



# The Copernicus space data ecosystem

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Copernicus EU



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

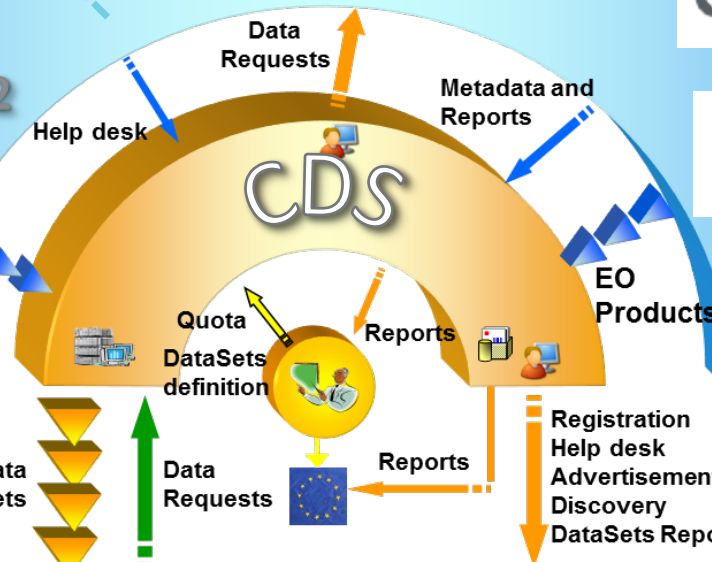
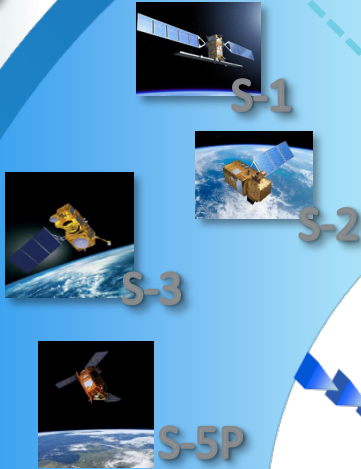
Space

# Copernicus Sentinel

# CCMES

User Uptake

# Sentinels



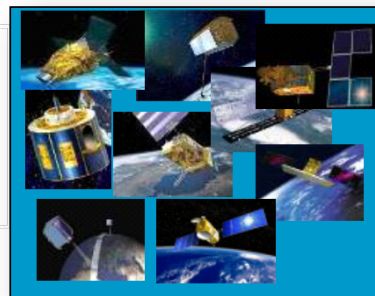
# COPERNICUS CORE USERS

# COPERNICUS OVERVIEW

User Uptake

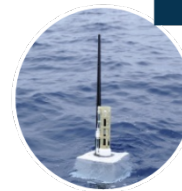


6 services use Earth Observation data to deliver ...



Sentinels

Data access



in-situ

...added-value products



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Copernicus  
Europe's eyes on Earth



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# COPERNICUS CORE USERS

- Copernicus services
- Institutions and bodies of the Union
- EU research projects FP7/H2020
- Public authority
- International organisations & NGOs
- Public



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# Copernicus Services Component



Land Monitoring Service (pan-EU & local)

Land Monitoring Service (global)



Marine Environment Monitoring Service



Atmosphere Monitoring Service



Climate Monitoring Service

Emergency Management Service



Security Service (Border surveillance)



Security Service (Maritime Surveillance)



Security Service (Support to External Action)



In-situ Coordination



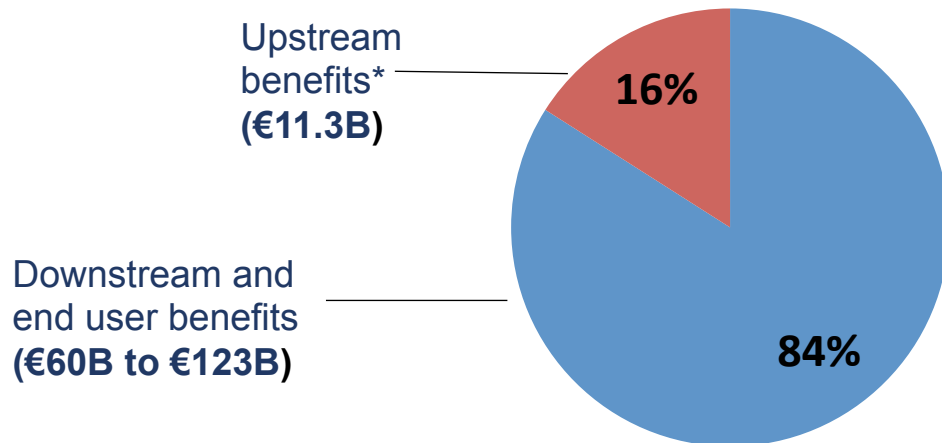
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# Overall benefits of Copernicus 2017-2035

Overall benefits  
(EUR 2017)

Between **€71B** and **€134B**

## Breakdown by segment of the value chain\*



\* The estimation includes only the upstream benefits generated by investment financed between 2017 and 2027. The upstream benefits generated by investment financed after 2027 are not included.

6



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# Downstream and end user benefits

- **Economic benefits, e.g.**
  - ✓ Increased revenue in the EO downstream sector
  - ✓ Improved agricultural productivity thanks to precision farming
- **Environmental benefits, e.g.**
  - ✓ CO<sub>2</sub> emissions saved thanks to increased renewable energy production
  - ✓ Hectares of forest saved thanks to improved fire prevention
- **Societal benefits, e.g.**
  - ✓ Life saved thanks to faster response to natural disasters
  - ✓ Reduced trafficking thanks to improved border surveillance

→ **Some of these benefits can be estimated and monetized**










User Uptake

# Downstream and end user benefits

## Sectors impacted

## Cumulated benefits (2017-2035)\*\*

	<p><b>Intermediate users / downstream</b></p> <ul style="list-style-type: none"> <li>EO downstream industry</li> <li>EO Big Data Analytics</li> </ul>	<p>Between <b>€7.6B and €10.6B</b> (€5.0B and €6.9B)</p>
	<p><b>Atmosphere &amp; climate</b></p> <ul style="list-style-type: none"> <li>Air quality and pollution monitoring</li> <li>Solar energy monitoring and forecasting</li> <li>Climate modelling</li> </ul>	<p>Between <b>€10.6B and €21.2B</b> (€7.1B and €14.2B)</p>
	<p><b>Land</b></p> <ul style="list-style-type: none"> <li>Crop monitoring</li> <li>Forestry protection</li> <li>Water resources management</li> <li>Wetlands monitoring</li> <li>CAP monitoring</li> <li>Ground elevation and ground motion monitoring</li> <li>Support to land mapping</li> </ul>	<p>Between <b>€28.1B and €61.1B</b> (€17.7B and €38.5B)</p>
	<p><b>Built environment</b></p> <ul style="list-style-type: none"> <li>Urban area monitoring</li> <li>Offshore wind renewable energy</li> <li>Oil &amp; gas infrastructure management</li> <li>Mining and quarrying: raw materials exploration and extraction</li> </ul>	<p>Between <b>€11.1B and €31.8B</b> (€7.3B and €20.6B)</p>
	<p><b>Marine &amp; ocean</b></p> <ul style="list-style-type: none"> <li>Coastal area monitoring</li> <li>Marine resources management</li> <li>Water quality monitoring</li> <li>Ice monitoring to support winter navigation/ship routing</li> <li>Maritime navigation</li> </ul>	<p>Between <b>€2.3B and €7.3B**</b> (€1.5B and €4.9B)</p>
	<p><b>Disasters &amp; geohazards</b></p> <ul style="list-style-type: none"> <li>Fire detection and monitoring</li> <li>Flood monitoring and forecasting</li> <li>Pandemic monitoring</li> </ul>	<p>Between <b>€25.4B and €44.5B</b> (€16.3B and €28.4B)</p>
	<p><b>Security</b></p> <ul style="list-style-type: none"> <li>Control of IUU fishing</li> <li>Maritime safety – Search &amp; Rescue</li> <li>Oil pollution monitoring</li> <li>Law enforcement and international crime</li> <li>EU borders surveillance</li> <li>Support to EU external action</li> </ul>	<p>Between <b>€7.5B and €14.7B</b> (€4.7B and €9.6B)</p>

\*not discounted in bold and discounted between brackets

\*\* The Marine & ocean thematic area does not include all applications related to marine activities (e.g. Search & Rescue or Oil pollution are in the Security thematic area)



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# Employment impact

→ Ensuring the continuation of Copernicus in the MFF 2021-2027 would have the following employment impact\* :



**Upstream employment** : about 12,000 job-years supported, which represents an average of **1700 permanent jobs** between 2021 and 2027. This comes on top of the 18,000 job-years supported between 2008 and 2020.



**Downstream employment:** between 27,000 and 37,000 job-years supported, which represents an average of **2100 permanent jobs** between 2021 and 2035.



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User Uptake

# The evolving landscape: technology

The (many) Digital and ICT Revolutions create new industries and business models

## Web 1.0



Web of Documents

*Read*

Intelligence via *searches*

## Web 2.0



Web of People

*Search, Tag, Collaborate*

Intelligence about *social networks*

## Web 3.0



Web of Data/Information

*Connect, Understand*

Intelligence by *connecting data and information*

DATAFICATION & VALUE GENERATION





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# The new Space race

- **The democratization of space**
  - 2000-3000 EO satellites to be launched by private sector by 2025
- **Venture capital investments into space in 2015 < €2 billion**
  - 95% was in the US while 1 out of 55 investments was in Europe.
- **90% of all data stores in the US**

**The *money* is not in the hardware or the data but in the business intelligence collected by the platforms**

**“when you interact with the data”**



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# How to match Copernicus and space data economy

- The Space Strategy for Europe recognizes the **importance of Space** for the **Digital Single Market**.
- It also acknowledges that the **potential of space solutions and data have not been fully exploited**.
- Need to:
  - **Boost demand**
  - **Facilitate access and use of space data and**
  - **Stimulate innovative solutions**
  - **Enhance skills, learning and knowledge transfer**



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# The Big Data: Challenges and Opportunities

## User Uptake

- Massive amounts of data
- Full, open and free-of-charge
- Ease of access and use



**Over 10 Petabyte/year of new data** with just Sentinels-1, -2 and -3 fully operational (data are downloaded many times over)

- ❑ Different types of **dissemination infrastructures**
  - **Data Governance**
- Member States Collaborative GS
- ❑ **New technology** developments
- ICT and EO **cross-fertilisation**
  - **Extreme Real Time Big Data Analytics**
  - **Deep Learning Capabilities (AI/ML)**
- ❑ **Interoperability** with non-EO datasets
  - **Data Lakes**
- Public programmes as enablers
- ❑ Growth and jobs in **downstream** sector
  - **User uptake**

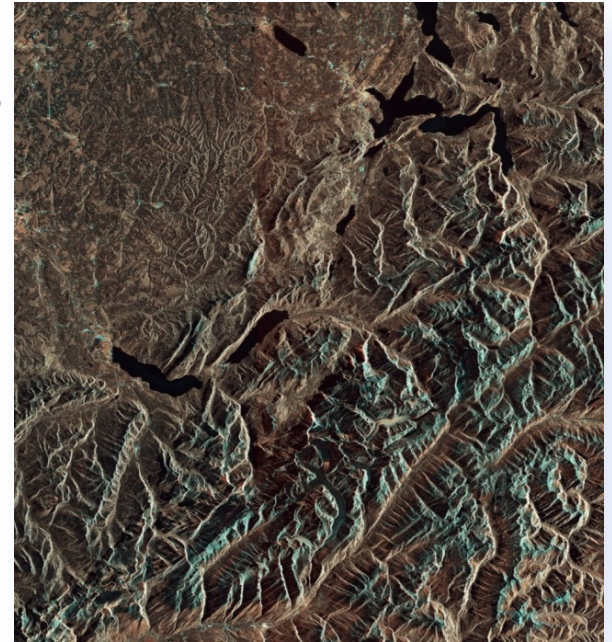


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# Copernicus Big Data approach

## Dual approach [risk management]:

1. Strengthening **Copernicus Distribution Services** for search, view, download
2. Setting up of **Data Access and Information Services (DIAS)**
  - **Access** to all Copernicus data and information virtually collocated with computing resources
  - Allowing Big Data **analytics** without the need to download the data and information
  - Allowing **data fusion with non-EO data** and information
  - **Bring together all user communities** (public authorities, research, commercial, ONG,...)



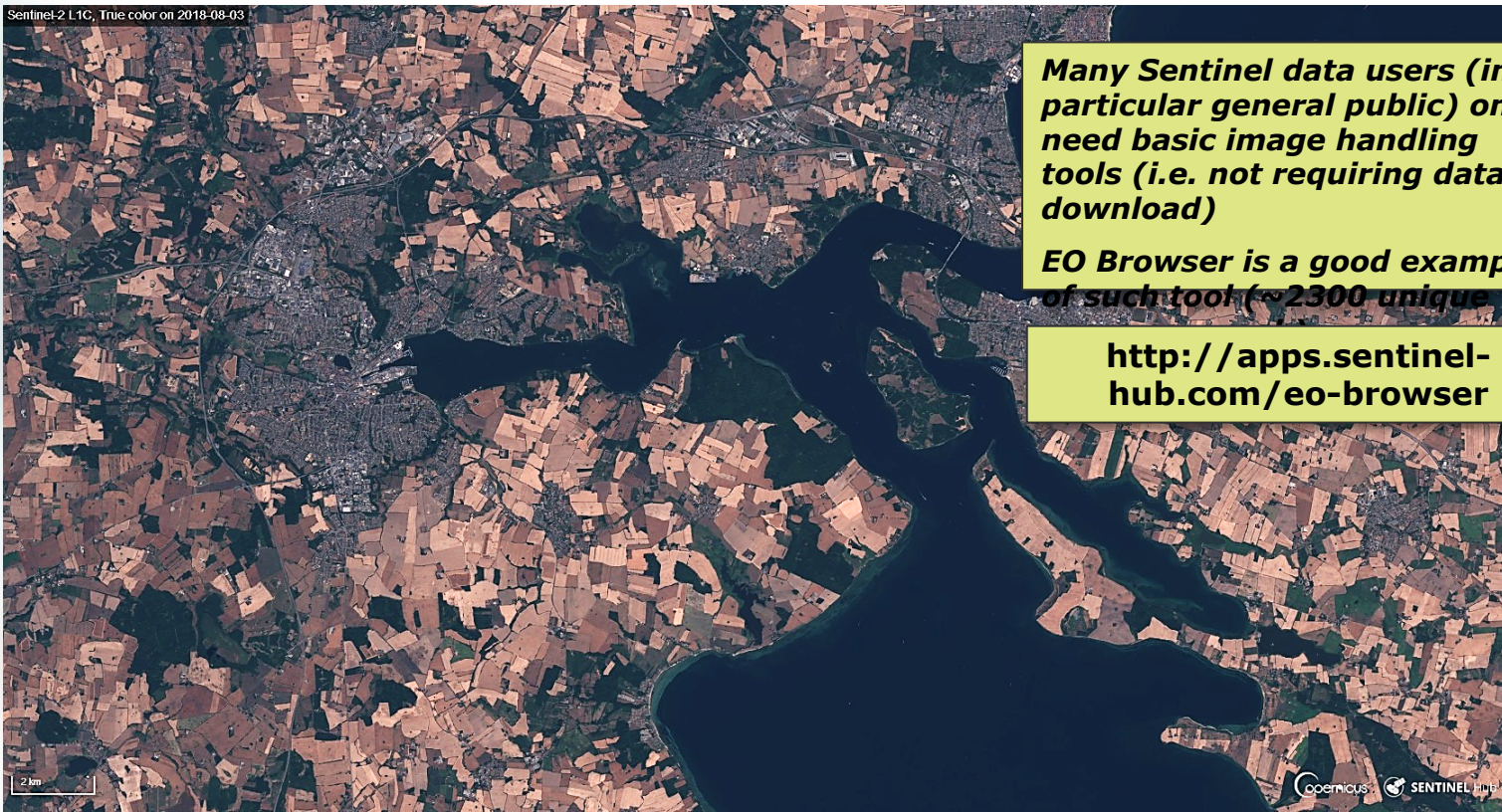
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# Sentinels Data Access – Image visualisation



**Many Sentinel data users (in particular general public) only need basic image handling tools (i.e. not requiring data download)**

**EO Browser is a good example of such tool (~2300 unique users)**

**<http://apps.sentinel-hub.com/eo-browser>**

**Sentinel-2  
Kolding, Denmark (3 August 2018)**



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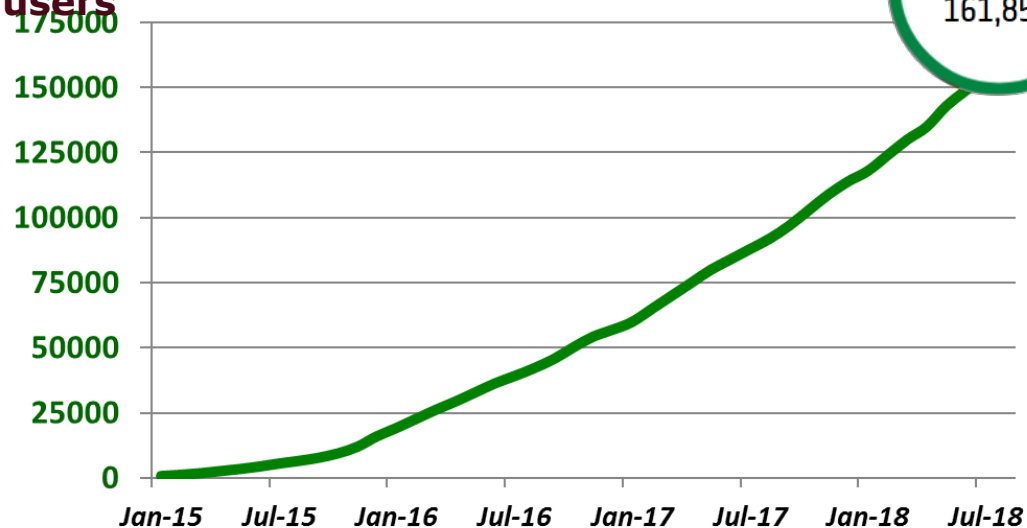
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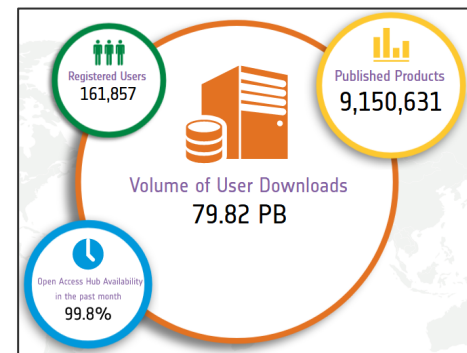
User Uptake

# Evolution of registered users on Sentinel Open Access Hub

Number of registered users



- sentinel-1a
- sentinel-1b
- sentinel-2a
- sentinel-2b
- sentinel-3a
- sentinel-5p



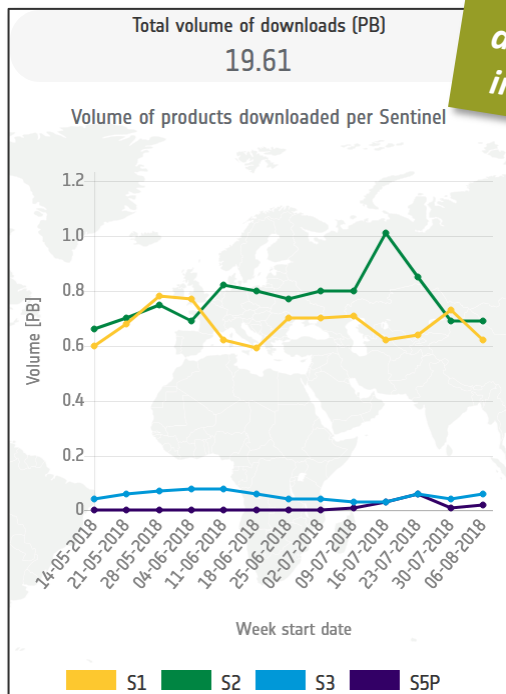
Statistics at mid-August 2018



# Sentinels Data Access – Open Access Hub

User Uptake

## Total volume of data volume on ESA Open Access Hub during *last 3 months*



20 PB  
downloaded  
in 3 months

Statistics of ESA Open Access Hub do not include active users downloading Sentinel data through :

- Eumetsat (Sentinel-3)
- Partners within national collaborative ground segment (in Europe)
- Partners within international ground segment (e.g. US or Australia)

Statistics of ESA Open Access Hub do not include active users using Sentinel data (without downloading products) through image visualisation and handling tools:

- "EO Browser" (see next slide)

Statistics at mid-August 2018



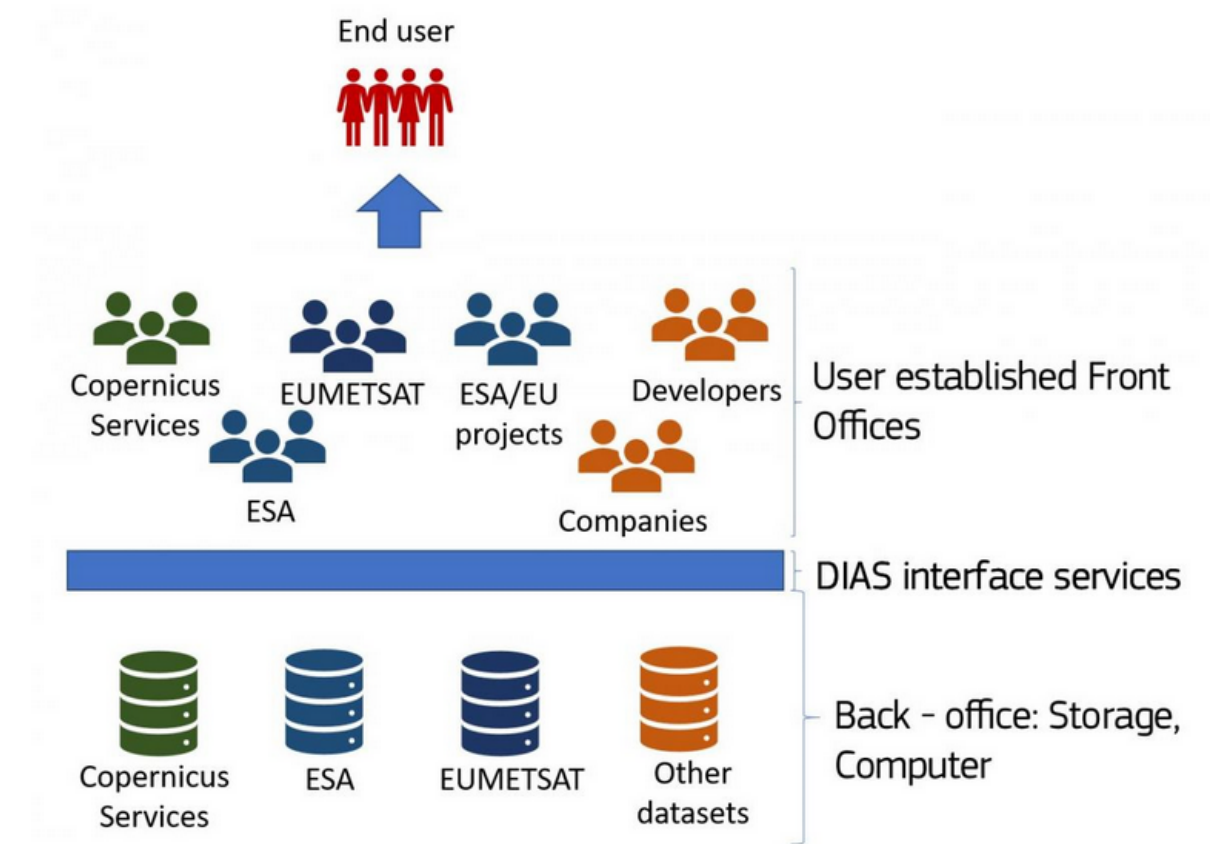
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# Government as an ecosystem enabler: DIAS platforms

User Uptake



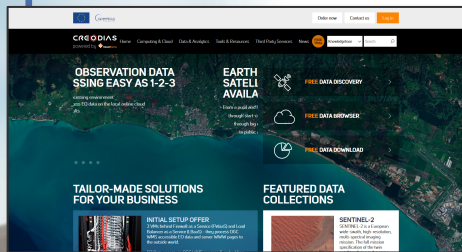


# Data & Information Access Services (DIAS)

User Uptake

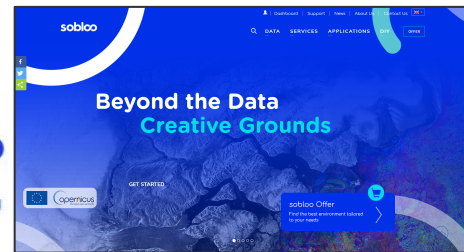
## THE DIAS & WHERE TO REACH THEM

[e.copernicus.eu/DIAS](http://e.copernicus.eu/DIAS)



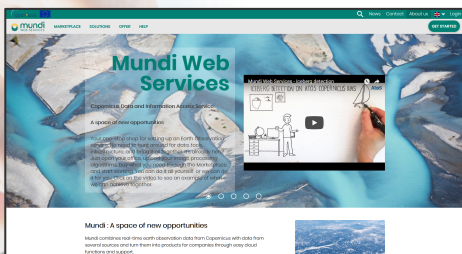
CREODIAS

[WWW.CREODIAS.EU](http://WWW.CREODIAS.EU)



sobloo

[WWW.SOBLOO.EU](http://WWW.SOBLOO.EU)



mundi  
WEB SERVICES

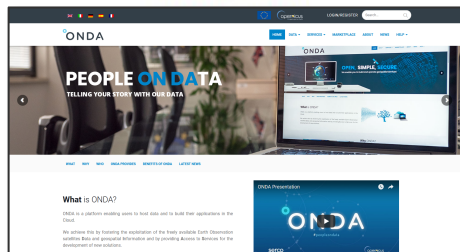
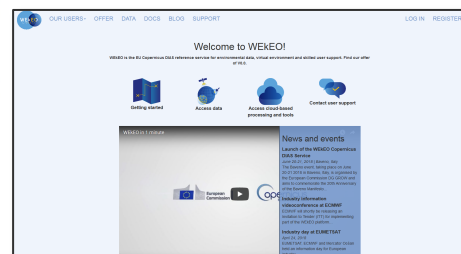
[WWW.MUNDIWEBSERVICES.COM](http://WWW.MUNDIWEBSERVICES.COM)

ONDA

[WWW.ONDA-DIAS.EU](http://WWW.ONDA-DIAS.EU)

WEKEO  
BY COPERNICUS

[WWW.WEKEO.EU](http://WWW.WEKEO.EU)



EUMETSAT

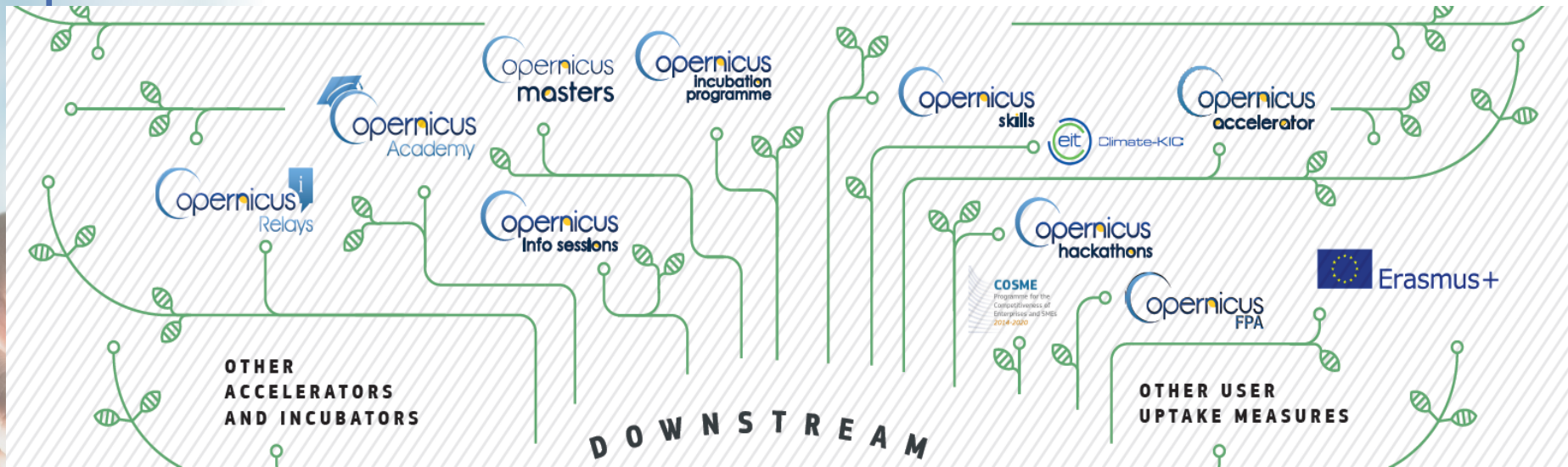


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# Government as an ecosystem enabler: users uptake actions

User Uptake



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## NEEDS & CHALLENGES OF THE SPACE DATA (GEO INFORMATION) SECTOR

- **The space sector** is experiencing innovations & changes bringing new companies, new business models and paradigms.
- **Space Strategy for Europe** (Oct 2016): "The potential of space solutions has not yet been fully exploited(...) The space sector needs to be better connected to other policies and economic areas."
- The space sector is a strategically important tool to realise the **Juncker Plan policy priorities**.
- The need of education and skilling of the young generation for the uptake of space data was highlighted by the **EU Competitiveness Council** since 2016.



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# Copernicus skills needs

- **KEY SKILLS**

- ✓ **Geomatics / geo-ICT**

- Use of satellite imagery and Copernicus data and information products
- Cartography and visualization
- Data Modelling, data Manipulation, data hybridation
- Geo-computation, geospatial data, GIS&T and society

- ✓ **Business and transversal skills**

- Management, accounting, marketing,
- Thematic knowledge (agriculture, forestry, climate change, raw materials, energy, constructions monitoring, water monitoring, security, smart cities, health, education, cultural heritage)

skills





# Copernicus Users Uptake Strategy (Skills focus actions)

- **Copernicus Start-up Programme:** Support to business development, start-up and SMEs (Copernicus Masters, Accelerator, Hackathon and Incubation Programme)  
<http://www.copernicus.eu/main/start-programmes>
- **Copernicus Skills programme:** skills and education building actions (innovation, entrepreneurship and data use) from/to universities/industry for the uptake of the Copernicus programme  
<http://www.copernicus.eu/main/skills>
- **Strong synergies with H2020** work programme 2018-2020
- **Framework Partnership Agreement (national initiatives)**
- **Research Users Support Service (RUS)** implemented by ESA



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## Copernicus skills programme "pilot actions"

- **E4GEO - Partnership for geospatial skills tools development**  
ERASMUS+ sectorial skills alliance - 4 ys project – 4 Mio € (JAN 2018)
- **Cooperation with EIT-KICs**
  - 1 grant - Climate KIC - "climathon" & summer school – 1 yr – 350k € (2017-18)
  - 1 grant - EIT Raw Material - postdoc scholarships – 1 yr – 250k € (2017-18)
  - 1 grant - EIT Raw Material - PhD prog., job placements – 3y – 1M € (2018-20)
- **COSME skills call 2017 for Copernicus (Tender process starts Q2 2018)**  
Awareness campaign & professions matching events in universities – 1y – 800k €
- **Copernicus Academy Network**  
Boosting a coordinated and synergic approach, best practices sharing between universities, research centers & national and local Copernicus stakeholders-users
- **Copernicus Relays Network** - hubs favoring business creation
- **User Uptake** through delegated entities  
(ESA< EUMETSAT< ECMWC<MERCATOR< EMSA)



# Copernicus Networks

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## Copernicus Relays

80 Relays  
33 countries  
4 continents

## Copernicus Academy

125 Academy members  
34 countries  
3 continents





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# Copernicus Masters

- **A competition for entrepreneurs, start-ups & students**, who develop applications based on Copernicus;
- **13 prizes**, worth €1.5 million (cash, business incubation, technical assistance...);
- **Evaluations of the winners 2018 are now ongoing**



Copernicus  
masters



## User Uptake

# Copernicus Hackathons

- A hackathon is a **sprint-like event** in which computer programmers and subject-experts collaborate intensively to develop software (in that case based on Copernicus data and services);
- Every year, the European Commission distributes 20 vouchers (20k) to organisations wishing to organise a Copernicus hackathon;
- 10 organisers have been selected in the first round. The first hackathons will be organised **at the end of September**.
- 2<sup>nd</sup> application phase is **open until 31 December 2018**



**Copernicus**  
hackathons



# Copernicus Incubation Programme

## User Uptake

- The European Commission finances the **incubation of 20 start-ups per year**;
- Each start-up receives 50K voucher to spend on **business development**;
- 1<sup>st</sup> applicaiton phase: 50 applications received, 7 start-ups selected
- 2<sup>nd</sup> phase being evaluated
- 3<sup>rd</sup> phase **open until 16 November 2018**



## SPACE DATA EU-WIDE PARTNERSHIP: “EO4GEO”

- **Space data (geo information)** was one of the **6 sectors** covered by the *Blueprint Lot 3* of the **Erasmus+ Sector Skills Alliances** call 2016.
- The **EO4GEO partnership 4 years project** results from the LOT3 call objectives:
  - *Translate the sectoral growth strategy for the next 5-10 years into changes in job profiles and identification of skills needs.*
  - *Develop concrete solutions, e.g. design and contribute to delivering new curricula, promote relevant sectorial qualifications and certifications.*
  - *Analyse EU funding opportunities (e.g. European Structural Funds, European Fund for Strategic Investment, Erasmus+, sectoral programmes), and develop models to promote their focused use.*
  - *Scale up successful projects and best practices.*

[https://ec.europa.eu/growth/content/new-skills-agenda-blueprint-sectoral-cooperation-skills-1\\_is](https://ec.europa.eu/growth/content/new-skills-agenda-blueprint-sectoral-cooperation-skills-1_is)



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## SPACE DATA EU-WIDE PARTNERSHIP: “EO4GEO”

- EO4GEO gathers **26 partners** from 12 countries from academia, private and public sector active in the education/training and space/geospatial sectors.
- Many of them are **Copernicus Academy and Relays Networks members**.
- The Consortium is supported by a strong group of **associated partners (22)** mostly consisting of associations or networks active in the same fields, and an Advisory Board of individual experts. This **network of networks** has been established in view of the Erasmus+ Sector Skills Alliance call and reflects the complex space/geospatial ecosystem.

- <http://www.eo4geo.eu/partnership/>





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# SPACE DATA EU-WIDE PARTNERSHIP: “EO4GEO”



## ➤ E4GEO Objectives



### EO/GI BODY OF KNOWLEDGE

EO4GEO will develop a commonly agreed Body of Knowledge (BoK) describing an **ontology for the space/geospatial domain** that can be permanently updated by making use of a set of collaborative tools



### EO/GI CURRICULA

A series of curricula carefully designed, discussed and agreed upon within the community, linked to a series of **occupational profiles** in the sector making use of the BoK and other competency frameworks



### EO/GI COURSES

A portfolio of VET training modules based on **existing training materials or newly developed ones** and a case-based learning method that is applicable for different scenarios and in any sub-sector of the space/geospatial domain



### TRAINING ACTIONS

A series of training actions for different case-based learning scenarios in the sub-sectors **‘integrated applications’, ‘smart cities’ and ‘climate change’** including group work and internships making use of collaborative methods and tools

# Copernicus ECOSYSTEM workshop coming

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# Copernicus Relays and Academy assembly coming

A central graphic for the Copernicus event. It features the word 'Copernicus' in a large, blue, sans-serif font with a yellow dot over the 'i'. Below it, the dates '10 and 11 October 2018' and the location 'in Brussels' are written in a smaller, dark blue font. The background is white with a green vine-like structure that branches out, ending in various circular icons representing different sectors: a classical building, a leaf, a shield, a bar chart, a factory, a microscope, a group of people, a satellite, and a globe. A hand is visible on the left side, pointing towards the graphic.

**Copernicus**  
10 and 11 October  
2018  
in Brussels



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**Copernicus**  
Europe's eyes on Earth



# THANK YOU

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