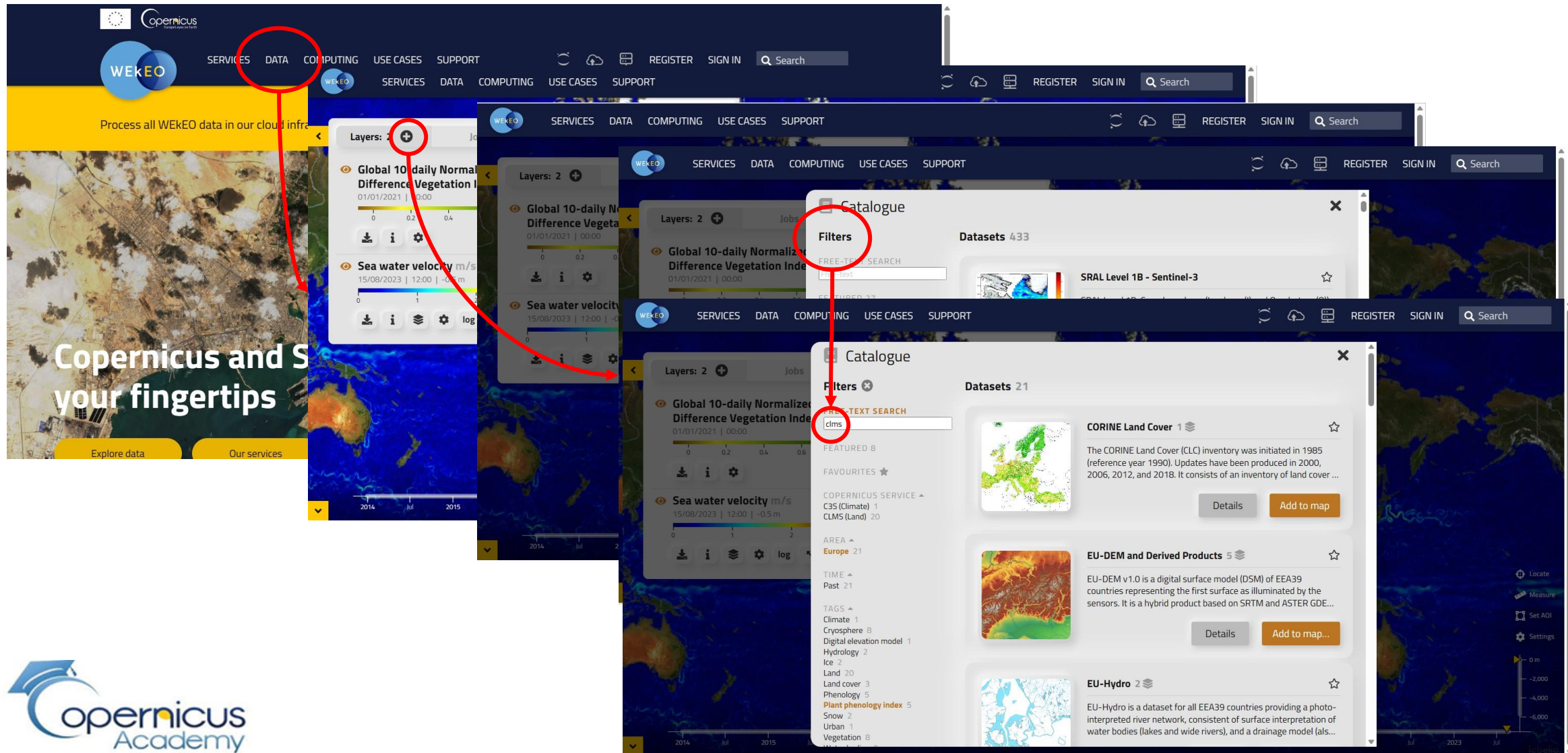
Datasets 433

SRAL Level 1B - Sentinel-3

Global Ocean Physics Analysis and Forecast

SENTINEL-1 Synthetic Aperture Radar (SAR)

WEkEO DIAS: access to CLMS products



WEkEO

SERVICES DATA COMPUTING USE CASES SUPPORT

REGISTER SIGN IN Search

Process all WEkEO data in our cloud infrastructure

Layers: 2

Global 10-daily Normalized Difference Vegetation Index

Sea water velocity m/s

Copernicus and S your fingertips

Explore data Our services

Catalogue

Filters

FREE-TEXT SEARCH

clms

Datasets 433

SRAL Level 1B - Sentinel-3

Datasets 21

CORINE Land Cover 1

The CORINE Land Cover (CLC) inventory was initiated in 1985 (reference year 1990). Updates have been produced in 2000, 2006, 2012, and 2018. It consists of an inventory of land cover ...

Details Add to map

EU-DEM and Derived Products 5

EU-DEM v1.0 is a digital surface model (DSM) of EEA39 countries representing the first surface as illuminated by the sensors. It is a hybrid product based on SRTM and ASTER GDE...

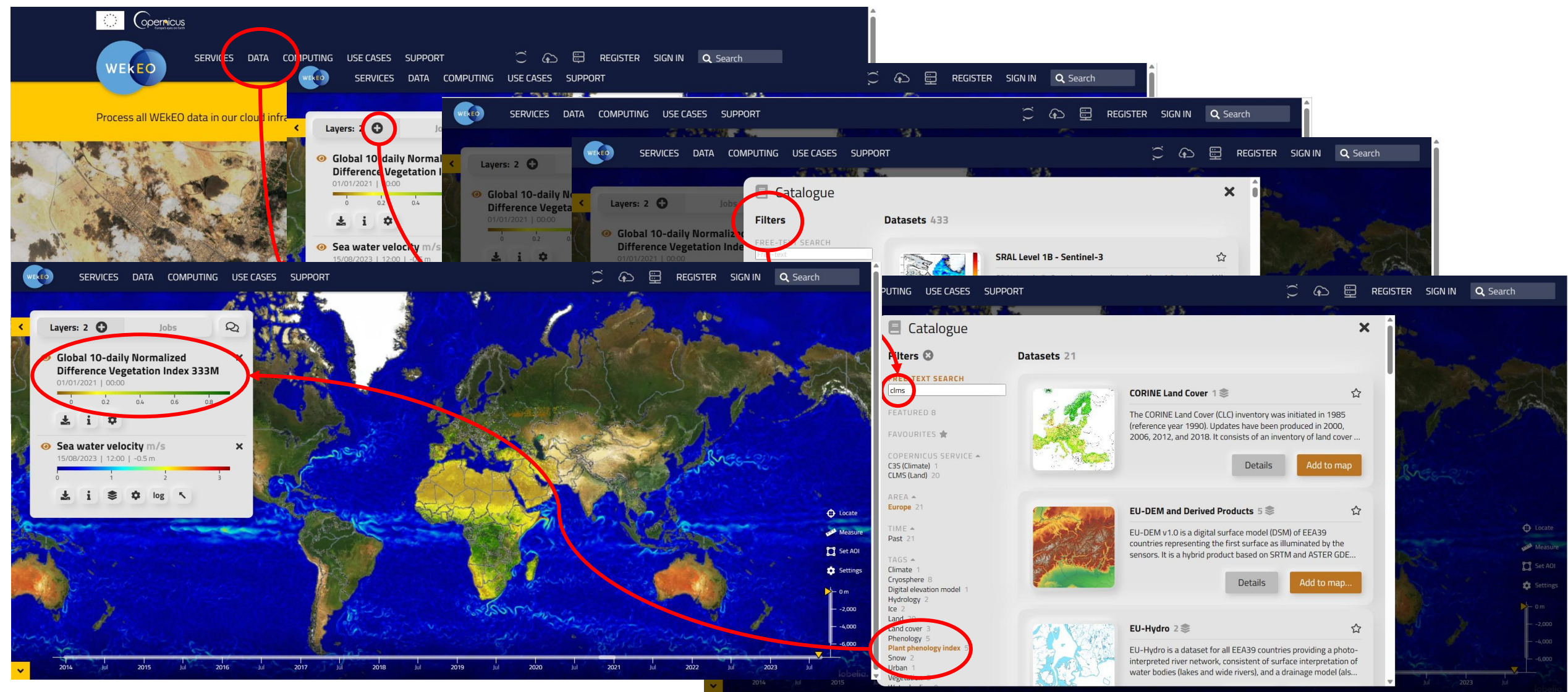
Details Add to map...

EU-Hydro 2

EU-Hydro is a dataset for all EEA39 countries providing a photo-interpreted river network, consistent of surface interpretation of water bodies (lakes and wide rivers), and a drainage model (als...



WEkEO DIAS: access to CLMS products



The screenshot displays the WEkEO web application interface, which is a platform for accessing and visualizing Copernicus Land Monitoring Service (CLMS) products. The interface is divided into several sections:

- Navigation Bar:** Located at the top, it includes the WEkEO logo, a search bar, and navigation links for SERVICES, DATA, COMPUTING, USE CASES, and SUPPORT. The 'DATA' link is highlighted with a red circle.
- Map View:** The main area shows a global map with various data layers overlaid. A red circle highlights the 'Global 10-daily Normalized Difference Vegetation Index 333M' layer, which is currently selected. Below the map, a timeline shows the years from 2014 to 2023.
- Layers Panel:** Located on the left side of the map, it lists the active layers: 'Global 10-daily Normalized Difference Vegetation Index 333M' and 'Sea water velocity m/s'. A red circle highlights the '+' icon next to the 'Layers: 2' header.
- Filters Panel:** A modal window titled 'Filters' is open, showing a search bar with the text 'clms' and a list of filters. A red circle highlights the 'clms' filter. The list of filters includes: 'COPERNICUS SERVICE', 'C35 (Climate)', 'CLMS (Land)', 'AREA', 'Europe', 'TIME', 'Past', 'TAGS', 'Climate', 'Cryosphere', 'Digital elevation model', 'Hydrology', 'Ice', 'Land cover', 'Land cover 3', 'Phenology', 'Plant phenology index', 'Snow', 'Urban', and 'Vegetation'.
- Catalogue Panel:** A modal window titled 'Catalogue' is open, showing a list of datasets. A red circle highlights the 'clms' filter. The list of datasets includes: 'CORINE Land Cover 1', 'EU-DEM and Derived Products 5', and 'EU-Hydro 2'.

WEkEO DIAS: access to CLMS products

WEkEO Support

Expert support is always at your service

Help Center

Get instant answers about WEkEO service

Let's bring Earth Observation knowledge at your fingertips

Search for articles...

What data is available in WEkEO?

How to download WEkEO data?

What is the WEkEO JupyterHub?

How to launch an instance (Virtual Machine) on WEkEO?

How to access Copernicus and Sentinel products using Data Viewer?

Advantages of the Essential, Advanced and Paid Cloud Computing plans



Getting Started with WEkEO

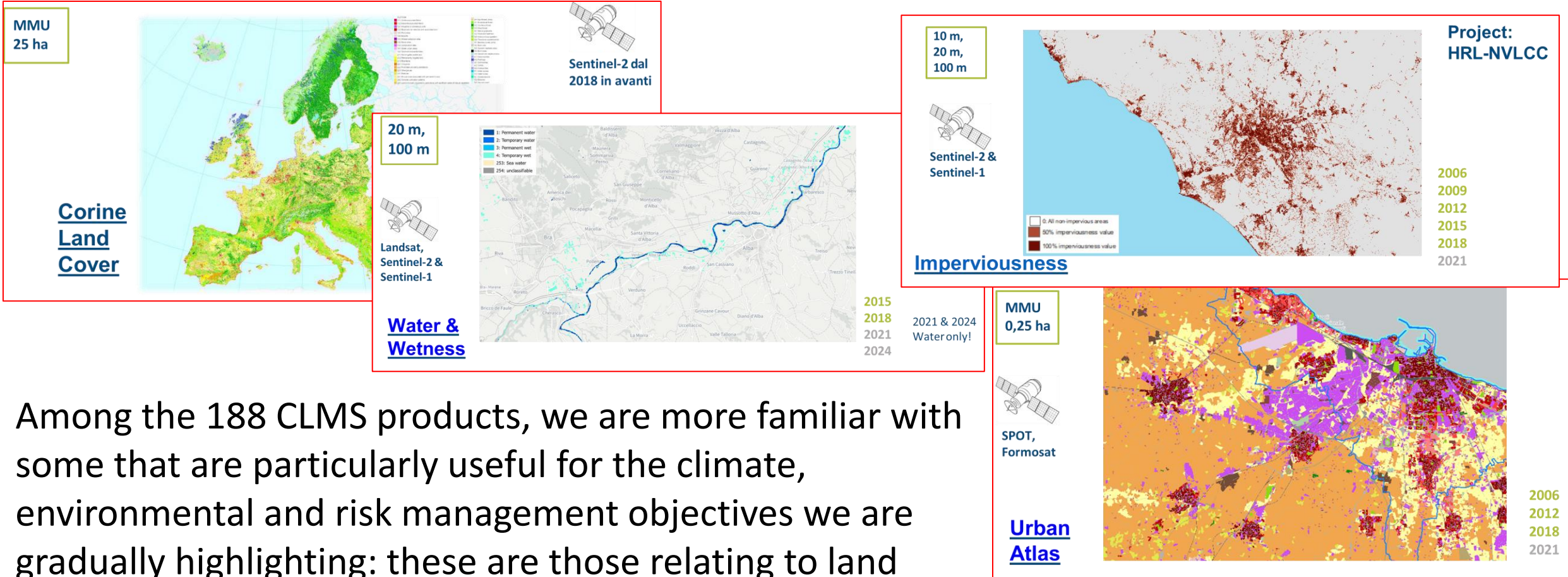
Everything you need to know to get started with the



WEkEO Data Viewer and Catalogue

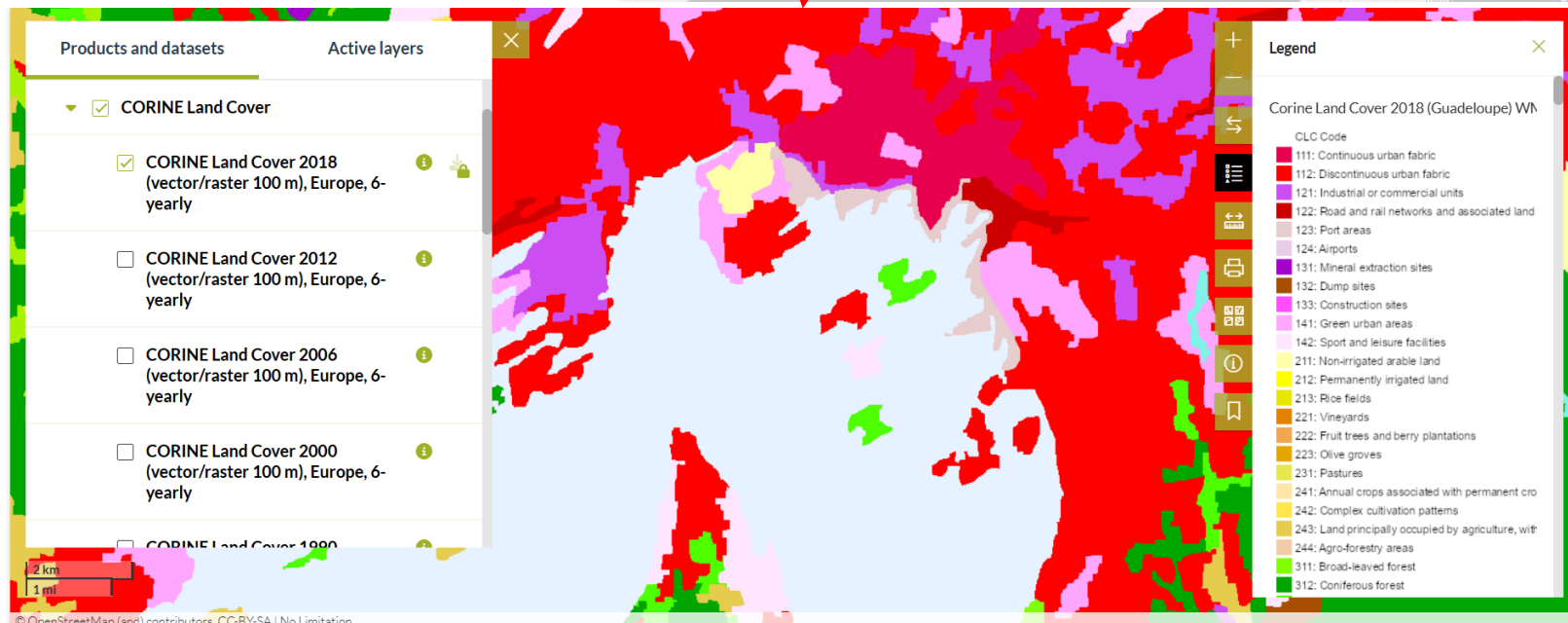
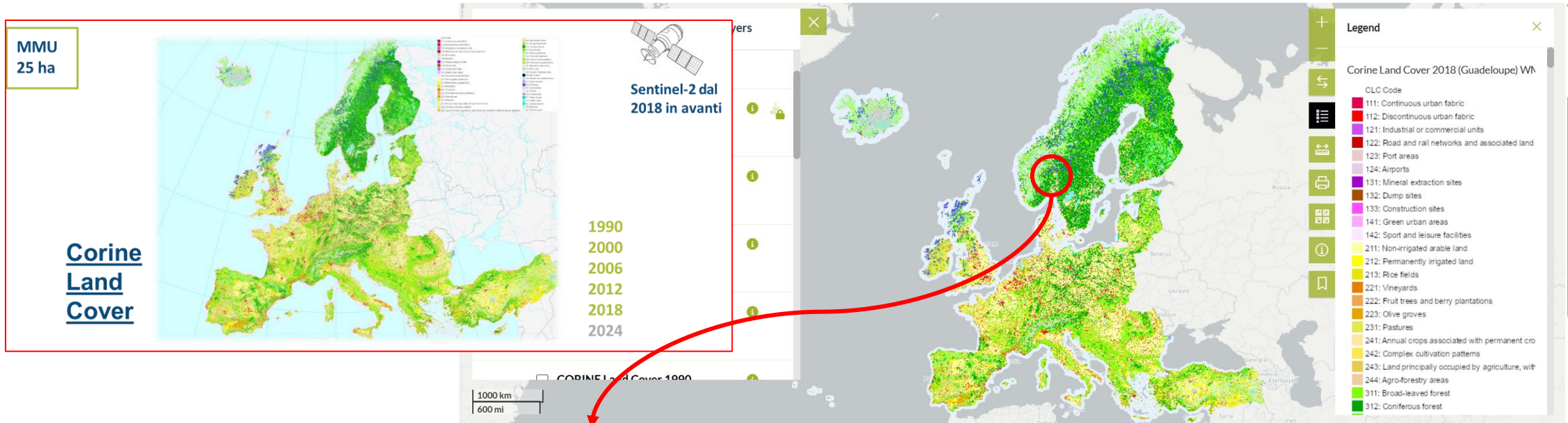
Let's discover the data Catalogue, data science and future

CLMS: Land Cover and Land Use Mapping products



Among the 188 CLMS products, we are more familiar with some that are particularly useful for the climate, environmental and risk management objectives we are gradually highlighting: these are those relating to land cover and land use, urban spatial development, particularly of large urban centres around even minor water bodies and along the coastline.

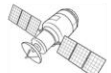
CLMS: Land Cover and Land Use Mapping products



The Corine Land Cover classification around Oslo harbour and airport in 2018

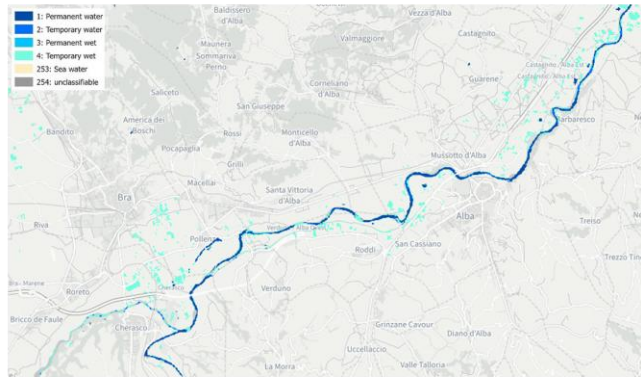
CLMS: Land Cover and Land Use Mapping products

20 m,
100 m



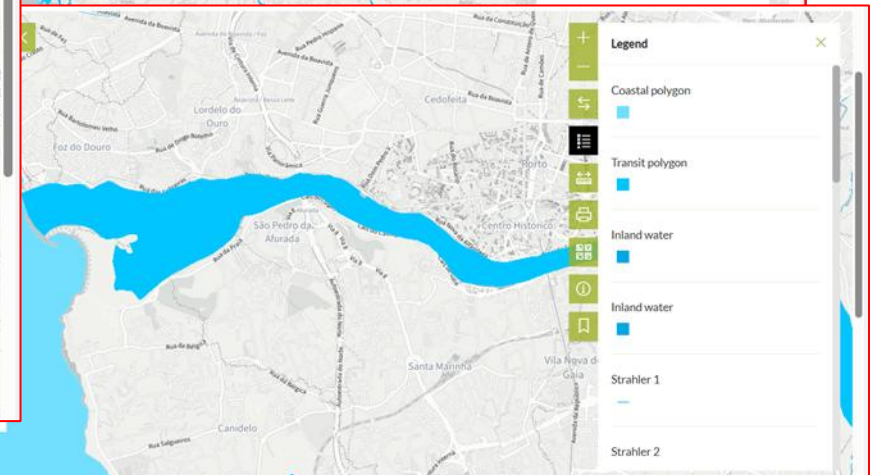
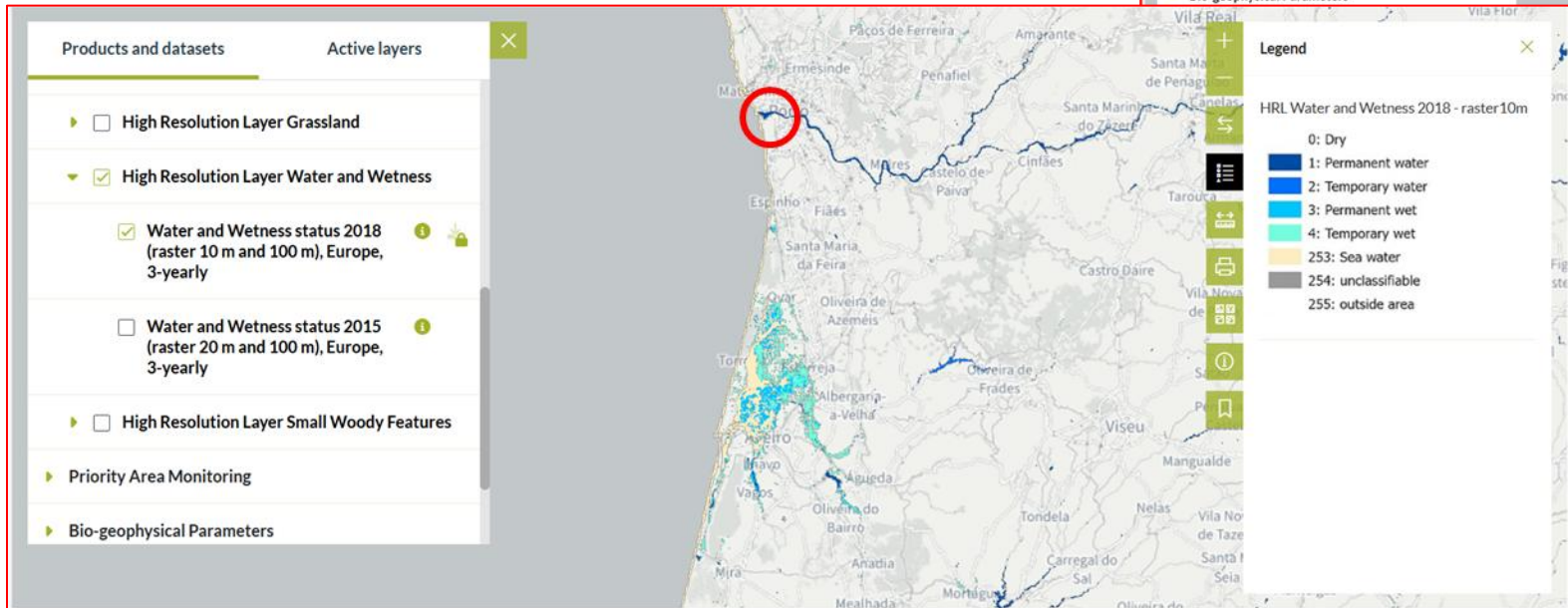
Landsat,
Sentinel-2 &
Sentinel-1

Water &
Wetness

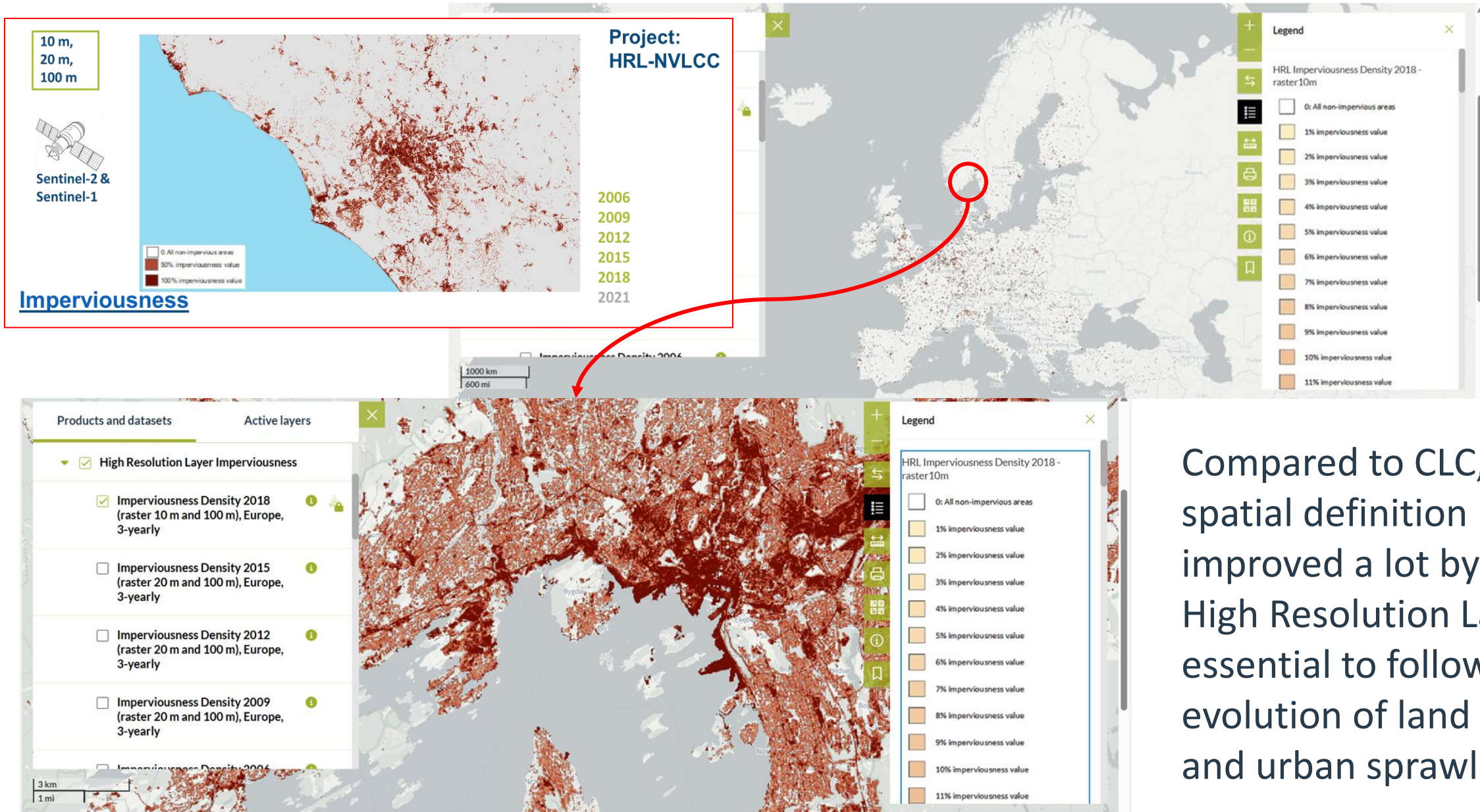


2015
2018
2021
2024

2021 & 2024
Water only!



CLMS: Land Cover and Land Use Mapping products



Compared to CLC, the spatial definition has improved a lot by using High Resolution Layers, essential to follow the evolution of land use and urban sprawl.

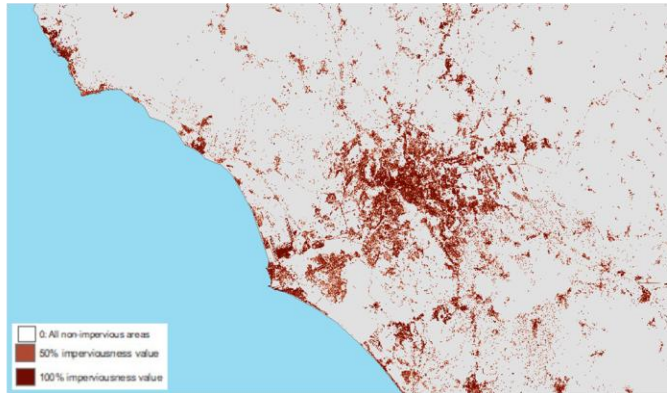
CLMS: Land Cover and Land Use Mapping products

10 m,
20 m,
100 m



Sentinel-2 &
Sentinel-1

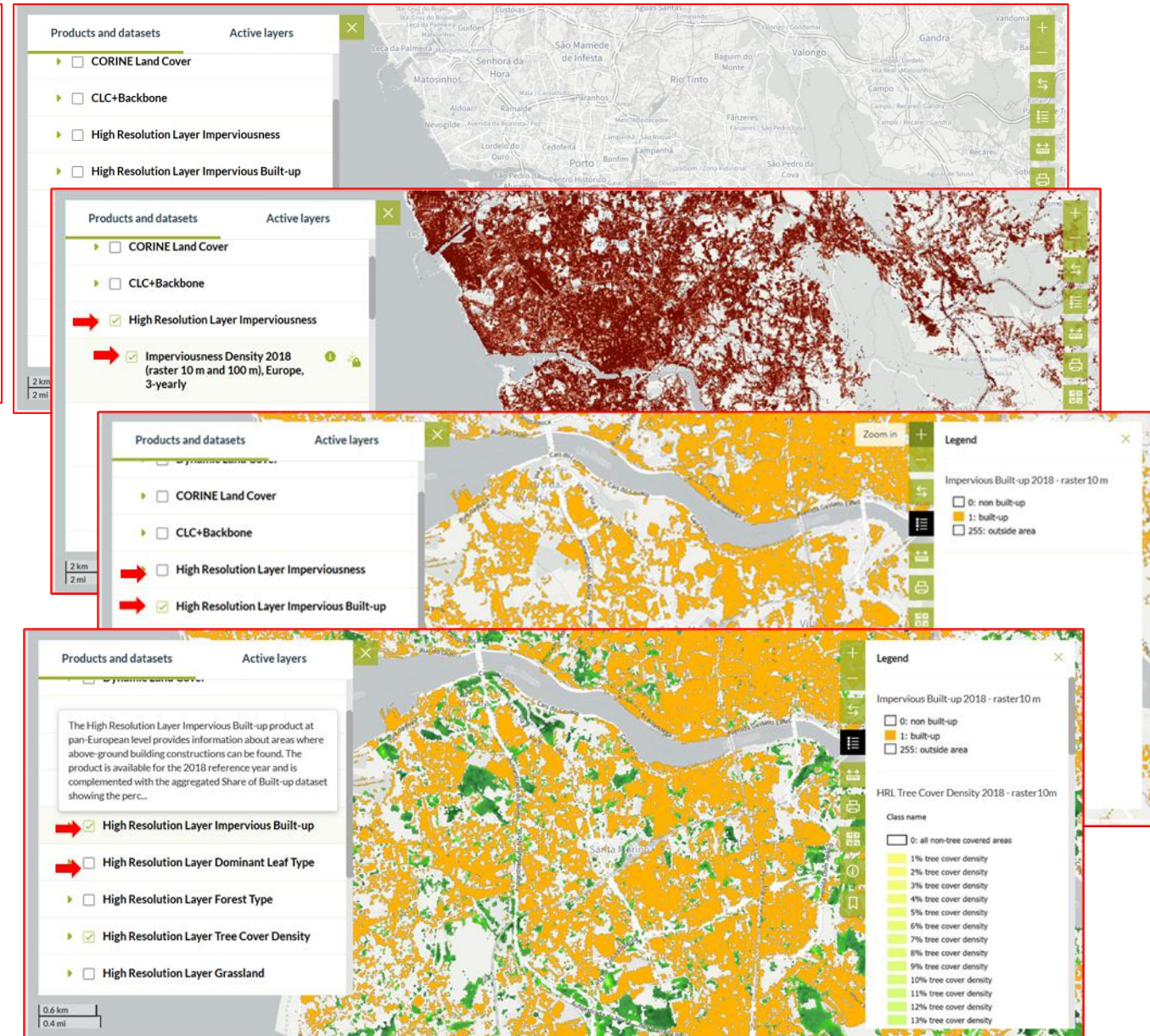
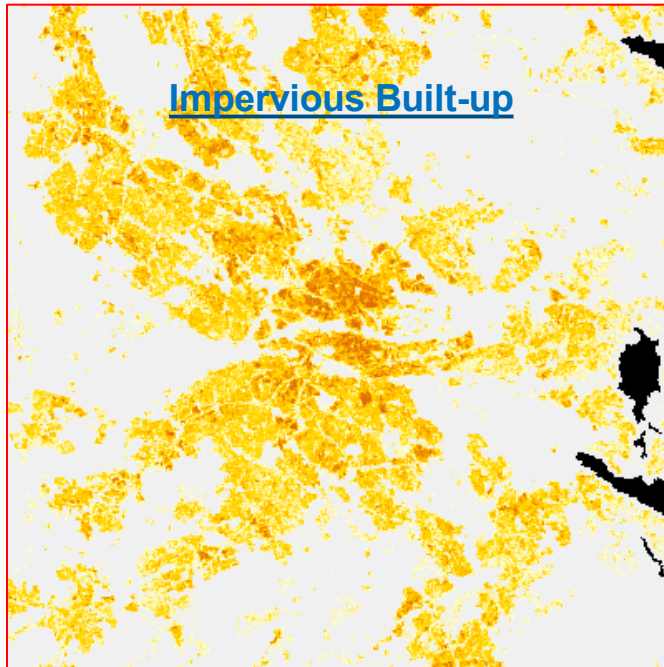
Imperviousness

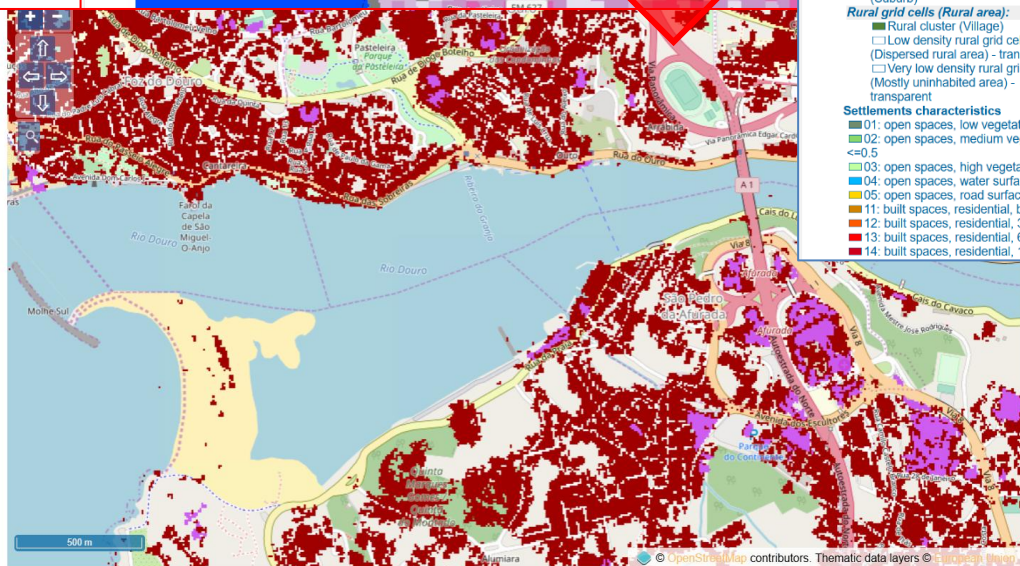
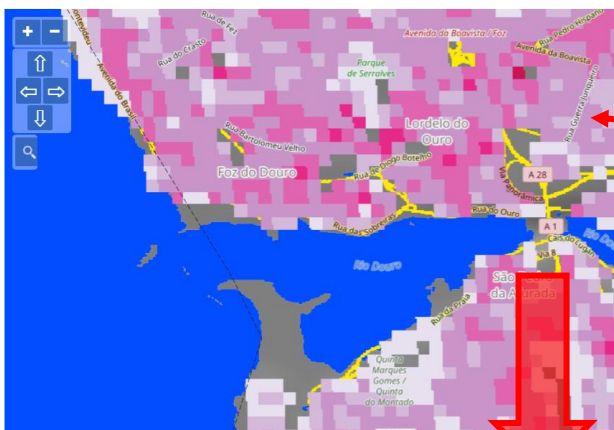


Project:
HRL-NVLCC

2006
2009
2012
2015
2018
2021

Impervious Built-up





GHSL - Global Human Settlement Layer

Open and free data and tools for assessing the human presence on the planet

[Home](#) [Copernicus](#) [Data and tools](#) ▾ [Visual analytics](#) ▾ [Degree of urbanisation](#) ▾ [Knowledge and training](#) ▾ [News](#)

[Home](#) > [Data and tools](#) > [GHSL Datasets information](#) > [GHS-POP - R2023A](#)

GHS-POP - R2023A

GHS-POP R2023A - GHS population grid multitemporal (1975-2030)



GHS-POP

JRC Data catalogue

GHS-POP

The spatial raster dataset depicts the distribution of residential population, expressed as the number of people per cell.

Residential population estimates between 1975 and 2020 in 5-year intervals and projections to 2025 and 2030 derived from CIESIN GPWv4.11 were disaggregated from census or administrative units to grid cells, informed by the distribution, volume, and classification of built-up as mapped in the Global Human Settlement Layer (GHS) global layer per corresponding epoch.

The main characteristics of this dataset are listed below.
The complete information about the GHS⁺ main products can be found in the [GHS⁺ Data Package 2023 report](#) (a.s. on).

You can look at the [interactive visualisation](#) of the GHS-POP data.

Population - P203 (res.) (100m), 2008

Base: Markers (when applicable), Country Borders, Shaded reliefs, Land mask, Place names

*Porting of the Degurba model in the GHSL framework (SMOD).

Legend

Degree of Urbanisation

Urban centre (City):

- Urban centre (City)

Urban cluster (Town & suburb):

- Dense and semi-dense urban cluster (Town)
- Suburban or peri-urban cells (Suburb)

Rural grid cells (Rural area):

- Rural cluster (Village)
- Low density rural grid cells (Dispersed rural area) - transparent
- Very low density rural grid cells (Mostly uninhabited area) - transparent

Population

□ Line data (transparent)

- 0 - 5
- 6 - 20
- 21 - 100
- 101 - 300
- 301 - 500
- 501 - 1,000
- 1,000 - Max

Built-up Volume

0 50,000 m³ 100,000 m³

Built-up Surface (10m)

0 50 m² 100 m²

Built-up Surface (100m)

0 5,000 m² 10,000 m²

Settlements characteristics

- 01: open spaces, low vegetation surfaces NDVI <= 0.3
- 02: open spaces, medium vegetation surfaces 0.3 < NDVI <= 0.5
- 03: open spaces, high vegetation surfaces NDVI > 0.5
- 04: open spaces, water surfaces LAND < 0.5
- 05: open spaces, road surfaces
- 11: built spaces, residential, building height <= 3m
- 12: built spaces, residential, 3m < building height <= 6m
- 13: built spaces, residential, 6m < building height <= 15m
- 14: built spaces, residential, 15m < building height <= 30m
- 21: built spaces, non-residential, building height <= 3m
- 22: built spaces, non-residential, 3m < building height <= 6m
- 23: built spaces, non-residential, 6m < building height <= 15m
- 24: built spaces, non-residential, 15m < building height <= 30m
- 25: built spaces, non-residential, building height > 30m

Interactive visualisation

Maps and charts showcasing the data produced by the GHSL.

This section provides a list of the interactive visualisations of the different GHSL data sets:

Global Visualisation

(1975-2030, release GHSL P2023)

This visualisation encompasses the following GHSL data:

- GHSL-SMOD R2023A - GHSL settlement layers, application of the Degree of Urbanisation methodology (stage 1) to GHSL-POP R2023A and GHSL-BUILT-S R2023A, multitemporal (1975-2030, 5 years interval)
- GHSL-POP R2023A - GHSL population grid multitemporal (1975-2030, 5 years interval)
- GHSL-BUILT-S R2023A - GHSL built-up volume grids derived from joint assessment of Sentinel-2, Landsat, and global DEM data, for 1975-2030 (5 years interval)
- GHSL-BUILT-S R2023A - GHSL built-up surface grid, derived from Sentinel-2 composite (2018) and Landsat, multitemporal (1975-2030, 5 years interval)
- GHSL-URB-R2023A - GHSL Settlement Characteristics, derived from Sentinel-2 composite (2018) and other GHSL R2023A data
- GHSL-LAND-R2022A - Land fraction as derived from Sentinel-2 image composite (2018) and OpenStreetMap (OSM) data (part of the P2022 release)
- Shaded-reliefs, part of the GHSL-SDATA R2023A - GHSL release R2023A supporting data

Feel free to [Download the GHSL Data Package 2023 report \(9.87 MB\)](#) containing the complete information about GHSL open data.

GHSL - Global Human Settlement Layer

Open and free data and tools for assessing the human presence on the planet

Home Copernicus Data and tools Visual analytics Degree of urbanisation Knowledge and training News

Home » Data and tools » GHSL Datasets information » GHS-BUILT-S - R2023A

GHS-BUILT-S - R2023A

GHS-BUILT-S R2023A - GHS built-up surface grid, derived from Sentinel2 composite and Landsat, multitemporal (1975-2030)



GHS-BUILT-S

The spatial raster dataset depicts the distribution of built-up surfaces, expressed as number of square metres. The data report about the **total built-up surface** and the **built-up surface allocated to dominant non-residential (NRES) uses**.

Data are spatial-temporal interpolated or extrapolated from 1975 to 2030 in 5 years intervals.

For the temporal anchor point of 2018 the data is published at 10m as observed from the S2 image data.

The main characteristics of this dataset are listed below.

The complete information about the data processing can be found in the [GHS Data Package 2023 report](#) ([report link](#))

You can take a look at the [interactive visualisation of the GHS-BUILT-S data](#).

Download the [GHS-BUILT-S R2023A dataset](#)

CLMS: VHR Layers and the European Image Mosaic

Copernicus Land Monitoring Service (CLMS)

We provide geographical information on land cover and its changes, land use, ground motion, vegetation state, water cycle and earth surface energy variables for both Europe and the entire globe.

All products are free of charge and can be used for any purpose.

Land Cover and Land Use Mapping
Land cover classifications complemented by detailed layers on vegetated and non-vegetated land cover characteristics

Priority Area Monitoring
Tailored land cover and land use information with a higher level of detail for specific areas of interest prone to environmental changes

Bio-geophysical Parameters
Qualified bio-geophysical products on the status and evolution of the land surface complemented by the long term time series

Ground Motion Monitoring
Information on the natural and anthropogenic ground motion throughout Europe with millimeter accuracy

Satellite Data
Satellite image mosaics from Copernicus and commercial satellite missions monitoring land surface

Reference and Validation Data
Ground-based observations, geospatial reference data used in CLMS product creation or validation

CLMS portfolio

Get overview
Explore

In this section you can explore the CLMS portfolio product by product. Here you can find information about the thematic scope of the products, consult technical documentation, register to user workshops, learn about new and planned updates. You can also easily access the datasets available for each product, but:

you can also search and access CLMS data and metadata in the [CLMS Dataset catalogue](#).

Current filters applied: 1

Clear filters
Filters

European Image Mosaic
Global Image Mosaic

Very High Resolution Layers: European Image Mosaic

Products and datasets
Active layers

☒ European Image Mosaic

☒ Very High Resolution Image

Products and datasets
Active layers

Land Cover and Land Use Mapping
Priority Area Monitoring
Bio-geophysical Parameters

Products and datasets
Active layers

Land Cover and Land Use Mapping
Priority Area Monitoring
Bio-geophysical Parameters
Satellite Data

Products and datasets
Active layers

Land Cover and Land Use Mapping
Priority Area Monitoring
Bio-geophysical Parameters
Satellite Data

☒ European Image Mosaic

☒ Very High Resolution Image Mosaic 2021 True Colour (raster 2 m), Europe

☐ Very High Resolution Image Mosaic 2018 True Colour (raster 2 m), Europe

Legend

VHR Image Mosaic 2021 - True Colour - raster 2 m

Red: Red
Green: Green
Blue: Blue

Zoom out

Lithosphere, soils and ground movements and interferometry

Lastly, let us remember that the lithosphere is subject to deformations and movements that might be also particularly damaging.

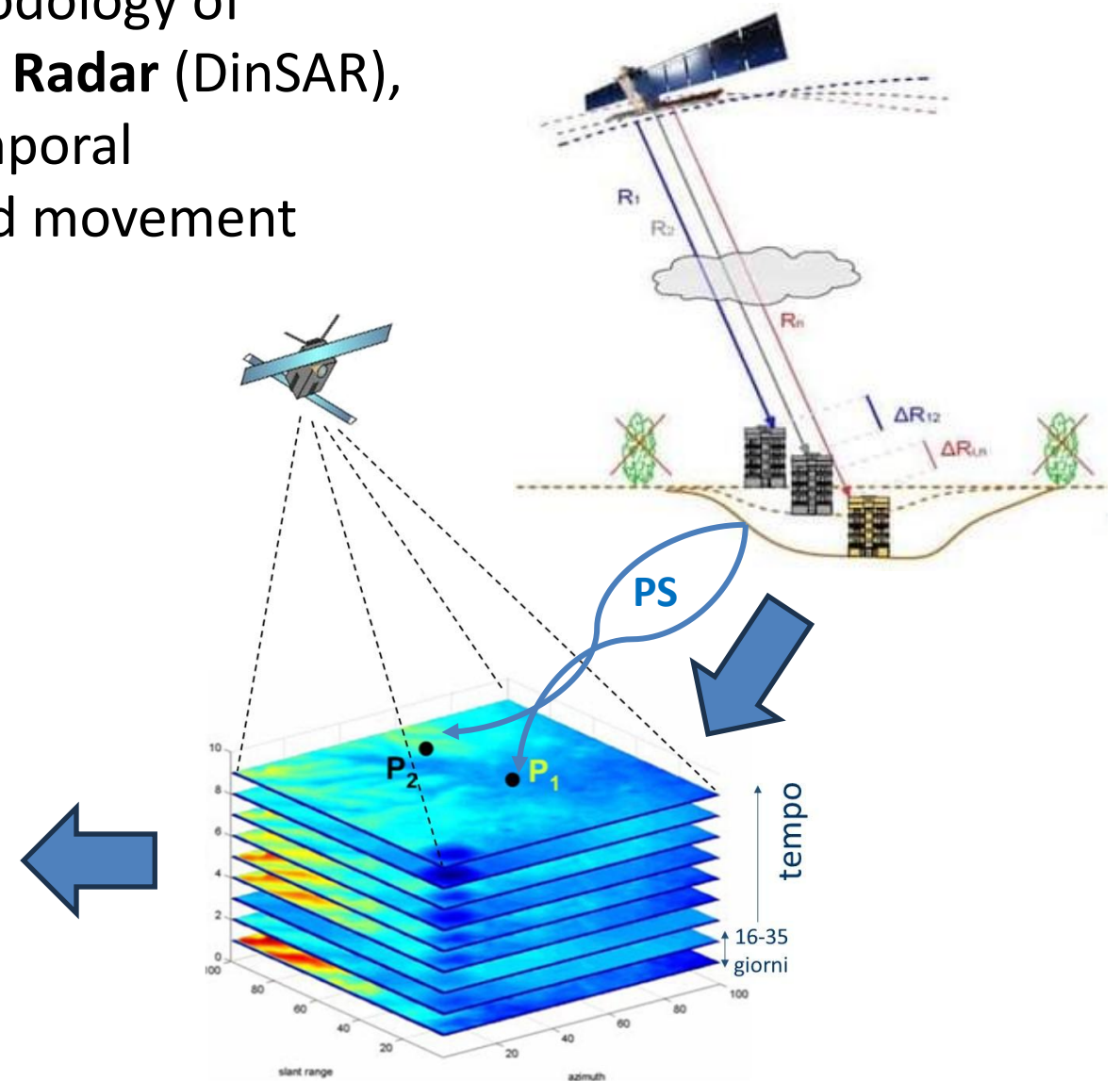
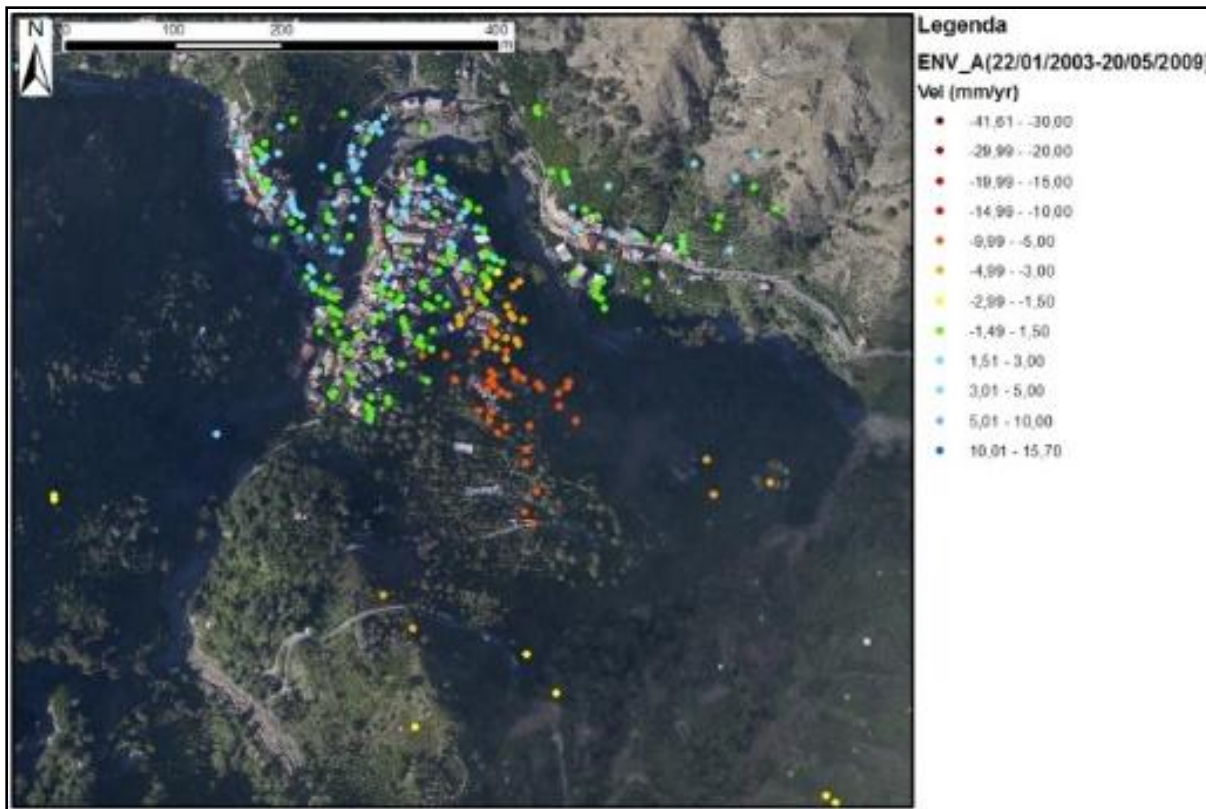
By being able to monitor them, in many cases we can, if not predict them, at least, anticipate their possibility of occurrence which allows us to try to reduce the possible damage, as well.

In this, as in the case of flooding events, we are helped not only by the visible part of electromagnetic spectrum, but also by the microwave one by making use of the satellite radar interferometry.

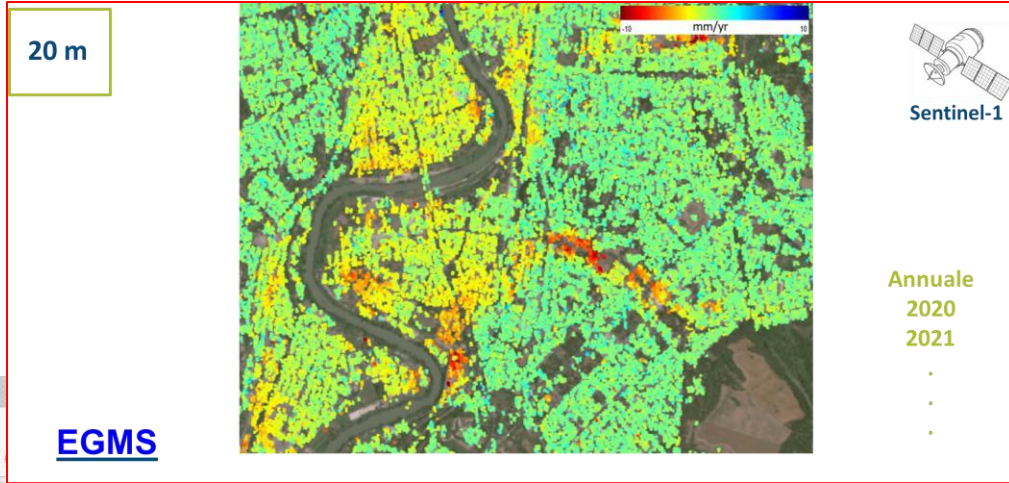


Interferometry and soils and ground movements

For instance, this is done by applying the methodology of **Differential interferometry Synthetic Aperture Radar (DinSAR)**, which is one of the most widely used multi-temporal interferometric techniques for detecting ground movement and/or deformation of structures.



CLMS: European Ground Motion Service



Global Pan-European Local Imagery and reference data Product portfolio News and events Language

Welcome to the EGMS

The European Ground Motion Service (EGMS) provides consistent and reliable information regarding natural and anthropogenic ground motion over the Copernicus Participating States and across national borders, with millimetre accuracy.

The EGMS represents a baseline for ground motion applications at continental, national and local level.

Please consult the [FAQ](#) for general questions and known issues.

Get access

View and download EGMS data via the [EGMS Explorer](#).

Get quick video introductions to the [EGMS](#) and the [EGMS Explorer](#).

Read about how to [use the EGMS Explorer](#).

Learn how best to [use EGMS products](#).

Understand the EGMS

opernicus Europe's eyes on Earth Land Monitoring Service

FAQ Ask the service

Global Pan-European Local Imagery and reference data Product portfolio

You are here: Home / Pan-European / European Ground Motion Service

European Ground Motion Service

Print User



Legend across all datasets. Limits are in mm/year.

Medium (-20 to 20) Min Max

InSAR default

12°C Nuvoloso

Cerca

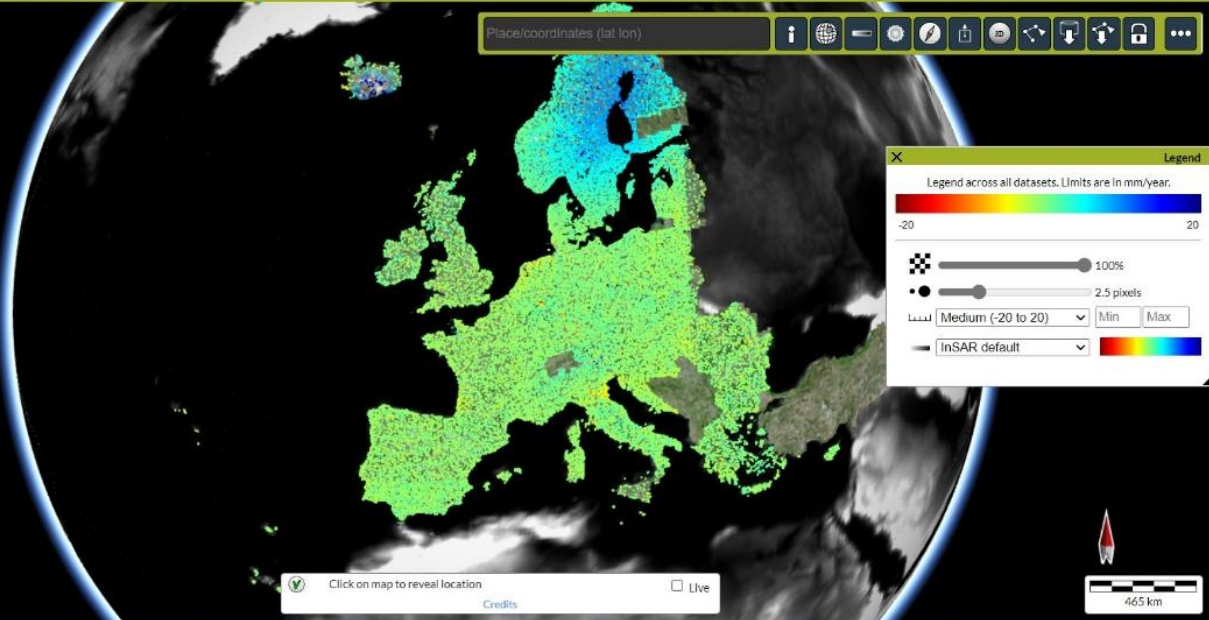
26/11/2022

opernicus Europe's eyes on Earth Land Monitoring European Environment Agency

European Ground Motion Service

Help Info

Place/coordinates (lat lon)



Legend across all datasets. Limits are in mm/year.

Medium (-20 to 20) Min Max

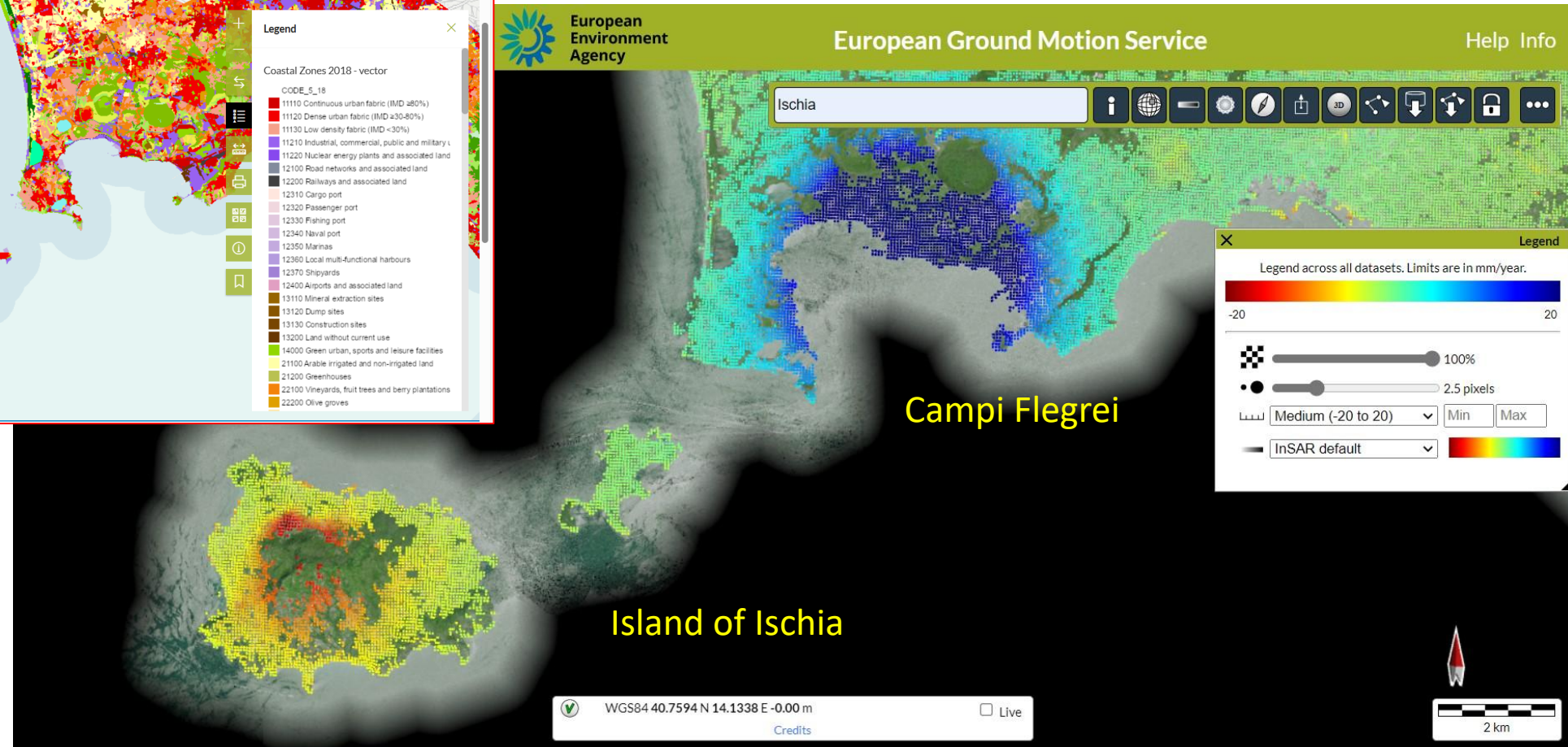
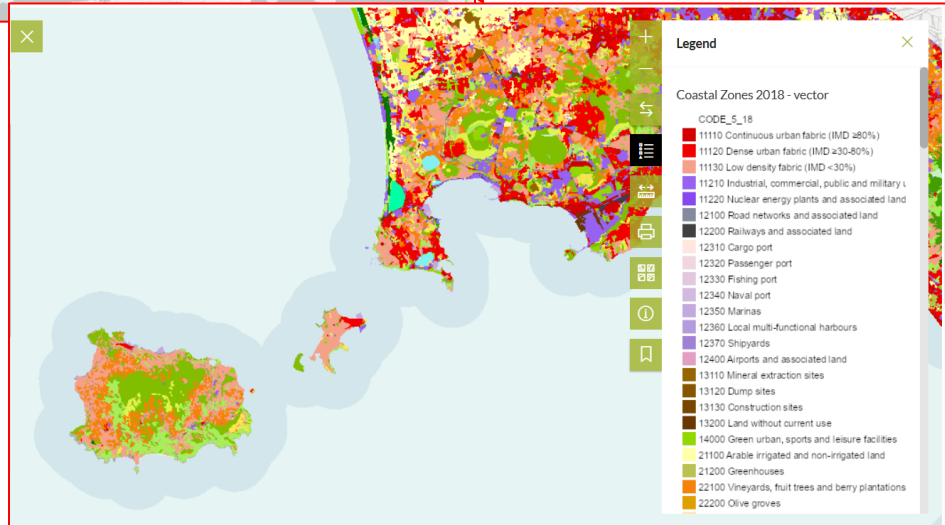
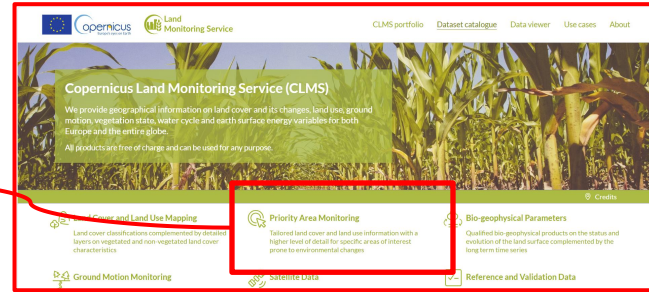
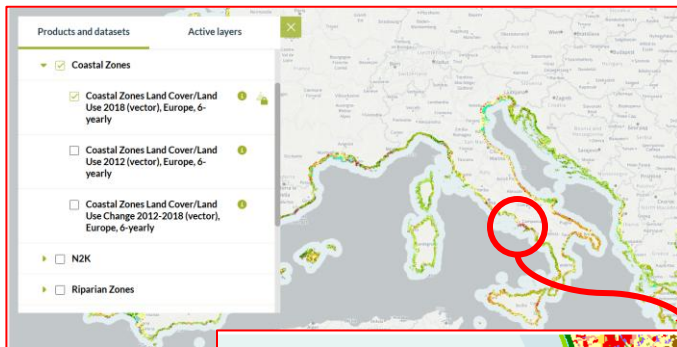
InSAR default

Click on map to reveal location

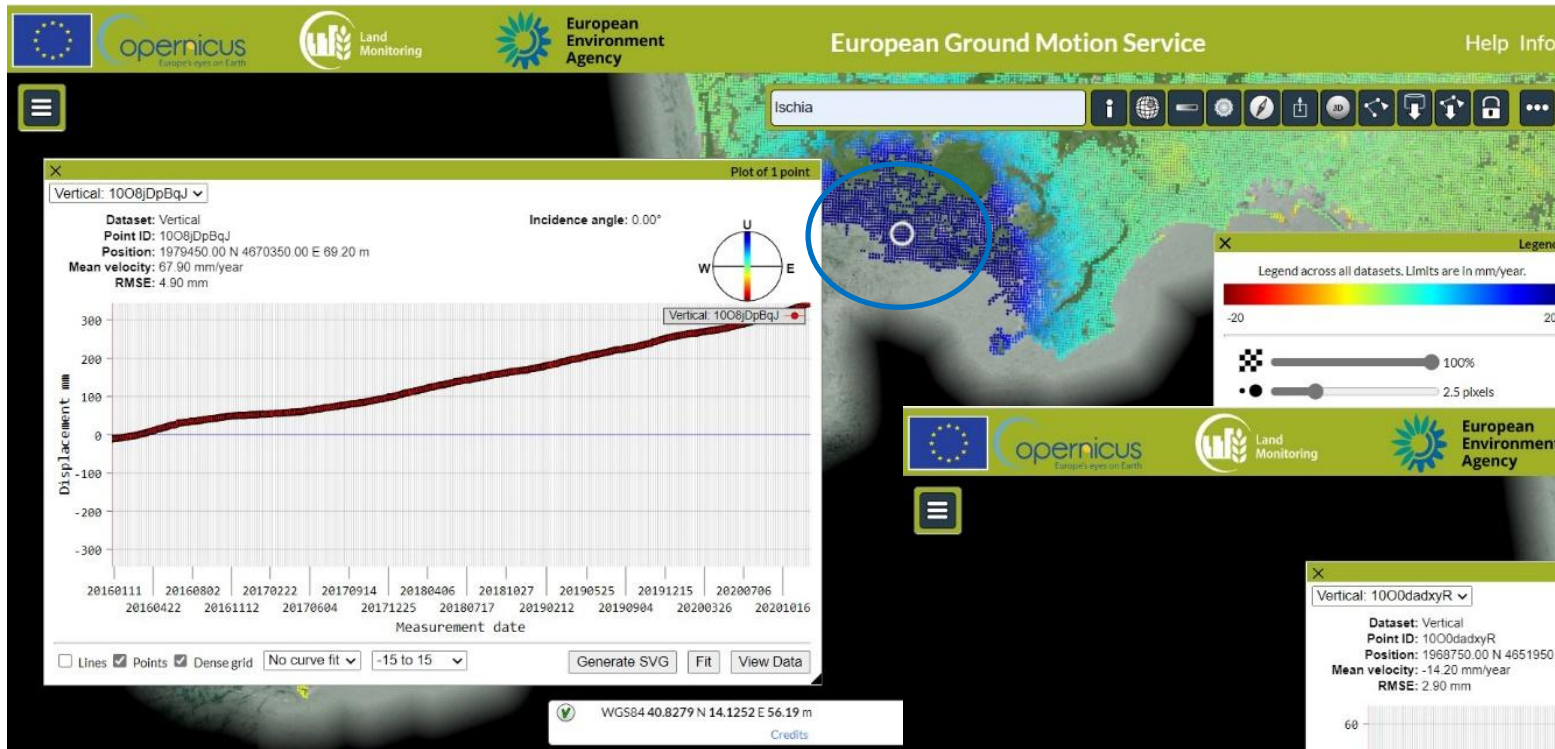
Live

465 km

CLMS: European Ground Motion Service

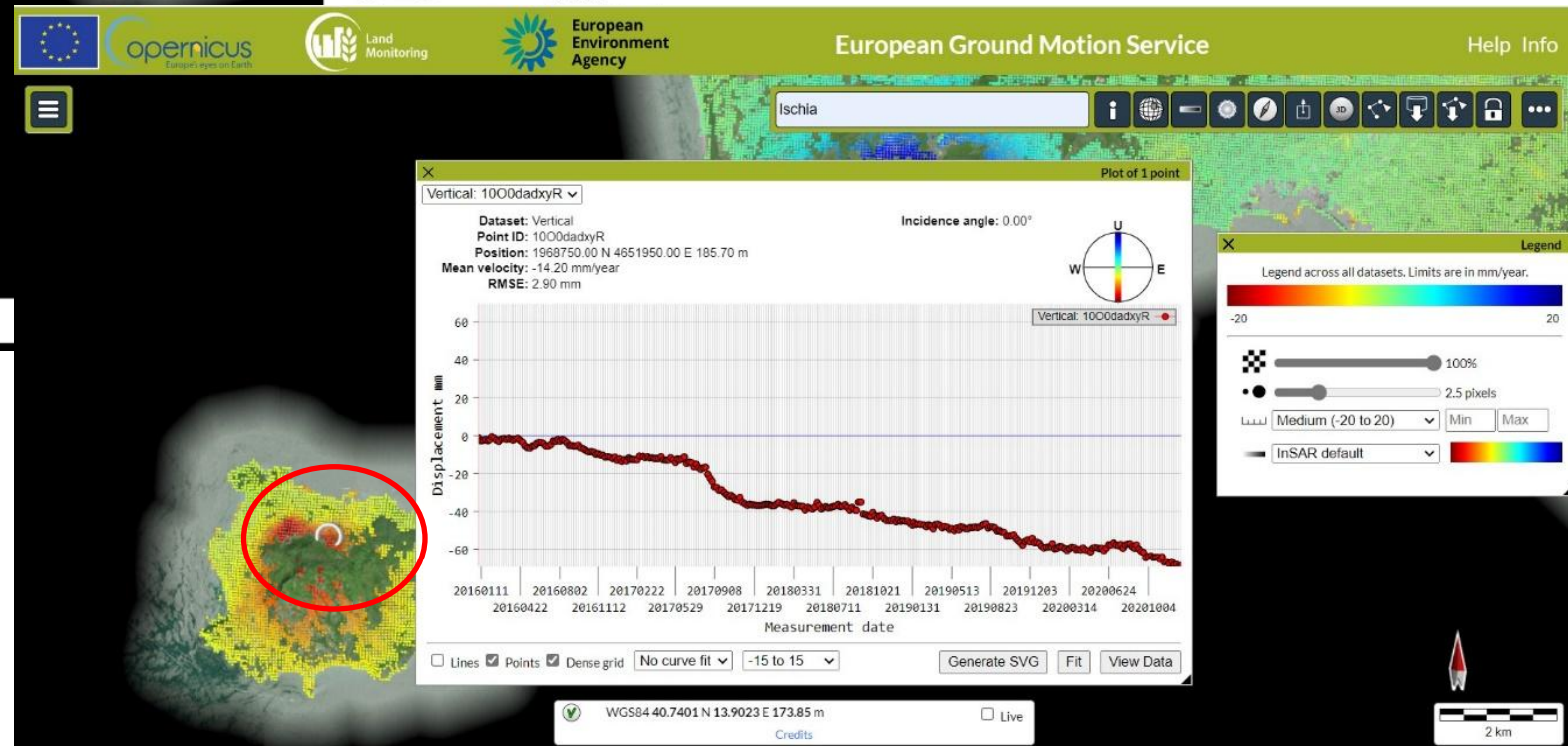


CLMS: European Ground Motion Service



Elevation trend (blue) of the Campi Flegrei between 2016 and 2020.

Sliding (red) of the northern slope of the island of Ischia between 2016 and 2020

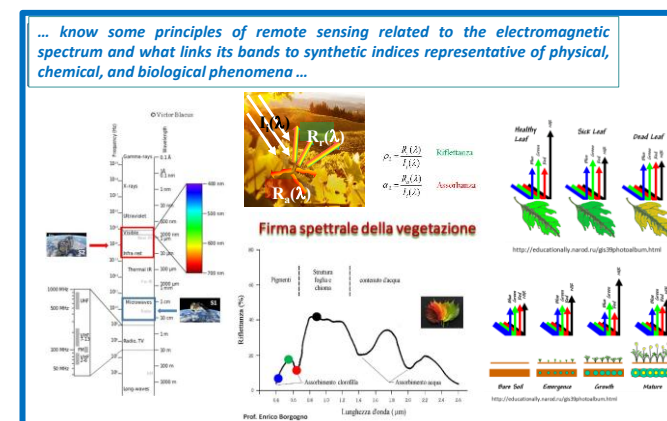
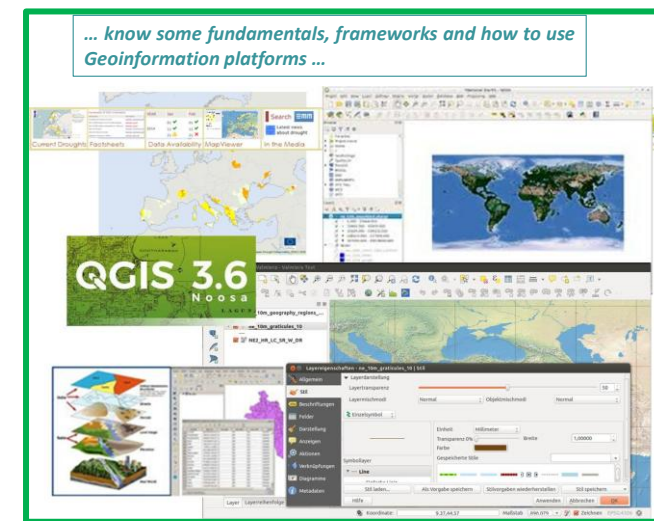


... Critical Elements for GMES and COPERNICUS deployment: need for some basic knowledge

One of the initial obstacles to making use of what GMES and Copernicus make available free of charge to everyone was undoubtedly that some commitment and effort to acquire a **minimum of basic geomatics** (remote sensing and geoinformation, in particular) and **computer literacy** in order to proactively access and benefit from them, are needed.

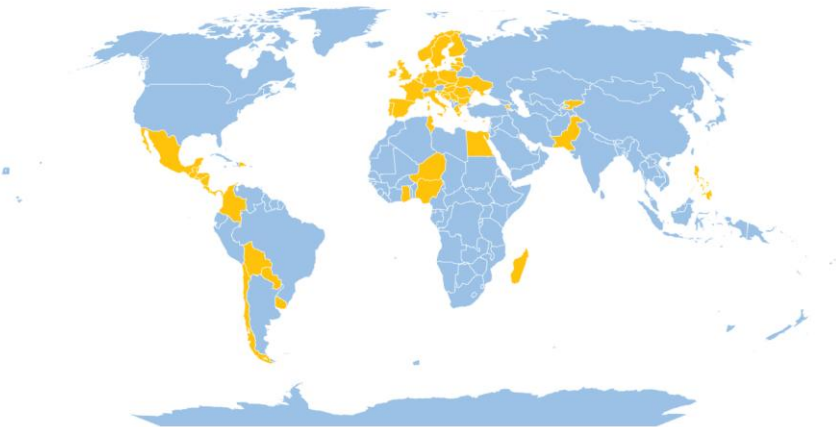
This limited their use primarily to the **scientific community** and to **subjects** that had a predominantly **STEM background** and/or held roles or pursued objectives that were primarily scientific and technical.

However, the two Programmes had been established with the ambition of being useful in meeting the needs and supporting the achievement of the **various user communities**, in a holistic manner, starting with those engaged in the various European Directives.



Since 2018, the Copernicus Academy National Network, as well as the European one, has taken on the task of overcoming these difficulties, bridging the gaps in knowledge, experience and expertise within these communities. In 2025, the consistency of the two networks was the following:

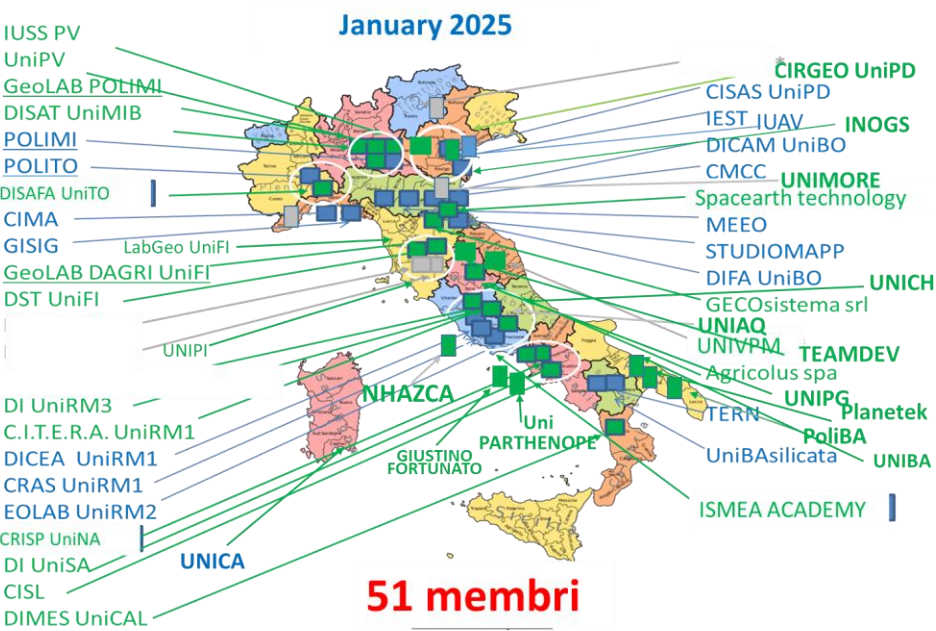
THE GLOBAL REACH OF THE EU NETWORKS



Currently the overall consistency of the EU Space Networks in the world is equal to **350 members** in **59 countries**



THE ITALIAN COPERNICUS ACADEMY NETWORK



... the role and the evolution of the Copernicus Academy National Network

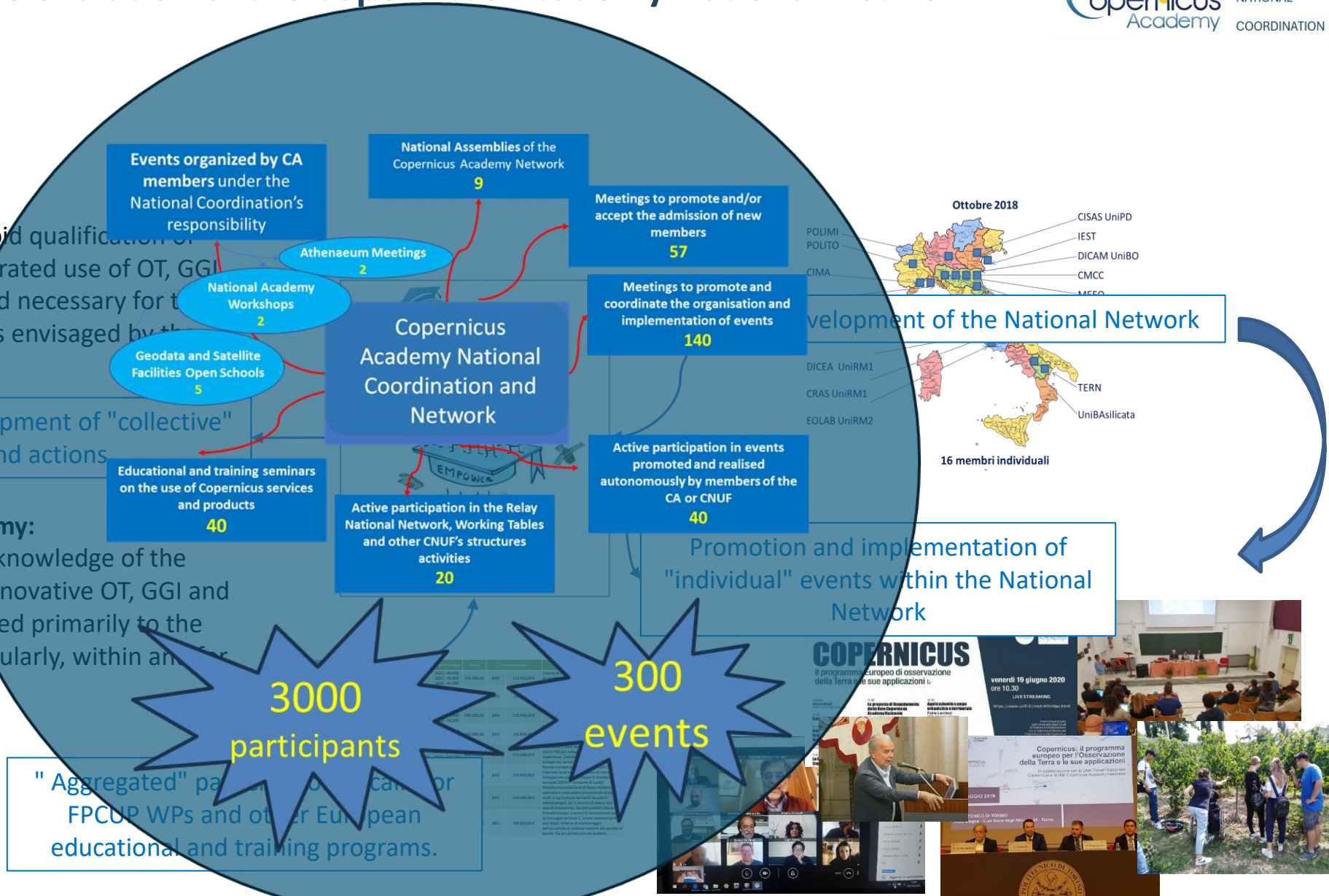
Position Paper:

The provision of training tools for the rapid qualification of professional profiles, related to the integrated use of OT, GGI and ICT methods and tools, advanced and necessary for the implementation of the innovative actions envisaged by the PNRR

Promotion, development of "collective" tools and actions

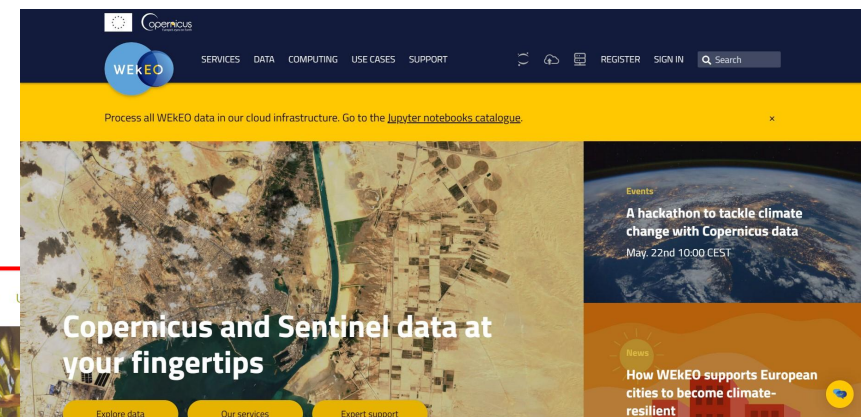
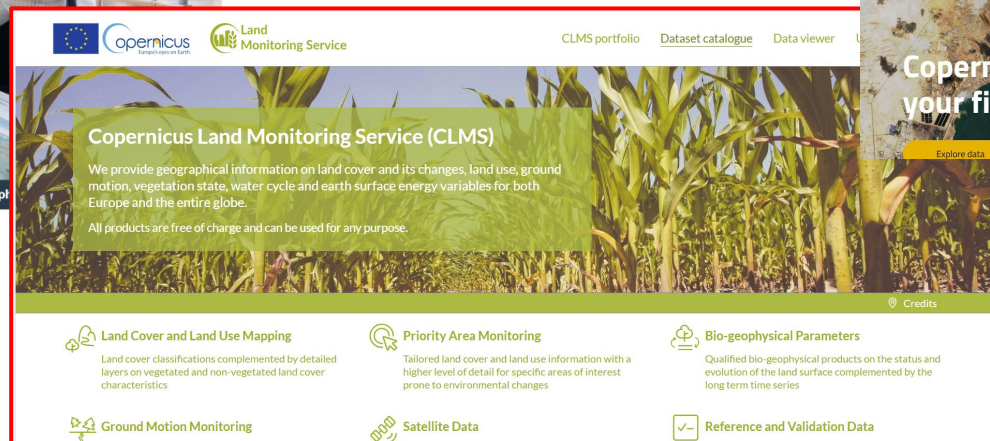
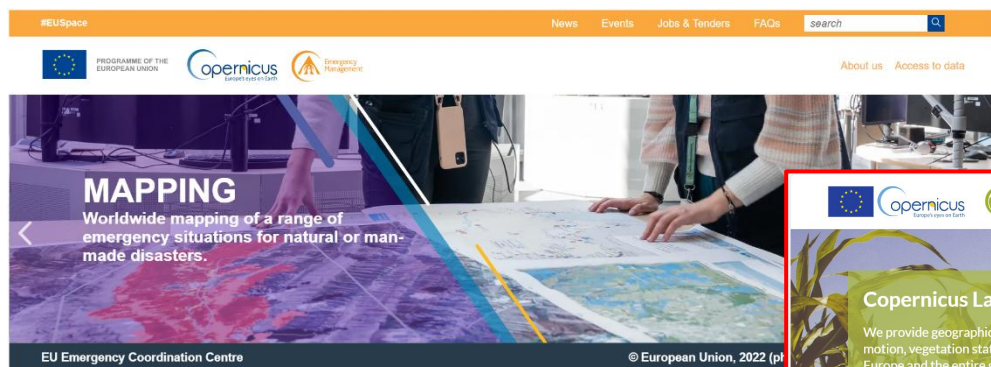
Italian Consortium for Copernicus Academy:

To promote and disseminate the culture, knowledge of the fundamentals and use of advanced and innovative OT, GGI and ICT technologies, methods and tools related primarily to the European Copernicus Program and, particularly, within and for the purposes of its Copernicus Academy



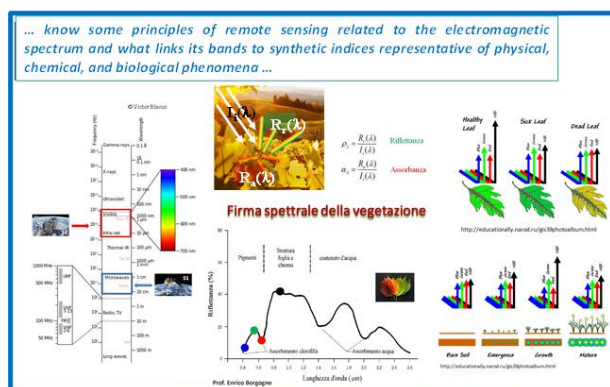
...Critical Elements for COPERNICUS deployment: the positive role of the OT/Copernicus viewers

Along this long journey, the OT/Copernicus viewers have greatly facilitated access to services, products and information at various levels, which have also grown in quantity, type, applicability and, consequently, usefulness for other communities and other members within each community, albeit in different roles, including administrative-managerial and technical-administrative ones, and/or with professional profiles, outside the STEM field; all of this applies equally to public administrations and to private manufacturing and service companies.



... new Critical Elements for COPERNICUS deployment: the advent of the Information Technology (IT) innovation

At the same time, IT innovation has penetrated the field of OT, Copernicus and Geomatics in general. Going well beyond the initial management of Big Data and the use of a language such as Python in the GIS field, the advent of other programming languages, Jupyter Notebooks, AIs and Large Language Models (LLMs) has transformed the advanced use and future prospects of what Copernicus makes available.



PYTHON
Programming
Language

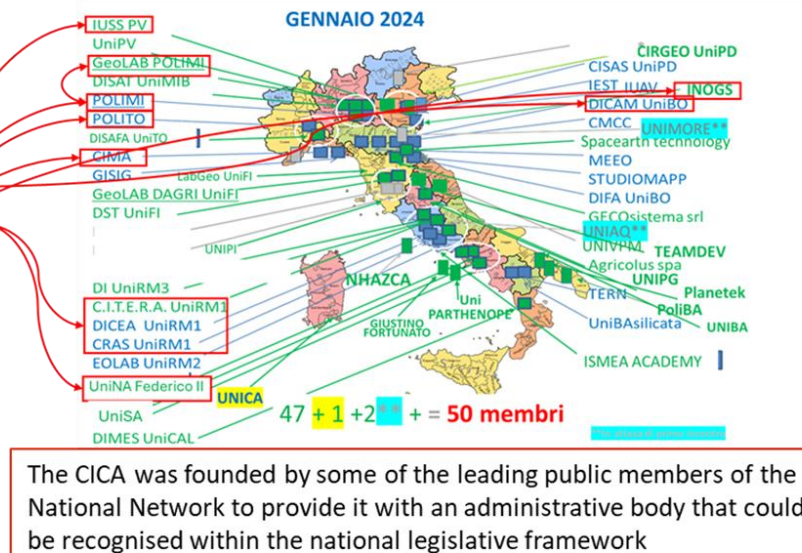


The Copernicus Academy has taken all this into account by enriching the content of its training activities, whilst also adapting and/or innovating them in line with their expansion to new user communities and their needs and objectives.



The Italian Consortium for the Copernicus Academy is a public non-profit organisation to primarily promote the Copernicus Academy and its network

- ✓ PoliTO
- ✓ PoliMI
- ✓ UniBO
- ✓ OGS
- ✓ IUSS PV
- ✓ CIMA
- ✓ UNIFI
- ✓ UniRM1
- ✓ UNINA



This has been achieved through specific processes to identify learners' knowledge, education and training needs, not merely based on purely theoretical references, but also on new and/or updated professional profiles identified in collaboration with management and/or leaders within the community, followed by the design and delivery of the activities.

These activities are linked to the development and implementation of the 'EO Skills Strategy' through the CICA.

ERASMUS PLUS
SECTOR SKILLS ALLIANCE
EO4GEO Project

Blueprint Strategy



SpaceSUITE

Linking space components for a skilled society

**Design, Develop and Delivery
Response (DDD)**



GISIG

Geographical Information Systems International Group



CICA

Consorzio Italiano per la Copernicus Academy

Raising awareness and Training



Large-scale Skills Partnerships

The problem to be faced:

Lack of professional skills and suitable professional profiles with adequate awareness and training to produce added institutional value in public administrations, as well as market value in enterprises through the introduction of innovation produced by the EU new strategic programme

**Business Process Model
and Notation (BPMN)**



IRIS²

← AMBASSADOR →



Galileo/EGNOS

← AMBASSADOR →



Copernicus

← AMBASSADOR →



The example of the CAMS NCP Italian initiative



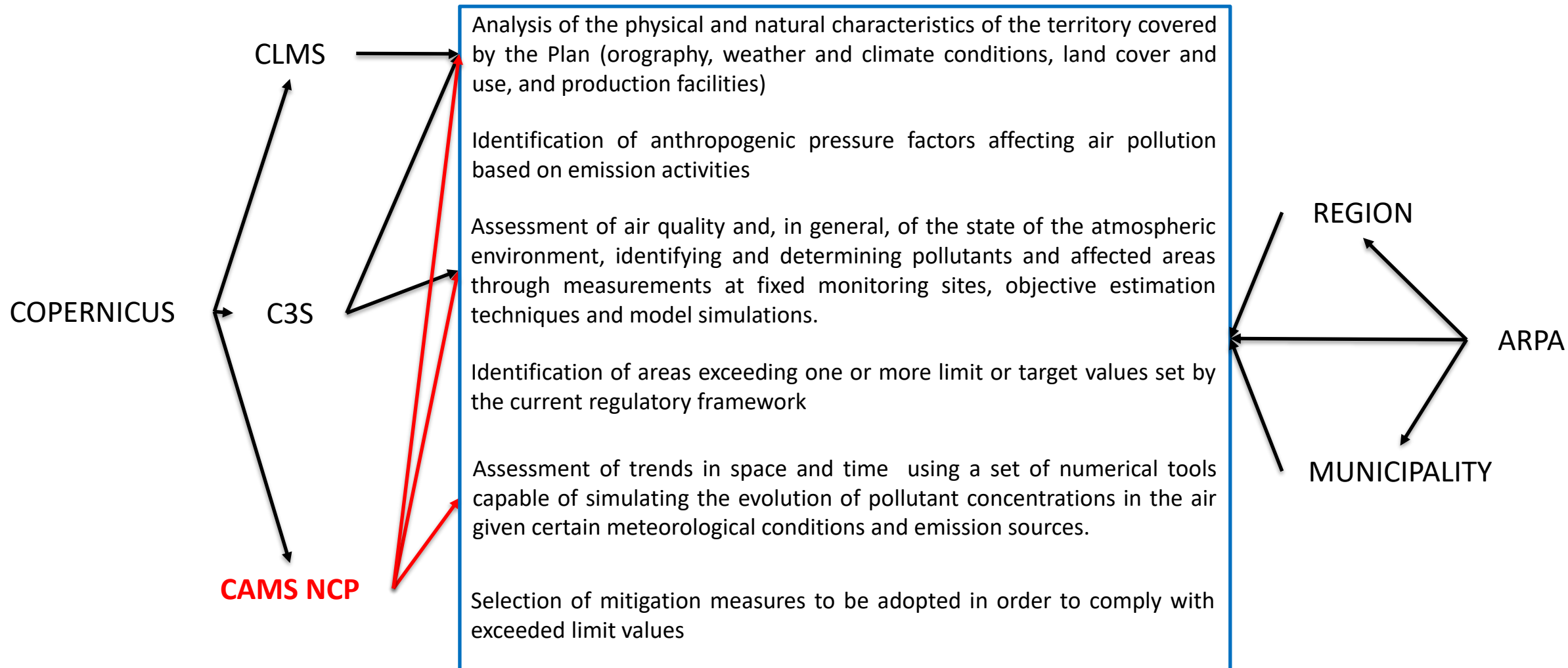
One of the aims of CAMS NCP Italy is focused on expanding the community of institutional users of Copernicus, particularly CAMS, but also other core services such as C3S and CLMS relating to Air Quality management.

The enlargement process, guided by the **Regional Air Quality Plans**, begins with the formal involvement of the **public administrations**, as well as their staff at various levels of responsibility for the design, implementation and operational management of such Plans and regarding EO/Copernicus.

Therefore, the following implementation of the process takes place based on:

- ✓ the '3D approach' from SpaceSUITE Program: Designing, Developing and Delivering.
- ✓ The identification of the current state of staff knowledge in EO, required professional profiles for an optimal use of EO/Copernicus products and services, knowledge and experience gaps and training needs and requirements.
- ✓ The creation of regional Working Groups with ARPAs, Regions and Municipalities equally involved.

THE REGIONAL AIR QUALITY MANAGEMENT PLAN, THE PUBLIC ADMINISTRATIONS INVOLVED IN IT, ITS MAIN CONTENTS, THE USE OF COPERNICUS CORE SERVICES ARE SUMMARISED IN THE FOLLOWING OUTLINE.



ENLARGEMENT OF CAMS USER COMMUNITY BY REFERRING TO THE REGIONAL AIR QUALITY MANAGEMENT PLANS AND TO THE COMMUNITIES AND STAFF INVOLVED IN DEVELOPING AND IMPLEMENTING THEM



ASSESSMENT OF KNOWLEDGE AND SKILLS LEVELS ...

INTERVIEWS REGARDING THE POSSIBLE USE OF EO IN THE PUBLIC ADMINISTRATION SECTOR ...

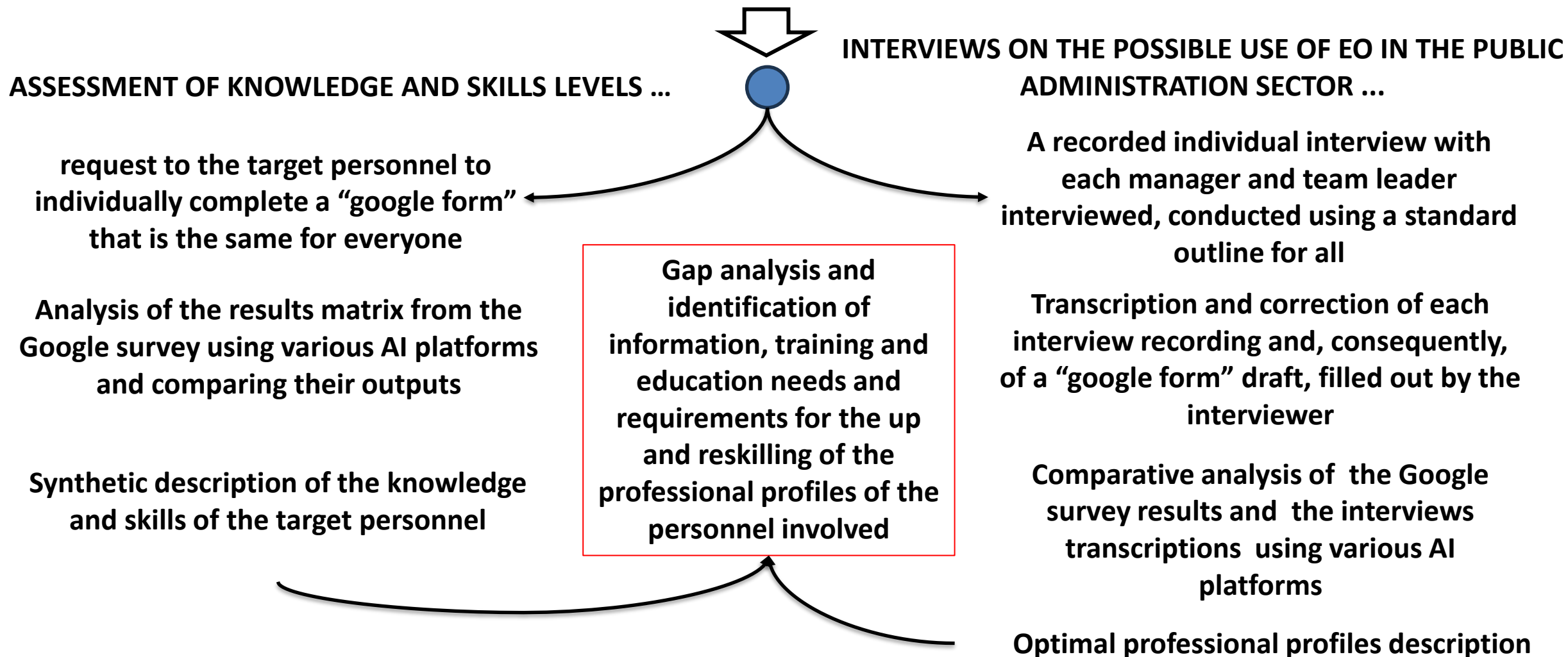
State of general knowledge related to EO, Copernicus and air quality management

Optimal professional profiles

Gap analysis and identification of information, training and education needs and requirements for the up and reskilling of the professional profiles of the personnel involved

Design and implementation of training activities

ENLARGEMENT OF CAMS USER COMMUNITY BY REFERRING TO THE REGIONAL AIR QUALITY MANAGEMENT PLANS AND TO THE COMMUNITIES AND STAFF INVOLVED IN DEVELOPING AND IMPLEMENTING THEM



OUTLINE FOR THE QUESTIONNAIRES, INTERVIEW AND AI USE WITHIN THE ENLARGEMENT PROCESS

THE QUESTIONNAIRE ON THE LEVEL OF KNOWLEDGE AND USE OF EO IN THE FIELD OF AIR QUALITY MANAGEMENT

PURPOSE:

To assess the level of knowledge and expertise in the field of Earth Observation, Copernicus and its operational services, with a particular focus on CAMS, as well as Geomatics, among public administration personnel to be employed operationally in the field of air quality management

TARGET PERSONNEL: Technical-technical, technical-administrative and administrative-management personnel

THE INTERVIEW ON THE POSSIBILITY OF USING OT IN THE PUBLIC ADMINISTRATION FOR AIR QUALITY MANAGEMENT AND THE IDENTIFICATION OF OPTIMAL PROFESSIONAL PROFILES FOR THIS PURPOSE:

To gather the opinions of managers and officials on **i)** which functional and operational areas of the public administration to which they belong and which are related to air quality management it would be appropriate and useful to promote awareness and use of Earth Observation and Copernicus, and **ii)** what the characteristics and skills of the professional profiles of internal staff employed and/or to be employed effectively for this purpose should be

INTERVIEWEES: Human, instrumental and financial resource managers at different hierarchical levels and through different management methods

EXAMPLES OF OPTIMAL PROFESSIONAL PROFILES OBTAINED WITHIN THE ENLARGEMENT PROCESS

1. Integrated Data & Geospatial Analyst

This is neither the classic GIS specialist nor the simple data analyst, but professionals capable of:

- integrating satellite, in situ and modelling data;
- using cloud platforms and AI tools;
- transforming EO/Copernicus data into operational products for decision support.

This is a hybrid role combining:

- data scientist,
- GIS expert,
- environmental analyst,
- interoperability specialist.

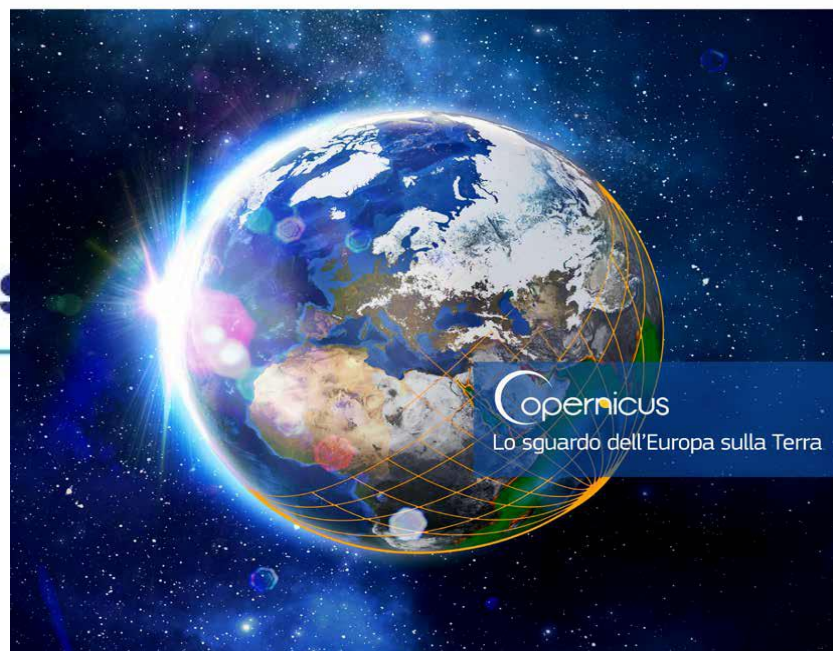
This profile appears to be becoming central, particularly for:

- integrated environmental monitoring,
- risk management,
- support for territorial policies.

At the end of this long interactive process involving both “humans and non-humans,” we may develop proposals, for example, for optimal and referential new professional profiles that are reasonable for moving forward with the process

OTHER EXAMPLES OF OPTIMAL PROFESSIONAL PROFILES

2. ‘Broker’ or technical-scientific translator
3. Expert in digital integration and environmental AI
4. Coordinator of collaborative networks and capacity building
5. Environmental Data Governance Expert



https://youtu.be/uzF_ftCeZ5Y



Thanks !!

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