



# Copernicus



Space



Copernicus EU



Copernicus EU



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[www.copernicus.eu](http://www.copernicus.eu)



Copernicus

## WHAT IS COPERNICUS?

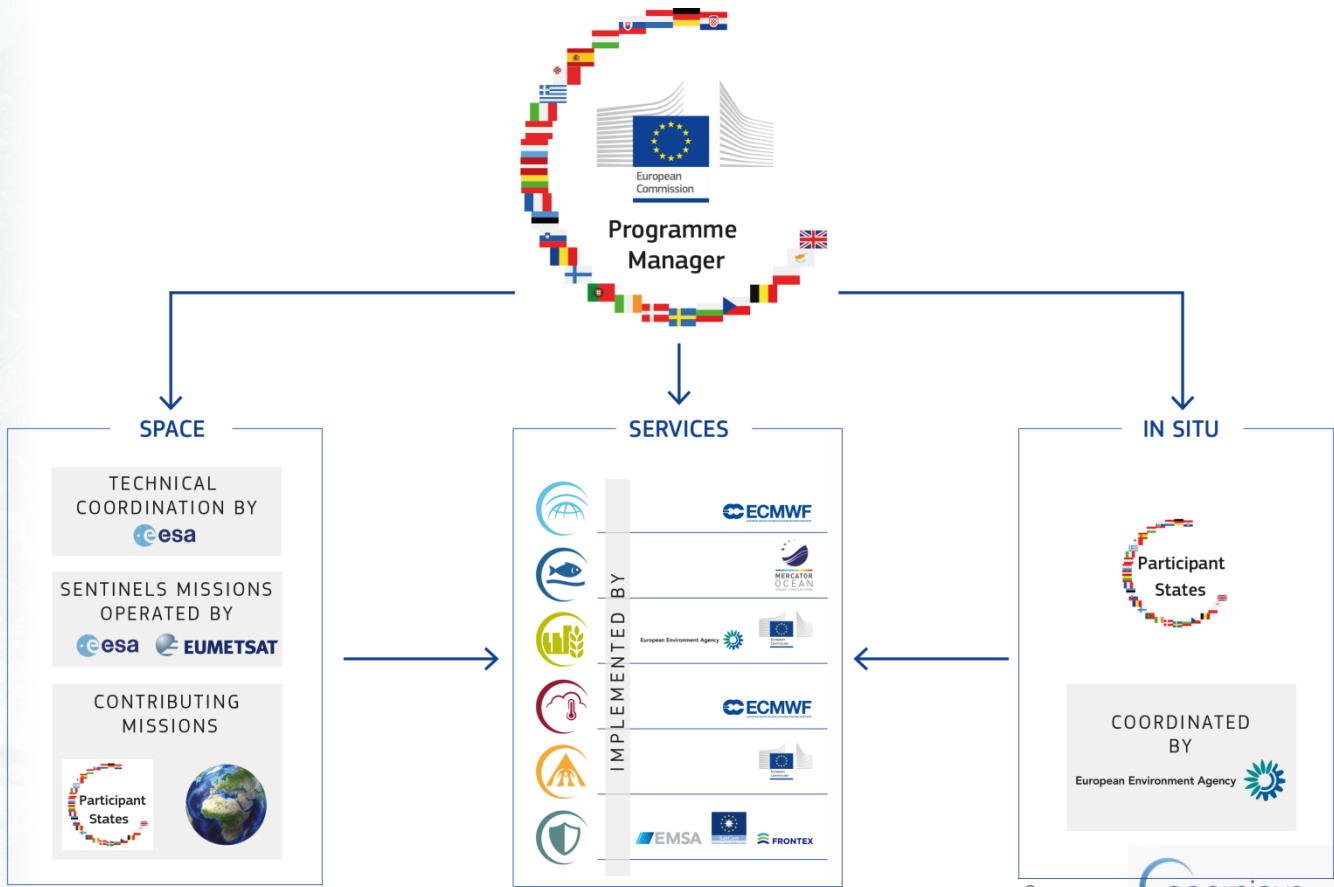
- **Copernicus is a flagship programme** of the European Union:
  - Monitors **the Earth**, its environment and ecosystems
  - Prepares for **crises, security risks** and **natural or man-made disasters**
  - Contributes to the **EU's role as a global soft power**
- a **full, free and open data policy**
- Is a tool for **economic development** and a driver for the **digital economy**

<http://copernicus.eu/>



Copernicus







# WHO IS BEHIND COPERNICUS?





Copernicus

# COPERNICUS DATA AND SERVICES

- **Space component:** Data from Space
  - A family of dedicated EU-owned satellites: the Sentinels
  - Contributing missions: satellites operated by ESA, EUMETSAT, EU members, third countries, commercial providers
- Data on the ground, in the sea, in the air: **in-situ measurement**
- **Copernicus Services:** turning data into information
  -  Atmosphere Monitoring;
  -  Marine Environment Monitoring;
  -  Land Monitoring;
  -  Climate Change;
  -  Emergency Management;
  -  Security.



Space Component

# THE SENTINELS

FULL, FREE AND OPEN

## Sentinel Mission and Status

## Key Features

	<b>SENTINEL-1:</b> 9-40m resolution, 6 days revisit at equator	<i>S1-A and B in orbit</i>
	<b>SENTINEL-2:</b> 10-60m resolution, 5 days revisit time	<i>S2-A in Orbit S2-B in Orbit</i>
	<b>SENTINEL-3:</b> 300-1200m resolution, <2 days revisit	<i>S3-A in Orbit S3-B in Orbit</i>
	<b>SENTINEL-4:</b> 8km resolution, 60 min revisit time	<i>1st Launch Q4 2022</i>
	<b>SENTINEL-5p:</b> 7-68km resolution, 1 day revisit	<i>S5-P in Orbit</i>
	<b>SENTINEL-5:</b> 7.5-50km resolution, 1 day revisit	<i>1st Launch in 2021</i>
	<b>SENTINEL-6:</b> 10 days revisit time	<i>July 2020</i>

Polar-orbiting, all-weather, day-and-night radar imaging

Polar-orbiting, multispectral optical, high-res imaging

Optical and altimeter mission monitoring sea and land parameters

Payload for atmosphere chemistry monitoring on MTG-S

Mission to reduce data gaps between Envisat, and S-5

Payload for atmosphere chemistry monitoring on MetOp 2<sup>nd</sup>Gen

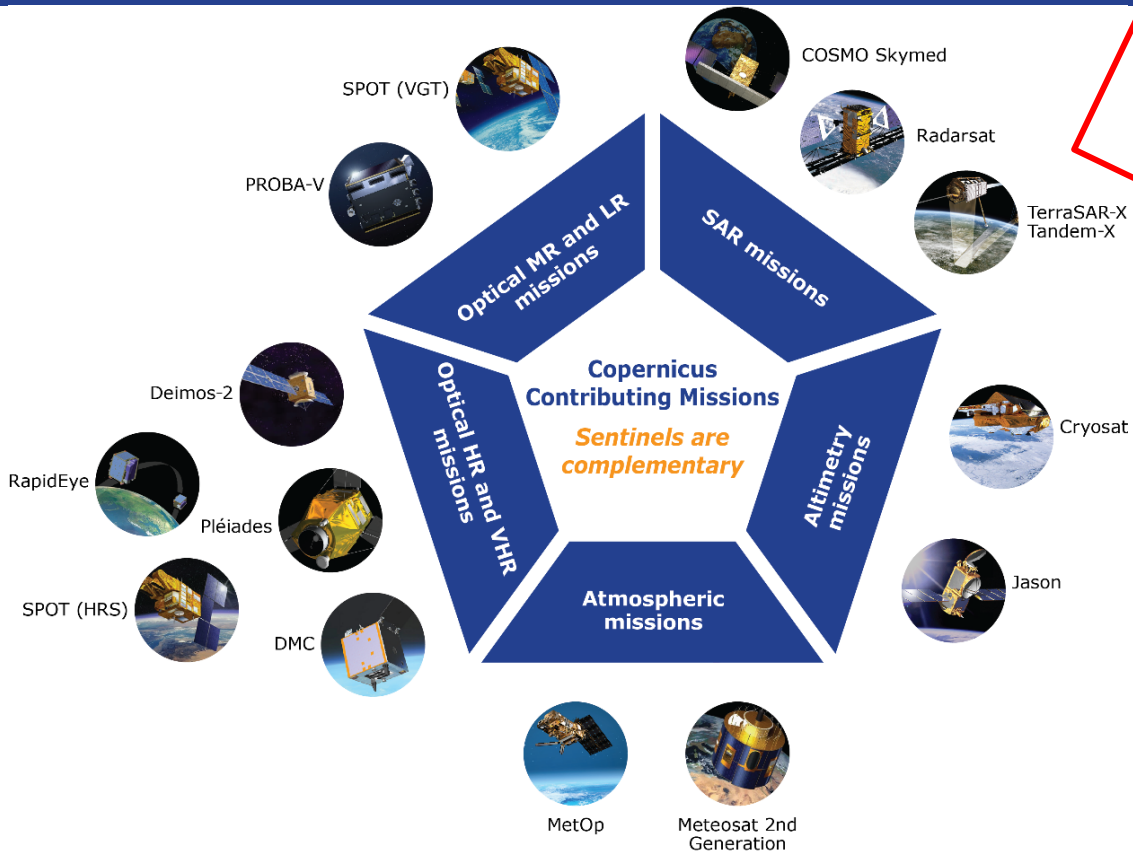
Radar altimeter to measure sea-surface height globally





Space Component

# THE CONTRIBUTING MISSIONS



Subject to Data Owner's Data Policy



In situ

# 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





Copernicus

# COPERNICUS SERVICES

*Monitoring the State of the Earth System Environment ...*



Land Monitoring



Marine Environment Monitoring



Climate Change



Atmosphere Monitoring



Emergency Management



Security

*... Six cross-cutting Thematic Services*





Land  
Monitoring

# Benefit areas and products examples

Ecosystems

Biodiversity

Agriculture

Forestry

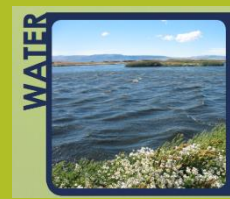
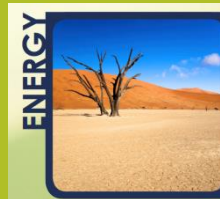
Energy

Natural Resources

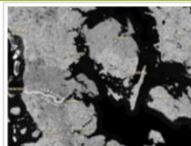
Water

Urban planning

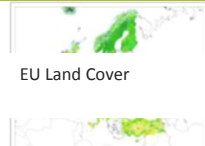
## Global



## Pan-European



[Image Mosaics](#)

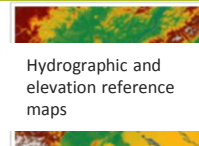


[CORINE Land Cover](#)



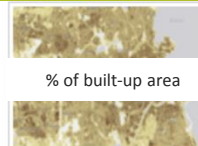
[Specific land cover info](#)

[High Resolution Layers](#)



[Hydrographic and elevation reference maps](#)

[Reference Data](#)



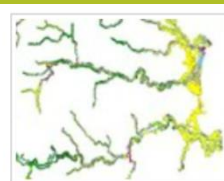
[% of built-up area](#)

[Related Pan-European products](#)

## Local



[Urban Atlas](#)



[Riparian Zones](#)



[Natura 2000 \(N2K\)](#)



Marine  
Monitoring

# Benefit areas and products examples

**Marine safety**

**Marine resources**

**Coastal and marine environment**

**Climate and meteorological forecasting**

**Other: Transport, Tourism, Environment, Pollution, Energy, etc.**



**Sea Level**

**Ocean Salinity**

**Ocean Temperature**

**Sea Ice**






**Wind**

**Ocean Currents**

**Ocean Colour / Biogeochemistry**  
(e.g. optics, chlorophyll, biology, chemistry)



# Benefit areas and products examples

Health	Air Quality and Atmospheric Composition	
Environment	Climate forcing	
Pollution	Ozone layer & UV	
Climate	Solar radiation	
Renewable Energy	Emissions and surface fluxes	



Climate  
Change

# Benefit areas and products examples

**Climate change**

**Consistent Estimates of the  
Essential Climate Variables (ECVs)**



**Mitigation and  
adaptation**

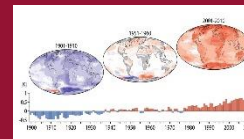
**Support to Mitigation and  
Adaptation Strategies**



**Weather forecast**

**Pollution**

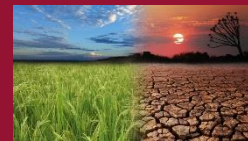
**Global and Regional  
Reanalyses**



**Environment**

**Health**

**Seasonal Forecasts  
And Climate Projections**





**Disaster  
Emergency  
Situations**

**Humanitarian  
Crisis**



## Risk & Recovery Mapping:

- Reference Maps
- Pre-disaster Situation Maps
- Post-disaster Situation Maps

## Rapid Mapping:

- Reference Maps
- Delineation Maps
- Grading Maps

## Early Warning:

- Floods: EFAS
- Forest Fires: EFFIS

*EFAS = European Flood Awareness System;  
EFFIS=European Forest Fire Information System*





Security

# Benefit areas and products examples

## Border Surveillance

- Coastal monitoring
- Pre-frontier monitoring
- Reference mapping



## Maritime Surveillance

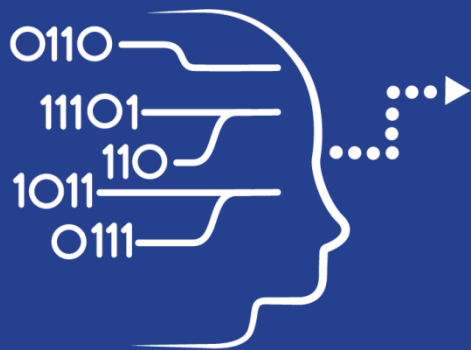
- Maritime surveillance of an area of interest
- Vessel detection
- Vessel tracking and reporting
- Vessel anomaly detection



## Support to EU External Action

- Road network status assessment
- Conflict damage assessment
- Critical infrastructure analysis
- Reference map
- Support to evacuation plans
- Crisis situation map
- Border map
- Camp analysis





User Uptake

# Copernicus Data Access

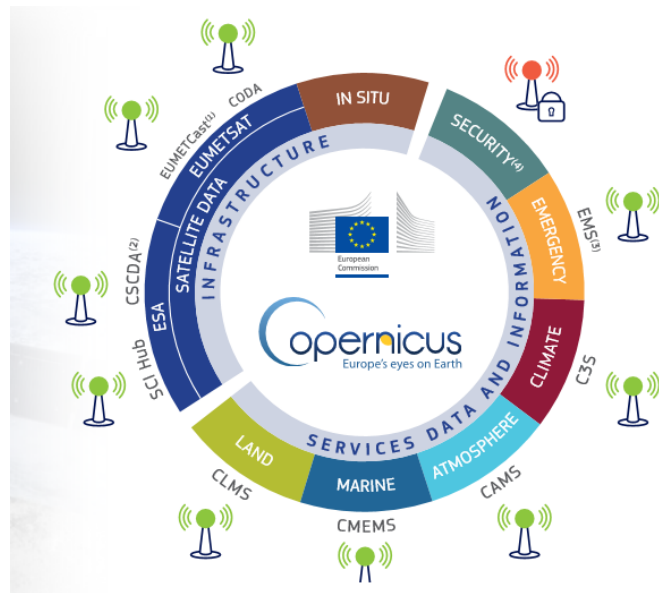
- 10 European Access points
- Several national and private initiatives



## User Uptake

# Copernicus Data Access Overview

- Satellite Data distribution Hubs
  - Sentinels
  - Contributing missions
  - Access to images in NRT
  - Access to archives
- Services Information portals for
  - Added value products, indicators
  - Models
  - Archives, Near Real Time and Forecasts products



Note: Copernicus in situ component provides in situ data access, serving the Copernicus services. It is not delivering in-situ data to the end-users.



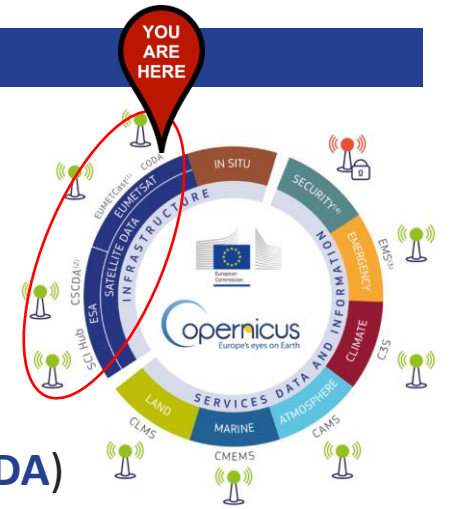
Space Component



# Access to Satellite Data

4 data access points:


- 2 managed by ESA:
  - Scientific Data Hub (**SCI Hub**)
  - Copernicus Space Component Data Access (**CSCDA**)
- 2 managed by EUMETSAT
  - **EUMETCast**
  - Copernicus Online Data Access (**CODA**)

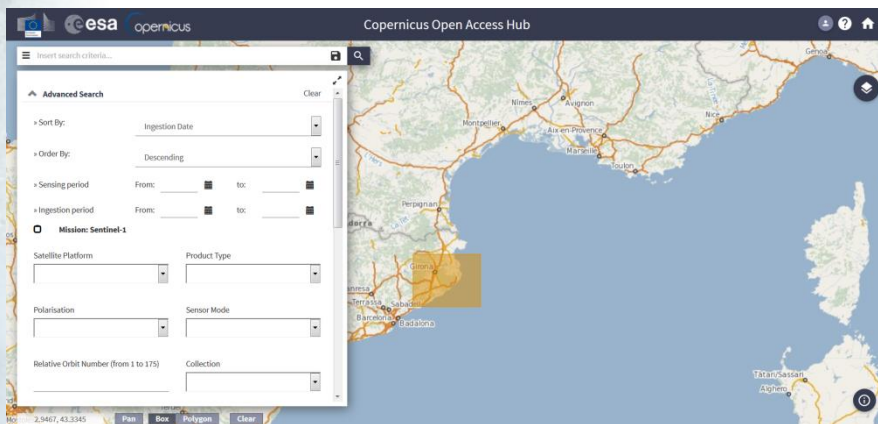




Space  
Component

**FULL, FREE AND OPEN**

Where	How	Key Figures						
<p><a href="https://scihub.copernicus.eu">https://scihub.copernicus.eu</a></p> 	<p>Two kinds of user interfaces:</p> <ul style="list-style-type: none"> <li>Graphic User Interface</li> <li>Application Programming Interfaces (API)</li> </ul> <p>Two API Options:</p> <ul style="list-style-type: none"> <li>Open Data Protocol</li> <li>Open Search</li> </ul>	<table border="1"> <tr> <td data-bbox="1296 241 1464 401"> <p><b>15,243</b> users successfully registered in 2015</p> </td> <td data-bbox="1470 241 1638 401"> <p><b>355,939</b> products published</p> </td> <td data-bbox="1644 241 1812 401"> <p><b>502 Tbytes</b> published</p> </td> </tr> <tr> <td data-bbox="1296 434 1464 595"> <p><b>1,050</b> average number of products published per day</p> </td> <td data-bbox="1470 434 1638 595"> <p><b>6,900</b> average number of products downloaded per day</p> </td> <td data-bbox="1644 434 1812 595"> <p><b>Each user</b> 2 concurrent downloads max and 500 Mbit/s</p> </td> </tr> </table>	<p><b>15,243</b> users successfully registered in 2015</p>	<p><b>355,939</b> products published</p>	<p><b>502 Tbytes</b> published</p>	<p><b>1,050</b> average number of products published per day</p>	<p><b>6,900</b> average number of products downloaded per day</p>	<p><b>Each user</b> 2 concurrent downloads max and 500 Mbit/s</p>
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Space  
Component

**RESTRICTED**

Where	How	Key Figures
<p>Registration with <a href="mailto:eosupport@Copernicus.esa.int">eosupport@Copernicus.esa.int</a></p>  <p>Access for Collaborative Ground Segment</p>	<ul style="list-style-type: none"> <li>• Access restrictions: <b>EU Public authorities and institutions, EU Research projects, Copernicus Services</b></li> <li>• <a href="https://spacedata.copernicus.eu/web/cscda/copernicus-users/access-rights">https://spacedata.copernicus.eu/web/cscda/copernicus-users/access-rights</a></li> <li>• Order quota (for R&amp;D and Copernicus services only)</li> </ul>	<div data-bbox="1360 397 1528 554"> <p><b>Worldwide SAR coverage</b> in High Resolution (20m)</p> </div> <div data-bbox="1580 397 1748 554"> <p><b>24/7 satellite availability</b> for emergencies</p> </div> <div data-bbox="1360 576 1528 733"> <p><b>High Resolution (10-20m)</b> of 39 European States</p> </div> <div data-bbox="1580 576 1748 733"> <p><b>Very High Resolution (1-4m)</b> of 39 European States</p> </div>



Space  
Com

**FULL, FREE AND OPEN**  
But you must get the station and pay a yearly fee

Where	How	Other info
<ul style="list-style-type: none"> <li>All data listed on the <b>EUMETSAT Product Navigator</b>.</li> <li>Register on <b>EUMETSAT EO Portal (EOP)</b></li> </ul>	<ul style="list-style-type: none"> <li>Get the station , configure and receive stream of data</li> <li>Client S/W and ECU installed on your PC decrypt/decode incoming data stream</li> </ul>	<ul style="list-style-type: none"> <li>Open data policy depending on the data.</li> <li>Frequent user trainings organised by EUMETSAT</li> </ul>

- primary dissemination mechanism for the **near real-time**
- multi-service dissemination system based on multicast technology
- uses commercial telecommunication geostationary satellites using DVB standards and research networks



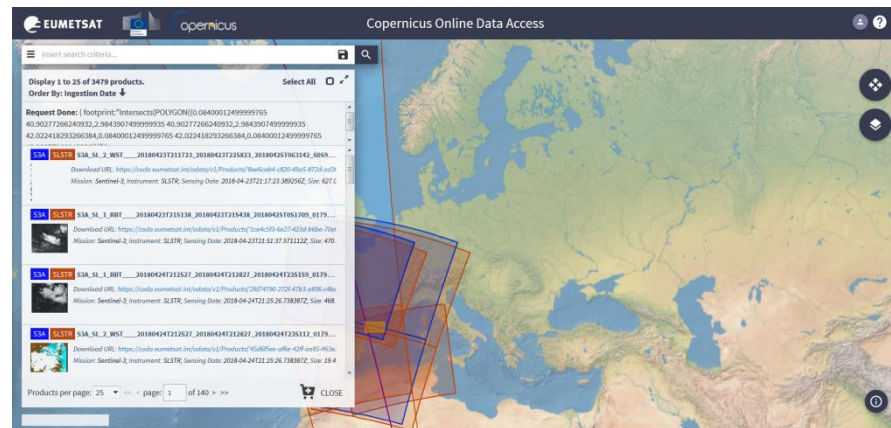
Space Component

**FULL, FREE AND OPEN**

- Access to Sentinel-3 Level 1 and Level 2 (Marine) global data in different latency modes:

LATENCY MODES	DESCRIPTION	TIME ARCHIVE
Near Real-Time (NRT)	Products available to users within three hours after sensing	1 month
Short time critical (STC)	Products available to users within within 48 hours after sensing. (Only for SRAL products)	
Non time critical (NTC)	Products available to users within one month after sensing	1 year

- <https://coda.eumetsat.int/>



# Access to Services Data and Information

- 6 Thematic Copernicus Services:
  - 5 are under Full, free and open access:
    - Land (CLMS) <https://land.copernicus.eu>
    - Marine (CMEMS) <http://marine.copernicus.eu>
    - Atmosphere (CAMS) <http://atmosphere.copernicus.eu>
    - Climate (C3S) <http://climate.copernicus.eu>
    - Emergency (EMS) <http://emergency.copernicus.eu>
  - 1 has restricted access
    - Security



Data  
Access

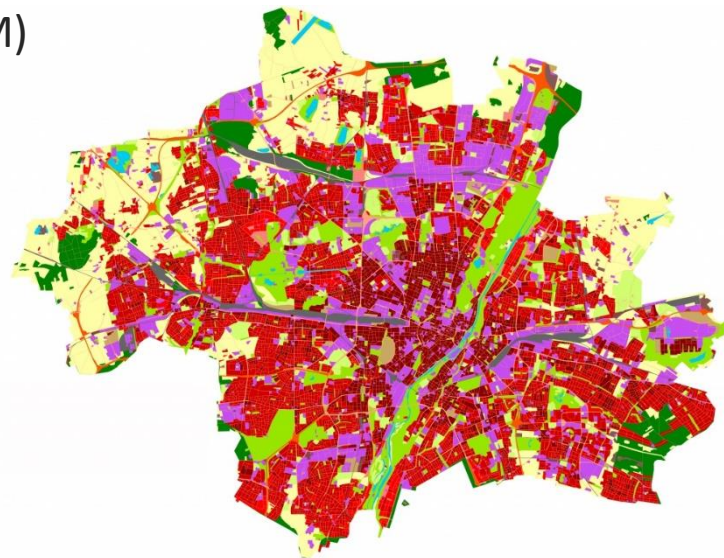


Land  
Monitoring

FULL, FREE AND  
OPEN

## ACCESS TO CLMS

- What type of product is available ?
  - Land Use / Land Cover (CORINE)
  - Hydrology
  - Digital Elevation Model (DEM)
  - Urban Atlas
  - Natura 2000,
  - etc...







Land  
Monitoring

FULL, FREE AND  
OPEN

# ACCESS TO CLMS

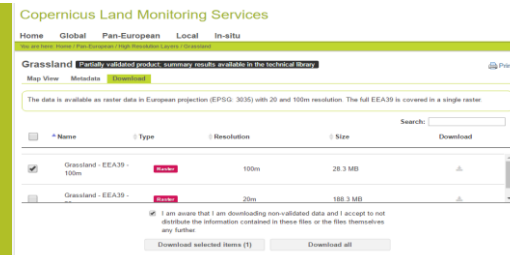
**Global** <http://land.copernicus.vgt.vito.be/PDF/portal/Application.html#Home>

- Register or log in
- Select portal with desired parameters
- Indicate time frame and area of interest
- Download the selected result



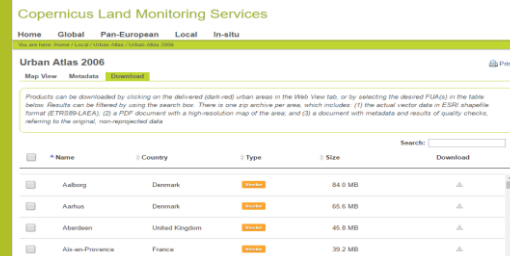
**Pan-European** <http://land.copernicus.eu/pan-european>

- Select the desired portal
- Switch to Download tab
- Select the desired dataset
- Agree and download the selected result



**Local** <http://land.copernicus.eu/local>

- Select the desired portal
- Switch to Download tab
- Select the desired dataset
- Agree and download the selected result





## National Initiatives- Collaborative Ground Segment

Initiative Name	Initiative Leader	Website and Target User Group
THEIA Land Data Centre	CEA, Cerema, IRSTEA, IRD, CNRS, INRA, IGN, Meteo France, CIRAD, ONERA	<ul style="list-style-type: none"> <li>• URL: <a href="http://theia-land.fr">theia-land.fr</a></li> <li>• Scientific communities and public authorities</li> </ul>
NOA Hellenic National Sentinel Data Mirror Site	NOA, IAASARS	<ul style="list-style-type: none"> <li>• URL: <a href="http://sentinels.space.noa.gr">sentinels.space.noa.gr</a></li> <li>• Scientific communities, public authorities, private industry players</li> </ul>
CATAPULT Satellite Applications and CEDA	UK Space Agency	<ul style="list-style-type: none"> <li>• URL: <a href="http://sa.catapult.org.uk">sa.catapult.org.uk</a></li> <li>• Scientific communities, public authorities, private industry players</li> </ul>
ESA Thematic Exploitation Platforms	ESA	<ul style="list-style-type: none"> <li>• URL: <a href="http://tep.eo.esa.int">tep.eo.esa.int</a></li> <li>• All user types</li> </ul>
Platform for Exploiting Products from Sentinels (PEPS1)	CNES	<ul style="list-style-type: none"> <li>• URL: <a href="http://peps.cnes.fr">peps.cnes.fr</a></li> <li>• Scientific communities and public authorities</li> </ul>



## Private Initiatives

Initiative Name	Initiative Leader	Website and Target User Group
CLOUDEO	CloudEO	<ul style="list-style-type: none"> <li>• URL: <a href="http://cloudeo-ag.com">cloudeo-ag.com</a></li> <li>• Users and developers of geo services, providers of geo data, services, applications and tools</li> </ul>
Earth Observation Data Centre (EO DC) for water resources monitoring	Vienna University of Technology Department of Geodesy and Geo-info	<ul style="list-style-type: none"> <li>• URL: <a href="http://eodc.eu">eodc.eu</a></li> <li>• Regional public authorities and private users</li> </ul>
GEOPEdia platform	Sinergise	<ul style="list-style-type: none"> <li>• URL: <a href="http://geopedia.world">geopedia.world</a></li> <li>• National, regional public authorities and private users</li> </ul>
GEOSTORM platform	CS-SI	<ul style="list-style-type: none"> <li>• URL: <a href="http://geostorm.eu">geostorm.eu</a></li> <li>• Regional authorities and private users</li> </ul>
Sentinel-2 on AWS	Amazon	<ul style="list-style-type: none"> <li>• URL: <a href="http://sentinel-pds.s3-website.eu-central-1.amazonaws.com">sentinel-pds.s3-website.eu-central-1.amazonaws.com</a></li> <li>• Developers, private/public downstream players</li> </ul>
Google Earth Engine	Google	<ul style="list-style-type: none"> <li>• URL: <a href="http://earthengine.google.com">earthengine.google.com</a></li> <li>• Regional authorities and private users</li> </ul>



Data  
Access

# Data and Information Access Service - DIAS

- DIAS provides a scalable computing and storage environment for third parties
- Access to data and imagery, information from Services, access to processing tools and resources
- Intention to procure parallel services: **5 consortia**
  - 4 procured by EC through ESA
  - 1 as a cooperation between EUMETSAT, ECMWF and Mercator
- Overall **ensuring that Copernicus data is easily accessible and used!**
- Launch of the DIAS's on **20 June 2018**



# COPERNICUS USER UPTAKE INITIATIVES



User Uptake

