The Copernicus space data ecosystem

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Copernicus EU
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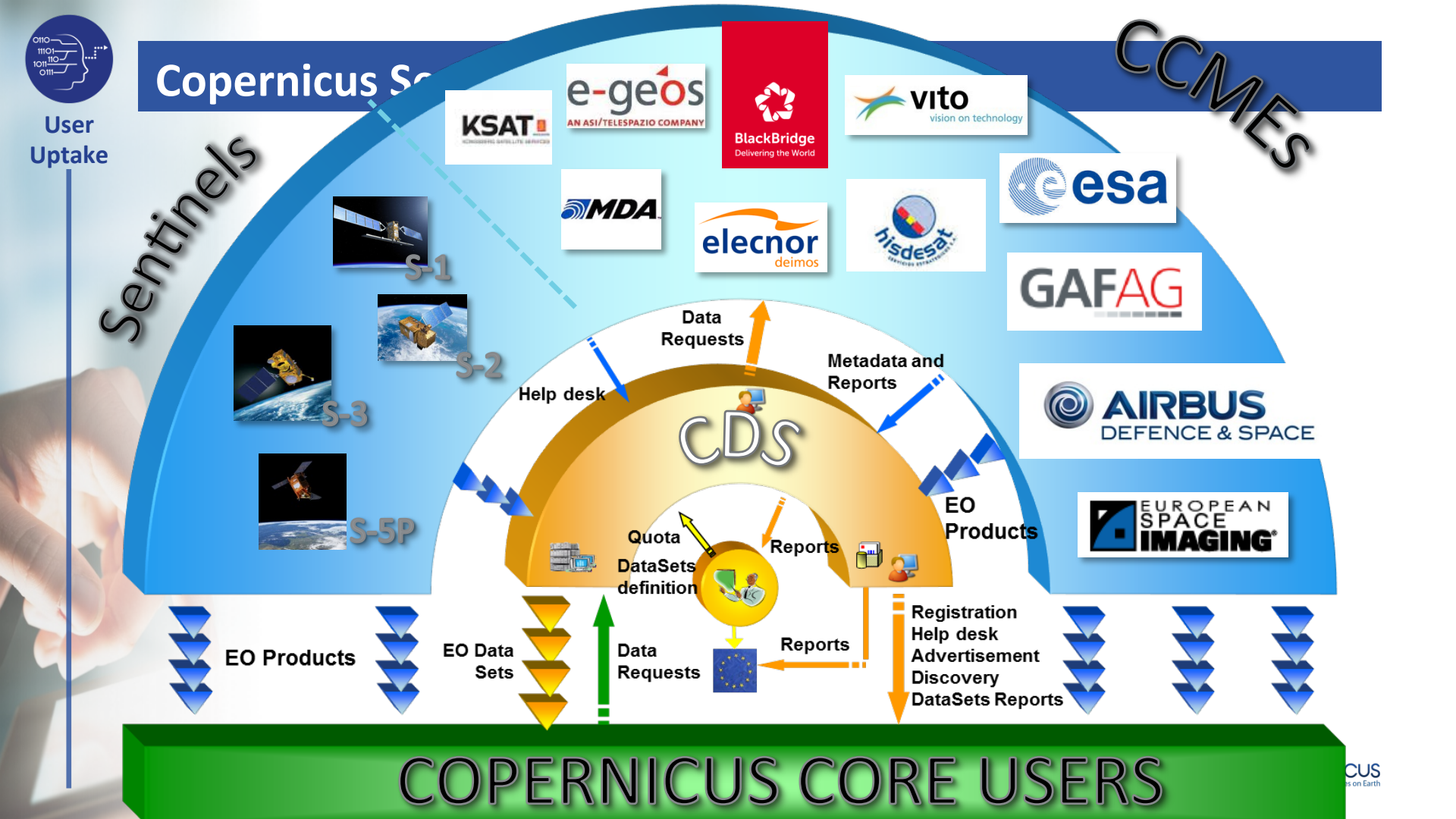
Space

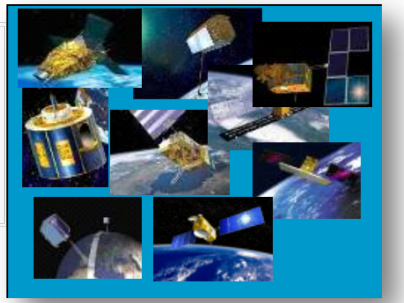
Europe's eyes on Earth


User Uptake
Copernicus Sa
CCMES
Sentinels
KSAT
e-geos
AN ASI/TELESPAZIO COMPANY
BlackBridge
Delivering the World
vito
vision on technology
MDA
elecnor
deimos
hisdesat
esa
GAFAG
AIRBUS
DEFENCE & SPACE
EUROPEAN SPACE IMAGING
S-1
S-2
S-3
S-5P
Data Requests
Help desk
Metadata and Reports
CDS
EO Products
Quota
DataSets definition
Reports
EO Products
EO Data Sets
Data Requests
Reports
Registration
Help desk
Advertisement
Discovery
DataSets Reports
COPERNICUS CORE USERS

COPERNICUS OVERVIEW

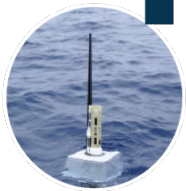
User Uptake

6 services use Earth Observation data to deliver …



Sentinels

Data access



in-situ

…added-value products

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User Uptake

COPERNICUS CORE USERS

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

User Uptake

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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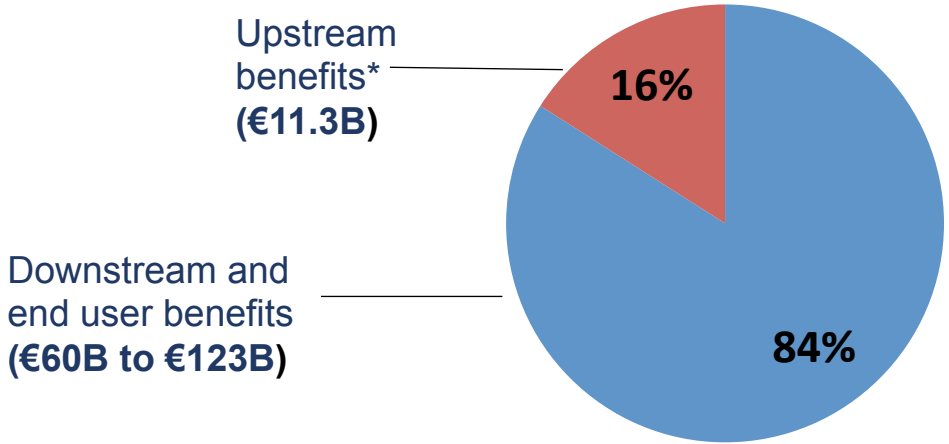
User Uptake

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.

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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.**
  - ✓ C02 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)**
Intermediate users / downstream • EO downstream industry • EO Big Data Analytics	Between **€7.6B** and **€10.6B** *(€5.0B and €6.9B)*
Atmosphere & climate • Air quality and pollution monitoring • Solar energy monitoring and forecasting • Climate modelling	Between **€10.6B** and **€21.2B** *(€7.1B and €14.2B)*
Land • Crop monitoring • Forestry protection • Water resources management • Wetlands monitoring • CAP monitoring • Ground elevation and ground motion monitoring • Support to land mapping	Between **€28.1B** and **€61.1B** *(€17.7B and €38.5B)*
Built environment • Urban area monitoring • Offshore wind renewable energy • Oil & gas infrastructure management • Mining and quarrying: raw materials exploration and extraction	Between **€11.1B** and **€31.8B** *(€7.3B and €20.6B)*
Marine & ocean • Coastal area monitoring • Marine resources management • Water quality monitoring • Ice monitoring to support winter navigation/ship routing • Maritime navigation	Between **€2.3B** and **€7.3B**** *(€1.5B and €4.9B)*
Disasters & geohazards • Fire detection and monitoring • Flood monitoring and forecasting • Pandemic monitoring	Between **€25.4B** and **€44.5B** *(€16.3B and €28.4B)*
Security • Control of IUU fishing • Maritime safety – Search & Rescue • Oil pollution monitoring • Law enforcement and international crime • EU borders surveillance • Support to EU external action	Between **€7.5B** and **€14.7B** *(€4.7B and €9.6B)*

*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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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**

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**

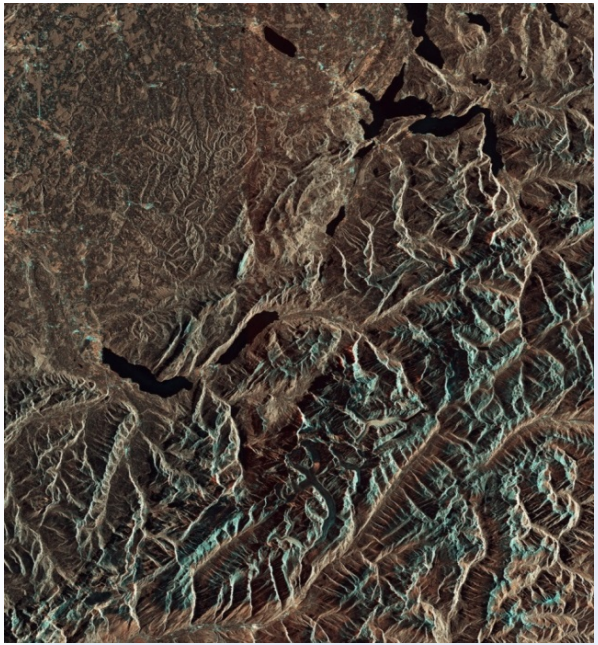
User Uptake

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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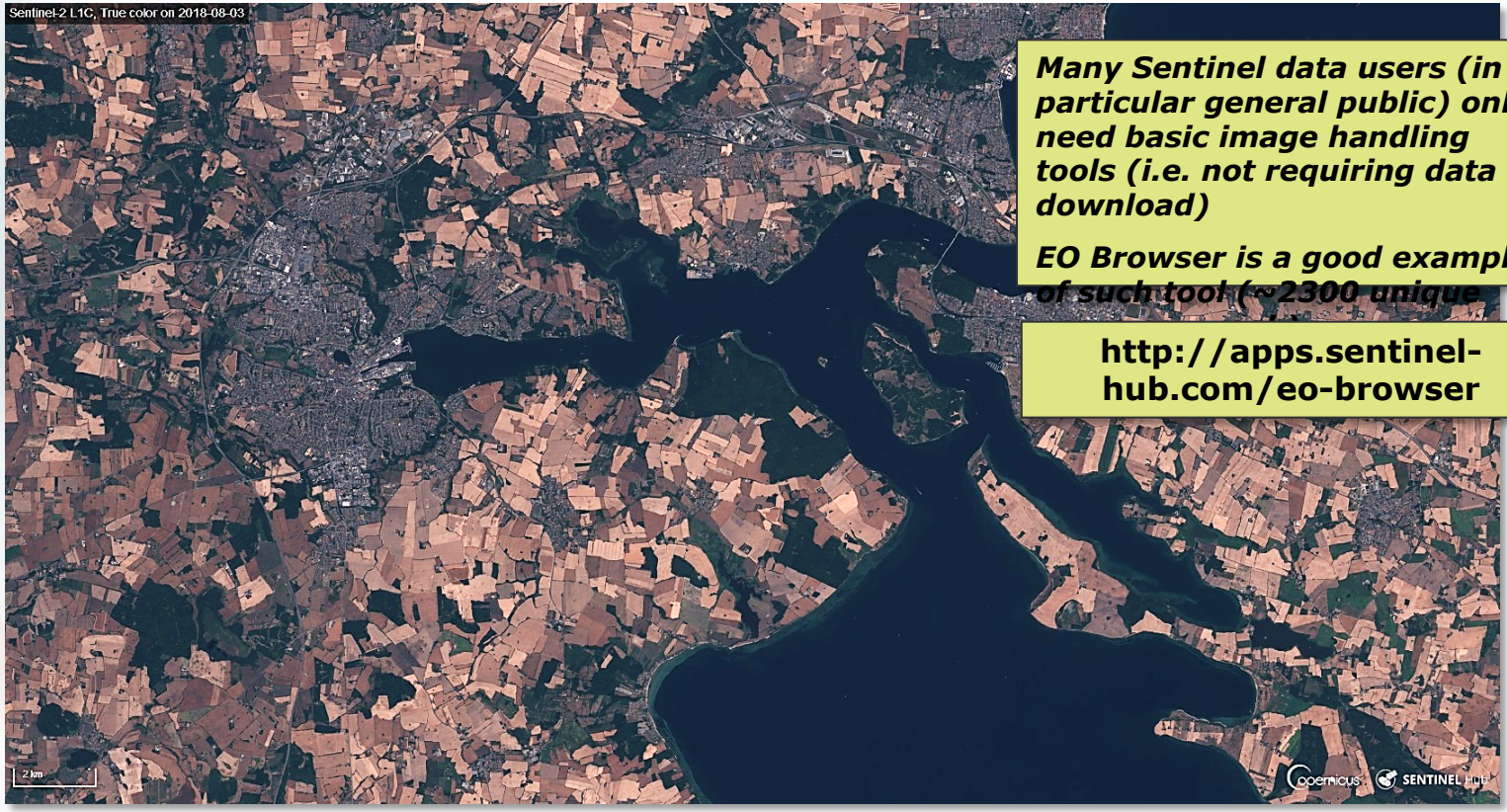
User Uptake

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

http://apps.sentinel-hub.com/eo-browser

Sentinel-2
Kolding, Denmark (3 August 2018)

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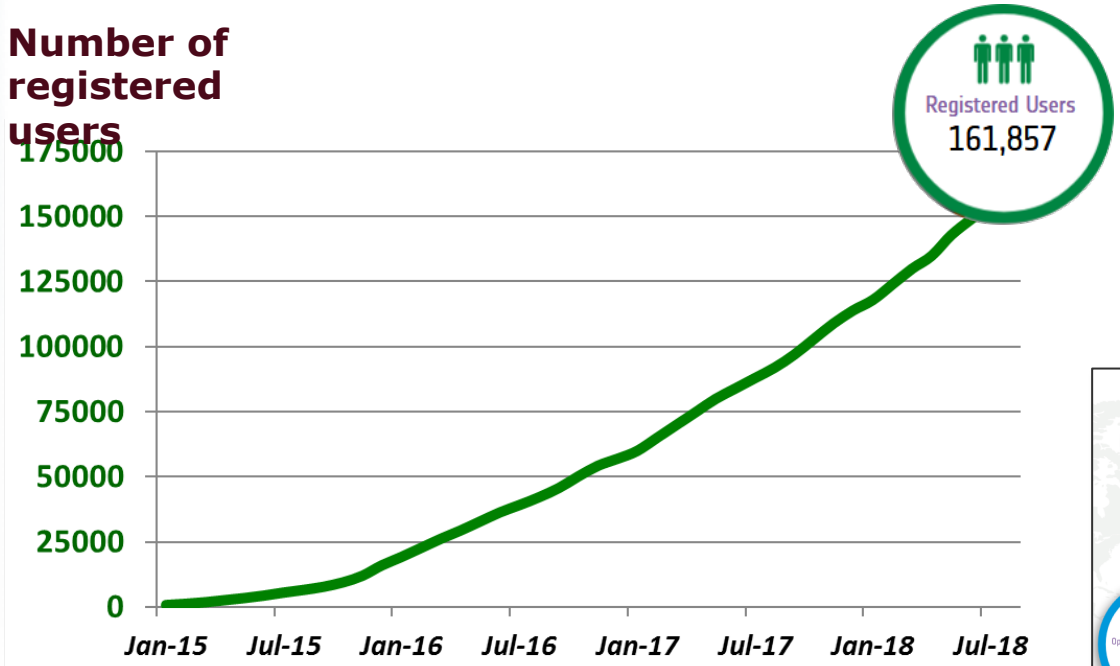
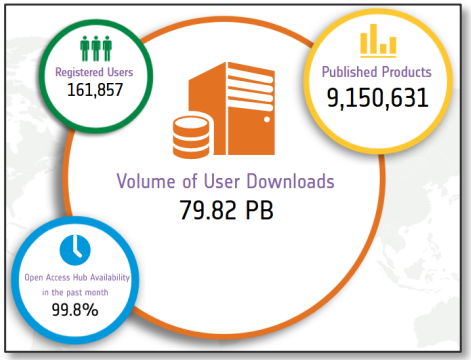
User Uptake

Evolution of registered users on Sentinel Open Access Hub



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



Statistics at mid-August 2018

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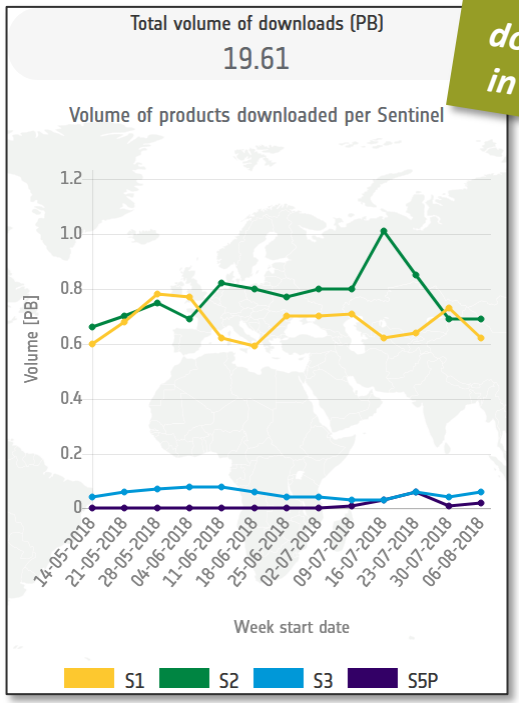
Sentinels Data Access – Open Access Hub

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 <u>downloading</u> 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 <u>using</u> 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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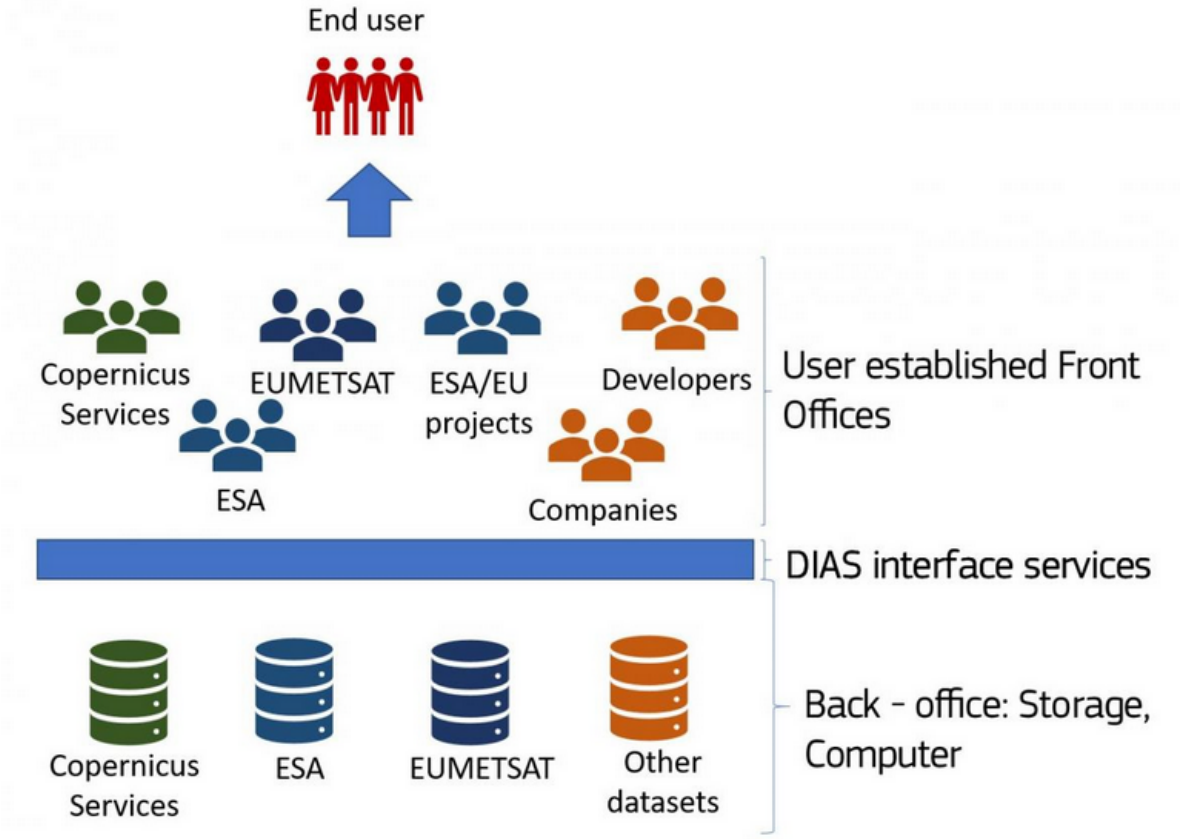
User Uptake

Government as an ecosystem enabler: DIAS platforms



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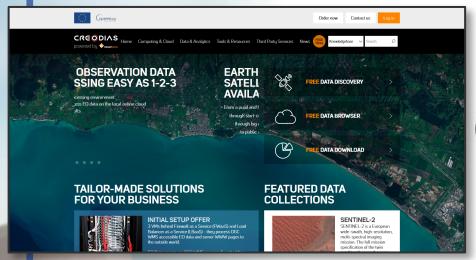
Data & Information Access Services (DIAS)

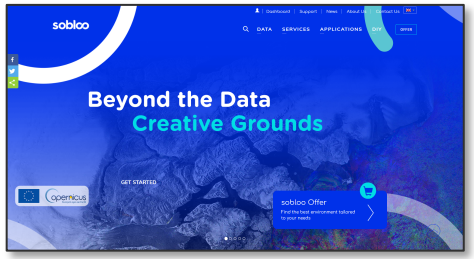
User Uptake

e.copernicus.eu/DIAS

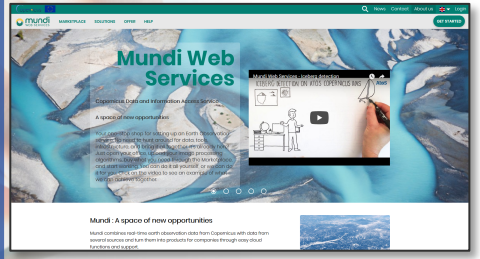
THE DIAS & WHERE TO REACH THEM



CREODIAS
WWW.CREODIAS.EU

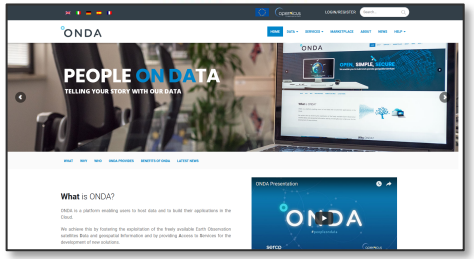


sobloo
WWW.SOBLOO.EU

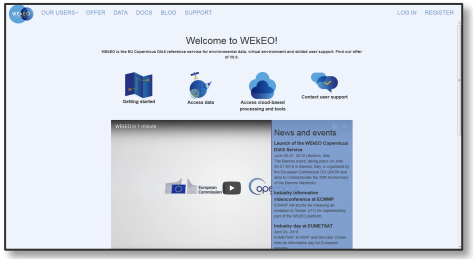


mundi WEB SERVICES
WWW.MUNDIWEBSERVICES.COM

ONDA
WWW.ONDA-DIAS.EU



WEkEO
WWW.WEKEO.EU



EUMETSAT

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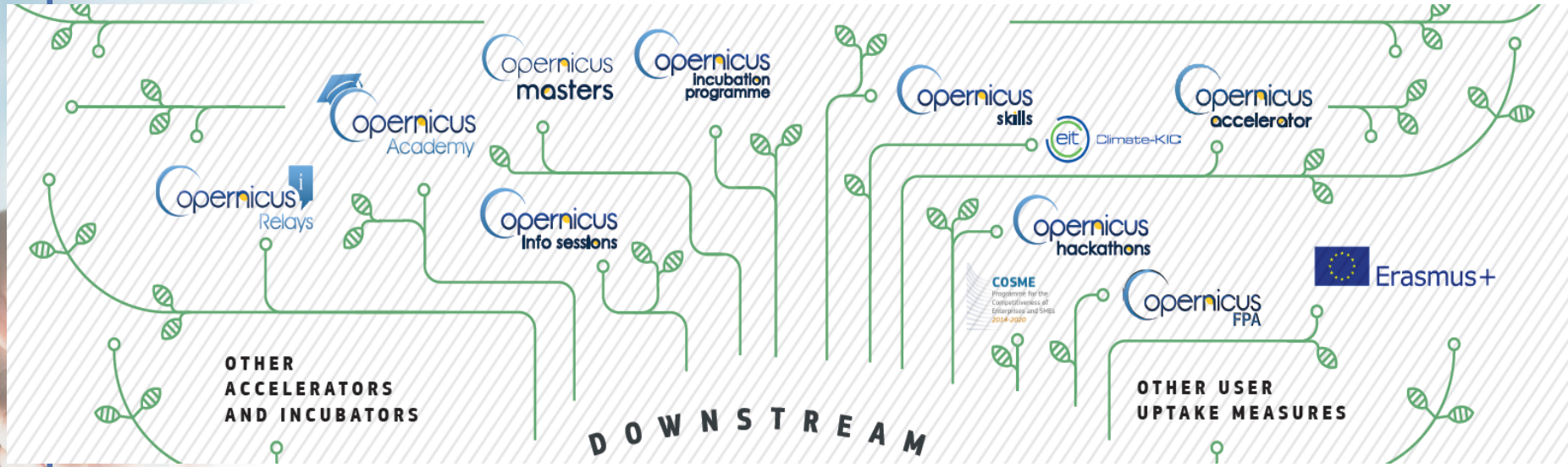
Government as an ecosystem enabler: users uptake actions

User Uptake



Copernicus

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

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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

User Uptake

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)

User Uptake

Copernicus Networks

Copernicus Relays

80 Relays
33 countries
4 continents

Copernicus Academy

125 Academy members
34 countries
3 continents

User Uptake

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

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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**.
- 2nd application phase is **open until 31 December 2018**

Copernicus hackathons

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Copernicus Incubation Programme

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

Copernicus incubation

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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

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/**

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

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Copernicus ECOSYSTEM workshop coming

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Copernicus Relays and Academy assembly coming

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THANK YOU

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